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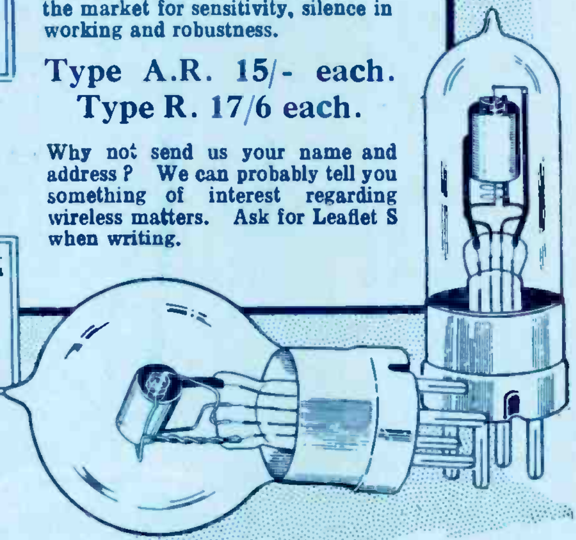

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No. 500.

No. 501.

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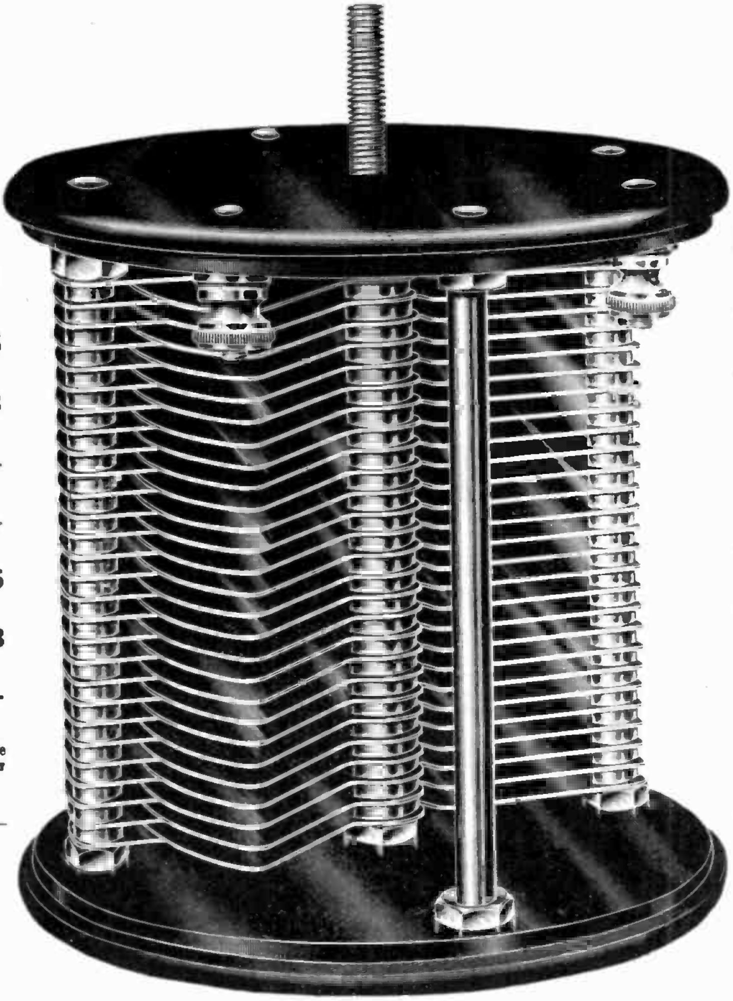

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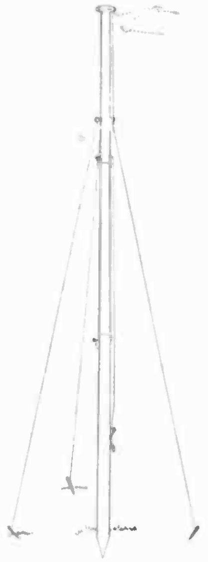

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THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN
A MAGAZINE DEVOTED TO WIRELESS TELEGRAPHY AND TELEPHONY

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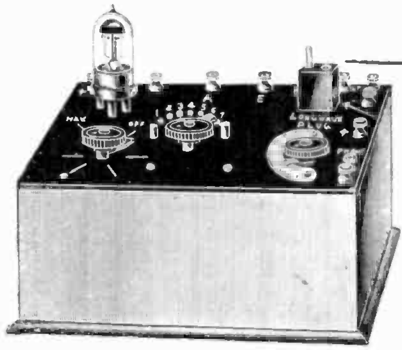

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THE WIRELESS WORLD AND RADIO REVIEW

THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GT. BRITAIN

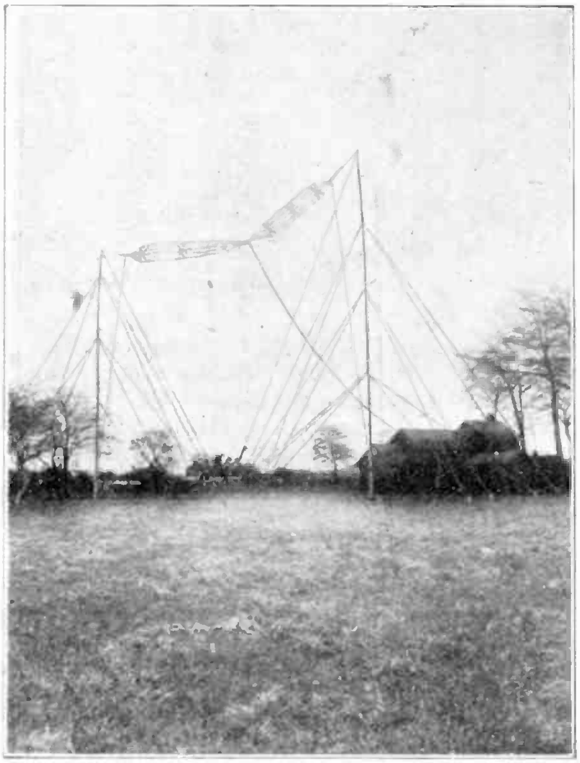
No. 185 [No. 22. Vol. XI.] MARCH 3rd, 1923. Weekly

"5 MS."

THE TRANSMITTING STATION OF THE MANCHESTER WIRELESS SOCIETY.

ONE has heard a good deal recently of the reception in this country, often with inferior or indifferent apparatus, of the transmissions of American amateurs. It is now reported that 5 MS (the C.W. transmitter built and operated by members of the Manchester Wireless Society) has been received in Pittsburg, U.S.A. Below is a copy of a letter from Pittsburg reporting the reception of signals.

(*Copy of letter addressed to Mr. F.H. Schnell, Traffic Manager, American Radio Relay League, from J. B. Westervelt and J.H. Leighmer.*)



The aerial. It is 80 ft. high and the masts are 120 ft. apart.

Radio 8 ZD.
5306, Westminster Place,
Pittsburg, Pa.
December 12, 1922.

Mr. F. H. Schnell,
Hartford, Ct.

My Dear Mr. Schnell,

I have just learned from Mr. John Leighmer, operator JL of this station and operator of station 8 ALF, that he received signals from a British station signing 5 MS. He gives the time as 0511 G.M.T., December 10th, and says signals were heard until about 0514 G.M.T.

The station sounded like D.C., but was broken up, giving the effect of rectified 25 cycle A.C. QSS was medium, he says.

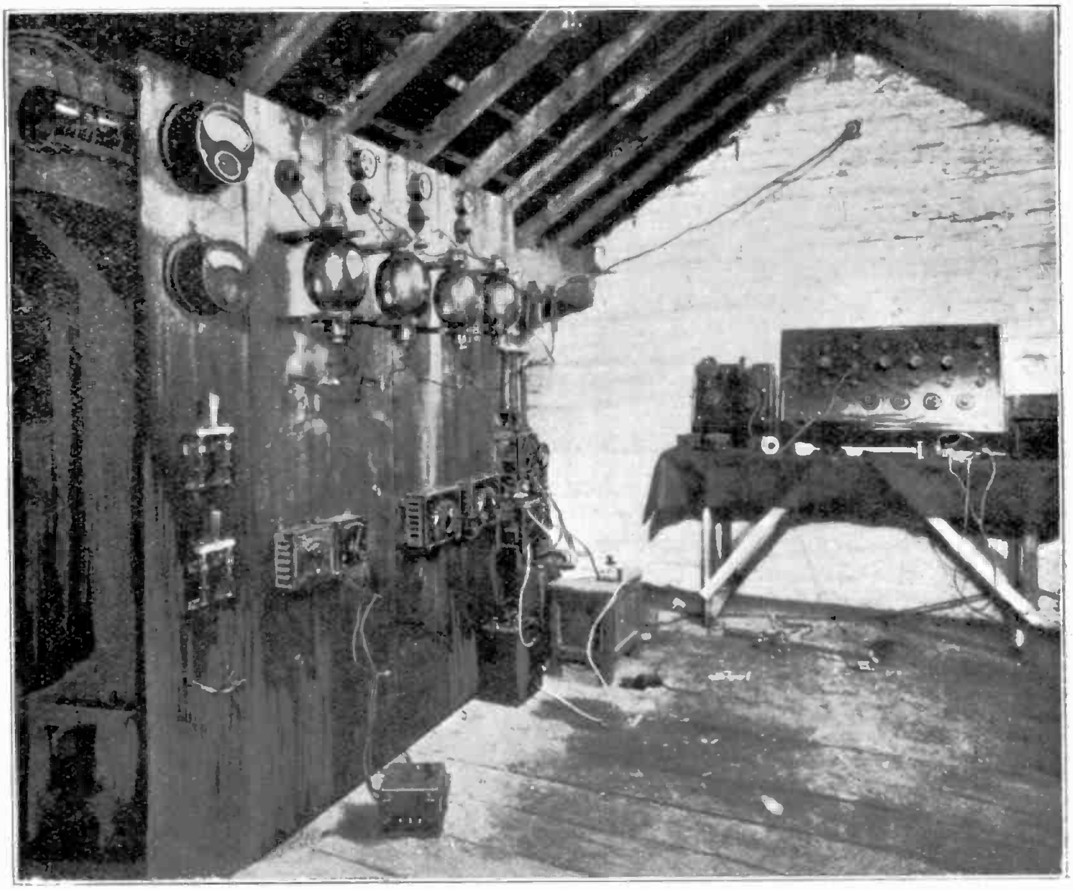
Wavelength of about 270 metres.

I regret the delay in forwarding this information, and trust that it will be of interest to those concerned.

Very truly yours,
J. B. Westervelt (WX).
John Leighmer (JL).

One Manchester amateur has reported having heard American amateurs discussing by wireless telephony the reception of the signals transmitted from 5MS.

When these reports are confirmed Manchester Wireless Society may stand credited



The Transmitting and Receiving Apparatus.

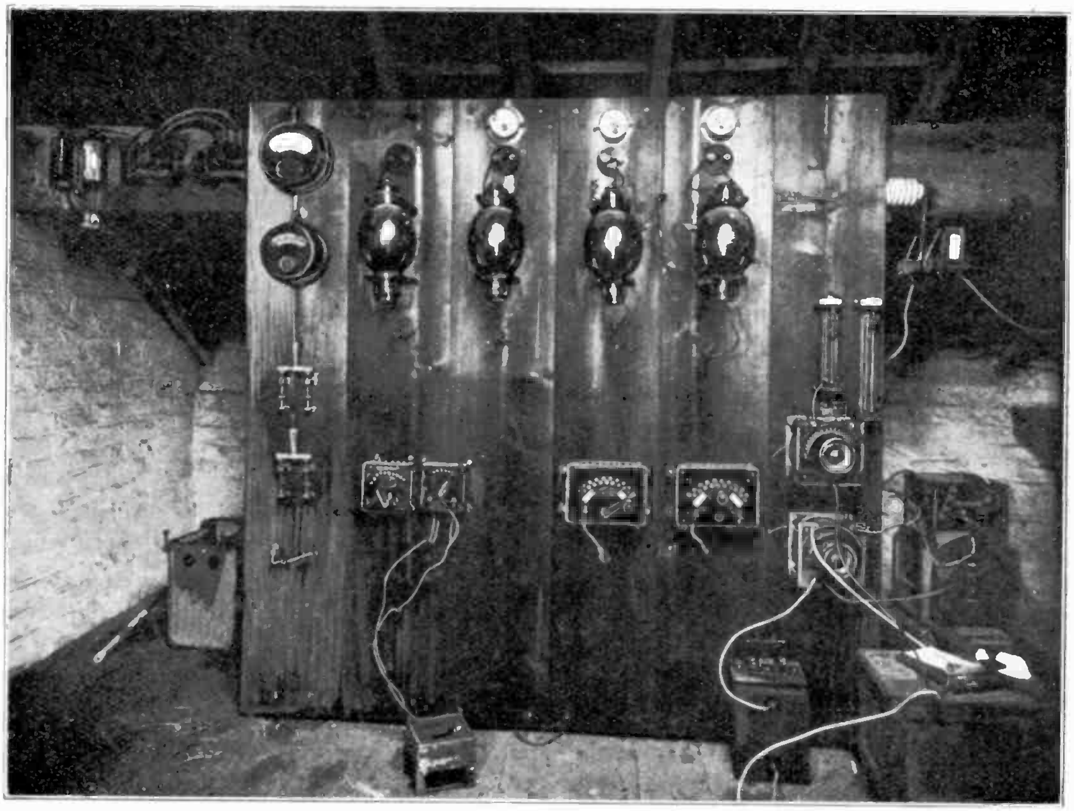
with being the first to have their transmissions received in America, and so it is thought a short discussion of the transmitting apparatus will be of interest.

It is pointed out here that credit should not be given so much for the actual transmission and reception of the signals as for the obstacles and difficulties which have been overcome before the station could be built at all, the chief difficulty being the electric supply, which is 100 volts 80 cycles, single phase. Lack of funds made it impossible to purchase suitable transformers for this periodicity, so recourse had to be made to the nearest available apparatus. The 100 volt 80 cycle mains, supply energy to the high tension transformer, rectifier filament transformer, and power valve filament transformer. Each transformer is provided with a centre tap. The high tension transformer is rated at 200 watts, 100 volts to 10,000 volts, 50 cycles. The primary energy dealt with is something less than 1 kW., so that the transformer is seriously overloaded. The approximate voltage between the centre tap and the anodes of the rectifying valves is 5,000. " U3 " type rectifying valves are used, a voltmeter being connected across each filament.

It is obvious that, given an ample supply of current, an efficient filter system should be employed, but this has to be sacrificed so as to eliminate loss in chokes, the result being, probably, not pure C.W., which point was reported upon by the American amateurs who received the transmissions. The oscillating circuit comprises two " T 450 " valves, a tuned grid circuit, and a direct coupled aerial. The direct current high tension is connected across a condenser, which is joined in the foot of the aerial system and passes to the anode of the two valves in parallel from the A.T.I. and anode tap. The anode tap is variable to secure the best efficiency. The earth is connected with the centre points of the filament transformers, and to the grid circuit. The grid circuit comprises a coil coupled with the A.T.I., and is tuned with a small variable condenser, the vanes of which are widely spaced to withstand the voltage. The grid condenser and leak are both variable and the key is arranged to connect or disconnect the grid leak with the grid condenser. Additional cells up to about 70 volts are connected to provide more negative on the grids of the valves.

Contrary to usual ideas about a direct coupled aerial not being conducive to sharp tuning, it was found in this instance that the reverse result was obtained owing to every part of the circuit being variable, enabling very critical adjustments to be made. This point was particularly and favourably reported upon by a good many members of the wireless fraternity. The aerial is of the sausage type, connected "T" fashion. The horizontal cage comprises six wires arranged round suitable hoops, and is supported between masts 80 feet high and 120 feet apart. The lead-in is also in the form of the six wires spaced round the small loops, and is taken from the electrical centre of the aerial.

The earth consists of a number of wires buried in the ground at water level, and run the whole length of the aerial. When the set is properly adjusted, the aerial ammeter connected in the aerial circuits reads 9 amperes, which is considered very good, observing that the actual input is less than 1 kW. This particular circuit when being experimented with previous to the actual tests, and using the same apparatus, but with a D.C. supply of 2,500 volts, registered an aerial current of 12 amps., with an input of 1 kW. It has been decided to continue tests each Sunday, using alternate stations 5 MS and 5 MT, until further notice. Any reports will be appreciated, and should be forwarded to the Hon. Secretary, Manchester Wireless Society, 2,



Another view of the Transmitter. The mounting of the components permits of ample spacing and easy access to the high tension equipment which is assembled behind.

Parkside Road, Princess Road, Manchester, stating particulars of receiver, strength and characteristics of signals. The wavelength will be as near 200 metres as possible.

The thanks of the Society are due to the Marconi-Osram Valve Company, and the Mullard Radio Valve Company, for the loan of the transmitting valves. Also to Messrs, Burndept, Ltd., for the advice given on various technical points. Mr. J. H. Brown, Vice-President of the Society, made success possible by providing the best facilities as regards accommodation for the complete station.

Notes on Rectified A.C. for Plate Circuits.

By Mortimer A. Codd.

WHILE carrying out investigations on electrolytic rectifiers during the past twelve months, certain experiments were tried with the view to employing rectified A.C. to feed the plate circuit of one or more valves.

In the first place it was necessary to ascertain the order of the current flowing in the circuit using the normal type of reception valves.

The current from a 50-volt dry battery in good condition was passed through a standard laboratory Weston milliammeter.

Using up to seven valves, the current varied from 1 to 2 millamperes per valve, thus with three H.F., one rectifier and two L.F. valves the current used was from 8 to 12 milliamperes.

This experiment is most instructive, the variation in current with the different conditions of tuning, etc., being most illuminating.

As the current required is so minute, quite a small rectifying cell will suffice. Fig 1 gives a diagram from which it will be seen that the "middle point" method of connection is employed.

Fig. 2 is an oscillograph of the voltage curve taken directly over the rectifier. It will be noticed that the lowest point of the rectified wave is considerably above the zero line. This is due, possibly, to the capacity of the aluminium electrodes which even when small have a very considerable capacity.

The writer suggests this property may adventitiously aid in smoothing the resultant current when passed through the series choke coil.

In measuring the current at this point it should be borne in mind that the usual moving coil instrument cannot be used since the current is pulsating and the instrument therefore itself acts as a very efficient choke.

In this case a Paul vacuo-junction thermal milliammeter was used.

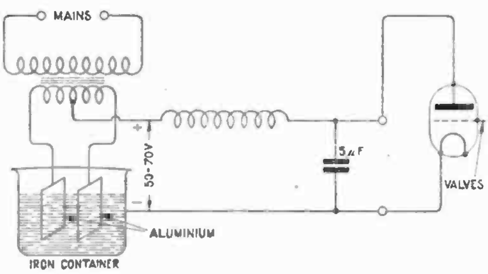


Fig. 1. The Electrolytic Rectifier and smoothing circuit.

In order to smooth out the rectified current a choke was inserted in series as shown in the diagram, the value of the self induction being of the order of 25 henries. Probably two smaller chokes, one inserted in each leg, would give better results, besides presenting a more symmetrical arrangement.

The condenser, as shown, was very necessary, the value being varied on trial from 0·1 to 10 microfarads.

Quite good results were obtained with 0·5 microfarads, but 5 microfarads gave perfect results. Fig. 3 is an oscillograph of the voltage curve of the filtered wave, so near to

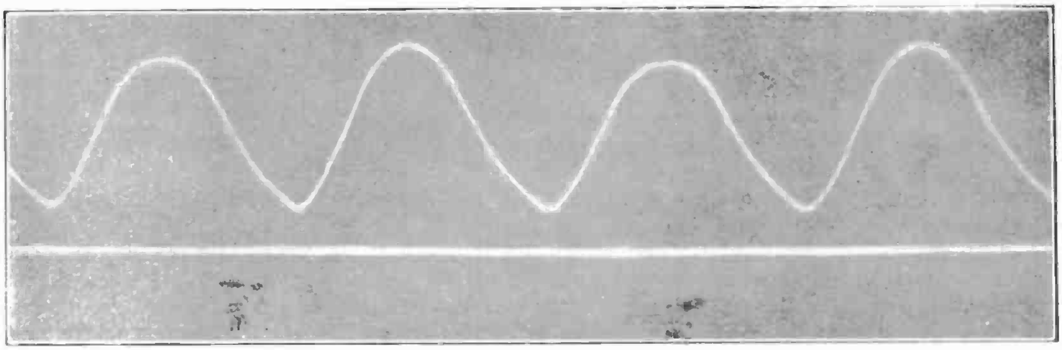


Fig. 2. Voltage as derived from the Rectifier with a 50 cycle supply.

continuity as barely to be distinguishable from a straight line.

Both Figs. 2 and 3 are voltage curves, and are so similar to the corresponding current curves which were also taken that their reproduction is unnecessary.

This system seems to present certain advantages not only for reception, but for transmission. Further, by employing a coarse winding on the transformer it would be possible to charge the filament batteries also or even to dispense with them altogether.

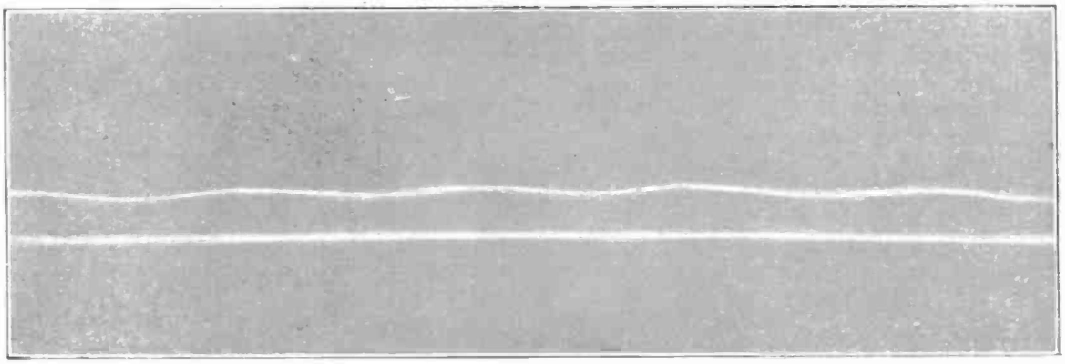


Fig. 3. Voltage after passing Rectifier and smoothing choke and condenser. Frequency 50 cycles.

Illegal Use of Wireless Apparatus

The announcement which has recently appeared in the daily press of the first prosecution by the Post Office of a person using a wireless receiving set without a licence will not come as a surprise to readers of this journal. In these pages, the necessity of keeping within the law has been persistently pointed out, and even at a time when it was becoming very difficult for those desiring to conduct experiments to obtain the necessary experimental licence, an endeavour to meet the difficulties was made in an article which appeared on page 394 in the issue dated December 23, 1922. In this article, the issue of an additional type of licence for those who desired to make up their own sets was advocated for the first time. It was of interest to note that very shortly after this article had appeared, the Post Office did actually start to authorise the making up of receivers from components, thereby introducing just such an additional type of licence as had been suggested.

The importance of obtaining a licence before using wireless apparatus, and making quite certain that the licence obtained is one applicable to the type of apparatus, is a matter which the wireless societies in particular are in a special position to impress upon those who, being new to the subject, may be unacquainted with the existing conditions.

Semi-Aperiodic H.F. Transformers

By J. H. REEVES, M.B.E.

(*Continued from page* 684 *of previous issue.*)

IN a footnote in the first part of this article attention was drawn to the changes in optimum wavelength produced by various types of panel and valves, hence the three panels will be described on which these transformers have been tested.

Panel A.—A photograph of this appears in Fig. 8, and the scheme of its wiring in Fig. 9. It will be noted that low capacity has been the aim throughout.

Panel B.—This is identical in layout and wiring except that ordinary R type, four-pin valves are used.

Panel C.—This belonged to a friend, and was arranged for valve socket transformers, disc type, with variable condenser tuning across each primary.

As illustrating the great differences it may here be said that suitable transformers for the broadcasting band were found to have 350, 250, 110, turns in the primary respectively on A, B, and C.

The size of wire finally selected, as well as the 4¼ ins. standardised length, were chosen as results of measurements made on the experimental panel, and are therefore most suitable for panel B. Modifications have been necessary to suit panel A. The choice of gauge is determined by two considerations (1) if too fine it is hard to wind evenly; (2) if too large transformers for longer wavelengths become unwieldy. Tests have been made with wires running from 40 to 47 S.W.G., double and single silk covered, the final choice being 45 S.W.G., D.S.C., constantan wire supplied by the Concordia Electric Wire Company, and sometimes for the secondaries 42 S.W.G., S.S.C. copper. The H.R. wire winds 185-190 turns to 1 in., and on panel B 600 turns, primary and secondary, gave excellent results

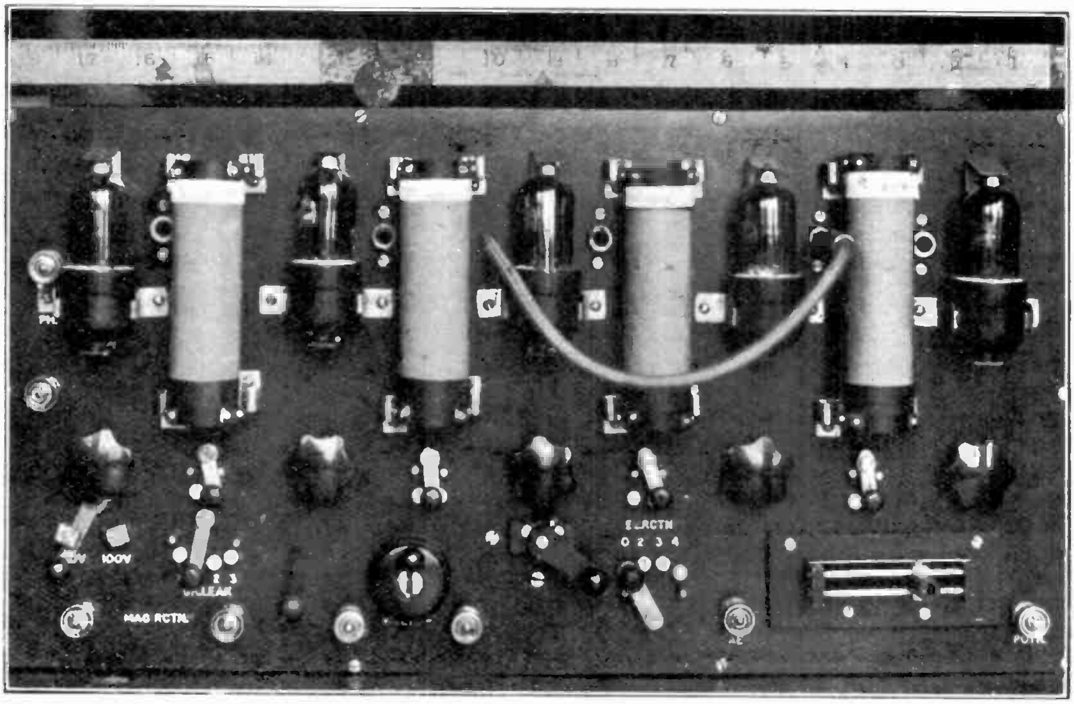


Fig. 8. High Frequency Amplifier employing the Transformer described and designed to give a minimum of capacity in wiring and arrangement. Break jacks permit of the use of the required degree of amplification.

on 900 metres with a band of approximately 600-1,500 for fairly efficient amplification. This number winds nicely into the standard 4¼ ins. body.

The primaries were originally wound directly on to the ebonite body; a few have to hold, and a useful guide may be put down as follows: secondary = primary + 20 per cent.

It will be tedious to give further details as to the number of turns, as with the exception of those suitable for the 200 metre band a

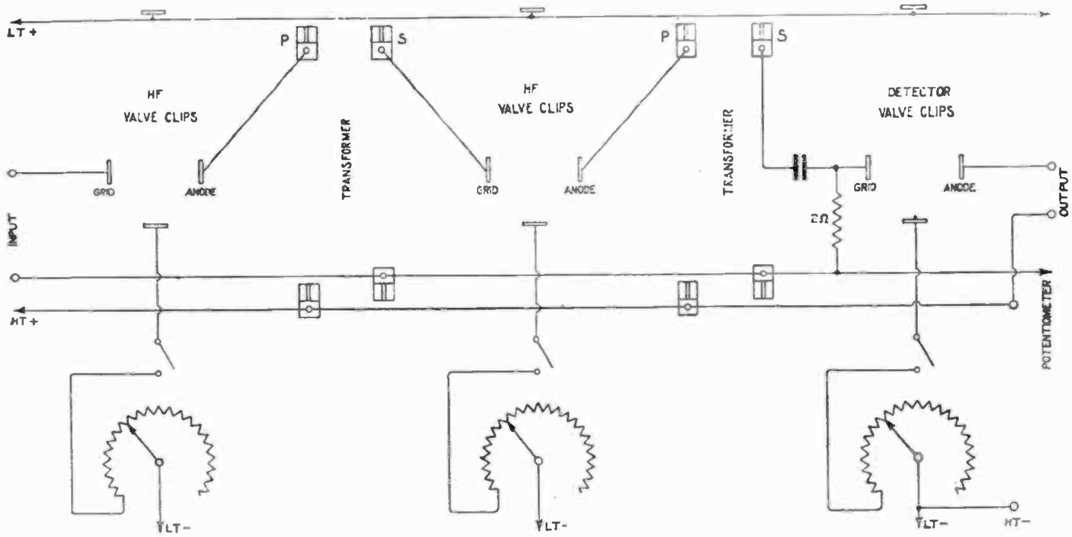


Fig. 9. Wiring lay-out of the H.F. Amplifier showing the special arrangement of the leads.

recently been wound with the body first surrounded by paper. These have not yet been fully tested as regards efficiency of reception, but so far as this has been done the improvement is most marked.

Between the layers were tried oiled silk and empire cloth; these were found to give difficulty in winding the secondaries quite evenly, and for them was substituted celluloid from disused photograph negatives cleared of gelatine, of the order 0·003 in. thick.

Mechanically this proved perfect, but in deference to the expressed opinion that electrically celluloid is bad, paper has been substituted. If this latter is damped, pasted on, and then well dried, it gives a winding surface equal to celluloid, but the coils so wound have not yet been tested properly.

Experiments were made to see if any step-up effect could be obtained by winding more turns on the secondaries; for instance, on panel B, four were tried, all with primaries 280 turns, and secondaries 280, 300, 350, 400 turns. Of these the 350 was best, but not much better than the 280 and 300. The 400 was decidedly inferior. On others about the same proportion seemed convenient rule seems to have shown itself as follows:—

For Panels of Type B.

Primary, 45 *S.W.G., H.R. D.S.C.*

Secondary, 45 *S.W.G., H.R. D.S.C., or copper* 42 *S.W.G. S.S.C.*

Number of turns on primary = ⅔ *wavelength in metres.*

Number of turns on secondary = *primary* + 20 *per cent.*

N.B.—For 200 *metres* 100 *and* 130, *to* 110 *and* 150 *seems about right.*

For Panels of Type A.

In the above rule for ⅔ *substitute* 6/7.

For Panels of Type C.

So very much depends on the wiring and switch gear that no hard and fast rule can be given, but on the friend's panel one of 110-150, both 40 S.W.G. copper, with an 0·0003 condenser tuning proved very good at 400 metres.

One will be given for panel type A.

Primary 350 H.R., secondary 400 copper, optimum wavelength about 390 metres. Primary wound over paper, paper between layers. Three of these could be worked without much trouble from self oscillation, and a fourth, all H.R., could be added. These have given quite respectable amplification at 190 and 600 metres.

Experiments have been made to substitute for the transformers a resistance capacity coupling to fit the same clips. These are illustrated in Fig. 10. They have only been in use a short while, but the first tests show great promise for longer wavelengths. The problem of a suitable transformer on the A type panel for 900-1,500 has not yet been solved.

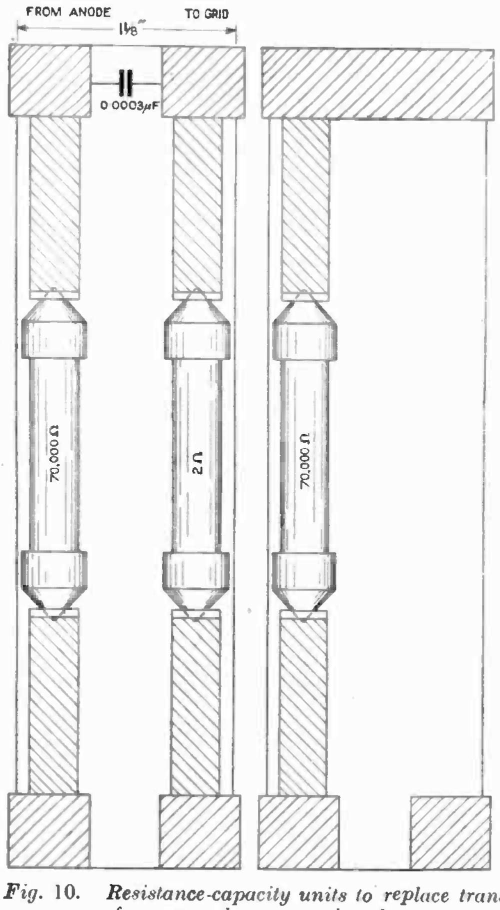


Fig. 10. Resistance-capacity units to replace transformers on longer wavelengths.

One consideration has not been tried, *viz.*, seeing that sometimes only part of the body is used, would it not be better to wind with rather larger wire? Several transformers have thus been wound, and the only point which seems definitely settled is that rather more turns are required as the size of wire increases.

One more point has been considered and tested. In laying out a multi-valve H.F. panel provision has to be made for using less than the full number of valves. Two such methods are illustrated in Fig. (*a*) and (*b*).

The first was founded on the practice in the 7-valve amplifier previously mentioned; the second is by means of an ordinary telephone jack and plug. This latter will be noted in the photo of the panel (Fig. 8), and this type found preference, but it will be noticed that the insertion of the aerial plug introduces a small capacity leak to earth through the secondary. If consequent loss of efficiency is of importance the removal of the transformer immediately preceding the first valve in use ought to increase signal strength. On the B type panel such loss was not definitely established, but there is no doubt about it being present in the A type. A simple remedy lies in pulling forward the top ends of the transformers not in use, the friction of the lower clips proving quite sufficient to hold the transformers in a slightly inclined position.

In connection with the use of a variable number of H.F. valves it should be noted

(1) That each additional valve brought into action alters the sign of the reaction, hence, if this be used a reversing switch should be in the reaction circuit. In any case this switch is a useful addition.

(2) That as the impulses increase from the first to last H.F. valve, varying degrees of filament brightness may be necessary. Hence the provision of separate filament

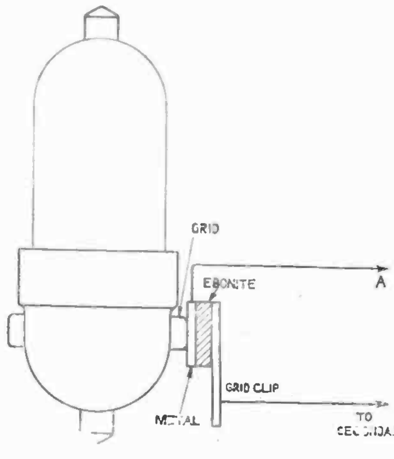


Fig. 11(a). A method of tapping-in on to the grid circuits to vary the number of valves used.

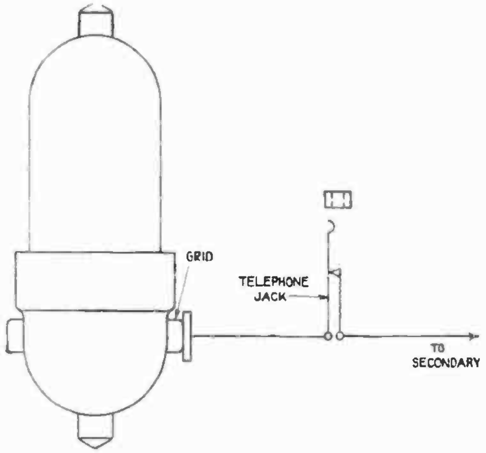


Fig. 11(*b*). *Another method of breaking-in on the grid circuits.*

control to each valve. It was found that the valves were distinctly sensitive to this control, hence the fitting of a separate on and off switch to each so that on putting a valve out of action its rheostat adjustment may remain in what has been found to be its best.

In conclusion, these tests and numbers can only form a small portion of data collected years ago in the research departments of the manufacturing companies, obtained, as they are, at the expenditure of time and money and past experience. The writer hopes that in bringing these details to the knowledge of amateur workers he will induce others to come forward and give their own results for mutual benefit.

Looking after the Filament Battery.

ADVICE ON KEEPING ACCUMULATORS IN GOOD CONDITION.

MANY broadcast listeners-in are being introduced to the use of accumulators for the first time, and it is well to point out a few of the difficulties met with in maintaining accumulators in good condition so that they may give reliable service and have long life.

One of the greatest contributory causes of deterioration in an accumulator battery is through overworking it—that is, employing a battery which has insufficient capacity for the amount of the current which it is required to give. Accumulators are rated in ampere hours, and the user must satisfy himself that the ampere hour capacity as stated on the label is *actual*, and not the rating with regard to intermittent discharge such as would be the case were it used for motor car ignition purposes. The actual capacity of an accumulator is exactly half the stated "ignition" rating. An accumulator having an actual capacity of say, 60 ampere hours, should be capable of, delivering a current of 2 amperes for 30 hours, or 3 amperes for 20 hours and so on. Each receiving valve requires a current of about 0·8 amperes, and thus the total number of hours which an accumulator should run a receiver before recharging can be arrived at by multiplying the number of valves with which the set is fitted by 0·8, and dividing the actual ampere hour capacity by the product.

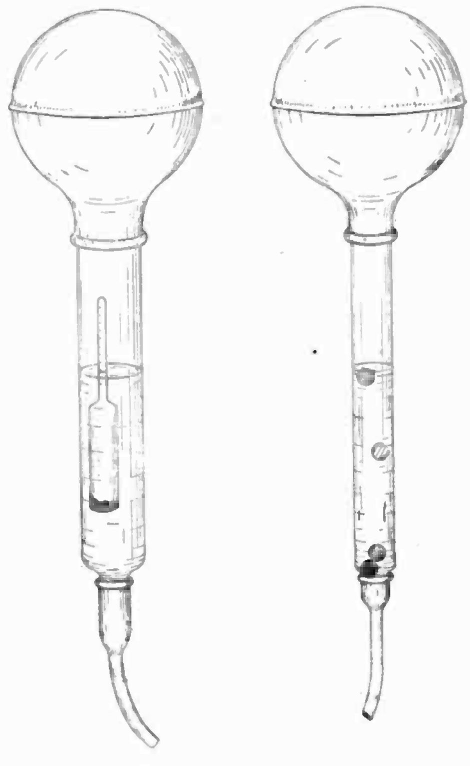


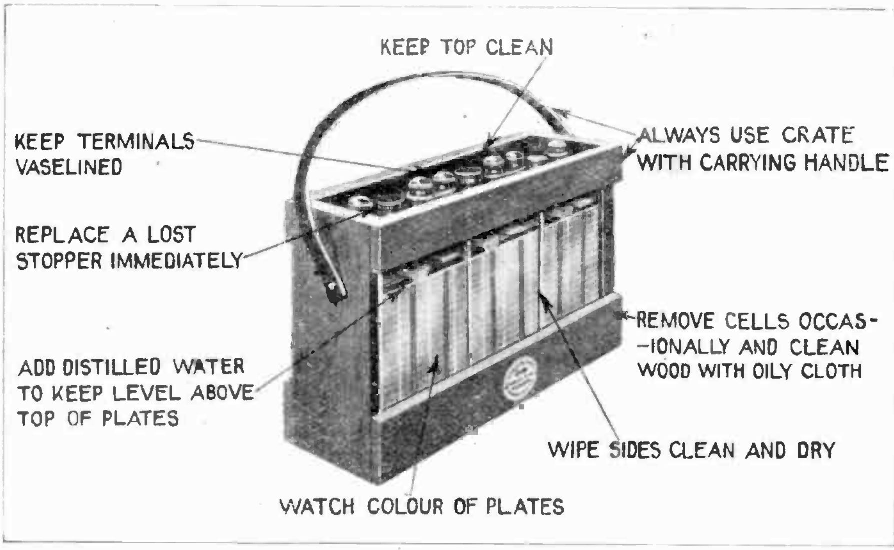
Fig. 1. *Fig.* 2.

Types of Hydrometers.

When purchasing an accumulator, it is worth while asking the retailer to give it the first charge, as this needs to be carried out with care. For the purchaser who charges his own accumulators, instructions are usually provided on the battery, and a point of great importance is that the first charge should be carried out slowly, and charging should be continued until the battery gasses freely.

One very good method of charging a new accumulator by which it is possible to ensure that the acid in the charged cell is of the right specific gravity, is to fill the accumulator with acid having a gravity of 1·200, charge for the required time as stated on the accumulator, and then discard the original acid and refill with fresh acid having a gravity of 1·250. It is the gravity of the acid which is the best guide as to the condition of an accumulator, and in order that it may vary through the required range, the method by which the accumulator is filled with acid of the correct gravity when fully charged is recommended.

It is best to procure acid specially made up for accumulator work and of the required gravity. This diluted acid is made up from pure sulphuric acid and distilled water, and can consequently be relied upon to be free from impurity. If this cannot be obtained, pure sulphuric acid must be purchased having a gravity of 1·835 and diluted to the required strength with distilled water. The operation must be carried out with caution as considerable heat is involved when acid and water are brought together, and on no account must the water be poured into the acid, as the great evolution of heat will set up spontaneous boiling, and the liquid will froth vigorously. The acid should be carefully measured out, and slowly poured whilst stirring into the distilled water, allowing the mixture to cool should the temperature rise too rapidly. Only glass and china receptacles must be used for sulphuric acid, and care must be taken to see that no foreign matter is present. Four parts of distilled water and one part of acid produce a diluted solution having approximately the correct specific gravity with 1·200.



A Portable 6-volt. accumulator, suitable for use with a receiver having several valve amplifiers. Accumulators must be carefully looked after to maintain them in good condition.

In order to easily determine the specific gravity of the acid in an accumulator, a hydrometer of the type shown in Fig. 1 is recommended as it permits of the drawing off of acid from the accumulator. Another type (Fig. 2), in which coloured glass beads are employed instead of a floating hydrometer, is equally useful, beads of certain colours being arranged to float, while others sink, according to the gravity of the acid in which they are suspended.

An article on the home charging of accumulators from D.C. mains appeared in a recent issue.* whilst numerous devices to permit of charging from A.C. mains have been described from time to time.†

When circumstances necessitate the taking of the accumulator to a local electrician or garage for charging, the user should make the same observations with regard to the density of the acid as if he were charging the accumulator himself. The condition of the accumulator can then be watched and any indication of deterioration observed.

The gravity of the electrolyte in the cells should be taken when fully charged and when discharged, and the two figures should differ from one another by about 0·025.

The colour of the plates, too, is an indication as to the condition of the battery. When discharged, the positive plates will have a reddish-brown colour and the negatives a dark grey, whilst when fully charged, the positive plates should be a dark chocolate colour and the negatives whitish-grey.

It is important that the electrolyte should be kept above the top of the plates, and this level is usually kept up by adding distilled water, though, if there is any indication that the gravity is too low, a little dilute acid may be put into the cell. The quantity of electrolyte in the cell becomes less, partly because of the evaporation, and also because of the electrolysis of the water during charging. It must be remembered that the water only is disposed of, and not the acid, hence the reason for adding water, and not sulphuric acid, to a cell which requires filling up.

An accumulator must not be left in a discharged condition, but, as soon as it is observed that the voltage is falling off (as would be indicated, of course, by a dimming of the filaments) it should be put on charge as early as possible. There is no detrimental action in more or less completely discharging an accumulator, provided it is put on charge immediately, and charging continued until the gravity indicates between 1·225 and 1·250. Immediately after being taken off charge, the voltage of the accumulator should be about 2·5 volts per cell, as may be easily determined with a small pocket-type voltmeter.

Expanding of the plates, particularly of the positives, is a frequent trouble and is indicated by a bulging of the case. The only remedy is to remove the plates, clean them, and file the edges. If this is not done the case may develop a leak, or the positive plates buckle so much that small pieces of paste will bridge them in contact with the negatives.

Frothing during charging is frequently a serious trouble with an accumulator, and should this occur with a more or less new cell, the user should refer the matter to the manufacturers, as it is usually due to unsuitable celluloid being employed for making the case.

Accumulator batteries must be kept clean. The top of the cases should be wiped down free from acid and dust from time to time, and the screw terminals removed, cleaned if necessary, and thoroughly smeared over with vaseline.

Sediment in the bottom of the celluloid container must be looked for, and should it become so deep that it makes contact with the plates, the cell should be thoroughly washed out and refilled with new electrolyte. It is usual, however, to leave a liberal space between the plates and the bottom of the container so that quite a lot of paste may fall from the plates before contact with them is likely. One of the chief causes for paste falling from the plates is charging and discharging at excessive rates. As far as charging is concerned, the instructions on the cell may, of course, be adhered to, but, when discharging, one should estimate the current which it is required to deliver by multiplying the number of valves which it operates by 0·8.

* P. 559, Jan. 27th, 1923, and p. 692, Feb. 24th, 1923.

† P. 318, June 10th, 1922, p. 397, June 24th, 1922, and p. 535, Jan. 20th, 1923.

The Condenser across the H.T.

Although the experienced amateur always adopts the practice of bridging the terminals of his H.T. battery with a condenser, doubt seems to exist as to the most suitable capacity. The internal resistance of the battery may be as high as 100 or 200 ohms. Such a resistance is undesirable in high or low frequency circuits, particularly if it is common to a number of valves.

The condenser used should have a value of about 2 microfarads in order that it may bypass currents at the frequency usual to telephony.

The Elementary Principles of Radio Telephony*

By G. G. BLAKE, M.I.E.E., A.Inst.P.

SINCE the inauguration of the London Wireless Society in 1913, many changes have taken place in the world of "Wireless." The Society has recently been renamed "The Radio Society of Great Britain," this change of name being made for two reasons; firstly, because ever since our inception we have been the body which has acted as the mouthpiece of the amateur on all occasions when it has been felt necessary to approach the Post Office, and it was felt that, as our work was of a national character, we could represent the amateur with even greater strength under this new title. The name "Radio" was chosen owing to the fact that it is rapidly replacing the old term "Wireless," and has now been adopted in all countries as an international word.

As far back as 1903 or 1904, and even prior to that date, many of those present to-night, including myself, commenced experimenting in radiotelegraphy, and we have had the pleasure of seeing the science grow with astonishing rapidity.

There are now some hundreds of societies all over the country, the most important of which are affiliated to the Radio Society of Great Britain, and I think it is fair to say that it is mainly owing to the work and growth of the "wireless" amateurs that Broadcasting has been established. As you know, a company has been organised which undertakes to transmit items of news, weather reports, lectures and concerts. Already they have commenced working their stations in London, Birmingham, Manchester and Newcastle.

There are two distinct types of listener. First there is the old amateur, holding an experimental licence, who is engaged in experimenting with a view to acquiring all the knowledge he can about the circuits which he employs, and in making improvements, and the more advanced workers occupying themselves in carrying out serious research work. Then there is the "broadcast listener," who has a "broadcast" licence, which only permits him to use apparatus having the stamp of the Broadcasting Company, and he uses his instruments for the sake of the information and entertainment which he receives.

There are a great number of receiving sets at various prices which he can buy, and if he gets a selective one, it is possible for him to sit in his own room at home and listen to either of the broadcast concerts he likes, and to reject the others by merely turning a couple of handles.

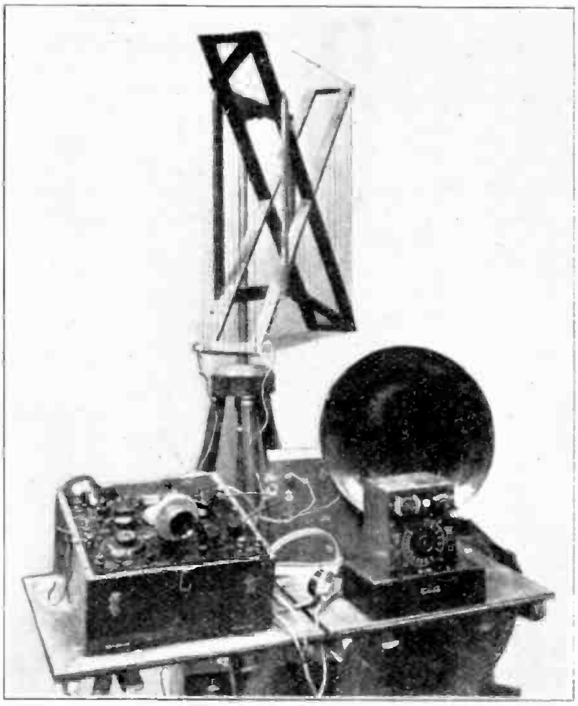


Fig. 1. Receiving Apparatus used during the Lecture.

At this point there is a very important matter to which I would like to call your attention. I have heard of a good many complaints from broadcast listeners, to the effect that they cannot hear the broadcast concerts as they are being jammed by other stations and amateur transmissions.

In these days the Post Office is rightly very particular in the granting of a transmitting licence, to ensure that the applicant shall have sufficient technical knowledge to prevent him from making use of an improper wavelength and so interfering with other stations. Amateur transmitters are using a band of wavelengths ranging from 150 to 200 metres, and a fixed wave of 440 metres. The London Broadcasting Station transmits on a wave of 369 metres, Manchester on 385, Birmingham on 425 and Newcastle on 400.

The tuning of C.W. and radiotelephone stations is sharp, and while we all experience a certain amount of jamming, particularly from spark stations, I would point out that if the broadcast listener is getting undue interference it is probably owing to his receiving set not being sufficiently selective in its tuning arrangements. Of course if he buys the cheapest possible set he cannot expect the Broadcasting Company (or a firm connected therewith) to supply him with anything

* An Experimental Lecture delivered before the Radio Society of Great Britain on January 12th, 1923.

else; but I would point out that he must not throw all the blame on the amateur transmitter. He has the remedy in his own hands, for he can buy a selective set by paying a little more for it, and he should then be able to cut out the interference.

For at least a couple of years music has been transmitted from the Hague in Holland. Recently the arrangements have been taken over by the *Daily Mail*, and concerts are still being transmitted from that station every Sunday afternoon from 3 till 5, on a wavelength of 1,050 metres. Then we have concerts transmitted from the Eiffel Tower in Paris, on a wavelength of 2,600 metres, also concerts transmitted by "La Société Française" (also from Paris), every evening at 8.45 till 10 on a wavelength of 1,565 metres, and in fact if we get many more stations transmitting we shall soon be able to hear more than we want.

The Committee of our Society feels that with the influx of the new class of wireless (perhaps I had better say Radio) listener, it now becomes our work to gather them together as a new class of amateur, and it devolves upon us to do all we can to look after and protect their interests. With this in view we recently formed a new section which anyone holding a broadcast listener's licence may join, and we propose to give lectures to them, and to hold special meetings for them from time to time.

We are also asking our affiliated Societies to do the same wherever possible. We expect that there will be many "broadcast listeners" who will get interested in the technical part of the subject and who will welcome our lectures and our help, so that the "broadcast listener" of to-day may become the experimenter of tomorrow. With this object we shall specially endeavour to make the lectures given to this section of our Society popular and instructive in character. All those who are admitted to this Section will be known as Associates of the Radio Society of Great Britain. As this is the inaugural lecture, I propose to make it an introduction to the study of radiotelegraphy, so as to leave the field quite open for subsequent lecturers.

The scientist, as you know, in order to account for certain phenomena, is in the habit of making postulates or theories These he is equally ready to discard or replace by others as soon as he finds some fact which does not fit in with his scheme of things or discovers some more plausible theory.

In order to explain light, X-rays, radiotelegraphy, etc., we believe there must be some medium present which, though we have never seen it, is there, and is capable of conveying wave motion. To this intangible and omnipresent medium we give the name "Ether."

At the present time, owing to the work of Einstein, the ether theory, which we radio men feel it is almost impossible to do without, is in the melting pot; but if it is dying it is making a hard fight, for many of our leading scientists still believe in the necessity for its existence. We cannot hope tonight to decide which school of thought is right; but as thoughts of the existence of the ether assist us in our study of radiotelephony, and account for all the facts we so far know concerning this branch of science, we will be of those who take its existence for granted.

Radiotelephony is a subject which possesses great fascination both to the engineer and to the man in the street; it is little short of a modern miracle. How, one asks, is it possible for the audience in this hall to hear music and speech taking place miles away, while the people next door are not conscious that any sounds are passing them? Can it be possible that these sounds are being transmitted for so many miles and arrive at their right destination without any telegraph or telephone wires connecting the two places? How is it that when several people are telephoning wirelessly at the same moment they do not create an unintelligible babble of voices? I hope this evening to make these points more understandable, and by actual demonstration to prove to you the truth of these seeming miracles.

I first want to give you just a fleeting glimpse of this part of the universe as scientists see it. We will try for a few minutes to forget that we are in this lecture hall, and let us imagine ourselves looking down upon our earth as it travels round the sun. It progresses at the rate of seventeen miles per second, and even at this enormous pace it takes a whole year to complete one journey round it. This speed so far exceeds our conception that it gave very just occasion for a remark of Lichtenberg, that while a man salutes another in the street he goes many miles bareheaded without catching cold. The earth takes, as I said, a whole year to complete its circuit around the sun; this gives us some conception of the relative smallness of our earth compared to the infinity of space wherein it moves. Now it is to this apparently empty space in which the far off stars and the solar system with all its planets exist, that I particularly wish to direct your attention.

Is it as empty as it at first sight seems? If it is empty, how can the light from the sun reach us across nothingness?

Science has analysed the rays of light and found that they are waves. Waves of what? That is the question. We know that they are not waves of air, as our atmosphere only exists a comparatively few miles around our earth, also light will pass across a vessel from which all air has been removed.

Again, as wind makes no difference to the strength of light or of radio signals, it cannot be the air which conveys them.

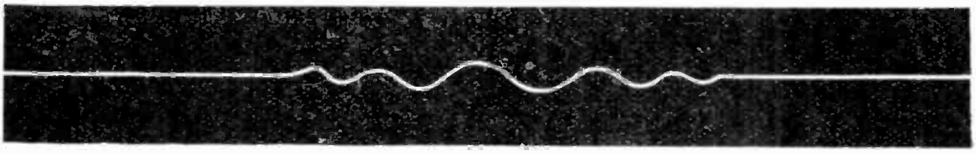
We therefore believe that all space is filled with something which we call the ether, which is capable of transmitting wave motion.

As we are able to see light through air, it is obvious that the ether permeates it. We know that X-rays will penetrate through all solid bodies; these rays are really vibrations of the ether of very short wavelength. It is obvious that this infinite ocean of ether permeates all things, including ourselves. We are in some respects like little fishes in an infinite ocean; the ocean in which we live is imperceptible to any of our senses. When we move in it, it passes through between the atoms of which we are made. We cannot feel it as it offers no resistance to our motion, we cannot smell it, see it, or hear any sound of it. The fact that it penetrates through what our senses tell us is solid matter proves to us how crude are our senses, and that in reality matter is by no means as solid as we have supposed.

Sir Oliver Lodge (who is an honorary member of this Society) once showed a very pretty experiment illustrating this. He filled a length of india-rubber tube with water, this he attached to a small motor, which caused it to rotate with great velocity. The motor was then suddenly stopped, and he showed that as long as the water in the tube continued in motion the tube exhibited the properties of a solid rod.

Imagine this spectrum drawn out at each end so that it covers a length at least 53 times that of the strip you see before you on the screen; it would then reach approximately from here (Savoy Street, Embankment) to the Strand (Fig. 3).

Down below the last visible violet rays you would come to what we call the ultra violet rays. Although these rays are so short that our eyes cannot see them, their presence can readily be



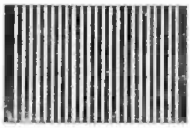


Fig. 2. The two components of a mechanical lantern slide for demonstrating wave motion. The white lines represent the transparent portions. The grid and wave line stand face to face in the lantern, giving a number of dots on the screen, and as the wave line travels past the grid, the effect of wave motion is produced. (Reproduced by the courtesy of Dr. J. A. Fleming.)

This slide (shown in Fig. 2), which Professor Fleming, one of our Vice-Presidents, has kindly allowed me to copy from a slide which he showed at the Royal Institution Christmas Lectures last year, will serve to illustrate wave motion. I want you to keep your eyes on the red dot which you see in the centre of the dotted line on the screen. You will notice that while the wave actually travels across the screen, the little dot, and in fact all the dots of which the line is composed, only move up and down in a straight line vertically.

When we see a ray of say, red light, it represents a series of such waves in the ether, all of one wavelength, reaching our eyes from the source of light. White light is made up of a number of rays of different wavelengths all travelling at the same speed, namely 186,000 miles per second, and all impinging on our eyes at the same moment of time.

(*The lecturer here showed a band of white light.*)

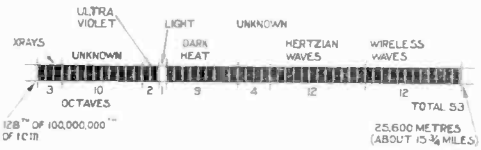


Fig. 3. The comparative frequencies of the known ether waves. The white portion represents those frequencies to which the eyes are sensitive.

By means of a prism we can separate out the rays composing this strip of white light so that each wavelength is allowed to reach our eyes independently of the others. *A colour slide of the spectrum was shown on the screen.*

Thus we see that the light was composed of violet, indigo, blue, green, yellow, orange, and red. (One octave.)

But these visible waves are by no means all the waves that are there. Far shorter waves are to be found below the violet, and much longer waves beyond the red.

detected, as I will presently show. Below these again we come to still other vibrations of such minute wavelength that they can freely pass through the spaces between the atoms in solid matter. These are known as X-rays.

Fig. 4 is an ordinary photograph of a small wireless set, and Fig. 5 is an X-ray picture of the same object, which shows how transparent it is to the X-rays.

(*By means of an X-ray apparatus and a large screen, transparency of the human body was demonstrated, and the heart of a member of the audience was shown beating.*)

Referring again to the spectrum, beyond the red end we come to infra-red radiations; beyond these again we have waves of much greater length, known as Hertzian waves, and it is these waves that we employ for radiotelegraphy and telephony.

It may help you to get a better grasp of what is involved by the presence of all these varying wavelengths in the ether, if I give you an illustration.

Suppose one of our greatest artists, say Turner, had seen all the beauty in a landscape it was possible for a man to see, he was only able to see less than one fifty-third of the colours which were there, for the visible spectrum is made up of only one fifty-third of the ether waves which are at present known to science; our eyes are blind to all the rest.

It has produced in me a feeling of awe and wonder, when I have stood with a number of other people in a garden of flowers of varied hue, to think how the light of the sun, made up as it is of all the colours, shines down upon them, and how each flower absorbs the energy of certain waves, reflecting others in all directions: yet however great the crowd, each person is conscious of the colour waves reflected from each flower. When one considers the immense number of waves, crossing and recrossing in every direction, without causing any interference with one another, it is hard to conceive it possible.

Yet, there it is, and not only the waves we see are there, but a far greater number which to us are invisible.

We cannot contemplate such wonders as these without a feeling of awe. Surely here is evidence of a master mind which conceived it all. One cannot believe that such laws as govern these wonders came into being by blind chance.

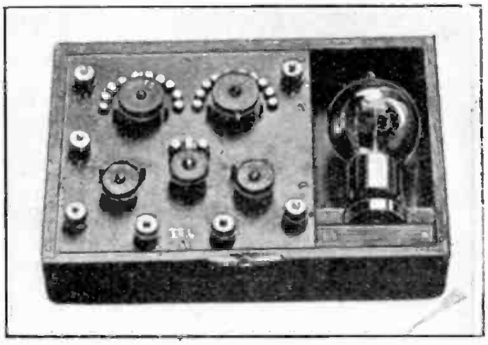


Fig. 4. A small wireless instrument as the eye discerns it with the aid of ether oscillations of a limited range of frequencies.

I will now endeavour to demonstrate to you the presence of some of the invisible waves of which we have been speaking, at each end of the spectrum.

(Here the lecturer obliterated the visible light emitted by an optical lantern by means of suitable coloured screens, and in the darkness in front of the lantern caused certain materials to glow, including slices of bread and butter and margarine, under the effects of the invisible rays. He also showed that the waves emitted by a small wireless transmitting apparatus were capable of freely passing through a wooden blackboard. He also showed a small electric spark apparatus, Fig. 4, and demonstrated that it not only emitted visible light radiations but simultaneously it produced ultra-violet at one end of the spectrum and Hertzian waves at the other. He showed the presence of these otherwise invisible radiations respectively by causing Willomite to fluoresce, and by causing a small electric lamp to glow when attached to a single loop of copper wire which he held in his hand at some distance from the origin of the rays.

The sensation of colour which we see depends upon the number of ether waves which strike the eye in a second. Thus the sensation of red is produced by imparting to the optic nerve 474 millions of millions of impulses per second, while violet, the visible light which you saw in the experiment just now, is produced by imparting to the nerve some 699 millions of millions of impulses per second. Sir John Herschell once said, "There is no mode of conceiving the subject which does not call upon us to admit the exertion of mechanical forces which may well be termed infinite."

I have endeavoured to convey to you some faint idea of the existence of an all-pervading medium, the highly complex properties of which are so subtle that we can only perceive its existence in our imagination, and that not without a great effort.

Let us now turn our attention to what we ordinarily consider to be solid matter. The work of Dalton, Crookes, Röentgen, J. J. Thompson, Rutherford, Soddy, Bragg, and many others, has shown us that it is made up of groups of atoms known as molecules, each atom, according to present theory, consisting of a positive nucleus around which are grouped a number of electrons (negatively charged). We can visualise each atom as a tiny solar system; between its positive nucleus, and its electrons, there are relatively vast spaces, which, like the inter-planetary spaces of our universe are permeated by the ocean of ether. In a fragment of any elementary substance it is believed that there are millions of atoms of that particular element, each made up of a definite number of electrons grouped round a positive nucleus, like planets around a sun.

The forces of the whole system being in a state of equilibrium, it is the definite number and grouping of the electrons which give to the substance the properties by which we distinguish it from other elements. There are, of course, several variations of this theory to account for certain phenomena, but I think what I have said will suffice for the purpose of this lecture. In addition to the electrons in each atom, there are vast numbers of free (or unattached) electrons, in the inter-atomic spaces, which can be caused to move like a swarm of gnats in a summer breeze. This movement of electrons constitutes an electric current.

Sir Oliver Lodge once said that there are as many atoms in a glass of water as there are glasses of water in the Atlantic Ocean, and modern science has proved to us that the electrons belonging to each atom are as far distant from their positive

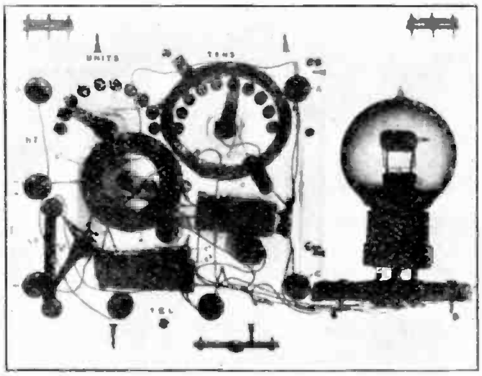


Fig. 5. The same instrument X-rayed, or when illuminated with ether waves of a frequency to which certain portions are transparent.

nuclei as are two specks of dust one in each corner of this lecture hall.

The number of electrons present in matter is unthinkable. If Adam had possessed a two ounce bottle full of air, at ordinary atmospheric pressure, and if he had commenced to remove the electrons from it at the rate of two per second, working night and day (Sundays included), and if he had lived on through the ages he would still be hard at work at it, and would not nearly have completed his task.

(To be concluded.)

Wireless Club Reports.

NOTE.—Under this heading the Editor will be pleased to give publication to reports of the meetings of Wireless Clubs and Societies. Such reports should be submitted without covering letter and worded as concisely as possible, the Editor reserving the right to edit and curtail the reports if necessary. **The Editor will be pleased to consider for publication papers read before Societies. An Asterisk denotes affiliation with the Radio Society of Great Britain.**

Correspondence with Clubs should be addressed to the Secretaries direct in every case unless otherwise stated.

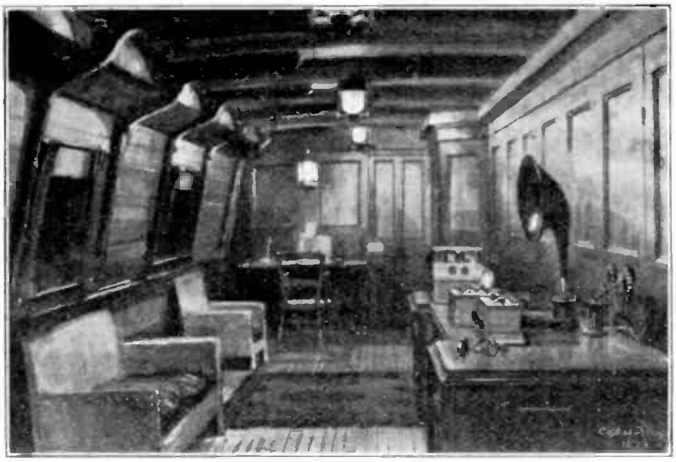
The Leeds and District Amateur Wireless Society.*

Hon. Secretary, Mr. D. E. Pettigrew, 37, Mexborough Avenue, Chapeltown Road, Leeds.

A dinner and smoking concert was held at the Peel Restaurant, Leeds, on January 22nd. Thirty members were present, the excellent fare and most entertaining musical items being thoroughly enjoyed by all. Members of the Society and members of the Leeds Amateur Dramatic Society kindly contributed to the programme.

An instructional meeting was held at the Grammar School on January 26th, Mr. S. Kniveton, F.R. Met. Soc., lecturing upon the "Construction of Intervalve Transformers." Theory and practice of H.F. and L.F. transformations were thoroughly examined.

A general meeting was held at the Grammar School on February 2nd, under the chairmanship of Mr. F. H. Pickard. Business having been dealt with, the Chairman called upon Mr. E. M. Washington to give a paper and demonstration entitled "Vacuum Tubes, Their History and Phenomena." The lecturer briefly considered the electronic theory of matter and examined the progress of the study of vacuum tube work. By the kindness of Messrs. Reynolds and Branson, Ltd., the lecturer was enabled to exhibit a unique collection of apparatus, which he most successfully demonstrated as the lecture proceeded. The X-ray tube and allied apparatus were also demonstrated. The discussion was eagerly supported by the meeting and a vote of thanks was accorded to Mr. Washington. Mr. T. Brown Thomson was elected Chairman for the next general meeting.



The interior of the Captain's cabin of H.M.S. "Impregnable," which is now being used by a West End wireless firm as a demonstration room.

Huddersfield Radio Society.*

Hon. Secretary, Mr. C. Dyson, 14, John William Street, Huddersfield.

An interesting demonstration of the "Burndept Ultra IV. Receiver" was given at the Huddersfield Radio Society's club-room, on Tuesday, January 30th, by Mr. Townsend of Messrs. Burndept, Ltd., Leeds. Mr. T. Brooke was Chairman and about 30 members were present. A very clear explanation of the receiver was given, as well as many useful "tips" for amateur "listeners-in." Music was heard from London, Manchester and Birmingham on a loud speaker and a Brown's amplifier. The set was taken to pieces and passed round for examination by the members. A vote of thanks was passed to Mr. Townsend, for his kindness on the proposal of the president, Mr. T. F. Brook, and seconded by Mr. H. W. Sellers. The lecture was followed by an open discussion of transmitting licences and the merits of various transmitters.

Barnsley and District Wireless Association.*

Hon. Secretary, Mr. G. W. Wigglesworth.

On Wednesday, January 24th, a special demonstration was given by Messrs. Jepson, Morgan and Coates, of the General Electric Company, the chair being taken by Major E. A. Barker, M.C., the President of the Association. The meeting was attended by about 100 people.

The Association's receiving set is being designed and hopes are entertained that it will be built and put into use very shortly. Plans are also being discussed for a summer programme of field days.

Stoke-on-Trent Wireless and Experimental Society.*

Hon. Secretary, Mr. F. T. Jones, 360, Cobridge Road, Hanley.

At a meeting of the Stoke-on-Trent Wireless and Experimental Society on February 1st, Mr. T. R. Clarke (Member), gave a lecture on "A Broadcasting Crystal Receiver."

He fully described the construction of a crystal receiver, on which he regularly receives the Manchester programmes over a distance of about 35 miles.

Mr. Clarke exhibited his crystal receiver, the good workmanship and neat appearance of which was much admired.

Mr. Clarke also gave a report of the Annual Conference of Wireless Societies, recently held in London, at which he represented the Stoke-on-Trent Society.

The Thames Valley Radio and Physical Association.*

Hon. Secretary, Mr. E. A. Rogers, 17, Leinster Avenue, East Sheen, S.W.14.

On Wednesday, January 31st, a concert was given by the Thames Valley Radio and Physical Association to the Mortlake Girl Guides and their friends, about 150 being present at headquarters. An excellent concert was received with the assistance of Messrs. Driver and Harris, and Mr. Rogers explained in simple language how they were able to give such concerts with the receiving apparatus. He also amused them for a few minutes by showing how simple it was to make many useful articles from a piece of paper. Miss Tennant, on behalf of the Commandant and Officers proposed a hearty vote of thanks to the Association.

On Thursday, February 1st, at a meeting of the Association, which was well attended, Mr. Kenneth Davy gave an interesting lecture on "Accumulators," explaining how they were made, how to take care of them, and how to charge them. It was evident from the way the lecture was given that much trouble had been spent in preparing it and that the lecturer was a master of the subject. Exhibits were kindly lent by Messrs. The Ediswan Company.

The next lecture was given on Thursday, February 15th, when Mr. Wade (of the M.O. Valve Company), lectured on "Valves and their Manufacture."

Hackney and District Radio Society.*

Hon. Secretary, Mr. C. H. Phillips, 247, Evering Road, E.5.

The weekly meeting of the above Society took place on Thursday, February 1st, at the Y.M.C.A., Mare Street, Hackney, E.8, with an attendance of over forty, the chair being taken by Mr. H. A. Epton.

After a general discussion on the recent Radio Conference, concerning which the Chairman and the Secretary made reports, and on broadcasting and experimental licences, a lecture was delivered by a new member of the Society, F. G. Francis, Esq., B.Sc., on "Electrical Units and Ohm's Law." Mr. Francis dealt with a most difficult subject, requiring mathematical calculations, in a simple and lucid style, and was heartily applauded.

At the conclusion of his lecture, Mr. Francis suggested that an evening be set aside for "waistcoat pocket" talks on radio experiences, and this was arranged for a future meeting.

The Secretary would like to hear from prospective members living in the district of Hackney. It is hoped to arrange shortly a public meeting and demonstration, with a lecture by a well-known radio expert.

The Cowes District Radio and Research Society.*

Hon. Secretary, Mr. J. W. L. Ingram, 1, Mill Hill Road, Cowes, I.W.

At the headquarters on Wednesday, January 17th, the Secretary gave a practical demonstration of coil-winding. Various types of coils were made, and their particular advantages in use explained and data for winding coils to specific wavelengths given. Following this, several members expressed their opinions and recounted their experiences in the use of different types of coil.

"High Frequency Intervalve Coupling" was the title of a very interesting and instructive lecture given by Mr. C. Mugliston at the meeting on January 24th.

The lecturer dealt with the various methods of coupling in turn, explaining the characteristics of each, particularly on short wave reception. The great interest taken in high frequency amplification by the members, resulted in a lively discussion at the conclusion of the lecture.

Derby Wireless Club.

Hon. Secretary, Mr. R. Osborne, The Limes, Chellaston, Derby.

A meeting of the above club was held on Thursday, February 1st, at the Shaftesbury Restaurant. When the minutes of the last formal meeting had been read and confirmed, Messrs. Taylor and Jolley submitted their report of the Wireless Conference held in London, on January 24th. A vote of thanks was then given to the two delegates for so kindly giving their services. It was agreed that the affiliation with the Radio Society of Great Britain be continued.

Mr. Allwood then opened a discussion on "Broadcasting," and sets for the reception of broadcasting. Several members related their experiences and described how they had met troubles which had arisen. A few words in regard to loud speakers proved very interesting, and much useful knowledge was gained.

The membership of the Club is increasing every week, and it is hoped that this state of affairs will continue. The Committee have arranged a programme of papers for the spring session, which, it is expected, will prove an attraction.

Isle of Man Radio Society.

Hon. Secretaries, Mr. J. S. Craine, 6, Belmont Terrace, and Mr. J. P. Johnson, 16, Hildesley Road, Douglas.

A meeting was held on Monday, January 22nd, in the Physics Laboratory of Park Road Secondary School, Douglas, which is the Society's headquarters, Mr. H. Colebourne occupying the chair. There was a good attendance, and thirteen new members were elected.

Mr. S. Hinton spoke on "The Construction of a Simple Wireless Receiving Station, with considerations of detecting and tuning." His treatment of the subject was very acceptable. He dealt almost exclusively with the principles underlying the action of the various component parts of a crystal receiver. His remarks were liberally illustrated by diagram and experiment. Crystal rectification was discussed, and the characteristic of a crystal explained. Many other kindred matters were gone into, and the whole demonstration and address was an intelligent and enlightening presentation.

The Pudsey and District Radio Society.

Hon. Secretary, Mr. W. G. A. Daniels, 21, The Wharrels, Lowtown, Pudsey.

A meeting was held at the Mechanics' Institute, on Monday, January 22nd, Mr. F. Wild being in the chair.

There was a fair attendance, and a number of new members were elected. Reference was made to ladies being accepted as members, and the Society extends a hearty welcome to any ladies interested in radio work.

The Chairman subsequently called upon Mr. W. C. Ramshaw, Vice-President of the Bradford Radio Society, to give his lecture on "The Fundamental Principles of Radio Telegraphy and Telephony." The lecturer ably dealt with his subject, which was greatly appreciated.

Bexhill and District Radio Society.

Hon. Secretary, 15a, Sea Road, Bexhill-on-Sea.

A general meeting of the Society was held at the Committee Room, 15a, Sea Road, on Thursday, February 1st. Mr. C. S. Parker (Chairman), presiding.

Mr. S. L. Taylor was appointed Vice-Chairman. It was proposed and carried that the London Joint City & Midland Bank should act as Bankers, the office of Treasurer thereby being dispensed with. Cheques would be signed by the Chairman and the Secretary.

Mr. P. Webber and Mr. Holes were appointed as Auditors.

A "Bench" Committee (consisting of Mr. Hill, Mr. Brickett and Mr. Taylor) was formed to deal with the mechanical side of the Society. A bench was to be fitted in the Committee Room for the use of junior members.

Provision was made for junior members to join the Society at half fee, who could go to the Committee Room at any time to take advantage of various magazines, etc. which were being given to the Society by several members.

The Secretary reported that a profit of £5 13s. 10d. was realised from the whist drive, recently held at the Kahveh Café.

Southend and District Radio Society.

Hon. Secretary, Mr. A. L. Whur, 4, Wimborne, Southend-on-Sea.

At the meeting held on Friday, February 2nd, the Chairman, Mr. D. L. Plaistowe discussed the various transmitting circuits submitted in response to an application by him on a previous occasion, for a suitable transmitting circuit for the Society's portable experimental station **5 QK**. It was decided to make a start at once on the building of a single valve portable transmitter, closed circuit with grid control.

Mr. F. Mayer gave a most interesting lecture on his station **2 LZ**, giving circuits of both transmitter and receiver, and particulars of some experiments carried out on very short wavelengths by that station, which proved to be of great interest.

Tottenham Wireless Society.

Hon. Secretary, Mr. R. A. Barker, 22, Broadwater Road, Bruce Grove, Tottenham, N.17.

At the meeting of the above Society held at 10, Bruce Grove, Tottenham, on January 31st, Mr. Kaine-Fish delivered his second lecture on "Valves." As the actual theory of valves and their intricate working is not so fully understood as it might be by many people, the lecture proved very instructive. The lecturer dealt with the theory and practise of valves as detectors, and low frequency and high frequency amplifiers, and showed exactly how they should be used in a wireless receiving set to obtain the maximum efficiency. The diagrams used during the lecture made the whole subject perfectly clear. A good discussion on the subject followed and Mr. Kaine-Fish went over all doubtful points.

Business was then discussed and a report of the last committee meeting was read. This included a good programme of lectures for February. Mr. Kaine-Fish also gave a report of the Annual Conference of the Radio Society of Great Britain held recently, at which meeting he represented the Tottenham Wireless Society.

The Wireless and Experimental Society.

Hon. Secretary, Mr. Geo Sutton.

At the meeting of the Wireless and Experimental Association at the Central Hall, Peckham, on Wednesday, January 24th, the Assistant Secretary reported that, acting on the instructions of the last meeting, he had written to the founders of the Prescot and District Wireless and Experimental Association wishing them success in their venture, and expressing the hope that the temporary stay of their Secretary in Prescot would be to their benefit. Mr. A. W. Knight then reported his experiences at the Conference of Wireless Amateurs convened at the instance of the Radio Society of Great Britain. The matter of the present position of the Broadcasting Company was fully discussed, but it seemed that the representative of the B.B.C. who was present at the Conference had nothing concrete to suggest as to how the present difficult position might be relieved.

Later in the evening Mr. Hersey exhibited a wavemeter which he had constructed, and Mr. Joughin presented to the notice of the members the new club wavemeter. Mr. Knight read a suggested set of rules governing the loan of the wavemeter to Association members. Mr. Voigt followed with the construction of a straight line graph for the wavemeter, and the meeting then proceeded to the consideration of the calibration of received signal strength. A short discussion on electron flow brought the meeting to a close at 10 p.m.

Bath Radio Club.

Hon. Secretary, Mr. Geo. J. B. Curtis, 6. Pierrepont Street, Bath.

An interesting meeting of the Bath Radio Club was held at the Old Red House, Bath, on January 26th. The Chairman being unavoidably absent, Mr. J. G. Young (founder of the Club), presided.

Following the usual half-hour's Morse code practice, with Mr. H. L. Bowen at the buzzer, the second of a series of six elementary lectures by Mr. L. E. R. Boxwell was delivered. This lecture comprised a study of oscillatory circuits with particular reference to the crystal set. Mr. Boxwell's able and lucid delivery won him the warm appreciation of all present. Members were unanimous in their opinion that they had seldom heard a lecture delivered with such clarity.

Brighton and Hove Radio Society.*

Hon. Secretary, Mr. D. F. Underwood, 68, Southdown Avenue, Brighton.

The usual fortnightly meeting of this Society was held at the residence of Mr. Magnus Volk on January 18th.

In the absence of the President, the chair was taken at 8 p.m. by Mr. W. E. Dingle.

The members were exceptionally fortunate in listening to a valuable address given by Mr. Volk upon the correct method of using tools and workshop practice generally. Mr. Volk lucidly explained several points, aided by diagrams, and specimens of various types of tools, etc. The orthodox method of using cutting tools in conjunction with a lathe was dealt with, the right and the wrong way being clearly defined. A discussion ensued during the course of which the following items received consideration: jointing, drilling, tapping, turning brass and ebonite, soldering, slide rest, and care of tools.

At the conclusion of the lecture Mr. James Cowie, A.M.I.E.E., moved a hearty vote of thanks to Mr. Volk, expressing appreciation on behalf of the members present for the very free way in which the knowledge had been imparted. This was carried unanimously.

The Brighton and Hove Radio Society is engaged upon experimental work of a valuable nature in the interests of the science generally, and more particularly at the present time in connection with the elimination of interference during the reception of broadcast transmissions caused by inexperienced persons. Too strict attention cannot be paid to this matter, and it is hoped that all local radio enthusiasts will co-operate to avoid annoyance in this direction by keeping their valves from oscillating.

Wanstead Wireless Society.

Hon. Secretary, Mr. A. B. Firman, 18, Clavering Road, Wanstead Park, E.12.

On Thursday, January 25th, 1923, the Society had what proved to be the most successful meeting of the season. The chair was taken by the President, William Platt, Esq., who was supported by Brig.-General R. B. Colvin, C.B., M.P., a Vice-President of the Society.

Major Parker, M.B.E., A.M.I.E.E., then gave a delightfully interesting and instructive lantern lecture dealing with the ether theory and the early discoveries and inventions of wireless telegraphy and telephony, passing on to a discussion on circuits and other items of practical interest to the amateur experimenter, and finally concluding the lecture by again showing slides depicting the commercial and other applications of the wireless of to-day.

Later, Major Parker thanked the Marconi Company for the lantern slides, and Mr. Lambert and others who so generously gave their services.

The Senior Lintonian Radio Society.

Hon. Secretary, Mr. J. D. Meeke, 14, Avonmore Road, West Kensington, W.14.

The above Society has been formed at Linton House School.

A meeting was held on Wednesday, January, 19th, and the following officers elected:—President, Mr. A. E. Hardie, M.A.; Vice-Presidents, Rev. H. Martin Thorpe, M.A., Mr. J. D. Steel, M.A., and Mr. W. H. Littleton; Chairman, Mr. D. G. Bower; Hon. Secretary, Mr. J. D. Meeke; Committee, Messrs. R. Croxton, J. Hardy and C. L. Bradley.

The first general meeting was held on Thursday, January 25th, with Mr. D. G. Bower in the chair, at which Mr. C. L. Bradley spoke on the "Elementary Principles of Wireless Telegraphy and Telephony." The Vice-President, Mr. J. D. Steel, was also present.

On Wednesday, January 31st, Mr. C. L. Bradley gave his paper on "Aerial Construction and Erection." The different types of aerials were shown in diagram, the earthing system and the insulation of the aerial being also explained.

Gorton and District Wireless Society.

Hon. Secretary, Mr. T. E. Rowe, 8, Fairhaven Street, West Gorton, Manchester.

At a meeting of wireless enthusiasts held at Gorton, Manchester, on Thursday evening, February 1st, the above Society was formed and the following members were appointed officers:—President, Mr. E. Jones; Hon. Secretary, Mr. T. E. Rowe; Asst. Hon. Secretary, Mr. O. A. Potter; Chairman, Mr. G. Sykes; Deputy Chairman, Mr. C. W. Potter.

The above officers, together with Messrs. W. Kirkham, Junr. and A. Oliver, also comprise the Committee.

Meetings are to be held every Thursday evening at 7 p.m. at the Headquarters, Gorton Villa Inn, Hyde Road, West Gorton, Manchester. A hearty welcome is extended to all enthusiasts living in the above district, and full particulars will be forwarded on application to the Secretary.

The North London Wireless Association.

Hon. Secretary, Mr. V. J. Hinkley, Northern Polytechnic Institute, Holloway, London, N.7.

The 115th meeting of the Association was held at 8 p.m. on Monday, January 29th, this being the second annual general meeting.

After the business of the meeting the President called upon the Hon. Auditor to make a report upon the financial affairs of the club. The report showed that, after expenses for rent, construction of three-valve experimental set, and secretarial expenses had been settled, there was a cash balance of £6 10s. 4½d.

The Hon. Secretary then read a report on the work of the Association during the past year. The next business to be put before the meeting was the election of Officers and Committee for the year 1923. The following is a list of the names of those now in office:—President, R. S. Clay, Esq., B.A., D.Sc.; Vice-President, B. Binyon, Esq., O.B.E.; Chairman, H. N. Wilson, Esq.; Vice-Chairman, J. Nicol, Esq., B.A., B.Sc.; Hon. Treasurer, F. S. Angel, Esq.; Committee, Messrs. G. D. Meyer, F. W. Horton, R. J. James, J. A. Reading, H. W. Nunn, A. G. Hill; Hon. Secretary, Mr. V. J. Hinkley.

The President at the conclusion of the above business gave an address on "Electrons, and the part they play in the Thermionic Valve," the object of which was to give a clearer conception, to both beginners and more advanced workers in wireless, of the nature of the electron. The lecturer touched upon the work of Crookes and of J. J. Thomson, and performed a number of experiments to illustrate his remarks.

Making a Simple Valve and Crystal Receiver.

THE BEGINNER'S CONSTRUCTIONAL ARTICLE.

IN the issue of February 24th, the construction of a simple crystal receiver was dealt with in detail. The receiver described is suitable for the reception of broadcasting up to a distance of approximately 30 miles. When it is desired to receive at greater distances, the addition of a high frequency amplifying valve circuit is necessary, and a receiver embodying such an arrangement is given below.

High frequency amplification is specially suitable when the distance from the transmitting station is likely to be in excess of that just mentioned, and it permits also, when required, of arranging the reaction coupling on to the windings of the inductances in the H.F. amplifying circuit instead of directly back to the aerial tuning circuits, thus limiting the extent of radiation. Such an arrangement was first advocated in this journal in a series of articles under the title of "Experimental Station Design," commencing from September 16th, 1922, and has since been approved by the Postmaster General for use in apparatus intended for reception on broadcast wavelengths.

Reaction is not made use of in the receiver about to be described, though it is quite an easy matter to add it when desired.

The article in the previous issue of this journal is intended for the man who is about to start in wireless. The design in this case has also been arranged to suit the beginner, but who is perhaps a little more ambitious than to be contented with merely a simple crystal set.

The materials required are as follows :—

Polished sheet ebonite, 10 ins. by 4 ins. by ¼ in.

No. 26 D.C.C. wire (get about 4 ozs.).

4 ozs. of No. 18 or 20 bare copper or tinned copper wire.

8 terminals.

4 valve legs with washers and back nuts.

Filament resistance with fixing screws (which will probably be 4BA by ½ in.).

A simple crystal detector (Silicon or "Perikon").

1 condenser 0·0003 mfds.

1 condenser 0·001 mfds.

Shellac varnish.

4 cards for inductances.

2 1-in. brass screws (4BA, round or cheese heads).

2 4BA nuts.

4 lengths (each nearly 1 yard) of "Sistoflex" insulating tubing.

A piece of wood for base, ½ in. to ¾ in. in thickness.

Miscellaneous brass wood screws.

The construction of the inductances should be the first step, and the method by which they

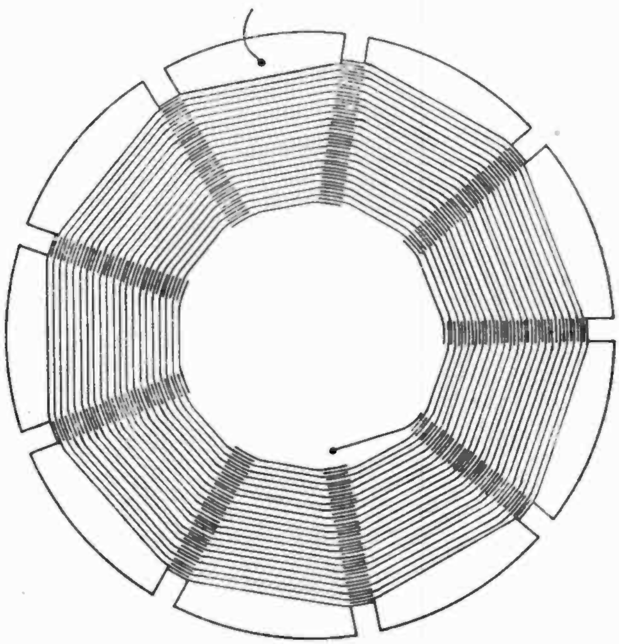


Fig. 1. A wound card inductance, drawn exact size.

have been made was fully dealt with in the previous issue. The shape and dimensions to which the cards must be cut are shown in Fig. 1. Starting at the centre, the card is wound full with the No. 26 D.C.C. wire. Four inductances will be required. Next, the panel should be made up which carries the filament resistance, crystal detector, valve holder, condensers, and terminals. The dimensions of this panel are shown in Fig. 2 and also the setting out for the positions of the holes.

The ebonite must be sawn to size and the edges finished by careful filing and rubbing down with emery cloth. Care should be taken to ensure that the edges are at right angles to one another and also with the face, and, moreover, that they are quite straight. The reader should purchase a small steel square for this purpose.

The position of the holes should be measured out with the utmost care and accuracy, particularly with regard to the position of those which are to carry the valve legs.

Fine scratching lines may be made on the under-side indicating the positions for the holes, and before drilling, points must be made with a sharp centre-punch in order to act as a guide for the point of the drill and to prevent it wandering over the smooth ebonite surface.

If the terminals and valve legs have 4BA threads, then the sizes of the holes will be 5/32 in. Care must be taken in drilling the holes not to fracture the back of the ebonite, and to avoid this, it is advisable to drill down on to a piece of hard wood or scrap ebonite.

The mounting of the filament resistance and the crystal detector will depend upon the types purchased, and it is quite a simple matter to devise a method for securing these two components, according to their design.

Before finally assembling the components on the panel the polished surface should be removed by rubbing with emery cloth attached to a small block of wood. By rubbing in small circles and using a fairly rough emery cloth, it is possible to remove the polish and produce a good matt finish free from scratches. A trace of oil may be used while rubbing down. The surface must be wiped quite clean and free from oil before finishing.

Fig. 3 gives the complete lay-out of the finished instrument and little explanation is required with regard to assembling. It is quite apparent from the diagram how the inductance coils are to be mounted, and the method in which they should swing one over the other.

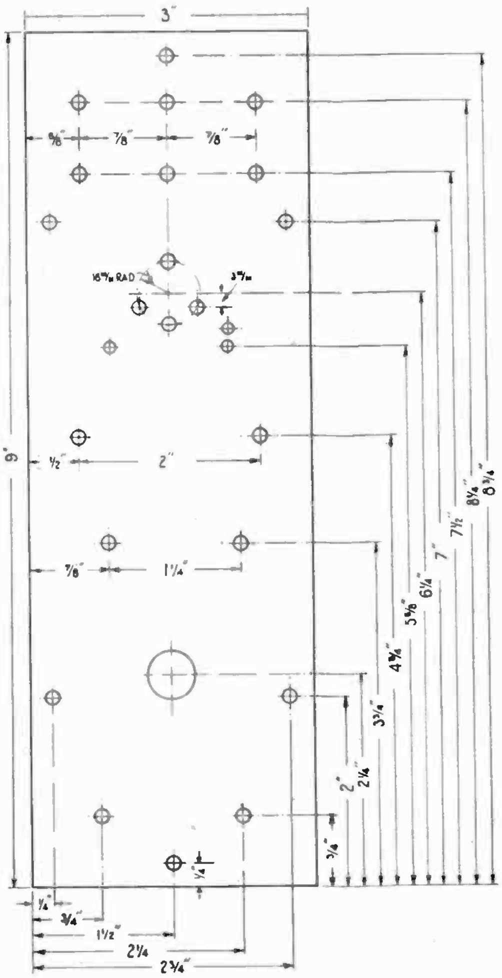


Fig. 2. The setting out of the holes in the ebonite panel.

The wiring is shown in Fig. 4 and is quite easy to follow. It is shown also in Fig. 5, in the form in which wireless circuits are usually represented.

It may be necessary, before finally soldering off the ends of the moving coils, to try the effects of reversing the connections to the ends, or unscrewing them from the moving arms and turning them over.

The moving inductances are secured to the wooden adjusting arms by means of No 4. by ½ in. brass screws with countersunk heads,

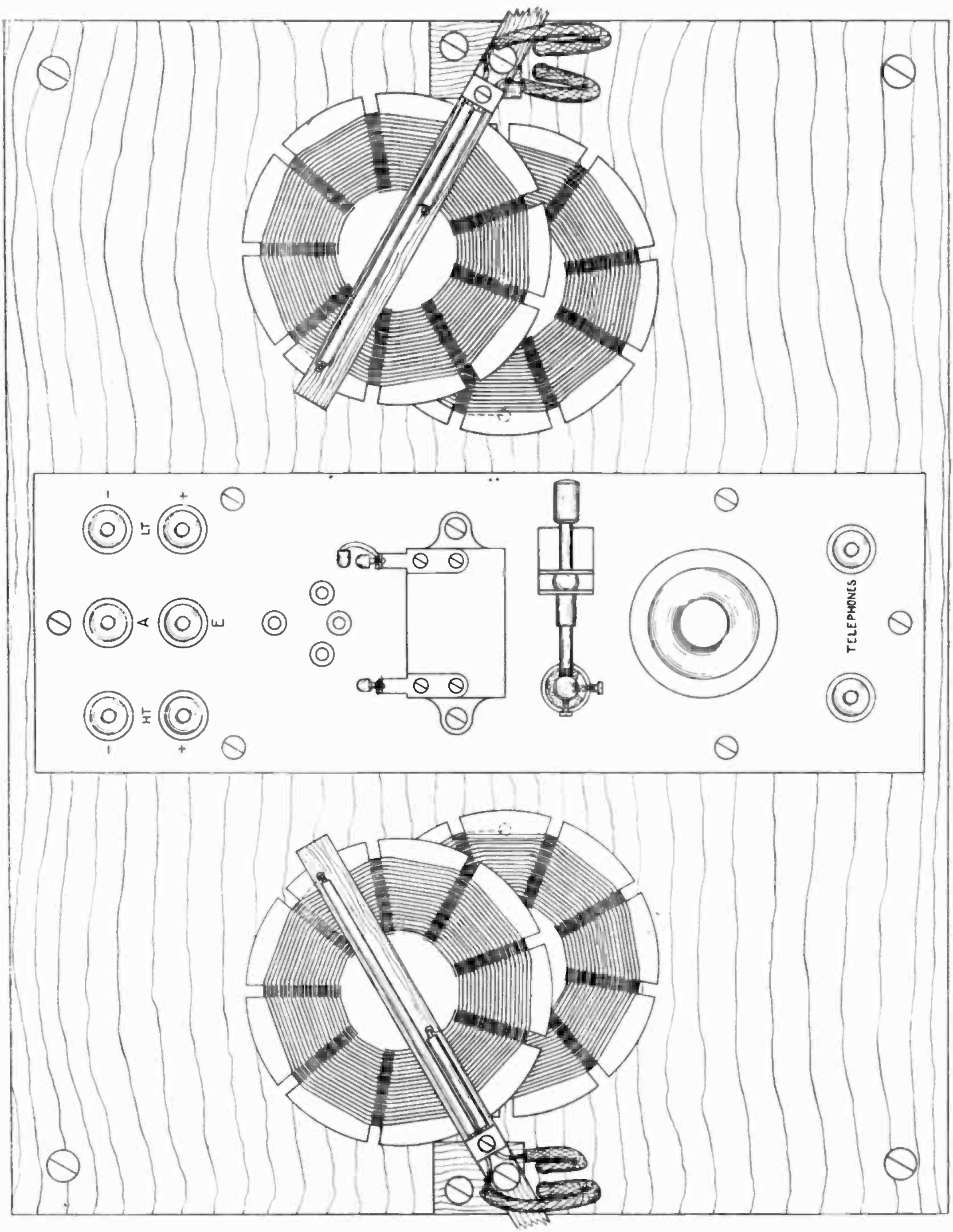


Fig. 3. The complete receiver, with H.F. amplifier and valve detector. It is drawn to scale, and the overall dimensions are 12″ × 9½″.

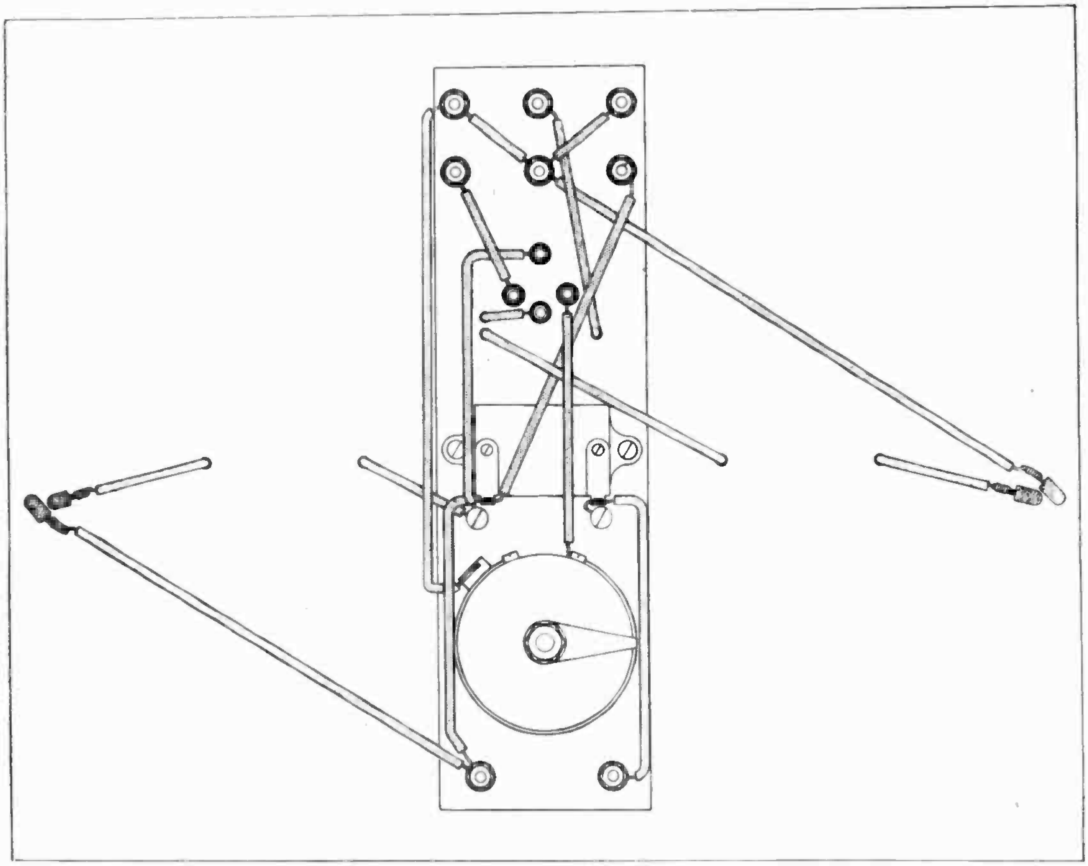


Fig. 4. The connections on the underside.

and to prevent the screws from tearing the card, an additional piece of stiff card should be put on in the centre.

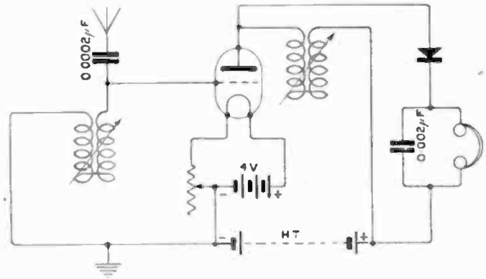


Fig. 5. Circuit diagram.

The tuning-in of signals is effected by moving the two inductances more or less together, though the actual setting of one with regard to the position of the other moving coil depends essentially upon the dimensions of the aerial to which the set is connected.

It must not be overlooked that the crystal must be adjusted to its most sensitive setting before tuning is attempted. The type of valve used is of importance, and should be one which has a characteristic which is specially suitable for H.F. amplifying, such as the "R."

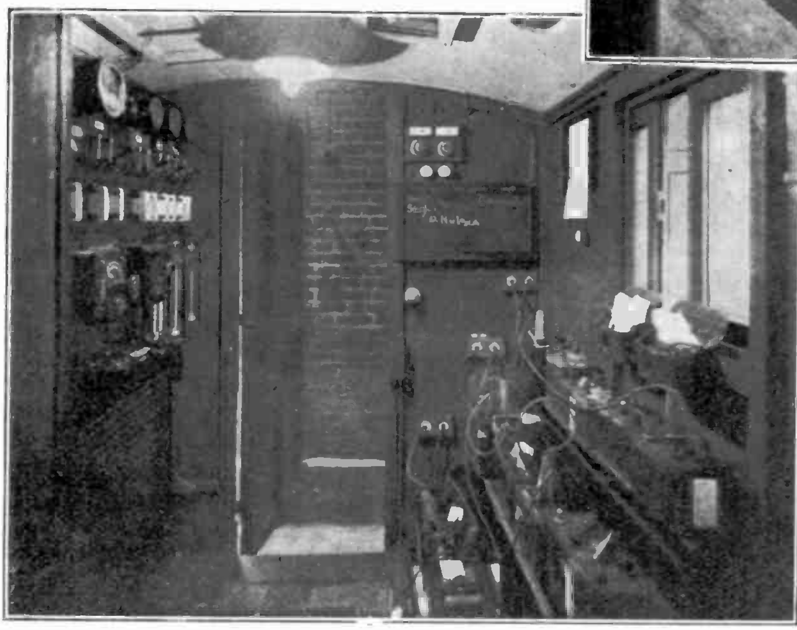
The method of adding reaction to this tuner will be dealt with in a subsequent issue.

Accumulator Charging Station.

THE accompanying photographs show an accumulator charging equipment which has been designed essentially for providing various charging rates, such as are required when handling the many types and sizes of batteries used in wireless work. Power is taken from D.C. mains at 220 volts for driving a motor generator, the windings of which are arranged to give practically constant voltage when the load fluctuates through a wide range. Current is fed on to two distributing switchboards, each of which provides three charging rates. Overload and no-load release switches are arranged to prevent damage to batteries on charge should the supply vary within certain narrow limits from the normal charging rates of the distributing circuits. An auxiliary prime mover is available for use in the event of breakdown.

Provision is made for charging and discharging new cells so as to bring them into good condition. Charged batteries which are not required for immediate use are kept on the circuit, with a very changing current, such as is passed by a lamp.

Above. — The motor generator and main switch - board at the charging station of The Park Motor Co., Ltd., in Wells Street, S.W.



Left.—The accumulator room and auxiliary distributing board.

The station is well set out, and the distributing circuits and leads being permanently wired, the chance of damage to cells is practically eliminated.

Notes

A Norwegian Station's Transatlantic Success.

The wireless station at Bergen, Norway, it is stated, has recently been in communication with American stations and reports from America show that transmissions from Bergen have been clearly received there.

British Broadcasting Received in Denmark.

A Danish reader reports that with his single-valve set at Copenhagen he is able to hear British broadcasting from **2 LO**, **5 IT** and **5 NO**. **2 LO** (London) is 920 km., **5 IT** (Birmingham) is 1,000 km. and Newcastle 800 km. from Copenhagen. The reader's aerial consists of two wires, each 40 metres in length and 20 metres in height.

Continental Stations Received by a Staffordshire Reader.

While listening-in round about 200 metres during February, Mr. A. C. H. Bassano of Old Hill, Staffordshire, heard **8 AP** (France), **OMX** (Holland), **OBS** (Holland), and **OYS** (Holland)—all on C.W. The receiver was a 3-valve set—one high frequency, one detector, one low frequency; the H.F. being tuned anode. The signal strength was about R 5-R 7 in each case.

Broadcasting in India.

The Indian Government has decided to permit private enterprise to undertake broadcasting by wireless in India and Burma upon lines similar to those followed in the United Kingdom. A Conference has accordingly been arranged to take place in March, under the Presidency of the Director General of Posts and Telegraphs to discuss the project of forming a company open to both British and Indian manufacturers of receiving apparatus.

The Award of the Faraday Medal.

The Council of the Institution of Electrical Engineers have made the second award of the Faraday Medal to the Honourable Sir Charles Algernon Parsons, K.C.B., F.R.S., Honorary Member of the Institution. The Faraday Medal is awarded for notable scientific or industrial achievement in Electrical Engineering or for conspicuous service rendered to the advancement of electrical science.

Broadcasting Licences.

Up to the end of January, it is reported 58,000 licences for the reception of broadcasting had been issued by the Post Office.

Senatore Marconi Planning Investigation of Atmospherics.

Senatore Marconi will shortly undertake a cruise in his steam yacht *Electra*, which is now being refitted in the Solent. As in the case of the cruise last year, the object is deeper research into wireless matters, and in particular the influence of atmospheric disturbances.

Wireless Sets for Liner Passengers.

The United States liner *Leviathan* which will start on the New York-Southampton service in June, will have wireless headphones in every cabin.

The New British Broadcasting Stations.

Reports from various parts of the country served by the new Cardiff broadcasting station indicate that the first transmissions were a great success, and notably there was a total absence of interference. The Glasgow station which it was expected to have in operation by March 19th, may actually be ready to begin transmissions well before that date, as the British Broadcasting Company are naturally anxious to have this station working at the time the National Opera Company is due to visit Glasgow. It is probable therefore, that the new station may be opened at the beginning of March. The opening ceremony will be performed by the Lord Provost of Glasgow (Sir Thomas Paxton) and Lord Gainford (Chairman of the British Broadcasting Company). Sir William Noble and other directors of the Company will also be present.

Do you hear Brussels Aerodrome ?

The Brussels Aerodrome radiotelephone station broadcasts weather reports on 1,100 metres at 12·00 and 16·50 G.M.T. every day excepting Sundays and Belgian bank holidays. The 16·50 report includes a short summary of the day's aerial traffic at Brussels Aerodrome. The report issued from Uccle **(OPO)** on C.W. at 12·00 G.M.T. on 1,500 metres is only transmitted on Sundays and Belgian bank holidays, and when the R/T station is out of action.

The Director of the Belgian Royal Meteorological Institute kindly requests amateurs who receive Brussels 'phone messages at a distance greater than 300 miles, to let him know, through the medium of *The Wireless World and Radio Review*, the amount of amplification necessary to receive the message.

The Bamberger Tests.

In the early morning of February 24th, signals were received in England from the Bamberger Station, New York. The occasion was a special test transmission, details of which were given in a recent issue. Mr. Inman of Hampstead, using one H.F., detector and one L.F., heard every word from 6 o'clock until the station closed down at 6.15. Mr. Brice, also of Hampstead, heard portions of the transmissions, using a detector valve and one L.F. Mr. Baldry, of Wembley, Middlesex, also received a portion of the programme with receiver employing a detector valve and two note magnifiers. Each of these gentlemen in reporting particulars, pointed out that reception would have been much better had there been less interference from local oscillating receivers.

Newspapers and the Broadcasting Programmes.

The continuance of the Broadcasting Programmes in the daily newspapers has now been agreed upon in view of the widespread desire that this feature should be available to the large number of persons possessing receiving sets throughout the country.

International Meteorological Reports.

The Director of the Office National Météorologique of Paris, announces the procedure adopted regarding weather reports received from ships It is explained that observations made by French ships are transmitted in the first weather report sent out from the Eiffel Tower, following their reception. These Eiffel Tower transmissions are carried out under high power at intervals of about three hours throughout the day, viz., 0220, 0400, 0820, 1005, 1420, 1600, 1920, 2100. In addition to this, reports from French ships may appear in the Le Bourget transmissions at 1050, 1128, 1250 and 1528. In this case they are repeated either in their complete form in the Eiffel Tower report of 1420, or in abbreviated form in the Eiffel Tower report of 1600.

All reports received in France from ships of other nationalities are repeated in an abbreviated form in the high power transmissions from the Eiffel Tower at 0400, 1005, 1600 and 2100. These reports are only transmitted if they are not more than 24 hours old. Where several reports relating to the same locality are received from different ships, only one is transmitted. It is of the greatest importance, therefore, the Director points out, that observations made by ships should be communicated without delay to the Office Météorologique de France in order that the information may be utilised to the greatest possible advantage.

Radio Society of Great Britain : Elementary Lecture for Associates.

The third of the series of elementary lectures, primarily intended for Associates of the Society, will be given by Mr. L. F. Fogarty, A.M.I.E.E., at the Institution of Electrical Engineers, Victoria Embankment, on Friday, March 16th, at 6.30 p.m. The title of the lecture will be :—"Accumulators, Dry Cells, and the Currents used in the Reception of Radio Telephony." The lecture will be illustrated by experiments. Non-members may obtain an admission card by forwarding a stamped addressed envelope to the Hon. Secretary, 32, Quex Road, West Hampstead, N.W.6. Readers are reminded that Associateship of the Society is open to anyone interested in wireless, and no qualifications are required. The annual subscription is 5s.

Correspondence.

To the Editor of The Wireless World and Radio Review.

Sir,—The fact that the Writtle concert has now been definitely closed down has recently been publicly announced. This concert was brought into being specially for the benefit of amateur experimenters, and directly by reason of a petition to the P.M.G., presented by the Radio Society of Great Britain, and signed by about 60 affiliated societies, the Halifax Wireless Society making the original suggestion. Directly permission was granted for this concert, the Marconi Scientific Instrument Co. very kindly made arrangements to carry out the weekly programmes from a special station at Writtle. Thousands of your readers will know how successful these concerts have been, and I wish to express the sincere thanks of the Radio Society of Great Britain, and I am sure also the thanks of all the affiliated societies, for the public-spirited manner in which Messrs. Marconi Scientific Instrument Co. have carried out these concerts week after week with unfailing regularity over so long a period.

Leslie McMichael,

Hon. Sec. of the Radio Society of Great Britain.
32, Quex Road,
West Hampstead, London, N.W.6.
February 17th, 1923.

To the Editor of The Wireless World and Radio Review.

Sir,—I was much interested in the article on the vernier time beats as given by Mr. Mitchell in the current issue of *The Wireless World and Radio Review*.

There are, however, some points which I think require a little further explanation.

For example the times of the first and 300 beat are now given in sidereal time by **FL**, as to-day. January 15th, for instance the series are 17352632 and 17401948 equal to 453·16 time occupied in sending the 300 beats. If a clock is to be adjusted by these beats to G.M.T. is not some further correction necessary.

The series as mentioned by your correspondent and examples given appear to be based on the old system when Paris gave out the times of the first and 300 dots in G.M.T. I should be glad if some further information could be given through your contributor, with examples on the present system, showing how a clock may be adjusted or checked on G.M.T.

P. M. Plumtree.

Sir,—The examples given in my article are not based on the old system, and they are given in sidereal time units as now sent out by Paris **FL**.

Taking the series you quote—

17401948 = 17h. 40m. 19·48s.
17352632 = 17h. 35m. 26·32s.
Difference = 4m. 53·16s.
= 293·16 sec (sidereal).

∴ Interval between any two dots

$$= \frac{293\cdot16}{299} \text{ sidereal sec.}$$
$$= 0\cdot9805 \text{ sidereal sec. (approx.)}$$

The tables required for converting intervals of sidereal time to intervals of mean Solar Time are given in the "Meteorological and Time Signal Section" of the *Year Book of Wireless Telegraphy*, 1923, in the section on Time Signals, together with an example of the use of the tables.

In order to be able to set a clock to G.M.T. from the "rhythmic beats," it is necessary to know the mean time at the preceding sidereal noon, and these values are given for everyday in the year in the "Nautical Almanack" (published by H.M. Stationery Office, Kingsway, W.C.2, price 5s.), page 3, *et seq.* It was not possible to give these values in the pages of *The Wireless World and Radio Review*, owing to the amount of space they would have taken up.

These rhythmic beats are intended chiefly for accurate longitude measurements at astronomical observatories, where the standard clock is set to sidereal time for reasons given in my article. For setting a clock to G.M.T. adopt either the above method or make use of the New International System of T.S. at 0923 G.M.T., daily from **FL**, as explained in previous articles.

W. G. W. Mitchell.

Calendar of Current Events

Thursday, March 1st.

Daily Mail Ideal Home Exhibition (with Wireless Section). Opening day. (March 1st-24th inclusive.)

At 9.20 to 10.20 p.m. Dutch Concert from **PCGG**, The Hague, on 1,050 metres.

LUTON WIRELESS SOCIETY.

At 8 p.m. At Hitchin Road Boys' School. Practical Work and Demonstration.

STOKE-ON-TRENT WIRELESS AND EXPERIMENTAL SOCIETY.

Lecture: "Half-an-hour with a Technical Dictionary." By Mr. F. Bew.

THAMES VALLEY RADIO AND PHYSICAL ASSOCIATION.

At 8 p.m. Film on Radio Transmission and Reception.

Friday, March 2nd.

SHEFFIELD AND DISTRICT WIRELESS SOCIETY.

At 7.30 p.m. At the Dept. of Applied Science, St. George's Square. Lecture on "The Progress of Telephony and its Bearing on Modern Life." By Mr. W. Davies.

LEEDS AND DISTRICT AMATEUR WIRELESS SOCIETY.

Lecture on "The Evolution of Receiving Valve Amplifiers." By Mr. H. H. T. Burbury.

RADIO SOCIETY OF HIGHGATE.

At 7.45 p.m. At the 1919 Club, South Grove. Lecture: "Modulation" by Mr. H. Andrewes, B.Sc.

Saturday, March 3rd.

IPSWICH AND DISTRICT WIRELESS SOCIETY.

At 8 p.m. At 55, Fonnereau Road. Lecture by Mr. A. Southgate, A.M.I.E.E.

Sunday, March 4th.

From 3 to 5 p.m. Concert from **PCGG**, The Hague, on 1,050 metres.

Monday, March 5th.

9.20 to 10.20 p.m. Dutch Concert from **PCGG**, The Hague, on 1,050 metres.

CAMBRIDGE UNIVERSITY WIRELESS SOCIETY.

At 8.30 p.m. Lecture on "Some Anti-Atmospheric Devices." By Major A. G. Lee, M.C.

Tuesday, March 6th.

LOWESTOFT AND DISTRICT WIRELESS SOCIETY.

At St. Margaret's Institute, Alexandra Road, Lowestoft. Third Annual Meeting.

EAST LONDON RADIO SOCIETY.

Meeting.

WEST LONDON WIRELESS AND EXPERIMENTAL ASSOCIATION.

Lecture on "Wireless and Flying." By Lieut. D. Sinclair.

Wednesday, March 7th.

THE INSTITUTION OF ELECTRICAL ENGINEERS (WIRELESS SECTION).

At 6 p.m. At Savoy Place, Victoria Embankment, W.C.2. Lecture on "The Development of High Power Valves." By Mr. H. Morris-Airey, C.B.E.

HALIFAX WIRELESS CLUB AND RADIO SCIENTIFIC SOCIETY.

Elementary Mutual Instruction.

MANCHESTER WIRELESS SOCIETY.

At 7.30 p.m. In Council Chamber, Houldsworth Hall. Lecture: "My Experiences in the Reception of Wireless Messages." By Mr. J. W. Goodman.

EDINBURGH AND DISTRICT RADIO SOCIETY.

At 8 p.m. At 117, George Street. Business meeting. Lecture by Mr. G. D. Crichton.

NORTH MIDDLESEX WIRELESS CLUB.

At the Shaftesbury Hall, Bowes Park, N.11. Annual Meeting.

LEEDS Y.M.C.A. WIRELESS SOCIETY.

At 7.30 p.m. Lecture: "Wireless as applied to Aircraft" (with lantern illustrations). By Mr. M. Eskdale (Bradford Wireless Society).

Thursday, March 8th.

At 9.20 to 10.20 p.m. Dutch Concert from **PCGG**, The Hague, on 1,050 metres.

ILFORD AND DISTRICT RADIO SOCIETY.

Lecture: "Magnetic Detector and Multiple Tuner." By Mr. A. J. Thompson.

LUTON WIRELESS SOCIETY.

At 8 p.m. At Hitchin Road Boys' School. Lecture on "Measurement of Valve Characteristics." By Messrs. G. W. Chandler and W. F. Neal.

Friday, March 9th.

SHEFFIELD AND DISTRICT WIRELESS SOCIETY.

At 7.30 p.m. At Dept. of Applied Science, St. George's Square. Elementary Class conducted by Mr. J. G. Jackson, B.Sc.

LEEDS AND DISTRICT AMATEUR WIRELESS SOCIETY.

Lecture: "Experiences with an Experimental Receiving Installation." By Mr. J. Croysdale.

RADIO SOCIETY OF HIGHGATE.

At 7.45 p.m. At the 1919 Club, South Grove. Lecture: "Measuring Instruments used in Wireless" by Mr. G. A. V. Sowter, B.Sc.

BROADCASTING STATIONS.

Regular evening programmes, details of which appear in the daily press, are now conducted from the following stations of the British Broadcasting Company:—

London	2LO	369 metres.
Birmingham	5IT	420 ,,
Manchester	2ZY	385 ,,
Newcastle	5NO	400 ,,
Cardiff	5WA	395 ,,

Glasgow Broadcasting Station (5 SC) is expected to be in operation on March 19th.

FRENCH BROADCASTING TIMES.

Eiffel Tower. 2,600 metres. 11.15 a.m. weather reports (duration 10 mins.) 6.20 p.m., weather reports and concert (duration about 30 mins.) 10.10 p.m., weather reports (duration 10 mins.).

Radiola Concerts. 1565 metres, 5.5 p.m. news; 5.15 p.m. concert till 6 p.m.; 8.45 p.m. news; 9 p.m. concert till 10 p.m.

L'Ecole Supérieure des Postes Télégraphes et Telephones de Paris. 450 metres. Tuesdays and Thursdays, 7.45 p.m. to 10 p.m. Saturdays, 4.30 p.m. to 7.30 p.m.

Radio Society of Great Britain.

REPORT OF ANNUAL CONFERENCE HELD ON JAN. 24th, 1923.

(*Continued from page 705 of the previous issue*)

Mr. L. F. Fogarty (Hon. Treasurer, The Radio Society of Great Britain).

I very rarely address a meeting either of the Radio Society of Great Britain or of this Conference without speaking about finance, and I do not propose to disappoint you on this particular occasion. We appreciate that the majority of the affiliated societies object to an increased subscription. That is perhaps fairly natural, particularly as they do not know why the increased subscription is necessary. The point is this, that the general expenses of the Radio Society of Great Britain last year exceeded its income by £38, and obviously, therefore, we cannot do more, either for ourselves or for the affiliated societies without an increased subscription. A subscription of 1s. per head in place of the present fee seemed to us at the time a fair proposal, but of course it is open to discussion, but to refuse any increase means that we shall perhaps have to do less than we have done so far. Several members have pointed out that the subscription which their members pay to their societies is too small to allow them to contribute more than they are at present doing. We appreciate that there are a great many societies in that condition. Now, speaking personally, and not as a member of the Committee of the Radio Society of Great Britain, I want to emphasise the fact that in my opinion any attempt to run a Radio Society with too small a subscription is a mistake, and usually dooms the enterprise to failure. I think most secretaries of societies, managers of businesses, and every engineer will agree that there is a certain state of efficiency below which it does not pay to do anything. If you try to run a society on anything but a satisfactory subscription you cannot give your members the convenience of reasonable apparatus, and decent accommodation for meetings, with the result that your members stay away. The whole thing goes in a vicious circle, and finally the scheme falls to pieces. Essentially you should charge a fair admission fee and a fair subscription. You will either have success or you will find it is not worth doing. There was one suggestion made that this Society should accept say, in lieu of the present fee, 5 per cent. of the subscriptions of the provincial societies. I think I am correct in saying that the minimum number of members which a society must have before it can become affiliated to the Radio Society of Great Britain is twenty members. We have been told that some of these societies have a subscription as low as 2s. 6d. If they have twenty members, each paying 2s. 6d., and we agreed to accept five per cent. of that, the total amount would be 2s. 6d. from that society. What could we do for you in the way of sending journals, writing you letters and advice, for 2s. 6d. a year? That, I think you will agree, is absolutely impossible.

The whole question as to whether the increased subscription should or should not be paid seems to me to depend on whether you ultimately adopt the idea of bringing into being this General Committee, and if this General Committee is going to meet in various parts of the country. We are undertaking to meet the expense of hiring halls, etc., but visits to various parts of the country, and the secretarial work in arranging these things, obviously means an increased subscription of some kind. We are quite willing to pay our own share, and our subscription, as everyone knows, is set at a reasonable figure. The whole matter depends upon whether you adopt this General Committee.

If, some time or other, this Committee comes into being—I am very keen that it should, for I feel good will result from it—I should like to see the funds (a separate fund if you like) representing this 1s. per head amounting to such proportions as to enable us to offer not only accommodation (the hire of the hall), but to pay the delegates their reasonable expenses such as fares, etc. The 120 affiliated societies in the kingdom might want to send two members each, that would make 240. Assume 240 persons, with an average expense in attending the meeting of about £2 each, and you will readily see that a very considerable sum of money would have to be found annually to carry out that idea. On the other hand, without such scheme, I can foresee that these conferences will not always be attended by quite so many people from the far parts of the country as may be desirable, and in that case the Committee will find it difficult to arrive at a definite decision upon every point, simply because there will not be a representative there to speak for every society in the kingdom.

Mr. F. Hope-Jones (Chairman).

It may be asked what was the motive of the Committee of the Radio Society of Great Britain in putting on the Agenda an apparently ill-digested scheme? Let me remind you of what I said in introducing the subject. We have our ears to the ground, always listening for what the provinces want. We welcome these conferences and look forward to them for guidance in all matters of important policy. We want to make the most of them, and to anticipate your wishes if you are not satisfied. Are you content with this annual meeting? We want to give you such an opportunity as we have tried to do to-day to suggest what concerns you more than us—some method that you may care to propose among yourselves of forming a sort of Association of Societies in order to bring your points of view clearly before us, and even to take upon yourselves the executive authority should you wish it. That is our motive in promoting this discussion.

Personally, I think you can rest contented as to your interests being guarded by my colleagues and myself on the Committee. We think we have been fairly successful in finding out what you want and in giving effect to your wishes. That is our constant aim throughout each year and we have no desire that you should form yourselves into an Association of Societies and create an organisation of your own to take the executive authority yourselves. Personally, I do not think the circumstances warrant it. I do not think the political forecasts at the present time in wireless affairs demand it. I think your interests are sufficiently well looked after as they are. Though no concrete proposal has been put forward, later in the afternoon I will try and give you a further opportunity of bringing one up.

I propose now to pass to a subject akin to it, inasmuch as it refers to the formation of another Society, namely the Relay League.

"The British Wireless Relay League; co-operation of all Societies in the organisation and management of the League."

We have been asked to put that on our Agenda and I am quite sure there are gentlemen in the room who will tell us in the first place, as briefly as possible, but no doubt forcibly and effectively, the aims and objects of the proposed Relay League.

It originated in Manchester. Mr. Evans is here, so I will call upon him to open the subject.

Mr. Y. W. P. Evans (Manchester Wireless Society).

Sometime last year I attempted to form a British Wireless Relay League on something like the lines on which a league is run in America, simply because I thought it was necessary and that we ought to form a kind of brotherhood throughout the country of people possessing transmitting licences. The object of the Relay League in America was to form a body to assist in a collective effort of carrying out various experiments. A number of suggestions put forward may be ahead of the commercial world in wireless, and with the opportunity of publishing these ideas and encouraging collective experimental work on particular subjects, much useful information will result.

My object is to forward our work in general, and see if we cannot get together some organisation which will prevent many evils—individual jealousy in wireless transmitting, and so on. At the same time it is up to those holding a transmitting licence to make suggestions and put forward views as to how transmitting can be carried out efficiently. At the present time there is the band of wavelengths —from 150 to 200 or a fixed wave of 440—and, especially for the London area, this is ridiculous. You cannot all be working on 440 at once unless you have an organisation to carry out experiments at certain times, and each man in his turn. I have sent out 350 communications to various holders of licences, and societies are in communication with a view to an improvement of the existing transmitting conditions. An efficient organisation of all amateur transmitters would maintain a service of excellent utility. A Relay organisation among the whole band of transmitters throughout the country could be carried out under the auspices of the League, and reports of the results would appear in *The Wireless World and Radio Review*.

I have been in communication with practically every amateur organisation, and the Americans and French particularly show a desire to see a League established here, and an International League for carrying out definite experiments between countries. I daresay a good many of you will know that Manchester has been trying for some time to get across to America with a view to establishing direct communication between the two countries. We have done it with France, and we shall not be satisfied until we have done it with America. I should like to see that spirit shown throughout the country.

I may say I asked for this matter to be put on the agenda so that the societies could be approached with a view to obtaining from them their co-operation. I do not mean that the societies shall collectively become members of the League, but every Society can assist the League by inducing transmitting licensees to join.

As regards the rules, they have been amended somewhat from the first that we sent out. We do not intend to be dictators, and we do not profess to dictate to anyone. I am simply trying to help forward the cause in general. I ask the opinion of the meeting as to whether they think it worth while going on. The support of *The Wireless World and Radio Review*, of the Radio Society of Great Britain, of several societies in France, Holland, Belgium, and American Radio Relay League, may, I think, be depended upon. The present officers have been elected provisionally, and of course, they can always be changed in course of time by the members of the League themselves.

The Chairman.

The American Relay League was very successful. It organised the first communications on short wavelength across the Atlantic. On this side there is one man who has done here what the whole of the American Relay League did in the U.S.A., and that is Mr. Philip Coursey, whom I will now call upon to express his views.

Mr. Philip Coursey.

There are several things to be said for and against the formation of such a Relay League as has been suggested. You are all aware, no doubt, of the existence of the American Radio Relay League and of the sort of work it does. To a certain extent I join issue with Mr. Evans as to the need of that work, but all the correspondence I have had with them strengthens my opinion that their chief aim and object in relay work is communication rather than experiments. They mainly want to handle messages, and the greater the distance the better they like it. There are some extraordinary examples of such handling of messages.

As regards this country the chief objects of such a League would be for experimental work mainly in conjunction with other countries. In our own country, there is really very little use for relay messages, as with short wavelength and amateur power any part of the country could be reached on C.W. transmission. I am not referring so much to telephony, of course, and that is a field in which further experimental work may be done.

The three main French societies formed a committee in connection with the Transatlantic Tests, and that committee is extremely anxious to work in conjunction with us, and, as Mr. Evans says, the American Relay League is also very anxious to work with us. The Americans themselves are astonished at what we have done during the last month, and they frankly admit that our receiving sets are vastly ahead of theirs in efficiency. They, however, have had much more experience than we have in transmitting.

Mr. Evans referred to communication from this country to the United States

It will be remembered that the Radio Society put up a special station in London, for which the Post Office gave us a temporary licence, and we transmitted messages to the States in conjunction with other tests. We sent a special code message, together with Christmas greetings (which we added on to the end of it), about Christmas time. These tests, which were entirely successful, demonstrated what could be done with short wave on C.W. transmission.

The main use for any such League appears to be that it will carry on for experimental purposes the organisation which was started by the meetings of transmitting licensees held a short time ago. If there is any possible way of bringing all new licensees together, under any such league or similar association, in order that they can be informed of what other amateurs are doing, the difficulties they have encountered, and what rules have been found necessary among ourselves to facilitate such experimental work, and its existence can be brought to the notice of all new licensees, then it would be extremely useful.

Regarding offenders against the ordinary rules governing the operation of sets, there is only one way of punishing a member who persistently continues in his offence, and that is by reporting him to the Post Office as being guilty of a breach of the licence regulations. I am convinced that if its members are thoroughly agreed a league such as is suggested could have very useful results.

If, for example, there were introduced some simple organisation to ensure that several stations were always listening in at certain times for American signals, we could in that way obtain most valuable information on the short wave transmission possibilities over the Atlantic. In connection with our tests which we have carried out, we found that although the signal strength varied during the period of the tests, and although the number of signals fluctuated enormously, there was no complete break. Such an organisation would doubtless work in with many of the officially recognised international societies which are investigating such matters at the present time.

In connection with such work I am in support of this formation. But if it is merely for relaying messages for ourselves I do not think it has anything like the scope that the American League has. Its use for relay in that way would be, of course, simply to collect information together as to the result of the particular tests made, and to enable it to be collected quickly. As a final suggestion, as you all know, the term wireless is being dropped generally in favour of radio, and in view of this fact I suggest the British Radio Relay League would be a better title than the British Wireless Relay League.

Mr. H. S. Pocock.

I do not think I have anything to add to what Mr. Evans and Mr. Coursey have said in regard to the League. I would merely like to state that *The Wireless World and Radio Review* would be very pleased to assist in every way possible in furthering the work of the League. I think the fuller organisation and the objects of the League would be a matter for discussion amongst those particularly concerned.

Mr. Y. W. P. Evans.

It was not so much the intention to relay messages for their sake alone, but to further experiments, especially in telephony. Messages, however, that refer to any special test, can be relayed by Morse, as Mr. Coursey suggests.

Mr. H. S. Walker (Hounslow and District Wireless Society).

The question of the Radio Relay League is a rather important matter. I may say that during some recent tests we transmitted mostly during the hours of the stilly night, sitting up for ten days. There are many points cropping up which I think the Radio Relay League could settle. We have discussed it in our society and our society would be prepared to support it with all the assistance in its power.

We would like to know, however, what would be the attitude of the Postmaster-General towards relaying messages?

Mr. Y. W. P. Evans.

The Postmaster-General has given permission for messages to be relayed provided they are confined to the work of the League.

Mr. A. J. Dixon (North Middlesex Wireless Society) supported the League, and other delegates also indicated useful work which might be undertaken.

Mr. Maurice Child.

Speaking as a member of the Radio Society of Great Britain, I foresee some objections to the formation of this League.

I think we ought to bear in mind that there is a vast difference between the American Relay League and anything which we could do in this country. The Americans have got a territory equal to practically the territory of the whole of Europe to work over. There is some utility perhaps in their experiments under such conditions, since scattered populations ought to be able to communicate one with another over such a vast area. If we are going to do anything of the same kind in Europe, we must first of all start, in my opinion, by not calling it a British Wireless Relay League, or even the British Radio Relay League, but The International Radio Relay League of Europe, or something of that kind. Now, the Americans have settled their internal political questions very satisfactorily for many years. But I ask you gentlemen, are the conditions in Europe to-day favourable for such a League to be formed? You can arrange communication between England and France, but can you work from England to Turkey, or can you work from England to Moscow? I think the time is not yet ripe for the formation of a League which is going to do experimental work between all these countries. We have got to get behind a great deal of red tape in Whitehall before we shall get favourable conditions.

Mr. W. Winkler (Edinburgh and District Radio Society).

We have heard that a great number of people are in favour of the institution of such a League, and at the same time there are others against the idea. Nobody is forced to join, and the organisation is there for those who wish to do so.

The Chairman.

I think that there is very useful work in front of this League. It would naturally handle transatlantic transmissions. Perhaps it is to be regretted, as Mr. Child pointed out, that it cannot very well tackle continental traffic at present, but it might expand into an international organisation afterwards, after experience in handling the work here. A certain banding together of transmitters is very advantageous. There are matters frequently arising which require the transmitters to confer together rather urgently. It seems to me essential that the Relay League would consist primarily of transmitters, although I understand from Mr. Evans that it is at present open to holders of "receiver" licences also. I just want to say this. If the British Radio Relay League undertook such important work as is indicated, it might have to act as a watch committee, reporting and trying to suppress bad manners in wireless. In these circumstances the League should strengthen its organisation and personnel. I would like to ask Mr. Evans when the British Wireless Relay League was formed.

Mr. Evans.

The original idea was embodied in a letter which I sent out in the autumn of last year, and up to the present time we have about 24 members, and I understand there are about 15 applications which are in abeyance until after this Conference.

The Chairman.

That sufficiently answers my question. Would Mr. Evans welcome my suggestion that the League's personnel should be considerably strengthened and more influence and ability added to that which you already have in large measure? It occurs to me that if you were able to persuade Mr. Coursey to become your President you would secure the greatest authority on that class of work on this side of the Atlantic, and all the other transmitters should be specially invited to join.

Mr. Evans, replying, said:

I would like to say that I did write to Mr. Coursey about this Relay League, but just at that time he was busy with the organisation of the Trans-atlantic Tests. I do assure Mr. Coursey that the valuable work he has done will not be overlooked in this League.

The Chairman then asked for a show of hands to indicate whether the desire of the meeting was to support the League or not. Very strong support was indicated.

The Chairman.

I promised to bring up again the first item on the Agenda, which relates to the organisation of the Conferences, and the meeting is now open to hear any proposals or alternatives to our present annual conference held in January.

Mr. H. Epton (Hackney and District) put forward a resolution relating to the constitution of the Radio Society of Great Britain, and it was explained by the Chairman that the Conference was not concerned with and had no powers to deal with such a matter.

Mr. L. F. Fogarty (Hon. Treasurer).

When a society becomes affiliated to the Radio Society of Great Britain there is included with the receipt for their subscription a membership card with a note asking the Secretary of the Society to fill in the name of their accredited member, and to notify me accordingly. A member so credited can attend and vote at every meeting of the Radio Society of Great Britain.

The Chairman.

The next item on the Agenda is:—

Broadcasting: How it affects members of Affiliated Societies:—

(a) From the point of view of those holding Transmitting Licences.

(b) Those holding Receiving Licences.

This afternoon we have with us, as a member of the Radio Society of Great Britain, a broadcasting authority. I refer to Mr. Reith, the General Manager of the British Broadcasting Company. I hope that we shall later have the pleasure of hearing something from Mr. Reith.

Major Basil Binyon.

I am sure all of us who are interested in amateur experimental work appreciate the fact that to the amateur, and particularly to the transmitting amateur, broadcasting may at times be very troublesome, particularly as regards the 440 metre wave. But surely, with the suggestion we have before us for the formation of a Radio Relay League, organised for all those holding transmitting licences, in conjunction with the Radio Society of Great Britain, I am sure we could obtain some other transmitting wave which would enable us to carry out those experiments throughout the whole broadcasting periods.

But just consider for a moment what it is that broadcasting can do for the amateur. One has heard of the disadvantages of broadcasting to the amateur. One ought not to lose sight, however, of some of the advantages, because at any rate I am convinced there are some advantages which arise. Speaking from my own experience, personally I certainly have found regular telephony programmes exceedingly useful in carrying out a whole variety of experiments in connection with improvements in receivers, testing of all other kinds of loud speakers, and research for improvements in articulation in receiving apparatus, and a number of things of that kind, where regular transmitting programmes are very beneficial.

Broadcasting is unquestionably creating a great deal of interest throughout the country. What does that mean to our amateur societies? People who knew nothing about it before have become interested purely from the point of view of hearing a concert. A little later on they come to want to know how the instruments work, and later they will join a wireless society, and it is therefore a great help in bringing in new recruits.

I would emphasise the point that societies are formed to look after the interests of the experimenter and that listeners-in will soon be the vast majority of wireless users, and though we may be organised we have to remember that if we are going to be a nuisance to the listener-in in any way he will perhaps organise himself against us, and therefore what we want to do is to regulate our transmissions or work in co-operation so that we secure the best results, and at the same time allow people who only want to listen in to broadcasting to enjoy broadcasting.

The discussion was opened by comments by a number of delegates, most of whom pointed out the difficulties under which experimental work, and especially transmitting, was conducted as a result of the monopolising of the ether over the period of broadcasting, and on a wide band of wavelengths.

Mr. J. W. C. Reith.

There was once a fellow called Daniel who, on entering a room, was introduced to society in which he found he was not welcome. Daniel was much wiser than I, because I came here willingly. In the little while I have been here I have been very much inclined to study the most expedient means of exit!

There is no doubt that the formation of the British Broadcasting Company has aroused criticism to a very large degree in two quarters. First from the amateur (or the experimenter), secondly from certain commercial undertakings who may consider that they have been excluded, or are about to be excluded, from fulfilling their lawful functions. The difficulties that we have been faced with have been, are still, and will continue to be, enormous. Criticisms which were made are, shall I say, of three orders. Before I indicate what those are, I may mention that I have had to decide three weeks ago, when I joined the British Broadcasting Company, whether I was going to set out to reply to those criticisms and endeavour to eliminate the misconceptions which had arisen, or whether I was going to get on with broadcasting. We decided to get on with broadcasting, and I think most of those who listened to our programme last week when we were transmitting opera would agree that we have attained a certain degree of success. Criticisms are of these three categories. First, the perfectly reasonable; second, the not wholly unintelligible, and thirdly the altogether ridiculous and inaccurate. I am not, of course, referring to the criticisms which we have heard to-day. I am just going to point out some of the difficulties. Our programmes are exceedingly expensive. A very gross misconception exists that we are a most prosperous firm, coining money. Our revenue is derived from two sources—Post Office licences and royalties. I could give you figures of the number of broadcasting licences and experimental licences, and the preponderance of the experimental licence over the other would, I think, surprise you. Now we know there are thousands of people in possession of apparatus with no licences at all. I personally know several and endeavour to deal with them. The Post Office are undoubtedly going to get at them some time. I know that there are firms selling to holders of broadasting licences apparatus which does not carry the Broadcasting Company's stamp. If a man with a broadcast licence goes and buys a set which is not marked "B.B.C." we get no tariff on it, and he gets the whole of our programme for 5s. a year. If he has an experimental licence and buys so-called experimental apparatus he may be doing it with the sole purpose of listening-in to broadcast programmes. We are up against the operations and opposition of "experimenters," falsely so called. One speaker indicated what broadcasting owed to the experiments of the amateur. Don't you think we realise it? Don't you think we realise that perfectly well, and that if it had not been for the many years of arduous efforts on the part of the amateur, broadcasting would not be an accomplished fact? We are not really the hard pig-headed commercial concern we are sometimes represented to be. Nor are we, on the other hand, an iniquitous monopoly, as some commercial concerns consider us to be. We acknowledge our debt to the amateur, and if we did not acknowledge it—well, more fools we!

I would point out that it is quite likely that the amateur may do a good deal for broadcasting in the future. If he is experimenting and succeeds, where is his market if the Broadcasting Company had not succeeded in preserving that market for him? The experimenter can help *us* in two points. Where you know a man is ungenerous and dishonourable, help us in that. Where you know a man is not using B.B.C. material—by unscrupulous means—help us in that! I think you will agree with me that it is not in accordance with British ideas that a man should get something for nothing.

We are in every way out not only to co-operate with you, but to assist you in recognised experiments where possible.

As regards broadcasting hours, we are under obligations to the public to put some kind of programme over, and everybody in the country holding copyright or any other rights are on to us. People say is it necessary to have broadcasting programmes from 5 to 11 o'clock regularly, and though it may surprise you, some people seem to enjoy them. What are the public going to say if we suddenly shut down to give the amateur a chance? We must regard, above all things, the terms of the licence under which we exist, and under those terms we are under an obligation to broadcast to the public through the stipulated hours.

We invite your co-operation, and, speaking on behalf of the Company, I say that we will and can have no other attitude towards you than that of anticipating your co-operation.

The Chairman then said:

We have had a very interesting discussion on broadcasting. I do not think anybody will accuse me of being a champion of broadcasting to the detriment of the amateur, and perhaps on that account I am all the more free to confess how greatly I enjoyed the programme of **2 LO**, particularly during the Christmas festivities, which, from the point of view of anyone with children at home, introduced a very novel and welcome element, to say nothing of Covent Garden opera, culminating in that wonderful Melba performance the other night. It was just two years ago, almost to the day, and in this very room, that the Second Annual Conference asked that permission should be granted to the Marconi Company to broadcast from Chelmsford.

We boldly asked for music, and, greatly daring, defended the request by claiming that the amateur experimenter was such an asset that he should be encouraged by popularising the science. After losing nine months in patient negotiations we presented a petition which produced the desired result within a fortnight. There is a saying that we English muddle through, that we go slowly, and always follow after other people, but that ultimately we usually do it very well. I think the Broadcasting Company are doing it very well, and that their organisation is not of the kind which is here to-day and gone to-morrow, but is substantially founded. Our duty is clear. It is perfectly true we were there first. It is true we were not consulted on the vexed question of wavelength. But don't let us forget that the object is the greatest good to the greatest number, and just as we have set up a standard of good manners in things wireless, so we must maintain it. We are going to see to it that the law is obeyed, and I think Mr. Reith will find that we are competent to do a great deal of work in the way of removing difficulties without detriment to our own interests. Certainly such evils as reaction, illegal practices, the taking out of no licences at all, and the purchase of goods which are not intended to be bought with broadcasting licences and things of that kind, will not be countenanced by the Radio Society of Great Britain. It and its 152 affiliated societies are on the side of law and order.

Questions and Answers

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 questions 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) Each communication sent in to be accompanied by the "Questions and Answers" coupon to be found in the advertisement columns of the issue current at the time of forwarding the questions. (4) The name and address of the querist, which is for reference and not for publication, to appear at the top of every sheet or sheets, and unless typewritten, this should be in block capitals. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." (5) 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.* **(6) Where a reply through the post is required every question sent in must be accompanied by a postal order for the amount of 1s., or 3s. 6d. for a maximum of four questions.** *(7) Four questions is the maximum which may be sent in at one time.*

"E.B." (S.E.15).—(1) The samples of materials submitted are quite suitable for use in the construction of condensers. The tinfoil is about 0·001″ thick and the paper less than 0·001″. It will be difficult to calculate with any accuracy the capacity of a condenser built with these materials. However, you should try. The specific inductive capacity of paper may be taken as 2·4. (2) We suggest you take tappings at 200, 350, 550 and 800 turns. The remainder of the wire should be used in a larger coil with a diameter of 2″. You will not require a variable condenser. (3) There is no best value for the coupling, and we suggest you find by experiment which is better for the wavelength range over which you wish to receive. (4) The correct sizes of pins and the spacing between the centres of the sockets is given on page 328, December 9th issue.

"R.K." (Flint) *asks* (1) *How to wire up a receiver so that different potentials may be applied to the high frequency detector and low frequency valves.*

(1) The connection is quite easily made. Instead of a common lead supplying the H.T. to the anode of the valve, one lead is taken to the high frequency valves, another to the detector valve, and the third to the low frequency valves. Three plugs are provided for tapping into the battery. The method is given in Fig. 1, page 601, February 3rd issue.

"H.R." (London, N.6) *refers to the Armstrong super-regenerative receiver and asks* (1) *Could a circuit be given in which only two valves are used.* (2) *May a cardboard tube wound with No. 26 D.C.C. coupled to the tuning coil be used instead of the variometer.* (3) *May 80 or 100 volts be used as the high tension supply for the anodes.* (4) *Is an "Ora" type valve suitable for this receiver.*

(1) See the reply to **"H.R." (Highgate)** in the issue of January 6, 1922, page 488. (2) and (4) It is always better, when one is constructing a receiver of this description, to follow out the writer's instructions precisely, and when one has gained working experience with this type of circuit, it is then an easy matter to make changes and experiment, but until considerable experience is obtained, great difficulty will be met with in securing satisfactory operation. (3) 80 or 100 volts is quite a suitable potential for the anodes of the valves.

"F.F." (Manchester) *asks* (1) *Whether the combined length of the aerial and lead-in may be 100′ irrespective of the number of wires used in parallel.* (2) *Would it be necessary, if one wishes to change the aerial, to get the permission of the Post Office.* (3) *Would the substitution of a four or six-wire cage aerial be an improvement. It is desired to conduct experiments with long wave reception.* (4) *Is 7/22 stranded wire better than No. 16 hard drawn copper wire for aerial purposes.*

(1) We believe the Post Office will allow you to erect an aerial, the length of which from the free end to the earth connection is 100′. Any number of wires may be used in parallel. (2) We do not think you will have to obtain permission before you may add more wires in parallel to the aerial. (3) We do not think any great advantage will be obtained by the use of a cage aerial, as you are only interested in reception. (4) We suggest you use the No. 7/22 stranded wire instead of No. 16 hard drawn copper wire.

"F.G." (Birmingham) *refers to Fig. 3, page 549, January 20th issue, and asks whether it will meet his requirements.*

With reference to the diagram, Fig. 3, page 549, January 20th issue, the circuit is quite correct, and is a good circuit if the switching arrangements meet your requirements. It is necessary to couple the high frequency valves by means of the condensers and resistance shown in the diagram, and we would point out that the resistance is not joined across the condenser, but is connected between the grid and filament. The method of connecting the potentiometer is indicated in the sketch. The potentiometer is joined across + and − L.T., and the two leaks from the grid leaks, instead of going directly to the filament battery, are taken to the sliding contact on the potentiometer. Because the reaction coil is coupled to the close circuit coil, energy may be radiated from the aerial circuit if care is not taken, and we suggest when listening to broadcast transmissions you keep this reaction coil short-circuited. The reaction coil could be removed from the circuit, and when it is required to listen to other transmissions, the short circuit could be removed and the reaction coil brought into use again. Apart from this, we think the Post Office would grant you permission to use this circuit.

"A.McD." (Edinburgh) *asks whether interference is likely to be caused from the use of a small motor generator which is used to supply plant-heating current.*

We suggest you try whether interference is caused through the receiver when the induction motor is running with the ordinary accumulator filament heating. If there is a hum present in the receivers, we suggest you screen the motor by placing it in an iron box, and take care with the earth lead. If the leads to the motor are earthed in any way, a separate earth should be made for the wireless receiver. It may consist of a galvanised iron sheet about 2′ wide and 3′ long, to which are soldered the earth wires. The earth lead should run directly to earth, and not run parallel with the power leads. When the generator is connected with the valve filaments, it may be noticed that there is a hum due to the commutator ripple. This is easily smoothed out by means of a large capacity condenser connected across the filaments. 4 to 6 mfds. would be suitable. Attention should be paid to the brushes of the generator, because any sparking here will be heard in the receivers.

"A.H." (Cambridge) *submits a diagram of connections and asks for criticism and advice.*

We have examined the diagram submitted, and the circuit is quite correct, but we suggest you use a closed circuit as well as the aerial circuit, and the connection from the grid leak resistance should also come to the potentiometer. The loose coupler may be used as the anode winding and a reaction coil, but it is rather large if it is desired to receive short wavelength signals. We suggest you rewind each winding with No. 22 D.C.C. and take off 15 tappings from the anode coil, and 6 from the reaction coil. The alternative to this arrangement is to use dead-end switches. The tuner coil is suitable. When the reaction coil is coupled with the anode coil, energy will not be generated in the aerial circuit, but when the reaction and aerial coils are coupled together, it is quite possible to set up oscillating energy in the aerial circuit, which will cause interference.

"J.S." (Bolton) *asks whether an inverted L type aerial is directional, and if so, whether it is worth while attempting to make use of the property.*

The ordinary inverted L type aerial is slightly directional, and to obtain the benefit of this property, the free end of the aerial should point away from the station it is wished to receive. However, the gain through making use of this property is very slight, and will, generally speaking, be hardly worth while. Therefore the lead-in should be taken at the most convenient end of the aerial. It should, of course, be direct, and be held away from the walls of buildings, trees, and so on.

"M.C." (Wicklow) *asks (1) For the dimensions of a grid leak to have a resistance of about 10,000 ω. (2) Whether a grid condenser and leak connected with each H.F. transformer will cause a reduction in the signal strength.*

(1) A suitable grid leak would be constructed as follows :—A piece of ebonite rod 1½″ in diameter should have eight grooves 0·5″ deep and 0·3″ wide. Each should contain 1,000 turns of No. 38 Eureka wire, preferably D.S.C. It is not necessary to take any pains to ensure that the grid leak winding shall be non-inductive, as no great advantage is brought about through the use of a non-inductive grid leak. It is very convenient to provide tappings on the grid leak, and in between the slots the wire may be brought to a brass tab which is secured with a small screw. Although the grid condensers and leaks are permanently connected in the receiver, it will be found that no serious loss in signal strength will result when high frequency transformers are used in place of the tuned anode or anode resistance method. It is, however, better to remove the grid condensers and leaks, except from the detector valve.

"H.F." (Orpington) *asks (1) How connections are arranged so that the anodes of the valves may be supplied with independent voltage taps. (2) How may the last valve in the L.F. amplifier be converted to a power valve.*

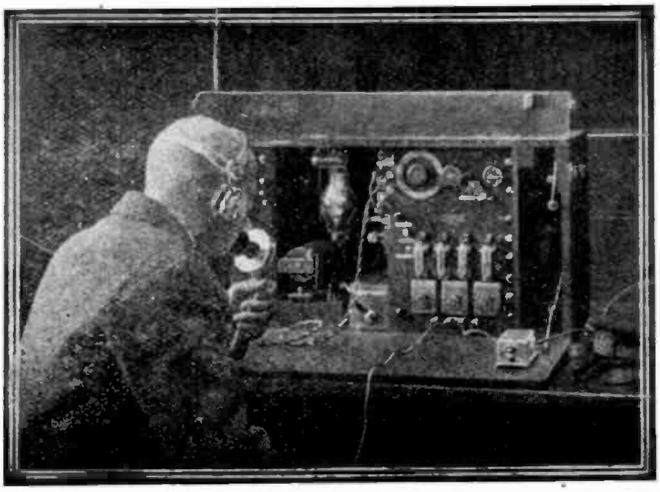
(1) The arrangement is very simple, and is indicated in Fig. 1, page 601, in the issue of February 3rd. Instead of the ends of the transformers being coupled together and taken to one H.T. terminal, independent leads are taken from the transformers, and are tapped off the battery as required. There will be no voltage drop due to the anode current passing through the filament resistance, because the anode current has such a small value. (2) We suggest you connect a few negative cells in the grid circuit of the last valve, and increase the anode potential to about 200 volts. We would refer you to the article on page 601, February 3rd issue of this journal.

"G.F.K." (Sidmouth) *asks (1) Whether we can identify stations from the particulars submitted. (2) Why the signal strength was increased when a tapping was taken from the centre of the grid leak, which consisted of pencil lines upon a piece of cardboard. (3) Would the H.T battery send sufficient current through the grid leak to cause it to run down rapidly. (4) Are the results obtained satisfactory for a single valve receiver.*

(1) We have no definite information concerning the stations referred to, and we believe the call-signs have only recently been allotted for experimental work. (2) We cannot say why you should obtain such a great increase of signal strength when the H.T. is connected with the grid leak, but we think if a proper grid leak were used, you would not notice changes in the signal strength through making connections of this kind. (3) The amount of current passed by the grid leak when connected with the H.T. battery would be so small that it could be neglected. (4) We consider you are obtaining good results with your receiver.

"A.C." (Woodford) *asks (1) Whether a telephone transformer is necessary. (2) What resistance telephones should be used. (3) If the telephone transformer is unnecessary, what would be the resistance of the telephones to be used, and how would they be connected in the same circuit.*

(1) and (2) We suggest you use the telephone transformer. 60 ohm telephones should be used. The transformer described on page 553 of the



January 20th issue is, as you suggest, quite suitable for your purpose. (3) If you do not care to go to the trouble of making a telephone transformer, high resistance telephones may be used. Telephones with a resistance of 4,000 ohms will be quite suitable, and should be connected in the circuit as shown on page 552 of the January 20th issue.

"READER" (Birmingham) *asks* (1) *Whether the circuit submitted is suitable.* (2) *What are suitable values for the condensers.* (3) *What would be a suitable frame aerial.* (4) *What is the value of the resistance marked R in the diagram submitted.*

(1) The receiver wired according to the diagram submitted will certainly give signals, but we suggest you use a standard arrangement. A number of circuits appear in these columns from time to time. (2) The condensers have the following values:— C_1, maximum value, 0·0005 mfds.; C_3, maximum value, 0·0003 mfds.; C_2, maximum capacity, 0·002 mfds. (3) We suggest a frame aerial with 6′ sides and ten turns, the turns being spaced ¼″ apart. No. 18 D.C.C. wire is suitable. Four or five tappings should be taken. The resistance R may be 2 megohms.

"A.C.S." (N.10) *submits a diagram of connections of his receiver and asks* (1) *Is the circuit correct.* (2) *What is the value of the inductance marked X in the diagram.* (3) *What H.T. battery is needed for use in connection with "Ora" type valves.*

(1) The diagram is quite correct, except that a connection across the series parallel switch is missing. This connection is given in all diagrams which appear in these columns. (2) The value of the inductance X is such that, together with the tuning condenser, it tunes to the wavelength of the closed circuit. A plug-in coil may be used, and would therefore have about twice as many turns as the closed circuit coil. (3) We suggest you use a 60-volt H.T. battery. A lower voltage often gives quite good results, but it is convenient to be able to provide 60 volts for the anodes of the low frequency valves, even if this voltage is not required for the high frequency valves.

"THREE VALVE" (Wallington) *asks* (1) *Whether better results should be expected if different types of valves are used for H.F. and L.F. amplification.* (2) *Why, with the aerial tuning condenser in parellel with the A.T.I., the signals are much weaker, and in addition, the receiver oscillates directly the anode winding is tuned to the wavelength of the aerial circuit.*

(1) We do not think there will be any great gain in signal strength through connecting different valves in the high frequency and L.F. portions of your receiver. It is generally advisable to use one type of valve throughout the receiver, and we suggest "Ora" type or "R" type valves. (2) When receiving short wavelength signals, it is often noticeable that the signal strength is louder when the A.T.C. and A.T.I. are connected in series. When the anode winding is in tune with the closed circuit, there is a tendency for the receiver to oscillate, and for this reason the grid leak is connected with the grid and + L.T. If there is still a tendency for the receiver to generate oscillations, we suggest you reverse the connection to the reaction coil, so that the tighter the reaction coil coupling, the greater is the reduction of signal strength.

"G.V.F." (Beckenham) *asks* (1) *What would be a suitable winding for an anode coil and reaction coil.* (2) *If an experimental licence is taken out between now and June, is it necessary to renew the licence again in June.* (3) *Is a variable grid leak likely to be satisfactory when made of a piece of ebonite, containing pencil lines along it.*

(1) We suggest you wind the anode coil 8″ long and 3½″ in diameter as suggested, with No. 34 S.S.C. wire. There should be 12 tappings. The reaction coil can be 2¾″ in diameter and 6″ long, of No. 34 S.S.C wire. (2) We have no definite information on this point, but the Post Office will ask you for the renewal of the fee when it is due. We believe it will be due upon the anniversary of the date of granting the licence. (3) We do not think a variable grid leak constructed as suggested is of much value, because it is so difficult for one to know the actual resistance of the leak, and it is not always possible to obtain consistent results. The usual value of grid condenser and leak is 0·0003 mfds. and 2 megohms.

"SPARKS" (Stone) *asks* (1) *Is the proposed arrangement correct.* (2) *What improvements could be made.* (3) *Would the Post Office give him permission to use the receiver.*

(1) and (2) The diagram is correct, but it is not necessary to connect a variable condenser across the L.F. transformer connected in the anode circuit of the first valve. The grid condenser should have a value of 0·0003 mfds., and you would find it helpful to connect a 2 mfd. condenser across the H.T. battery. (3) As the reaction coil is coupled with the aerial coil, it will be possible to easily transfer oscillating energy to the aerial circuit, and we do not think the Post Office will give you permission to use a circuit of this description, especially if the receiver is intended for the reception of broadcast transmissions. The reaction coil should be short-circuited, or one stage of high frequency amplification be used.

"RAWLINGS" (Hull) *submits particulars of a valve which he has purchased, and asks whether we can give him any information.*

We regret we have no information concerning a valve of the type in your possession. It is obviously an American valve probably a small power valve. You will be able by experiment to find out the approximate filament voltage and current, when we should probably be able to identify the valve.

"W.L.B." (Bristol) *asks* (1) *What is the wavelength range of a loose coupler, particulars of which are submitted.* (2) *What would be suitable windings for an anode coil.* (3) *What would be a suitable reaction coil.* (4) *What is the address of the manufacturers of the Fuller Block Accumulators.*

(1) The wavelength range of the loose coupler will depend very largely upon the dimensions of your aerial, but with a normal aerial the range covered is approximately 150 to 900 metres. (2) A suitable tuning coil would be 3″ in diameter and 6″ long, of No. 32 S.S.C. The coil should be tuned with a condenser having a maximum value of 0·0002 mfds. (3) A suitable reaction coil would be 2⅜″ in diameter and 4″ long, wound with No. 34 S.S.C. wire. Five tappings should be taken. (4) The address of the manufacturers of the Fuller's Block Accumulator is Iddesleigh House, Caxton Street, Westminster.

"STUCK" (N.W.8) *has a receiver and uses a crystal for rectification, and asks why the addition of one valve does not give much magnification.*

The fault probably lies in the transformer which is used. We suggest you try different combinations of crystals, and use the combination which gives the loudest signals. As you probably know, the different crystal combinations have different resistances, and with a little experimental work you will find the best combination which, used in conjunction with the transformer, gives the loudest signals.

"J.O." (Manchester) *asks what size variable inductance to use in conjunction with a crystal for the reception of broadcast transmissions.*

We suggest you use an aerial coil 4″ in diameter and 3″ long, of No. 20 D.C.C. The secondary may be 3″ in diameter and 4″ long, of No. 26 D.C.C.

"E.J.M." (Surrey) *asks whether the proposed method of coupled L.F. valves would give as good results as the usual low frequency transformer method.*

The proposed method is often used with success. The grid condenser should have a value of about 0·002 mfds., and the grid leak about 1 megohm. Good results should be obtained, and when proper adjustments are made, the results should compare favourably with the more usual transformer method of coupling.

"H.H.D." (Essex) *asks* (1) *Whether it is possible to charge accumulators from A.C. mains using a chemical rectifier of the type described recently in this journal.* (2) *If the method referred to is practicable, please give specifications of suitable transformer for use in connection with the charging of a four-valve accumulator.* (3) *What would be suitable dimensions for the cells used in the rec'ifier.*

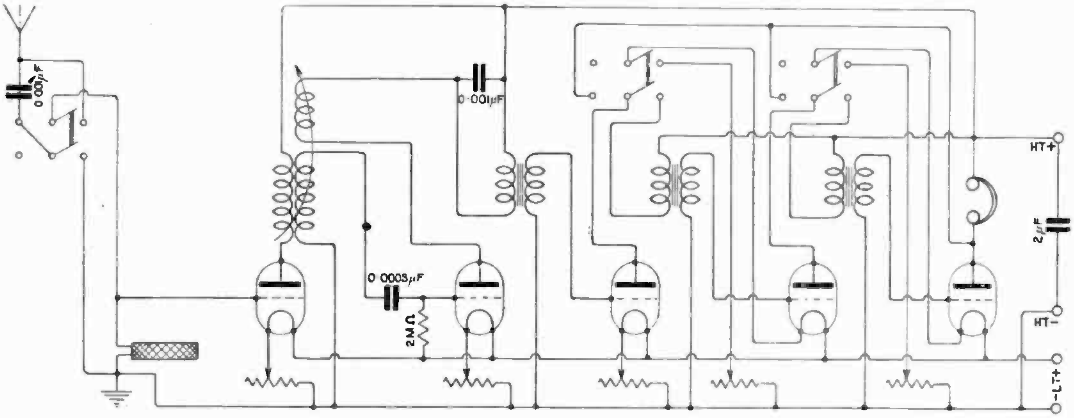


Fig. 1. A 5-valve receiver with 1 H.F., 1 Detector, and 3 L.F. valves. The H.F. valve is transformer coupled and the reaction coil is coupled with this transformer. Switches are provided for cutting out L.F. valves.

"R.T." (Kent) *asks for a diagram of a five-valve receiver.*

A suitable diagram is given in Fig. 1, and shows how one H.F., one detector, and three L.F. valves are connected. Suitable values for the condensers are given in the diagram. Switches are connected for the purpose of connecting the telephones to any of the last three valves.

"WIRELESS" (Staffs.) *asks* (1) *Whether the proposed method of constructing a low frequency transformer is suitable.* (2) *What resistance telephones should be used in conjunction with the telephone transformer.* (3) *What type of valve is recommended for use in the high frequency portion of the circuit.* (4) *Should he expect to get better results if the No. 12 copper wire which is at present used in his aerial were removed and No. 7/22 copper wire is used in its place.*

(1) The telephone transformer primary winding may consist of 2½ ozs. of No. 42 S.S.C. wire, the secondary being 5½ ozs. (2) The telephone transformer should work quite well if 60 ohms telephones are used. (3) We suggest you use "R" type or "Ora" type valves. There is nothing much to choose between them. (4) We do not think you should expect to obtain a great increase in signal strength through using 7/22 copper aerial wire in place of No. 12.

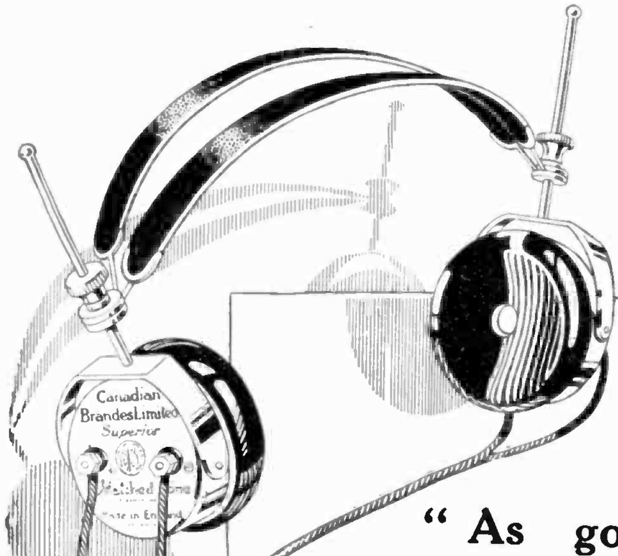
It is not possible to charge accumulators with the aid of the chemical rectifier referred to. This rectifier will only pass a current of a few milliammeters, and it is therefore only suitable for supplying the anode circuits of the receiver. To charge your accumulator satisfactorily, a current of 3 amperes would be required, and we suggest you use either a mechanical rectifier or a special valve rectifier.

SHARE MARKET REPORT.

Prices as we go to press on February 23rd are :—

Marconi Ordinary	£2	14	6
,, Preference	2	6	10
,, Debentures	108	0	0
,, Inter Marine ..	1	8	9
,, Canadian	0	11	6
Radio Corporation of America :—			
Ordinary		15	0
Preference		13	3

The Directors of W. T. Henley's Telegraph Works Company, Ltd., recommend a final dividend on the ordinary shares of 2s. per share less tax, making a total of 3s. per share.



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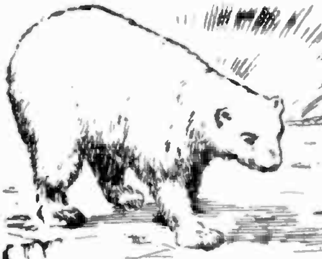


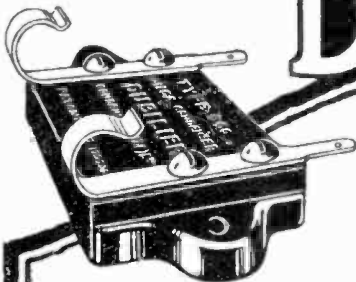
Questions and Answers COUPON

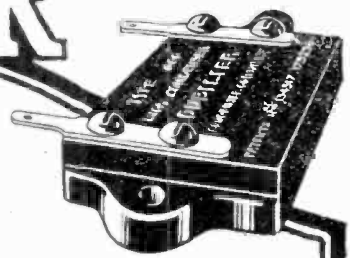
To accompany Questions sent in during the week commencing March 3rd, 1923.

VOL. XI, NO. 22

See Conditions on Page 747.

DUBILIER





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QUALITY PRODUCTS AT POPULAR PRICES

Because we concentrate on manufacturing condensers you get good deliveries.

Our policy makes sure that in Dubilier Condensers you get quality products at popular prices.

Dubilier Mica Condenser. Type 600.

For use in wireless receivers, with or without Dubilier grid leaks.

0·0001 mfd. and 0·001 mfd. - **2/6** each
0·001 mfd. to 0·005 mfd. - **3/-** each
Condensers with grid leaks - **5/-** each

Tested to 1,000 volts.

Dubilier Mica Condenser. Type 600a.

For close mounting in wireless receivers, space occupies $2\frac{3}{8}'' \times \frac{3}{8}''$.

below 0·001 mfd. - - - - **2/6** each
from 0·001 mfd. to 0·005 mfd. - **3/-** each

Tested to 1,000 volts.

The Dubilier Condenser. Type 577.

Is a small power condenser and is suitable for either transmitters or receivers. It has extraordinary small losses and the capacity remains constant under all conditions.

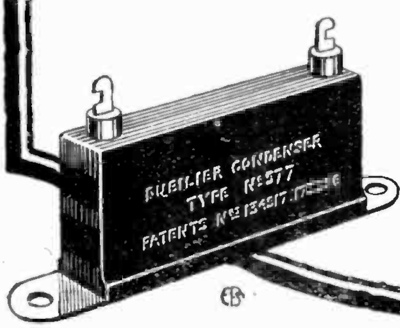
From 0·0001 mfd. to 0·01 mfd. **7/6** each. Tested to 2,000 volts.

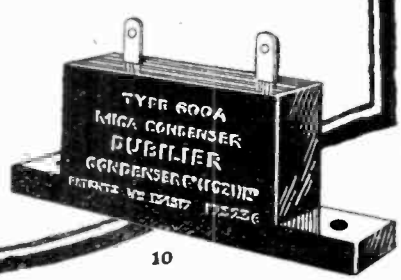
Trade terms and descriptive leaflets of these and large power Dubilier Condensers will be sent on request.

THE DUBILIER CONDENSER CO. (1921) LTD.

DUCON WORKS, GOLDHAWK ROAD, LONDON, W. 12

Telephone: Hammersmith 1084. *Telegrams: "Hivoltcon, Phone, London."*





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OF EVERY DESCRIPTION, and everything for wireless at everybody's price

THE " DUO "
2-VALVE RECEIVING SET
Designed for Broadcasting only

This Set has a patent coupling and will not radiate.
The High Tension Battery is enclosed, and there are only six external terminals, aerial, earth, 'phones, and low tension.
We claim that this Set is the easiest 2-Valve Set to manipulate on the market.
Price, complete, all accessories for working—
Including 'Phones, Batteries, H.T. and L.T., Aerial Wire, Insulators Total **£10 15s. 0d.**
B.B.C. Royalty Stamp, **£1 15s. ex.**

THE " PERFECTO "
VALVE SET

Comprises one D.T. valve and one L.F. valve. Functions alternatively to the Orpheus, this Set giving Volume where the other gives Range.
A Powerful Set for local Broadcasting. Complete 'Phones, Batteries, Accumulator, Valves, Aerial Wire and Insulators for—
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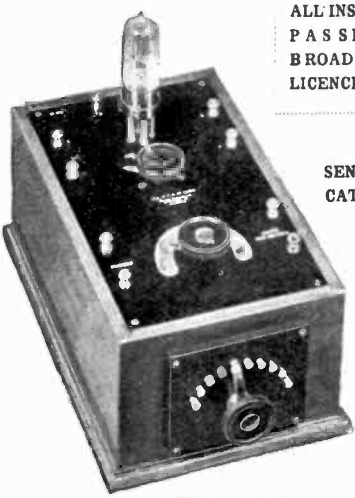

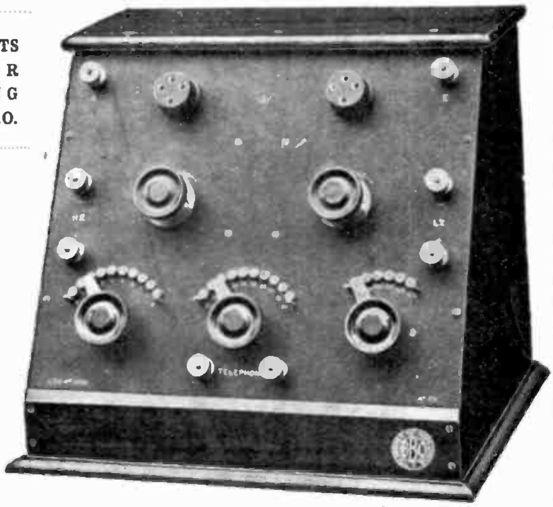

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B.B.C. Royalty Stamp .. .. **£1 0s. 0d.**
If Aerial Wire and Insulators required, 5s. extra.
Hundreds of Testimonials for Efficient Working.

A TWO-VALVE SET WITH REACTION APPROVED BY POSTMASTER-GENERAL FOR BROADCASTING, No. 0236.

Comprises one D.T. valve and one L.F. valve mounted in a handsome slope back cabinet. Separate filament control for each valve, wavelength range 200-4,000 miles. Price complete with phones, battery, accumulator, and valves, aerial wire and insulator
£13 13s. 0d.

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(Dept. C.) 81, Turnmill Street, London, E.C.

(Nearly opposite Farringdon Street Station, Metropolitan Railway), five minutes from Holborn Viaduct.

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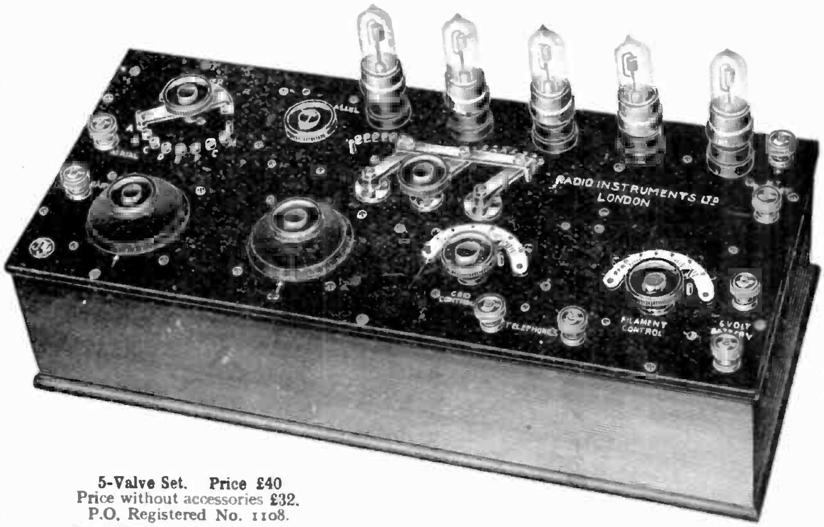
OUR NEW WORKS EXTENSION



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Price without accessories £32.
P.O. Registered No. 1108.

24 Broadcasting Models will be shown at the Ideal Home Exhibition, Stand 41.

A visit to Radio Instruments, Ltd., Stand will show you why Great Britain leads in the Wireless Industry. The magnificent collection of instruments here shown are due to our research staff who are responsible for the design of the 1st High Frequency Intervalve Transformer and reactance in this country.

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Price of instrument alone, £66. Valves extra.
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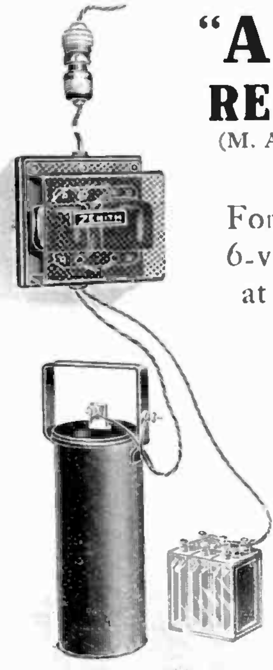
Chief Designer: W. A. APPLETON, M.B.E., M.I.R.E.,
late Admiralty Technical Research Officer.

ARE YOU LUCKY?

You are indeed !—if you have an alternating current supply at home, as you can efficiently charge your accumulator at a fraction of the usual cost, and save bother as well by using the



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(M. A. Codd's Patent)

For charging 6-volt Batteries at 2 amps.

90/-

Cooling Tank 15/- extra

State voltage and periodicity of supply.

MADE IN VARIOUS SIZES

Illustrated Catalogue post free fourpence.

TRADE TERMS ON APPLICATION

Also Transformers, H. T. Condensers, Fixed Condensers, Rotary Filament Resistances, Grid Leaks, and other Wireless Accessories.

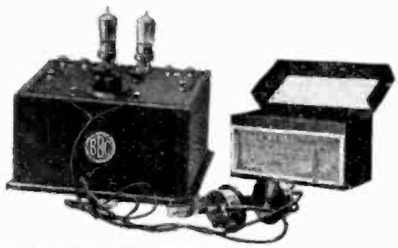
Zenith Manufacturing Co.

Contractors to H.M. Admiralty, War Office, Air Ministry, Post Office, L.C.C., &c.

Zenith Works, Villiers Road, Willesden Green, London, N.W.2

'Phone : Willesden 1115. 'Grams : Voltaohm, Willroad, London

A Wonderful 2 Valve Set



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The specification includes :—Variometer tuning (the ideal form) Range 75 miles. Will operate loud speaker up to 20 miles range on P.M.G. Aerial or 4 pairs of phones at 50 miles. Complete with 6 V. 60 amp. accumulator 60 V. HT Battery, 100 ft. aerial wire, 4 insulators, 1 pair 4,000 ohm phones. Price including all Royalties **£15 : 15 : 0**

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Back of Princes Theatre. *Phone—Regent 2636.*

WIRELESS BARGAINS

New Weston Relays	20/-
Ebonite Loud Speakers, less receiver, threaded to fit. Brown's, or Sterling Earpieces (no post orders)	18/-
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Ditto Telephone	15/-
2 and 3 Meg. Grid-Leaks	1/6
Grid and Blocking Condensers	1/6
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Crystal Detectors on Ebonite Base	2/-
Microphones with replaceable Insets	2/6
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3 Mf. Condensers, can be used as 1, 2 or 3 mf.	2/6
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H.T. Battery Boxes, polished teak, well made with plugs and sockets, and hinged lid, 10⅞ × 13½ × 5″	6/-
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Set of 8 Tablets (not printed)	1/-
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Intending purchasers may deposit the purchase money of any article advertised or sold by advertisers with Messrs. Bertram Day & Co., Ltd., who will acknowledge its receipt to the vendor and the depositor, the full addresses of whom should be given. Subject to special agreement between the parties, it is understood that all goods are sent on approval, each party paying carriage one way in the event of the goods being returned. The deposit will be retained until due advice of the completion of the purchase has been given or until the articles have been retained and accepted. In order to cover postage, etc., a fee of 6d. in respect of sums of £1 and under, and 1s. for sums in excess of £1, must be paid at the same time as the deposit.

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Mark III three-valve amplifiers, new, tested, £8 or nearest offer, 97, Hersel Road, West Ealing.

Loud Speakers 200 ohms, 25/- BURNHAM, "Cheam," Gold Hill, Chalfont St. Peter, Bucks.

Wireless Transmitters, less cases type No 1, fittings include one high-class variable spark gap, condenser and tuning 1" sterling spark coil and helix range 100 to 500 metres, work on 4 to 6 volts, price to clear 10/- each.

Tungsten Rivets. Specification heads approx. 1/8" diam. 1/16" thick, and shanks screwed 9 B.A. 1/8" long, 1/6 doz., or 15/- gross.—CADNEY, 42, Milton Court Road, New Cross, S.E.14

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Two-Valve Receiver (Units), with valves and Brown's "A" telephones, £5.

Aluminium Loud Speaker, adjustable diaphragm, 30s. Two tapped transformers, eight separate windings, each 12s. 6d. 59 copies "Wireless World," January, 1921 to September, 1922, complete, perfect, offers or exchanges.—KNIGHT, 98, Albert Street, Newark.

Brown's Relay Amplifier, new, equal two valves, perfect, £6 5s.—WHITE, 121, Adelaide Road, Chalk Farm.

British Thomson-Houston Portable Receiver with tuner, 300 to 20,000 metres, £25 (cost £43 10s.), and 3-valve L.F. amplifier, £12 (cost £19).—MORSON, 10, Church Street, Durham.

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Shackles and Thimbles for Aerials.—Shackles, 6d. Thimbles, 3d. 6" Steel strainers, 1s. 6d. Post free over 5s.—RADIO SPECIALITY CO., Heaton Street, Blackburn.

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Highest Conductivity at Lowest Prices.

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16	1 7	—	3 6
18	1 9½	—	3 9
20	1 11	4 0	4 9
22	2 5	4 6	5 0
24	3 0	5 0	5 9
26	3 6	5 6	6 6
28	4 2	5 9	6 10
30	5 2	6 6	8 1½
32	6 6½	8 2	9 0
34	7 9	9 6	10 7
36	9 2	11 3	12 3½
38	11 10	13 6	17 3
40	16 2½	17 0	23 5

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By John Scott-Taggart, F.Inst.P.
(Editor of *Modern Wireless*.)

THIS new Book will pilot you through all those difficult points which have always puzzled you.

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VASTLY SUPERIOR to Hertzite.
Every Particle is sensitive.
Trade only supplied.
Sample Piece 1/- post free.
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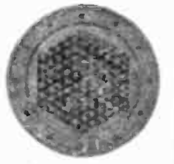
CAN NOT PACK



For Wireless or ordinary Telephones. An entirely new principle, having a Definite Resistance, Highly Sensitive, used with any receiver. Functions with less than One Milliampere, Definite Capacity, Long Range. Patents granted in Great Britain and applied for abroad. Small complete transmitters, 7/6. Larger, over 20 M/A, 10/-.

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WIRELESS PARTS AT KEENEST PRICES ! !
TO THE TRADE & AGENTS.

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—IS—

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A VISIT TO OUR WAREHOUSE (THE OLDEST METAL WAREHOUSE IN LONDON) WILL REPAY YOU.

Extraordinary value in Condensers, Vanes, Knobs, Valve-holders, Aerial Wire, Spacing Washers, Crystal Detectors, Knife Switches, Rheostats, Coil-holders, Terminals, Screwed Rod, Sliders, etc., etc.

LET US QUOTE YOU.

SATISFACTION GUARANTEED.
Prompt Delivery. Terms Cash.

Agents for the Ajax Anti-Re-Radiating Unit.

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For supplies of raw materials—all manufactured parts — complete crystal and valve sets and also all wireless accessories.

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Five-valve B.B.C. Set. Exchange motor cycle Value £40.—1, Othello Street, Liverpool.

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Wireless Sales Manager Required. Must have held similar position previously. Write stating qualifications and salary expected.—Box W.13, BERTRAM DAY'S ADVERTISING OFFICES, 9 and 10, Charing Cross, S.W.1.

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Accumulators charged for scientific treatment and care, send to ETON & Co., LTD., 260/266, High Road, Balham, S.W.12.

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Accumulator Charging Resistances, complete with flexible cable and adaptors to charge from any convenient lampholder, 1 Amp., 22s. 6d.; 2 Amp., 25s.; 3 Amp., 27s. 6d.; 4 Amp., 30s.; 5 Amps, 32s. 6d.—WALTHAM MANUFACTURING Co., 2, Jackson Road, Holloway, London, N.

Valves Repaired. New filaments fitted in valves, 6/6, post paid.—LEEDS FLINT GLASS COMPANY, Ltd., Electric Lamp Manufacturers, Aire Bank Lamp Works, Hunslet, Leeds.

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Gentleman seeks partnership in reputable, soundly established, profit-making wireless manufacturing concern. Investment, £1,000 to £2,000. Full particulars to be sent in first instance to THORPE & PEARSON, Corporate Accountants, 5, John Street, Bedford Row, W.C.

VARIABLE CONDENSERS.
Complete with Ebonite Knob, Scale and Pointer.
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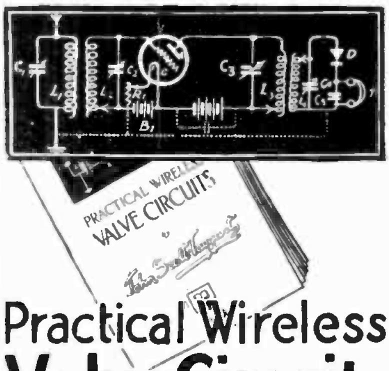

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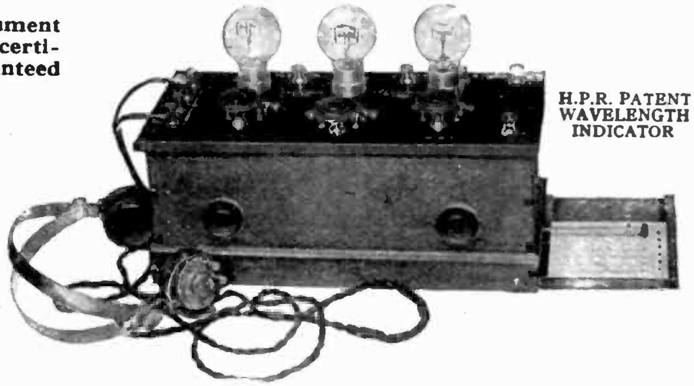

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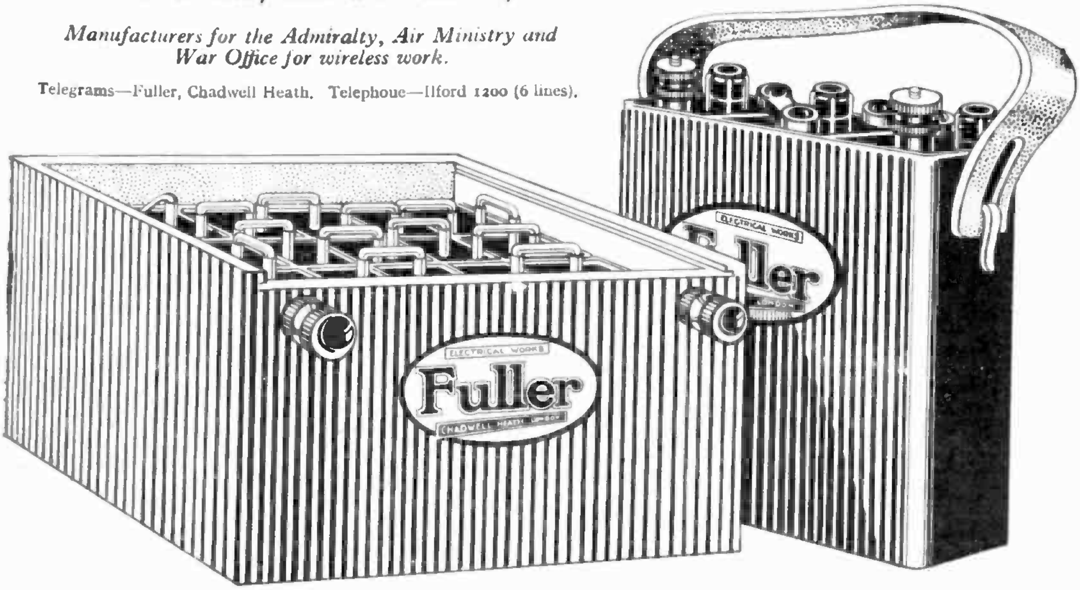

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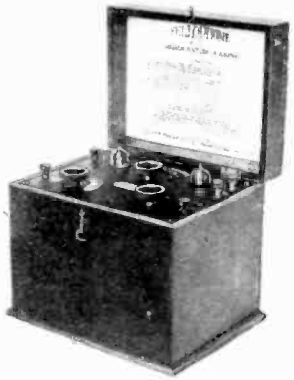

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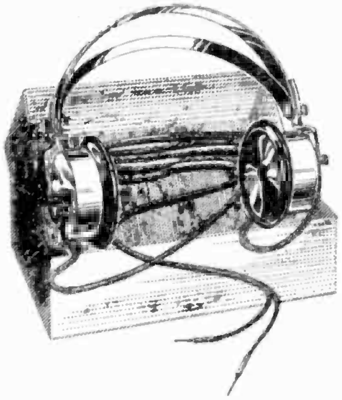

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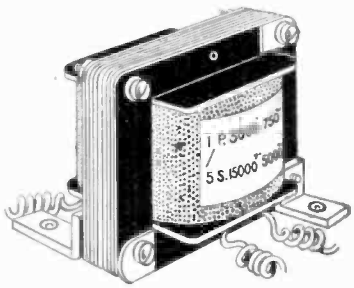

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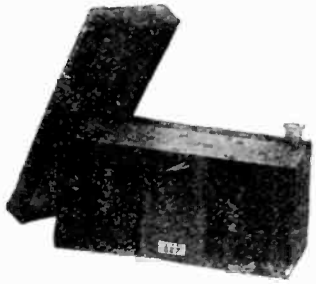

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THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN
A MAGAZINE DEVOTED TO WIRELESS TELEGRAPHY AND TELEPHONY

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THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN

No. 186 [No. 23 Vol. XI.] MARCH 10TH, 1923. WEEKLY

Some Practical Applications of Time Signals

By W. G. W. MITCHELL, B.Sc., F.R.A.S., F.R.Met.S.

1.—Method of Obtaining G.M.T. from Rhythmic Beats.

In my article which appeared on January 13th on Time Signals, all times were given in *sidereal time*, this being the standard unit of time adopted at astronomical observatories for the reasons set out in the article. There may be some uncertainty as to the method of arriving at G.M.T. from these results. Tables for converting intervals of sidereal time into the corresponding intervals of mean solar time will be found in the "Meteorological and Time Signal Section" of the *Year Book of Wireless Telegraphy*, 1923 edition, together with an example showing the working. Further, in order to be able to "set" a clock to mean solar time (*i.e.* G.M.T.) from the data furnished by the rhythmic beats, it is necessary to be provided with tables giving the mean solar time at the preceding sidereal noon. These tables are printed in the Nautical Almanack for the current year (published by H.M. Stationery Office, Kingsway, 5s.) under "Transit of First Point Aries," page iii of each month. Then the mean solar time required = mean time at preceding sidereal noon + the equivalent to the given sidereal time.

Therefore, unless the highest accuracy is aimed at, it is better to make use of the ordinary time signals sent three times daily from FL in order to determine G.M.T.

One further point about which there seems to be some misunderstanding cannot be passed over. It is very often assumed that the rhythmic beats commence *precisely* at 1,000 G.M.T. This is not the case, as will be seen from further reading below.

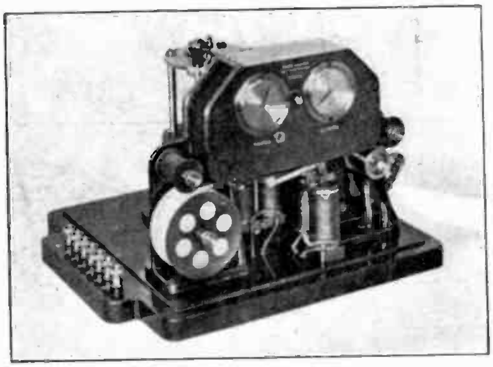
2.—Method of Determination of Longitude.

The difference in longitude between two places on the earth may be expressed as their difference in time, which again is simply a measure of the amount of rotation of the earth in that time interval. Whether this is expressed in mean solar time or sidereal time matters not; in practice the sidereal unit is adopted.

Previous to the facilities now afforded by long distance W/T, longitude determinations were only possible by using a celestial time signal common to all the world. One method consisted of the repeated transmission of chronometers (deck watches) between the ends of the arc it was desired to measure. Otherwise the two posts were required to be telegraphically connected by land line. A pre-arranged signal emitted from one station was automatically recorded at the other by some form of printing chronograph, due allowance being made for the "lag" of the interposed instruments. The actual recording of a certain instant of time enters so fundamentally into all longitude determinations that a brief description of one form of printing chronograph is given. The front and back view of the chronograph are shown in the photographs on the next page. This instrument prints on a paper strip the time of any signal in minutes, seconds and thousandths of seconds as in the actual record.

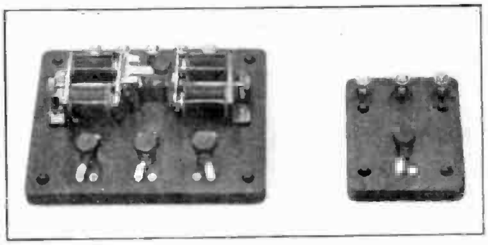
For this purpose three discs, with engraved printing figures on the periphery rotate over the paper strip, which is pressed against the disc during an extremely short time by an electromagnet, when a current excites the magnet.

The chronograph is driven by an electric motor, direct current 12 volts, provided with a very sensitive speed regulator. The error in the speed can be adjusted to be less than a few seconds per hour and a slight positive advance is given to the motor. A synchronisation device acted by a very accurate electric clock eliminates automatically every second the very small advance of the instrument. At the beginning of each second, the time recorded on the paper strip is the absolute time given by the clock; at the end of each second, the time as printed cannot be affected by an error exceeding 0·005 second. The chronograph can be placed at a great distance from the observer, and in longitude determinations it is set up at one of the stations and operated from the other station by means of the relay.

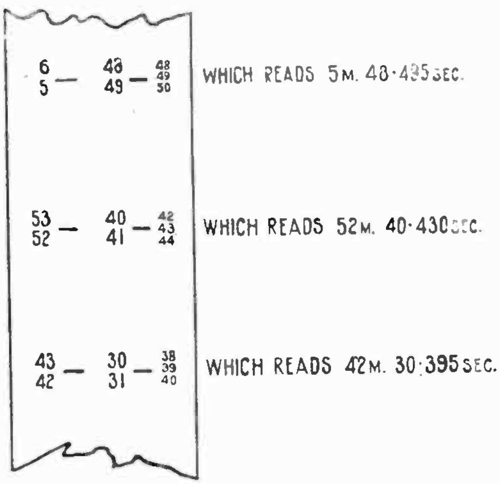


Front view of a Printing Chronograph.
By Courtesy of Société Genevoise d'Instruments de Physique.

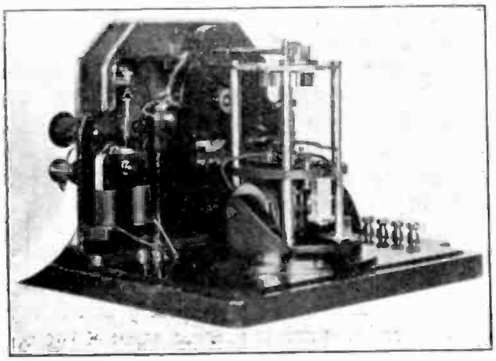
Let us consider the determination of longitude say between Washington and Greenwich by making use of the rhythmic beats sent by FL. The observatories at both places are provided with accurate clocks whose error and rate may be determined regularly. The times of receipt of the rhythmic beats are recorded simultaneously by both observatories, the records extending over an interval of months and each of sufficient duration to determine "lag" constants of the recording apparatus, and to make accidental errors negligible. By bringing together the two sets of results for comparison the times of receipt of the signals at Washington and the corresponding times at Greenwich, the differences in the two sets should be a *constant* interval of time which is, in effect, the difference in longitude. Provided, therefore, that means exist of determining a time standard at each end of the arc which it is required to measure, the time signal itself may be entirely eliminated, and further, for the purpose of the experiment, it is immaterial



Relay for Printing Chronograph.
By Courtesy of Société Genevoise d'Instruments de Physique.



An example of time recording on paper strip by the Printing Chronograph.

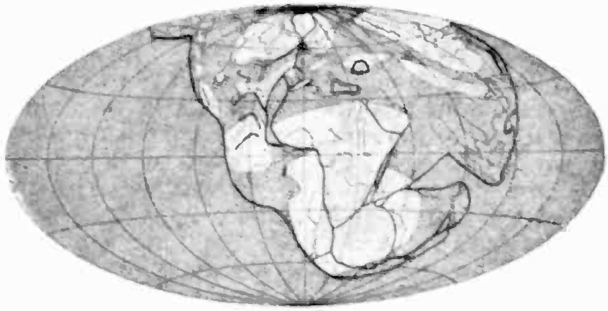


A back view of the same Printing Chronograph.
By Courtesy of Société Genevoise d'Instruments de Physique.

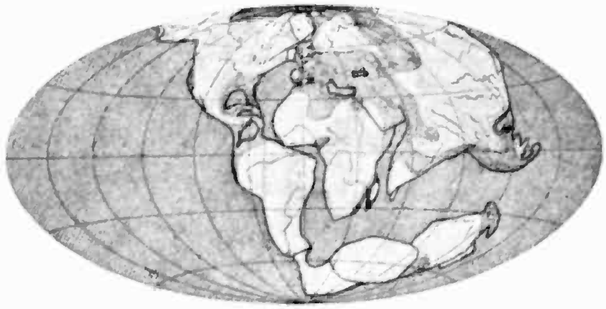
at what instant of time the signal is sent from Paris. This last statement shows the error of assuming that the rhythmic beats are regulated to commence at 1,000 G.M.T. precisely.

Such determinations have already been carried out and a comparison of the results so far obtained shows that a small fluctuation persists, after all known connections have been made. The error appears to be seasonal, and at present is not fully explained. The result of the Washington-Paris longitude determination made in 1913, using a crystal detector and a wavelength of 2,200 metres, with an emission from Paris of 18 kw. gave the longitude of Washington as 5 hrs. 17 mins. 36·549 secs. ± 0·0051 secs. By interchanging the observers at each end, a second result agreeing very closely with the first was obtained, namely, longitude = 5 hrs. 17 mins. 36·758 secs. ± 0·0027 sec. The *Longitude of Adelaide*, from an experiment conducted between June 21st and July 5th, 1920, using the rhythmic beats from Lyons, was 9 hrs. 14 mins. 19·95 secs., and from two series of Annapolis signals between July 6th and 28th, and August 8th and 19th, 1920, 9 hrs. 14 mins. 19·79 secs., and 9 hrs. 14 mins. 19·78 secs. respectively, the previously adopted value being 9 hrs. 14 mins. 20·07 secs.

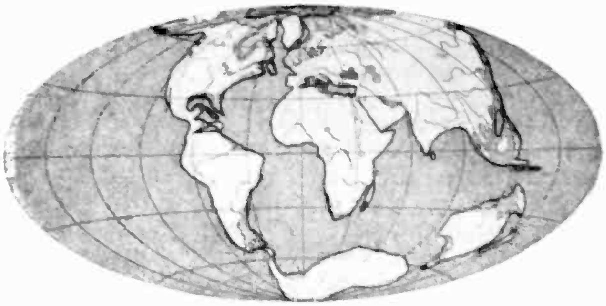
Discussing the signals received from Paris, Nauen and Annapolis, and taking weekly and monthly "means" of determined values from 1912 - 1919, the Astronomer Royal, Sir Frank Dyson, says "If the positive value is regarded as due to error in longitude and not as arising from instrumental errors, either in time determination, sending or reception of signals, these figures imply that Greenwich is about 0·03 sec. to westward of its assumed position relatively to Berlin, Paris and Washington."



(a)



(b)



(c) *By Courtesy of "Discovery."*

Maps to illustrate Professor Wegener's displacement theory. White portions denote land. (a) In the carboniferous period about fifty million years ago. (b) Eocene period when mammals became common about ten million years ago. (c) Old Quaternary period when man and present-day animals appeared about one million years ago.

The work has gone far enough to show that (*a*) longitude determinations made before the advent of W/T are subject to larger errors than were hitherto suspected, and (*b*) that the fluctuations appear to depend on the time determinations at the different observatories, and are not due to errors in transmission or reception of the signals.

(3) THE WEGENER HYPOTHESIS.

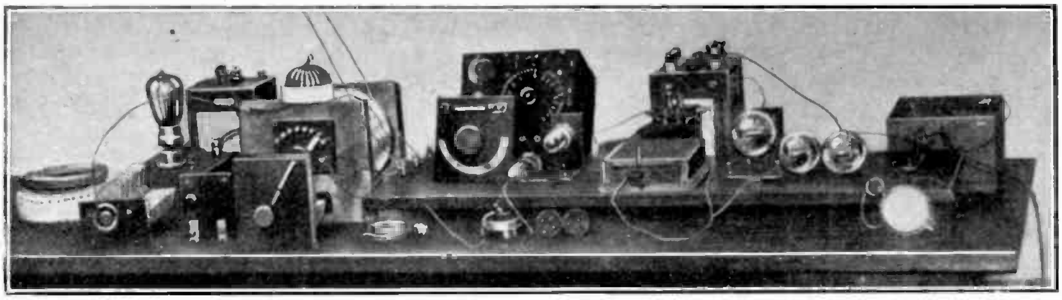
In view of the results previously cited, the question has arisen as to whether the discrepancies might be explained by a systematic movement of the parts of the earth's crust. Special interest attaches at the moment to the fascinating theory of Professor Wegener, and known as "The Wegener Hypothesis of Continental Drift." Briefly the theory assumes that the continents are "cakes" of light siliceous material floating on a heavier substratum. The continents, which are thus movable, are supposed, in early times, to have been joined together and to have formed one single land mass. Thus, according to Wegener, the continents are slowly drifting from the poles and from east to west. America appears to be going west faster than Europe, and in its westward drift has crumpled up on its forward side to form the continuous mountain chain known as the Andes. It is also suggested that Southern India has shrunk up northward as expressed by the great foldings of the Himalayas. Wegener also mentions a supposed motion of Greenland (the longitude of which has been determined three times in 1823, 1870 and 1907), indicating a continued westward drift during the past hundred years amounting to about thirty feet per annum. The theory was in the first place devised with a view of explaining the occurrence of allied forms of life on continents separated by great oceans, but it is now receiving much opposition from geologists.

Wireless thus opens up new ground for the determination of longitude and it may also provide some evidence in the future discussions of this new theory. Using modern long-distance working plant, it should not be impossible to establish a net of five or six points roughly equidistant round the globe. The longitude of these points would be found with high accuracy at frequent regular intervals of time, the closing of the arc thus establishing a check on the measures.

A Note on the Action of a Receiving Valve.

WHEN the filament in a valve is heated and the grid and plate are disconnected, negative electrons are given off from the filament, but on account of their small velocity they do not move far from the surface of the filament, and in fact they return to the positive end of the filament. When the plate of the valve is connected with the positive end of the filament, the plate, of course, has a slightly positive potential with respect to the negative end of the filament, and the electrons, which after all are negative electricity, are attracted to the positive plate, and they flow in the external circuit between the plate and the positive end of the filament. The number of electrons which reach the plate is small. When a positive potential is supplied to the plate, a far larger number of electrons are passed to the plate, until a point is reached at which no more electrons are drawn to the plate by the addition of positive volts.

If now a small potential is supplied to the grid, the grid will influence the number of electrons which go to the plate. The grid, of course, is much closer to the filament than the plate, and is made of fine wire with large spaces in between the wires. If a small positive potential is supplied to the grid, a large number of electrons will be attracted to the grid, and some will actually flow in the grid circuit, but on account of the spaces, a large number will pass through the grid openings and will reach the plate, so that we have two currents, a small grid current and a much larger plate current. If now a negative potential is applied to the grid, the grid returns the electrons back to the filament, and but few are able to escape through the openings and reach the plate. When a varying potential is applied to the grid, a varying number of electrons pass through the openings of the grid to the anode. Actually the shape of the current curve in the plate circuit is identical with the voltage curve applied on the grid.



Apparatus used by the Author in his experiments.

Notes on the Armstrong Super.

By Frederic L. Hogg.

A GREAT deal of interest has been aroused, especially in America, by the new super-regenerator circuit recently invented. On the publication of the circuits, many amateurs attempted to make the circuit work, and so obtain enormous amplification at little expense. In most cases, however, little success was obtained. In these notes I hope to be able to help some of those who have been unsuccessful so far, as once the circuit has been made to work, astonishing results can be obtained.

Immediately on the publication of the first article in the *Wireless World and Radio Review*, I attempted the circuits, each in turn, with more or less negative results. However, on seeing the article by Mr. Cockaday, mentioned by Mr. Percy W. Harris in his article, I had another try, and immediately, on getting constants correct, excellent results were obtained.

The whole secret lies in the proper proportioning of the various parts and plenty of patience. It is a simple matter to convert an ordinary single valve or two-valve (L.F.) set into an Armstrong by the addition of a small panel. This panel contains the oscillator coils and valve, etc.

The actual constants used on my set are as follows :—

Valves	Rectifier	" Ora "
	L.F. Amplifier	" R "
	Oscillator	Mullard " O.20 " Transmitter
H.T.	Rectifier and L.F.	60 volts
	Oscillator	120 volts
L.T.	Rectifier and L.F.	4 volts
	Oscillator	5.5 volts

From Fig. 1 it will be seen that the necessary additions are as follows :—

1. Valve.
2. Large honeycomb or slab coil.
3. 1 0.001μF. fixed condenser.
4. 1 0.001 μF. variable condenser.
5. 60 volts H.T., valve holder, etc.

A panel containing these suitably arranged can easily be made up. A switch can be placed in the lead from the oscillator grid to the detector grid, and then the set can be quickly changed from one circuit to the other.

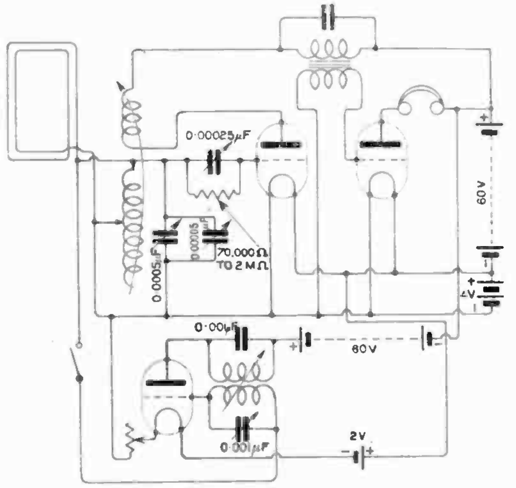


Fig. 1. Two-valve Receiving Circuit adapted for super-regenerative action.

No specific constructional details are given, as each experimenter wishes to make his set in a different way.

In erecting the set care must be taken to keep leads well spaced to avoid capacity effects.

As regards operation, the first point is to use a frame aerial invariably. An outside aerial makes the set very difficult to work, and the radiation is serious. I use a square frame, with 4 ft. sides and having 20 turns spaced ¼ in. This frame has a natural wavelength of about 600 metres which, when placed in parallel with the usual 440 metres inductances, just gives the correct inductance for 440 metres, making up for the loss of the aerial. This sounds peculiar but is what happens in practice owing to the large value of the reaction used.

Having erected the panel, etc., the procedure is as follows :—The oscillator is cut off from the grid circuit of the detector, and a loud telephony station tuned in on the frame. The oscillator filament current is then switched on, and with coupling and condensers at maximum, the connection is made by means of the cut-out switch. The detector will be far removed from the oscillation point, and the station will be inaudible. Then on slight adjustments of tuning, and increasing reaction very considerably, the station comes in with enormous strength. Of course it is assumed that the oscillator, reaction, etc., are of correct coupling for oscillation.

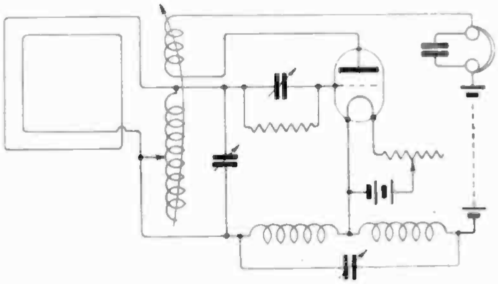


Fig. 2. A single valve circuit embodying the super-regenerative principle.

Various extraordinary squeals and howls are heard, and after a little experimenting it will be found possible to avoid these and to receive speech and music without distortion. It will be found that H.T. and L.T. voltages are fairly critical for best results.

It is fairly easy to operate the set after a few hours' practice, but certain things require to be done before the circuit is suitable for general use.

An amateur of my acquaintance evolved the arrangement shown in Fig. 2, and says that he will never go back to the usual circuit for long-distance work. Once this set is suitably arranged, there are no extra adjustments needed over the usual number.

On the three-valve circuit, Fig. 1, I have received telephony from the following London amateurs, on a loud speaker :— **2 OD, 2 ZT, 2 ZM, 2 NM, 2 WQ, 2 WJ, 5 BT, 5 CV, 5 BW, 2 WD** and **2 DF**. Many others, within about thirty-five miles radius, have been heard, either speech or morse, on the loud speaker (small Brown).

Of course, **2 LO, 2 OM, 2 ON, 2 KT** and **2 FQ** are absolutely impossible owing to their great strength, the loud speaker or telephones being nearly torn up ! The longest distance received is **2 IF**, speech and music, also on the loud speaker. This station is 60 miles away from Highgate.

In conclusion, I hope many amateurs will soon have " supers " going, as, after a little while, extraordinary results should be obtained with simplified circuits and easier control, which means greater ranges for our 10 watts of telephony.

The Ideal Home Exhibition.

At the *Daily Mail* Ideal Home Exhibition now being held at Olympia, the section devoted to wireless exhibits attracts enormous public interest.

The public demonstrations of wireless Broadcasting too, adds to the general attractiveness of this section.

A splendid array of wireless apparatus by all the leading manufacturers is on view and many novelties and new designs are shown for the first time. In our next number we shall describe and illustrate these exhibits.

A preliminary study of the apparatus on view indicates the progress which is being made by British manufacturers in the development of radio apparatus, particularly for Broadcast reception. The Exhibition affords a unique opportunity for prospective purchasers to examine every type of set before deciding on a purchase. Such an opportunity does not occur except through an Exhibition conducted on these lines, and it is one which should not be missed by anyone who is in any way interested in the subject, whether from a technical point of view or from the point of view which the name of the Exhibition suggests—that the home is not " ideal " unless wireless finds its place there amongst the many things which invention and industry have added to the home equipment.

The Elementary Principles of Radiotelephony.

By G. G. Blake, M.I.E.E., A.Inst.P.

(Continued from p. 729 of previous issue)

I have here an experiment which was shown last year before the Physical Society by Mr. F. Harrison Glew.

This experiment should, I think, make the existence of electrons more real to you. It has for some years been known that radium, in the process of disintegration, creates such violent disturbance in the air round about it that it breaks up the atoms of oxygen, nitrogen, etc., by causing them to smash into each other, and in the process some of the atoms loose a number of their electrons, so that not having their proper number, they exhibit a positive electrification, while other atoms gain several electrons more than they ought to have, and therefore exhibit negative electrification.

I have here two tiny radium coated spirals, and as long as I keep the radium covered, the atmosphere in this room remains in its normal condition, and when I turn the handle of this little machine and electrify this spiral nothing happens.

On removing the covers you will notice that the leaves of the electroscope spring apart, due to the rapid ionisation of the air by the electrical machine.

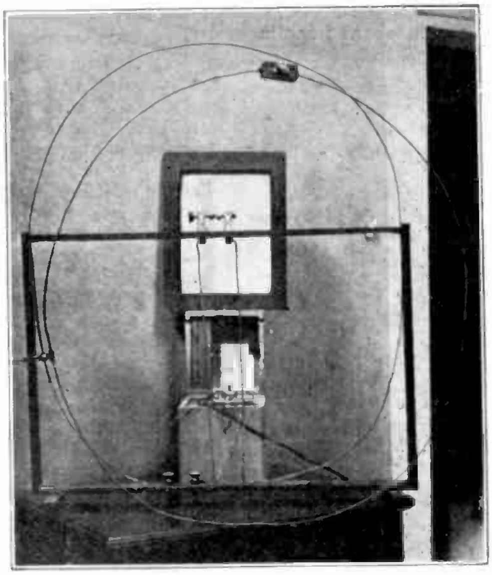
(The lecturer demonstrated this action by arranging the detecting electroscope in the optical lantern and casting an image of it on the screen. The electroscope and electrical machine were about 20 feet apart and on removing the caps from the radium tubes an immediate effect was indicated when the electrical machine was worked.)

I have already stated that in all conductors there are innumerable free or unattached electrons floating about in the inter-atomic spaces (*i.e.*, the spaces between the atoms), and that the movement of these electrons is what we know as an electric current.

If I rub this ebonite rod against my coat sleeve I rob the wool of my coat of a large number of its free electrons and increase the number on the ebonite rod, so that having an excess over its normal number, it exhibits negative electrification, and it creates a strain in the ether in its neighbourhood; this zone of disturbance reaches out and affects the electrons in other bodies in its vicinity.

For example, here is a little instrument which we call an electroscope; this consists of a metal rod or cylinder from the bottom of which are suspended two long metallic leaves.

The accompanying slide (see Fig. 6) is a diagram from which you will see that the little cylinder and the leaves can be considered as being part of a continuous system. The dots represent the free electrons in the interatomic spaces. Now when we bring our electroscope near the charged rod or vice versa it comes into the zone of strain in the ether created by the rod, and the free electrons are driven down into the leaves of the electroscope, and cause them to repel one another. We have not added to the number of electrons in the metal of which the electroscope is made, but we have driven most of them down into the leaves, the rod retaining less electrons than it does normally. Conditions will remain unchanged as long as we keep the charged ebonite rod stationary; but if we move it up and down (*i.e.*, if we cause a number of electrons in the vicinity of the electroscope to oscillate up and down we can cause the electrons in the electroscope to follow their movements, and move up and down in the metal of the electroscope.



With this apparatus the lecturer demonstrated how a wooden blackboard was transparent to ether strains of certain frequencies.

What happens in the metal of the electroscope happens in any metallic conductor.

In a transmitting aerial electrons travel at a speed approximating to that of light, so that even the very fastest movement which I can make by hand is extremely slow compared to their rate of travel.

I can, I think, give you a clearer conception of this phenomenon by the following experiment.

You see before you on the lecture table a block of jelly; this represents a portion of the ether, and you will see three discs, two of which are connected to movable pointers and are fastened to the front edge of the jelly (Fig. 7). A third disc rests on the top near to one of them. These discs represent groups of electrons. If I press down the top disc, the jelly becomes strained or stretched, and the one nearest to it is pulled out of position (*i.e.*, moved), if the movement is made slowly the third disc and pointer at the other end of the jelly (representing a distant receiving station) remains stationary.

So far we have only produced a condition analogous to electrostatic strains (similar to those which caused the electrons to move down into the leaves of the electroscope when I moved a charged rod in its vicinity).

If I press down the top disc and quickly release it so that it moves at above a certain critical speed, wave motion is produced throughout the entire mass of the jelly (which is seen to quake), and the third disc and pointer are seen to respond.

(The lecturer apologised for the somewhat crude state of his model, the idea of which, he explained, only occurred to him shortly before the lecture.)

In the case of radiotelegraphic and telephonic transmission and reception the electrons in the transmitting aerial are caused to oscillate up and down at so great a speed that their movement creates wave motion in the surrounding ether; when these waves reach the receiving aerial they cause the free electrons in it to oscillate, and it is the movement of these electrons which operates our receiving instruments.

In order to picture the process yet more easily, let us consider for a moment what happens in the case of just one electron, as it oscillates with all its brothers (and in these days probably sisters as well) up and down the aerial. Suppose we were dealing with an ocean of water which was invisible, instead of our ocean of ether, you could imagine

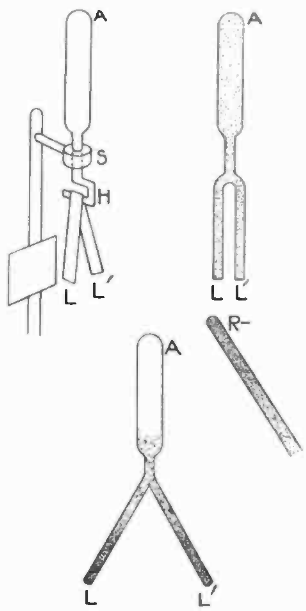


Fig. 6. Experiments with an electroscope. The uneven distribution of the electrons constitutes an electric charge.

a rope floating upon its surface, connected at one end to a floating buoy, and you could observe the wave motion produced by the buoy in the surrounding water by bobbing it up and down and watching the movements of the rope. Of course you would only see the wave motion along this one line; but you could show that the waves travelled out in every direction from the buoy, by arranging ropes radiating from it in every direction. We will now apply this simile to our ocean of ether, and one electron in our aerial.

The buoy represents the electron, and the rope one line of force radiating from it. Needless to say there are innumerable lines of force radiating in every direction; but we will observe this one. You must imagine that when the electron oscillates waves travel along the line of force, their wavelength (that is the distance between the crests of any two

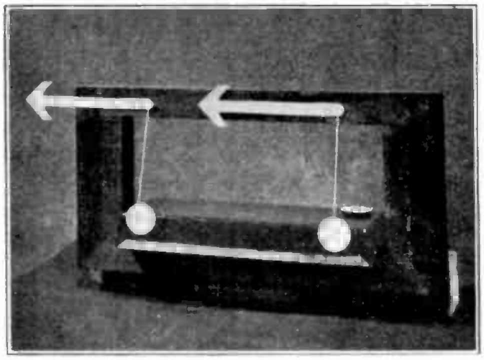


Fig. 7. A slab of jelly arranged to show the transmission of wave motion along it.

waves) depends upon the distance the electron has to travel; if the aerial is short, and it only has to move a short distance, it will do a greater number of journeys in a given time, and produce therefore a greater number of smaller waves.

A slide was here shown, and the movement of a single electron up and down the transmitting aerial was represented, and one electron was also represented in the receiving aerial. When the latter was out of tune, it remained stationary; but when the two stations were tuned to the same period of oscillation, the electron in receiving the aerial followed the movements of that in transmitting the aerial. The question was then asked how is the electron in the receiving aerial caused to oscillate, and a hitherto invisible line was revealed joining the two stations. When the electron in the transmitting aerial oscillated, it was seen that this line took on wave motion, and as this reached the receiving aerial it caused the electrons there also to oscillate. The lecturer pointed out that the slide only represented one electron; but its movements were typical of those of many billions of billions of free electrons in each aerial.

I spoke just now, when showing the mechanical slide, of tuning the two stations. Electrical tuning is analogous to musical tuning. You all probably know how tuning forks are tuned to one another, and that in order to transmit vibration from one fork to another, the two forks must both have the same period of vibration.

If you have a certain length of wire it obviously takes a certain period of time for the electrons in it to travel to one end of it and back again. Another wire in its vicinity is said to be in tune if it takes its electrons exactly the same time to do the same journey.

There are two main factors in the tuning of a wireless station, inductance and capacity. Roughly speaking, we can say that the length of its aerial represents its capacity, and the number of turns which we make it take in our instruments represent its inductance (this statement is not exactly correct, but will suffice just now), and you will see from this slide that it is the product of capacity by inductance which counts in tuning. All these stations are in tune. Some have long aerials and a small number of turns of wire and *vice versa*. (Fig. 8).

Here are two pendulums joined by a fine elastic thread, both are the same size and length (capacity), and both have weights at their extreme end (inductance). These two pendulums are in tune, and if we swing one of them it will rapidly transmit all the energy we apply to it to the other which will be seen to swing. If, however, we alter the position of the weight on one pendulum, *i.e.*, alter its inductance, they will no longer be in tune, and the second pendulum will remain stationary while the other swings.

Electrons, like water, can be caused to evaporate. Let us visualise for a moment a large dish of water, heated from below by a flame. If this water is at zero temperature, its molecules and atoms will be comparatively still; but as the temperature rises, they will get into a violent state of agitation, and soon they will move up to the surface with such velocity that many of them will be projected (as water vapour) right out of the dish into the surrounding atmosphere, where they will be absorbed.

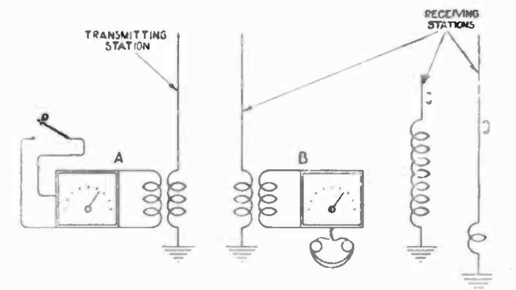


Fig. 8. The transmitting station A is producing signals at B. Aerials C and D are equally capable of being in tune with the transmitter.

After a time so many of them will have been absorbed in the air that it will not hold any more, *i.e.*, it will have reached saturation point, and after this stage has been reached they will fall back into the water, each time after they have been shot out of it. Now suppose we think of the warm water evaporating at a stage before saturation point has been reached, if anything at a lower temperature than the air, say a sheet of metal is held over the evaporating water, the temperature of the air is lowered and the water vapour is condensed back into the water.

A state of affairs very analogous to this exists in the interior of a thermionic valve used in radio, as I will endeavour to explain in a minute or two.

Having seen the two foregoing slides (Figs. 9 and 10), you will, I think, be easily able to understand this one (Fig. 11). On the left-hand side I have represented a simple receiving set complete with its aerial, condenser, inductance, high and low tension batteries, telephone and valve. On the right you see how the same circuit should be diagrammatically represented, this may help you in understanding electrical diagrams.

When the filament battery L is connected up to the filament of the valve, it acts as a pump, and pumps electrons rapidly through the wires leading from it and through the filament, this being made of exceedingly fine wire has difficulty in coping

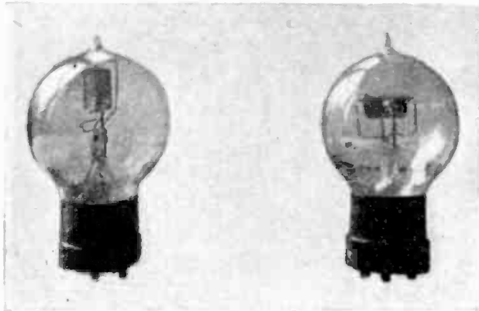


Fig. 9. Typical receiving valves.

with the rush of electrons and becomes hot, like a single policeman trying to restrain a crowd.

It is here that we can begin to make use of our analogy of the heated water, as the filament gets hot, electrons begin to evaporate from its surface, and in an inconceivably short space of time the space in the valve becomes saturated with them, after this they fall back on to the filament.

The valve is now said to have reached saturation point. If at this stage the high tension battery is connected up, it begins to pump away the electrons out of the valve, making room for others to come away from the filament, and the electrons it draws away pass through the telephone earpiece and then back again, to replace those being ejected by the hot filament.

In spite of this the filament may still evaporate electrons faster than the high tension battery can draw them off, and saturation point (though a higher one) be again reached.

We will now connect up the negative pole of a small battery E to the grid of the valve: this will pump a number of electrons into the grid.

As I explained earlier in my lecture, two like charges repel one another, so that the electrons

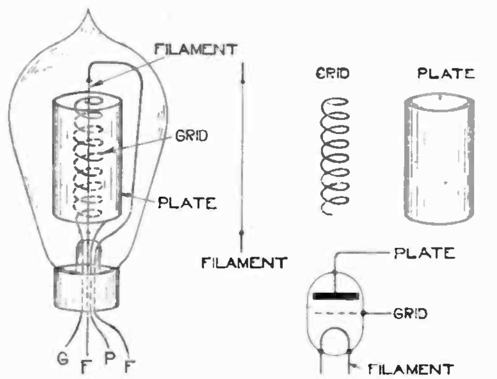


Fig. 10. Component parts of the valve and the method of representing them in wireless circuits.

on the grid push back the electrons coming across from the filament, and condense them back on to the filament (much as the cold metal plate condensed the water vapour back into our dish). They cannot any longer get across to the plate, and their flow through the telephone receiver ceases. (We have put our plate current pump or battery out of action.)

If at this stage a radio wave arrives at our receiving aerial, it causes the free electrons in it

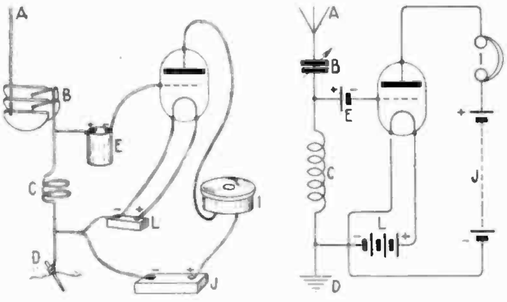


Fig. 11. Pictorial and diagrammatic representation of a valve circuit.

to rush down to its bottom end with terrific force and then up again as each wave passes. As they descend they suck all the electrons back from the grid, and for a moment paralyse our grid battery pump E. This liberates the electrons being evaporated off the filament, and a flow of them takes place through the telephone, making a sound. When the electrons again rush up the aerial, the grid battery E or grid pump again comes into play, and electrons rush into the grid, and repel those coming from the filament, and so the plate current is again stopped.

I have only mentioned the case of a single oscillation produced by one wave. In radiotelephony a continuous succession of such waves are radiated from the transmitting station, following one another at such a speed that the electrons in the receiving aerial oscillate at an extremely high frequency, and the corresponding vibrations which they cause in the diaphragm of the telephone are therefore above audition. These inaudiable waves act as the carrier of human voice, and when a person speaks into the telephone at the transmitting station, he causes audible ripples to take place on the carrier wave, and these ripples cause corresponding variations in intensity in the movement of the electrons through the telephone at the receiving station, these being at audible frequency are translated by the telephone into sound, and so an exact reproduction of the speaker's voice is attained.

At this point two slides were shown reproduced from an article by R. Ranger, from the "Radio Broadcast," an American journal, by kind permission of the publishers, which caused some amusement, as the electrons were represented as little imps and the atoms as worlds (Figs. 12 and 13).

A speech was then received on a small frame aerial, transmitted specially to the audience at the Institution of Electrical Engineers from the London Broadcasting station.

In July, 1920, in a lecture to the London Wireless Society in the Lecture Hall of the Society of Arts, I ventured on some predictions as to the future possibilities and developments of wireless, and as some of these have already come to pass I thought that in conclusion I could not do better than repeat what I then said, which was as follows:—

"May we not confidently look forward in the near future to a much wider use of wireless telephony? I forsee a time when it may be the general custom for us to receive our daily news in the morning while breakfasting, by wireless telephone.

"With a small frame aerial, an amplifier, and a loud speaking telephone we may hear our news from powerful telephone stations. I see no reason why photographophonic records could not be taken of public speeches, important lectures, etc., by making use of Ruhmer's photographophone" (See Fig. 14).

This was invented in 1900, and described in Dr. Erskine Murray's book. All public platforms could be fitted with microphones (much as they are now for the electrophone), these microphones would be used to control a speaking arc A or manometric flame, the light from which is photographed upon a photographic film F. When developed this film would be of uneven density, corresponding

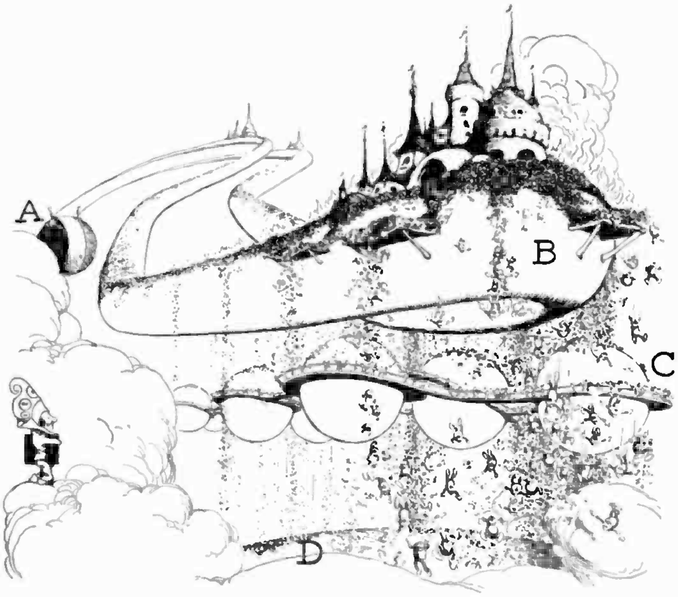


Fig. 12. The upper object represents the heated filament, projecting electrons, depicted as little imps, towards the plate and impeded in their progress by the grid.

accurately to the variations in the intensity of the light as controlled by the voice. The film could then be sent to the wireless transmitting station, where it would be passed in front of a steady source of light (as shown in diagram for Ruhmer's reproducer), the variations of light thus produced would be focussed upon a selenium cell. The corresponding current variations passing through this cell could then be amplified by a series of thermionic valves and employed to modulate the radiations from the aerial of the transmitting station.

So that not only would people hear the news, but they would hear the actual speeches delivered

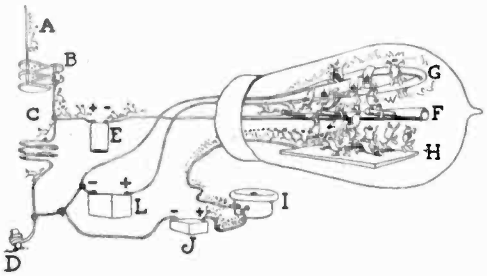


Fig. 13. The electron stream, indicated by the rapidly moving imps, in a valve receiving circuit.

word for word in the voices of the original speakers. Such photographophonic records should be far more reliable than shorthand notes.

To carry this dream one step further we could imagine all the speeches from, say, the Houses of Parliament, transmitted on one fixed wavelength, and other fixed wavelengths allotted to other important Institutions, so that as one sits at breakfast one could turn a switch on to a stud marked "Houses of Parliament," Albert Hall," etc., and select that portion of yesterday's news one wished to hear.

Should such a system become universal I forsee a time when a room is set apart in such an institution as this, where photographophonic records of important lectures that have been delivered during the week in all parts of the world are re-delivered either by wireless from transmitting stations or by reproduction directly from the film by using a selenium. cell, etc., in the lecture room, this together with a cinematographic reproduction of experiments given at the lecture synchronised with the speech film should give a most life-like representation. The synchronisation of the photographophonic film with cinematographic film opens up great possibilities to the film producer; it would enable plays to be reproduced, not only in dumb show as at present, but with words also. The nearest approach to this at present is, I believe, the synchronisation of the cinematographic film with the gramophone. One objection to this arrangement is the small size of the record; a photographophonic film could, of course, be of any desired length.

Before I resume my seat I would like to thank my assistant, Mr. Pickering, Mr. Hope-Jones, who

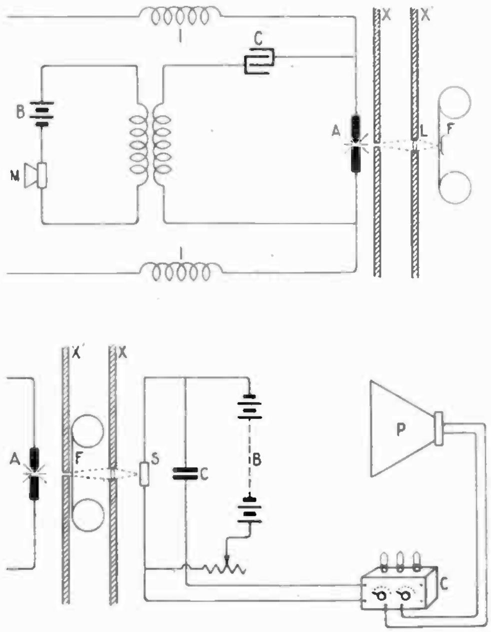


Fig. 14. Circuit arrangement of Ruhmer's photographophone.

kindly helped me to make some of the movable slides and who showed them in the lantern for us, and also the lanternist who kindly obliged us this evening.

The third of the series of lectures, especially arranged for Associates of the Radio Society of Great Britain, will take place at the Institute of Electrical Engineers, Savoy Street, Victoria Embankment, W.C., at 6.30 p.m. on Friday, March 16th, when Mr. L. F. Fogarty, A.M.I.E.E., will give an elementary instructional lecture dealing with Accumulators, Dry Cells and the Currents used in the Reception of Radiotelephony. The lecture will be accompanied by a number of experiments.

Much benefit can be derived from these attractive lectures by those new to wireless. Associateship is open to all interested in the subject and the annual subscription is five shillings.

Tickets for admission to the lectures can be obtained by sending a stamped addressed envelope to the Hon. Secretary, Mr. L. McMichael, 32 Quex Road, Hampstead, N.W.

All who are desirous of obtaining a working knowledge of wireless, which will be most useful to them in the manipulation of their apparatus, are cordially invited.

Wireless Club Reports.

NOTE.—Under this heading the Editor will be pleased to give publication to reports of the meetings of Wireless Clubs and Societies. Such reports should be submitted without covering letter and worded as concisely as possible, the Editor reserving the right to edit and curtail the reports if necessary. **The Editor will be pleased to consider for publication papers read before Societies. An Asterisk denotes affiliation with the Radio Society of Great Britain.**

Correspondence with Clubs should be addressed to the Secretaries direct in every case unless otherwise stated.

Liverpool Wireless Society*.

Hon. Secretary, Mr. G. H. Miller, 138, Belmont Road, Anfield, Liverpool.

The usual bi-monthly meeting of the above Society was held on Thursday, February 8th, at the Royal Institution, Colquitt Street, Liverpool.

Mr. E. B. Grindrod occupied the chair, and there was an attendance of more than 50 members and friends. Six new members were elected.

The Chairman asked for suggestions from members regarding subjects for lectures for the summer session, and in this connection members who were not able to be present at the meeting are also invited to submit suggestions.

Mr. S. W. Philpott (broadcasting member of Committee) suggested that reports from members relating to the merits of the broadcasting sets used by them, should be sent to the Hon. Secretary for consideration by the Society, and a separate evening in next session was promised by the Chairman to be devoted to discussion on broadcasting sets in use by members.

A demonstration was successfully given by Mr. A. W. Robinson, representative of Messrs. Pulford Bros., Ltd., Liverpool, of a set comprising six stages of H.F., one-valve detector, and one L.F., worked in conjunction with Magnavox loud speaker. The results were surprisingly loud. With reduced amplification, improved tone of reception was apparent.

Experiments were also conducted with the assistance of Mr. S. Lowey in reception with the aerial on the floor, and moved to different angles. The movement round the room showed that the position at different points of the compass materially affected signal strength, and was useful for direction finding.

A hearty vote of thanks was accorded to Mr. Robinson and Messrs. Pulford Bros., Ltd., who suitably replied.

The Portsmouth and District Wireless Association.*

Hon. Secretary, Mr. S. G. Hogg, 9, Pelham Road, Southsea.

The usual fortnightly business meeting of the Club was held on January 31st, the President, Mr. J. H. C. Harrold, A.M.I.R.E., being in the chair. The Secretary, Mr. S. G. Hogg, reported that the Association's application for affiliation to the Radio Society of Great Britain had been passed. Amongst other matters discussed it was proposed to start a Club journal, which was duly christened the "Portsmouth Aether." A number of members promised to write articles for the first number, which is now being looked forward to.

After the meeting, the President gave an interesting talk, in place of Mr. Mant, who was booked to address the Club on "Auto Telephony," but who, unfortunately, could not fulfil his engagement. The President, however, ably filled the breach by recounting his experiences in the war. Mr. Harrold explained the system of co-operation that existed between aeroplanes and the artillery, and the method adopted in directing the fire of the latter on enemy points.

The Secretary would welcome enquiries as regards the Club activities, and would be pleased also to welcome new members.

Bromley Radio and Experimental Society.*

Headquarters: Ex-Service Men's Club, Bromley.

Hon. Secretary, Mr. J. F. Croome, 26, Wendover Road, Bromley, Kent.

A particularly interesting meeting was held at the Society's headquarters on Monday, February 5th, when various types of receiving sets were entered for the first competition organised by the Society. The entries were divided into two classes: (*a*) Valve Sets, (*b*) Crystal Sets, with a further class for "Gadgets." Following a practical test of each instrument exhibited the undermentioned were adjudged the winners in the respective classes:—Valve Sets, Mr. E. F. Janes; Crystal Sets, Mr. W. E. Bridgman; Gadgets, Mr. W. E. Bridgman. The prizes were respectively a valve, a voltmeter and a wheel brace.

The Society, which meets every Monday at the Ex-Services Club, includes 66 members, and is completing its own three-valve receiving set. All interested in broadcasting and experimental wireless are cordially invited to become members.

The Finchley and District Wireless Society.*

Hon. Secretary, Mr. A. E. Field, 28, Holmwood Gardens, Finchley, N.3.

The Society met on Monday evening, February 5th, at St. Mary's Schools, Church End, Finchley, N.3., when a number of pieces of apparatus were exhibited by the members. Amongst these were a B.B.C. crystal set lent by Mr. Brown, a home-made tuner by Mr. Howard, and a high frequency amplifying unit made by Mr. Campion. The Club set made its first appearance and gave good results on **2 LO**. Later the Society discussed a number of improvements which it was hoped would take place shortly.

On Monday evening, February 12th, the Society met at 8.15 at St. Mary's Schools, when a number of arrangements were agreed upon. Competitions are to be held about every eight weeks. An exchange and mart of wireless apparatus will run continuously, and further advertisement of the club to amateurs in the district will be undertaken.

Mr. Brown was elected Vice-Chairman owing to Mr. Trussler's illness. Re-election of the committee members who have resigned was postponed owing to insufficient attendance. The Society also agreed to hold future meetings on Thursday evenings at the St. Mary's Schools, Church End, at 8.15.

Ipswich and District Wireless Club.*

Hon. Secretary, Mr. H. E. Barbrook, 46, Foundation Street, Ipswich.

Owing to the unavoidable absence of Mr. Waters the meeting on February 5th was an open night, and it was decided to discuss the question of local disturbances.

Mr. Stanley Lewis took the chair and opened with a very interesting chat on a new method of learning Morse.

The Club's technical adviser was called upon to give instructions to the members on the best method for the tuning in of telephony. Mr. Bird seemed to be quite at home in this subject, and gave a most interesting and instructive discourse, after which the Secretary announced that the Society's affiliation to the Radio Society of Great Britain had been accepted.

The Secretary also mentioned that the total membership had risen to ninety.

Members are reminded that subscriptions for 1923 are now due, and should be sent to the Hon. Treasurer, Mr. F. Page, of 58, Pearce Road, Ipswich, in order that new membership cards may be issued for the year ending November, 1923.

The Streatham Radio Society.*

Hon. Secretary, Mr. S. C. Newton, "Compton," Pendennis Road, Streatham, S.W.16.

The February meeting of the above Society was held at the headquarters, Streatham Hill College, on Feb. 7th, when a joint paper was contributed by Messrs. A. G. Wood, A. Nielson, and H. J. Swift, describing their work in connection with the reception of the transatlantic tests. This comprised a full description of the apparatus used, the methods of working, and the reading of a log giving details of the various stations received, some 48 in all. The paper, ably read by Mr. A. G. Wood, raised a keen discussion, and was highly appreciated.

Bradford Wireless Society.*

Hon. Secretary, Mr. J. Bever, 85, Emm Lane, Heaton, Bradford.

On January 25th, 26th and 27th, the Society held its Second Annual Exhibition at the Drill Hall, Belle Vue Barracks. The proceedings were opened at 6 p.m. on January 25th, by Professor Richardson, of the Technical College, in the presence of a large number of people. Apparatus by all the principal makers was exhibited by the various local agents, who gave demonstrations at intervals in addition to the demonstrations by the Society.

One welcome result of the exhibition is a considerable influx of new members to the Society.

A meeting was held in the club-room at 7.45 p.m. on February 9th, with the President, A. Leardet, Esq., in the chair. After the business of the meeting several new members were elected.

The chairman then called upon Mr. Denison (of Denison Bros., Halifax) to give his lecture on "General Wireless Matters." In a very lucid manner the lecturer imparted a great deal of valuable information in a short time, using a series of excellent lantern slides, including views of **2 KD**, the lecturer's station.

The West London Wireless and Experimental Association.*

Hon. Secretary, Mr. H. W. Cotton, 19, Bushey Road, Harlington, Middlesex.

Club Room: Belmont Road, Chiswick, W.4.

At a meeting held on February 5th, Mr. J. H. Bruce gave a paper on a specially-constructed three-valve set of his own design. Diagrams were afterwards passed round. The lecturer gave full data of the panel and its wiring, also reports on its achievements. After the lecture the set was opened up and passed round for inspection.

Forthcoming events:—February 20th, lecture by Mr. A. O. Gibbon. March 6th, lecture by Lieut. D. Sinclair, "Wireless and Flying."

The Wireless Society of Hull and District.*

Hon. Secretary, Mr. A. Nightscales, 79, Balfour Street, Hull.

A private exhibition of members' home-made apparatus was held at the club-room on January 26th. The quality of those shown was very good, and reflected great credit on the exhibitors. From the apparatus on view it could be clearly seen that most experimenters built up their sets upon the unit system, which would appear to be the best plan.

Mr. H. Strong (Vice-President) was in the chair, and previous to the exhibition, the members present were asked to consider the report of a sub-committee with regard to the holding of an invitation smoking concert. The report was adopted, and this important event will take place on Friday, February 23rd, in the Memorial Institute School Room, Dewsbury Street, at 8 p.m. A large attendance is expected on this occasion. Each member will receive an invitation card for himself and a lady.

Meetings of the Society are held on the second Monday and fourth Friday at the Signal Corps' Headquarters, Park Street, at 7.30.

New members will be welcomed, and full particulars re membership can be obtained by communicating with the Hon. Secretary, who will also be pleased to hear from any members willing to read papers or give lectures before the Society.

Radio Society of Birkenhead.

Hon. Secretary, Mr. R. Watson, 35, Fairview Road, Oxton, Birkenhead.

The fifth general meeting of the Radio Society of Birkenhead took place on the evening of February 1st. Buzzer practice as usual was held at 7.30 p.m. The attendance not being as good as it ought to be, the Committee expressed the hope that more advantage would be taken of Mr. McKinlay's buzzer class.

At 8 p.m., the Chairman, Mr. Austin, called upon Mr. Bailey to deliver his lecture on "Ohms Law," whereupon the lecturer, in a very clear manner, explained the various units of electricity. After the lecture, many questions were handed in to the technical advisers, Messrs. Hughes and Austin, who dealt with them in a very clear and lucid manner, drawing many diagrams on the board. The meeting terminated at 9.45 p.m.

Weston-super-Mare and District Radio Society.

Hon. Secretary, Mr. J. P. Gorton.

The first meeting of this Society at their new club-room at "Torwood," kindly loaned by Mr. H. Tidman, of that address, was held on January

26th, there being present the President, Chairman, and a fair number of members. Application has been made for an experimental wireless licence, and it was decided to build some receiving apparatus at the club-room.

Mr. P. Warrilow has presented the Society with a large accumulator, and another member has promised the loan of a foot lathe.

An aerial is about to be erected by Mr. J. Powell, and as soon as permission is obtained members have arranged to bring their gear to the club-room for demonstration purposes.

The attendance on the part of some of the Committeemen having been poor, Messrs. R. E. Morris, A. H. Giles, H. Tidman, W. Tucker and J. Powell were elected to the Committee in order to strengthen it.

It was decided to hold meetings on Wednesday evenings, when a "buzzer" class will be run for the benefit of those wishing to learn Morse reading.

The Isle of Man Radio Society.

Joint Secretaries, Messrs. J. S. Craine, 6, Belmont Terrace, and J. P. Johnson, 16, Hildesley Road, Douglas.

A meeting was held on Monday, February 5th, at the Secondary School, Douglas. Mr. H. Colebourn presided over an attendance of twenty-six. Five new members were elected. Preliminary business having been disposed of, Mr. J. S. Craine addressed the meeting. He confined himself entirely to the principles underlying the tuning of a receiving circuit, and his capable handling showed a thorough grasp of the subject. Blackboard diagrams were freely used, and it may be certainly said that the speaker conveyed a good deal of valuable theoretical information which will result in the more intelligent operation of receivers by all who heard him. Mr. Craine received the best thanks of the meeting for his able lecture.

Next week Mr. G. Gillmore will speak on "The Theory and Construction of Primary and Secondary Cells."

The Hornsey and District Wireless Society.

Hon. Secretary, Mr. H. Hyams, 188, Nelson Road, Hornsey, N.8.

The Society recently transferred its headquarters to The Queen's Hotel, Broadway, Crouch End, and is now making rapid progress.

A meeting was held on Monday, January 29th, and after the general business was dealt with the Chairman called upon one of the members, Mr. Pugh, to give a demonstration of wireless reception by indoor aerial. The apparatus used consisted of a valve detector, one L.F. amplifying panel with an additional valve connected through an old German transformer. Although the aerial consisted of only a few feet of bell wire carelessly slung across the room, the concert from **2 LO** was received excellently on an ordinary loud speaker. The result was so satisfactory that most of the members remained until the finish of the musical programme.

The Hon. Secretary will be pleased to send full particulars regarding membership on application.

Mansfield and District Wireless Society.

Hon. Secretary, Mr. W. A. Blackwell, 65, Nottingham Road, Mansfield.

The first annual meeting of the Mansfield and District Wireless Society was held at the Y.M.C.A. Hall, Mansfield, on January 30th, the chair being occupied by the President of the Society, J. Malcolm Whitehouse, Esq., F.G.S.

The minutes of the last two meetings disclosed continued interest in the work of the Society by its members, though, as the Secretary pointed out in the annual report, not the interest that should manifest itself in a town like Mansfield.

A move in the right direction has been made in the resolution to affiliate the Society with the Radio Society of Great Britain, a step which will doubtless tend to make its meetings of increasing value because of the advantages gained by unity with an Association possessing first-hand knowledge of any measures tending towards efficiency in wireless experimental work. It was reported that during the past year a very interesting lecture was given by Mr. J. T. Thornton, late principal of the City School of Wireless Telegraphy, Nottingham, dealing with the history of Wireless Telegraphy and its value in warfare and commercial enterprise. Another lecturer had been Mr. E. V. R. Martin, of the Derby Wireless Society, on the Principles and Practice of Wireless Telegraphy, including the workings of the Thermionic Valve. So instructive and interesting were these lectures that another invitation is to be extended to both these gentlemen to address the Society again in the near future.

The matter of erecting a new aerial and building up a wireless set is at present under consideration and is to be dealt with at an early date.

The Cheshunt Experimental Radio Club.

Hon. Secretary, Mr. J. Bonnett, 9, Gew's Corner, Cheshunt, Herts.

The fourth meeting of the above club, which now has a membership of twenty-two, was held on Monday, February 5th.

The Secretary is giving a course of lectures on the elementary theory of radio and the construction of receiving apparatus, with a view to enabling each member to obtain his own experimental licence.

Meetings are held every Monday at 7.30 p.m. at "The House," Churchfields Path, Cheshunt. All radio enthusiasts in and around the district are cordially invited to join.

Beckenham and District Radio Society.

Hon. Secretary, Mr. J. T. Butterfield, 10, The Close, Elmers End.

An interesting lecture was given by the Secretary on "Dual Control Circuits," on February 8th, at the Society's new headquarters.

During the evening it was stated that Lt. Walker, of **2 OM**, had kindly consented to give a lecture on Thursday, March 1st. It is hoped that the members of the Society will turn up in full force.

Scarborough and District Wireless Club.

The name of this Club has been changed to "The Scarborough Radio Society," and the new headquarters are at the Belle Vue Hotel, Scarborough.

Panel for a Single Valve Receiver.

EASY CONSTRUCTION OF A USEFUL INSTRUMENT.

THE crystal receiver described in a recent issue serves as a good introduction to the reception of wireless signals. It affords a simple exercise in home instrument making, and the operation of it brings out the principles of tuning, whilst successful reception with a crystal set indicates that there cannot be much wrong with the aerial, tuning coils, earth connections and telephones. Another recent article described the construction of a receiver which made use of a valve for increasing the magnitude of the currents induced in the aerial after which a crystal functioned in the usual way by causing the picked up currents to produce signals in the telephones.

The valve panel about to be described, carries the apparatus necessary for controlling and manipulating the valve, and is the first real step on the high road to the construction of perhaps, an elaborate experimental station. However that may be, every user of wireless apparatus finds that sooner or later he must possess a detector valve panel whether he intends to purchase one or build it himself.

The panel consists of a piece of ebonite which carries a valve holder, filament resistance with "off" position, grid condenser having a value of 0.0002 or 0.0003 microfarads, a grid leak of value between 1.5 and 2 megohms, telephone condenser of 0.001 or 0.002 microfarads and ten terminals. All of these, together with about two yards of "Sistoflex" insulating sleeving and some No. 18 or 20 bare or tinned copper wire for connecting up, can be found in the lists of retailers of wireless parts or at any of the numerous stores which now specialise in this class of business.

The piece of ebonite, which when purchased should be highly polished on both sides, must be large enough, so that when the edges are filed and rubbed smooth in the manner described in the two articles referred to above, a panel $4\frac{1}{2}$in. $\times$ $6\frac{1}{4}$ in. is obtained. The thickness of the panel is $\frac{1}{4}$ in. The marking out of the exact points for drilling holes should be carried out most carefully and an error of $\frac{1}{64}$ in. will not only be apparent to the eye when the parts are assembled, and thus spoil the appearance of the work, but in some instances will make the fitting up of the parts very difficult and necessitate the enlarging of any incorrectly located holes with a small rat-tail file. This advice is offered in order to impress upon the reader that he must appreciate right from the start the necessity for the utmost precision and accuracy, as it has such a marked effect on the appearance and value of his apparatus. It is quite common in wireless journals to see reproduced photographs of amateur apparatus to which the builder may have given a great deal of time and thought, yet which present a somewhat crude appearance for no other reason than that accuracy in setting out has been lacking.

Having procured the components, place them on a sheet of paper on which the outline of the panel is marked and measuring from two edges which are at right angles, fix the location and size of the holes to be made. With the great variety of types of components at present available it is not possible to give a working drawing making use of purchased parts, but it is quite a simple matter to go over them with a rule and thus arrive at the spacing for the holes.

Drawings of the front and underside of the panel are given in Figs. 1 and 2, and photographs of one constructed on the same lines but embodying another style of components are given in Figs. 3 and 4.

Before assembling, it is necessary to remove the polished surface of the ebonite and a good finish to the faces can be obtained by rubbing down with a piece of emery cloth wrapped round a block of wood. By employing a circular motion an even surface can be obtained, free from scratches. The reader is reminded that is is quite a simple matter to have the panel engraved by carefully marking it and placing it in the hands of one of the several firms who undertake this work and whose addresses can be found in the advertisement pages of this journal.

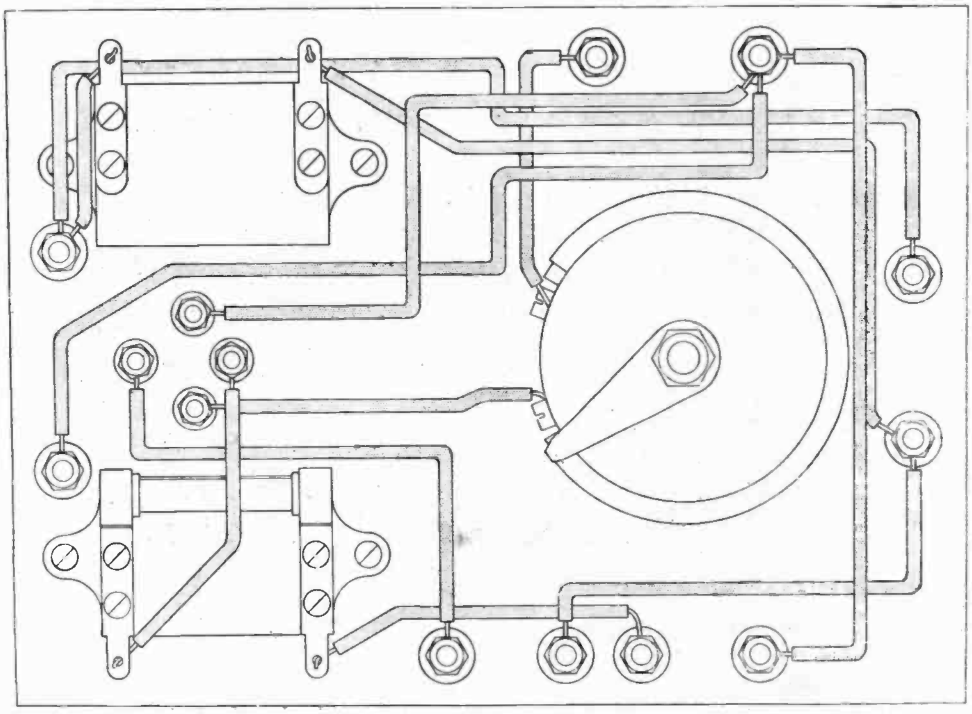


Fig. 2. The arrangement of the components on the underside. The practical wiring can be followed from this drawing.

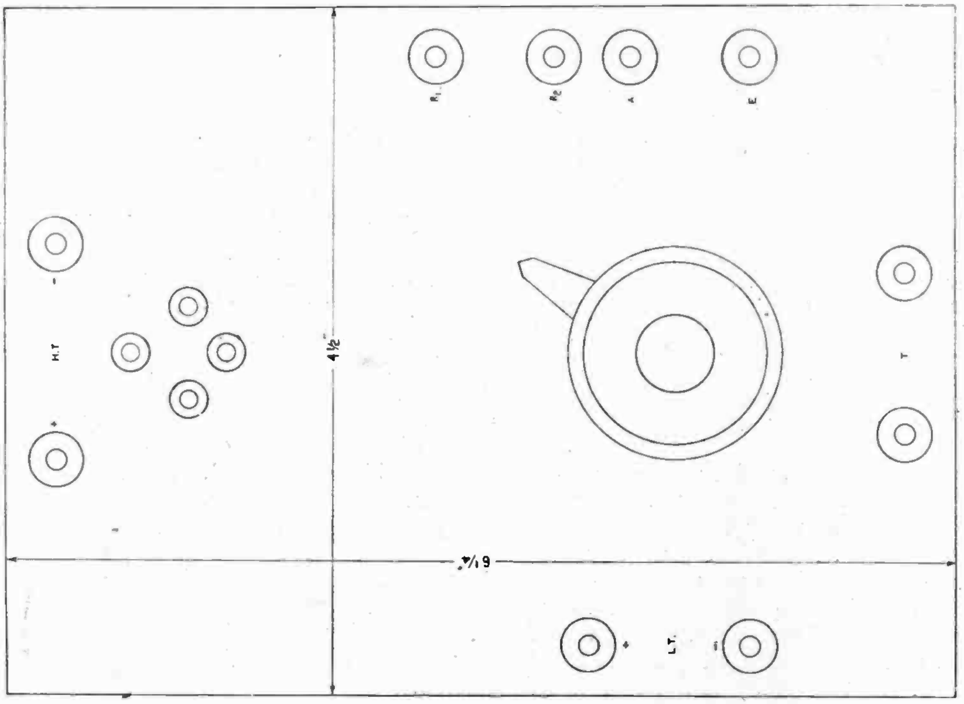


Fig. 1. Scale drawing of the top of the panel, showing lay-out of terminals and valve holder. The actual size is 6¼" × 4½".

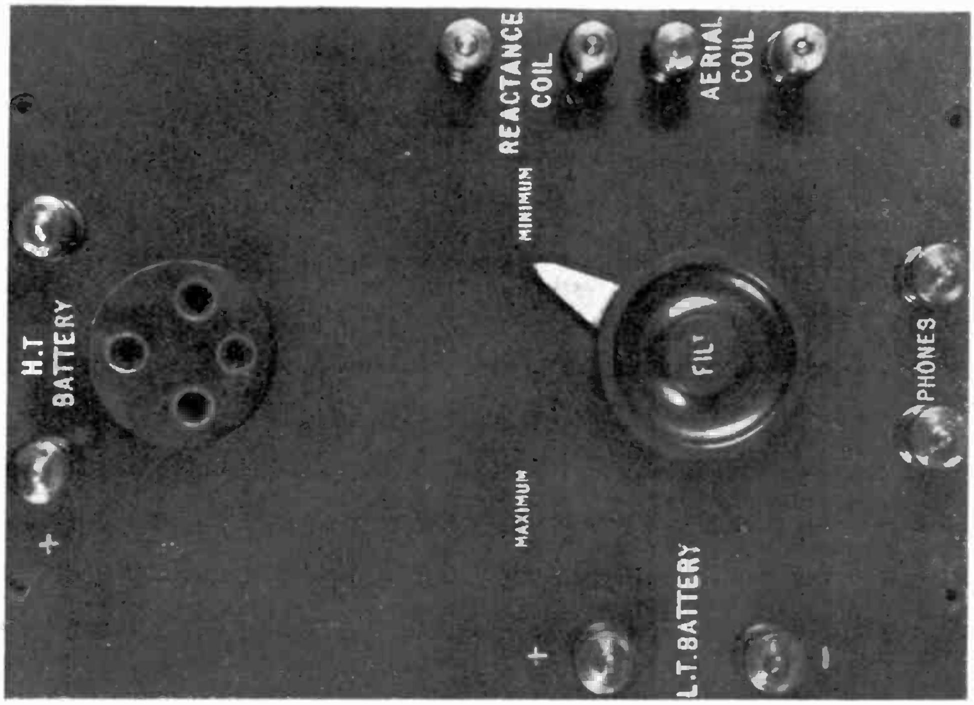


Fig. 3. A detector valve panel made to the description given in this article.

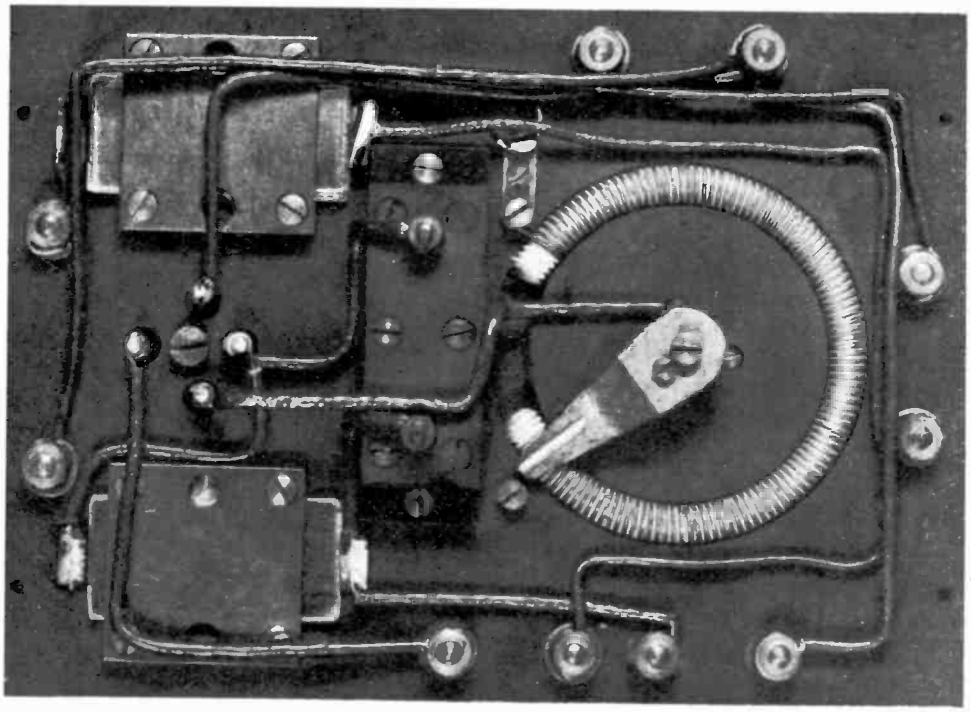


Fig. 4. Other types of component parts are made use of here. It is a simple matter to adapt the lay-out to suit the parts available.

The wiring up can be clearly seen in the drawing of the under-side and it should be observed that the leads do not take the shortest route between the points which they connect but are arranged parallel to the sides. This is a good practice for simplicity in tracing connections though in multivalve sets it is liable to set up noises owing to induction between certain of the leads. For this reason grid and tuning circuit leads should be well spaced from all others and kept as short as possible.

Fig. 5 is a circuit diagram of the panel wired up for experimental reception, while it shows also the arrangement worked out practically The method shown for obtaining reaction should not be used by the experimenter on broadcasting wavelengths, and many articles in this journal have advocated methods of limiting the extent of interference by receiving apparatus. This matter will be dealt with again in an early issue as applicable to the detector panel here described.

F.H.H.

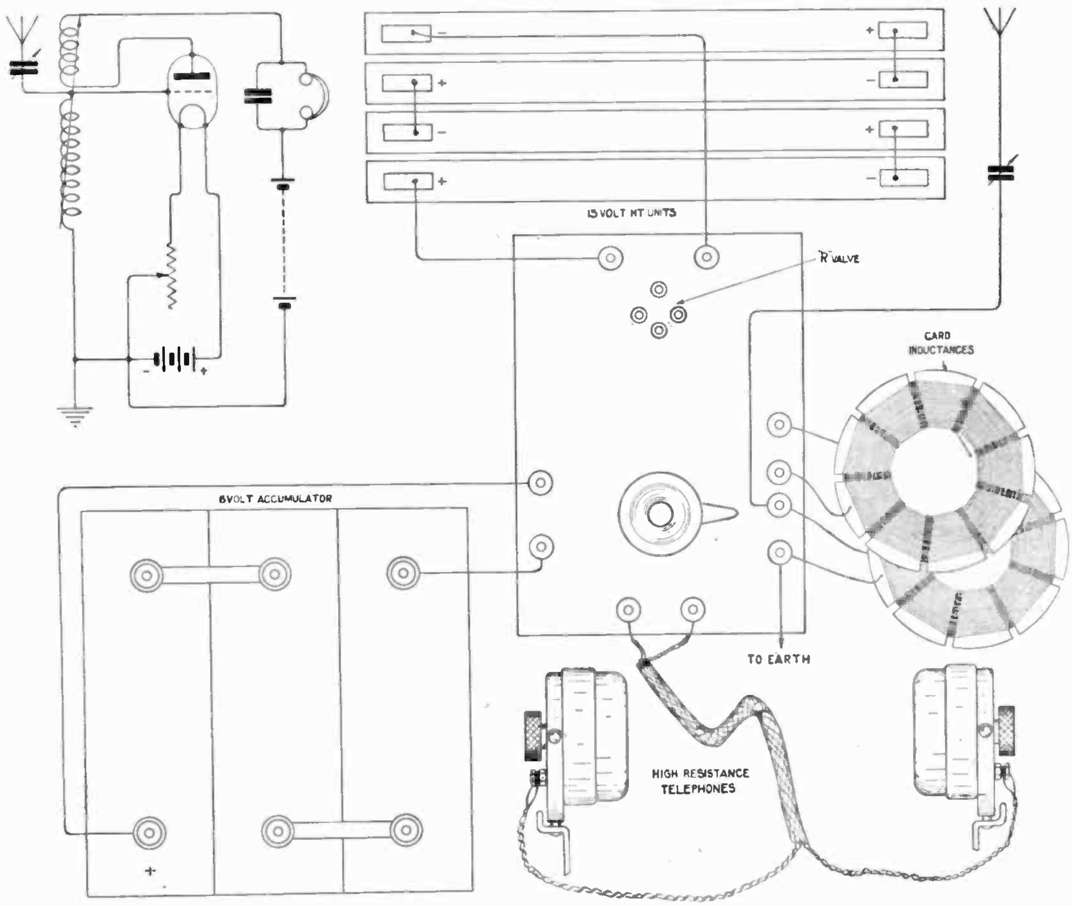


Fig. 5. The method of connecting up the panel in an experimental receiving circuit. The tuning coils are of the type described in recent issues, though any arrangement of coupling coils may be employed. A circuit of the entire outfit is shown diagrammatically on the left.

The Transatlantic Amateur Tests.

SUMMARISED REPORT OF BRITISH RECEPTIONS.

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

BRIEF notes have already appeared in these columns indicating some slight measure of the success of the series of Transatlantic Tests recently completed. Not only have they been successful, but the results achieved have astonished both the Americans and ourselves, even although we had some indication in advance of what was likely to come from the almost daily reports of American short-wave signals—amateur and broadcasting—being heard here.

The difference between the reports from a few listeners prior to the Tests, and the multitude of receptions made during the Test periods, arises almost entirely from the larger number of listeners taking part. Although we know quite well, and have also been repeatedly reminded of it by the U.S. League, that the bulk of U.S. radio amateurs are sending every night and should therefore be able to be heard here, there is no question that the publication of definite test arrangements acts as an enormous stimulus to encourage people to stay up all night and listen for signals.

The time difference between the two countries is a great deterrent to such listening-in without some additional encouragement, since we all have our daily duties; we have broadcasting till 10.30 p.m., we then have our own work to attend to, and if after that, from midnight to 6 a.m., we listen in for the U.S. signals, we have a rather small proportion of the twenty-four hours left for sleep. However, a number of listeners sacrificed their sleep during the tests, and sent in many reports of receptions made.

It may be useful here to recall briefly the main outline of the Tests. The first part lasted from December 12th to 21st inclusive, between midnight and 0600 G.M.T., during which times the U.S. and Canadian amateurs transmitted special test signals to Europe. From midnight to 2.30 a.m. each night there were ten "free-for-all" periods, each of fifteen minutes duration, and during these periods the transmitters in any one district could transmit for one fifteen-minute period. The transmission time for each district was changed from night to night so as to give everyone as far as possible an equal chance.

Between 2.30 a.m. and 6 a.m. successive fifteen-minute periods were allocated to groups of stations for "individual" transmissions, such transmissions including a special code word to enable the receptions to be verified on this side. In addition to these special transmissions, there were the ordinary communications between various U.S. amateurs, which were continuing throughout the whole time of the Tests.

Reports of receptions were asked for day by day so that the results obtained could be sent back to the American Radio Relay League by a radio message from Carnarvon each morning. These messages were repeated by New Brunswick station so that all U.S. and Canadian amateurs could get some idea of how the Tests were progressing. Many listeners were good enough to forward their results daily by telegram, telephone, or by express letter, and so materially helped in the preparation of these daily reports. Other reports were received by post, and were incorporated in the daily radio messages as early as possible. As the end of the Test periods approached Christmas, however, there were greater delays in the post reports, so that the daily radio messages towards the end of the tests, while reporting many receptions, were by no means complete. Some reports—in some cases posted from only a few miles away—were delayed in the post for over a week before delivery, and this fact, together with the large number of reports to be analysed, has accounted for the delay in presenting any proper report of the results achieved.

Before proceeding to a detailed discussion of the results it may be of interest to mention the radio messages which were prepared for transmission each day from Carnarvon. These messages, as has been explained in an earlier article in these columns, were sent in a code so as to avoid errors arising from accidental telegraphic mistakes, a word being used for each letter of the call sign being reported, the initial letter of the word giving the particular letter it is desired to indicate. Thus, **1 BCG** was reported as "One Boy Cast George," and so on.

Messages were transmitted daily from Carnarvon at 0700 G.M.T. from December 13th to December 23rd.

Unfortunately a few errors crept into these messages as transmitted, arising from the difficulties under which they were prepared—some in intervals between other office and experimental work, some in odd moments snatched during the erection of the transmitting station **5 WS**, some in the small hours of the morning. One or two errors have apparently arisen due to verbal mistakes occasioned by the necessity of shouting the calls from one person checking them off to another preparing the list for transmission, over the noise of motors, etc. (at **5 WS**), while others apparently arose from their having to be passed over the telephone. The summary set out below, of calls received each night, gives however a truer idea of the test results than the above telegrams, since some results were received too late for transmission by the radioed reports.

On some occasions certain U.S. stations were heard using their special code words at other times than during the "individual" transmission periods set out in the schedules, and when these were reported correctly, with the proper call letters, etc., they were reported in the radiograms as calls heard with code words verified. In the tabulated results set out below, these interceptions, if not during the "individual" periods, have been separated from the others, and included under Sections B or C as more appropriate.

During the ten days of the reception tests reports were received from 47 different amateur listening stations in Great Britain, and from two Dutch stations, making 49 in all. The total number of interceptions of U.S. and Canadian amateur signals reported in this way during these ten days was 2,297. This figure includes all interceptions—"Individual" transmissions, "Test" signals during the free-for-all periods, and calls and messages from stations simply carrying on their ordinary communications and "DX" transmissions.

A better idea of the distribution of these "calls heard" amongst these three classes of trans-

"GREAT CIRCLE" MAP WITH LONDON AS CENTRE.

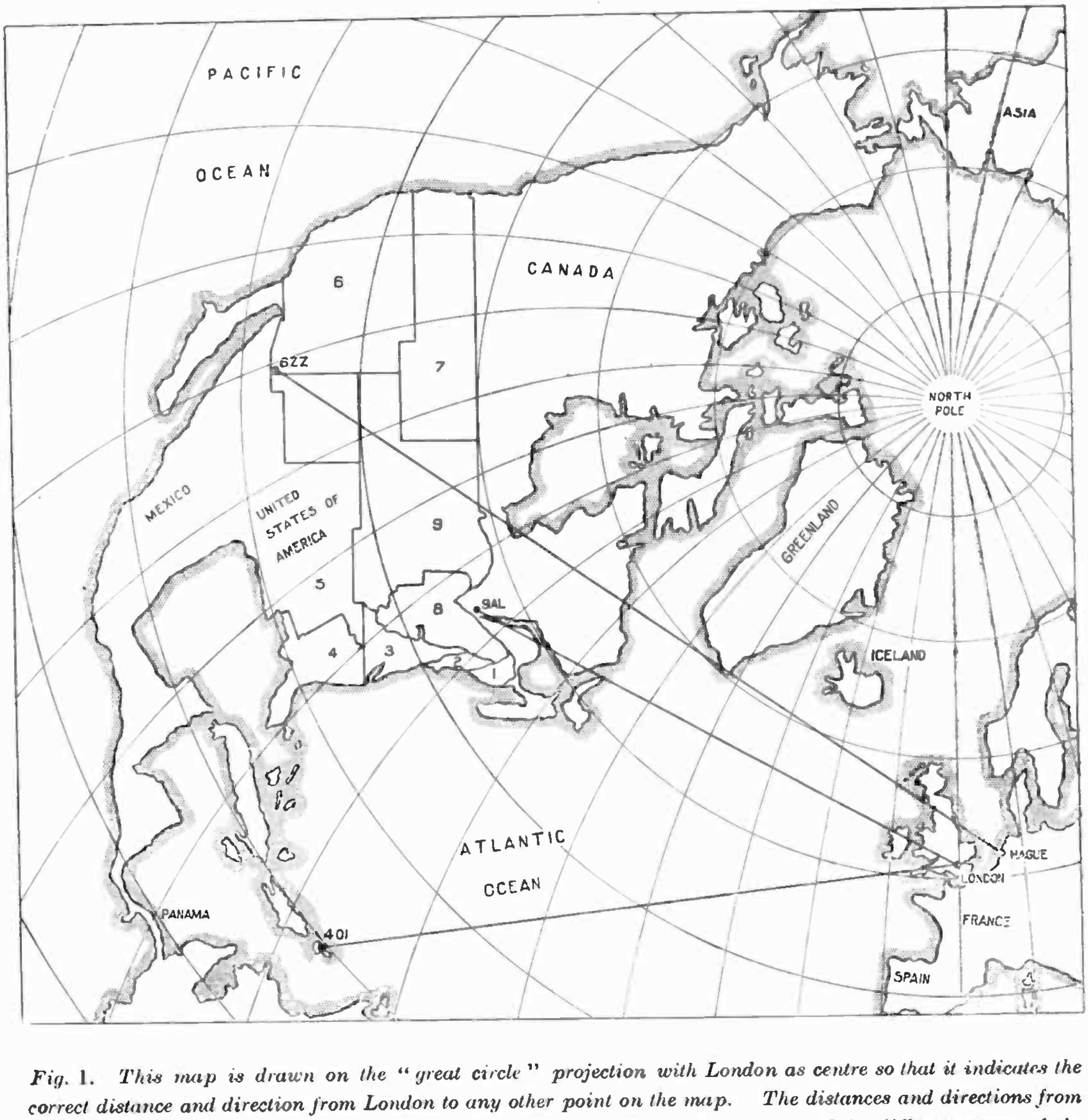


Fig. 1. This map is drawn on the "great circle" projection with London as centre so that it indicates the correct distance and direction from London to any other point on the map. The distances and directions from points in England will also be approximately accurate. The numbers indicated in different areas of the United States are the numbers of the different districts.

TABLE I.

Summary of Numbers of Stations heard.

District (U.S. Inspection District, or Canada).	Number of stations heard with verified Individual Transmissions at correct times, with code words, etc.	Number of stations heard during "free for all" period at correct schedule times.	Number of stations heard working DX, sending messages, etc.	Total number of different stations heard.
1st	20	44	97	134
2nd	24	44	126	154
3rd	15	26	45	59
4th	5	6	9	14
5th	2	3	20	24
6th	1	0	1	2
7th	0	0	5	5
8th	21	13	63	82
9th	5	1	28	31
Canada	1	1	2	2
Totals	94	138	393	507

In the above table the U.S. Inspection districts are identical with the numbers on the map, Figure 1.

missions may be obtained from the following summary, giving the numbers of different stations heard, under each of these classes for each of the U.S. inspection districts and for Canada.

It will be observed that the figures in the last column of the above table are not simply the sums of those in the preceding columns, as several of the stations heard making individual transmissions with code words, or transmitting at the schedule times during the free-for-all periods were also heard at other times sending messages, etc. The figures given in the last column are the numbers of *different* stations in each district that were heard during the tests.

The most successful districts were obviously the first and second, the third and eighth being next best. This, of course, was to be expected, both from last year's tests and also because these districts are nearer to the Atlantic seaboard. The sixth and seventh districts, on the Pacific coast, are naturally less well represented. A sixth district station was, however, heard with code word, thus verifying the reception, which reception is really a remarkable performance considering that the station is located in Arizona, on the Pacific side of the Rocky Mountains. Signals from all districts have been reported, but as several of these from the sixth and seventh districts were only ordinary DX calls, it was not possible definitely to verify them, as in the case of the individual transmissions.

It should also be pointed out that some signals (with code words) were reported on *every* night of the tests. The number reported varied largely from night to night, there being in particular two bad nights and one especially good one, and bearing this in mind, an *average* of over 200 interceptions from 50 different stations per night seems to the writer to be a great tribute both to the design of the receiving apparatus used, and to the skill of the operators who were listening in.

The wide area from which signals were heard is perhaps emphasised by the map in Fig. 1, which is a "great-circle" map plotted out from London as centre. Such a map gives an accurate idea of the apparent directions of the various places from London, as well as their true distances, since the waves will presumably follow the shortest path over the earth's surface, which is the "great circle" between those places. The "great circle" distances of these U.S. stations from any point in Great Britain will not differ very much from their distance from London, from which centre this map has been plotted.

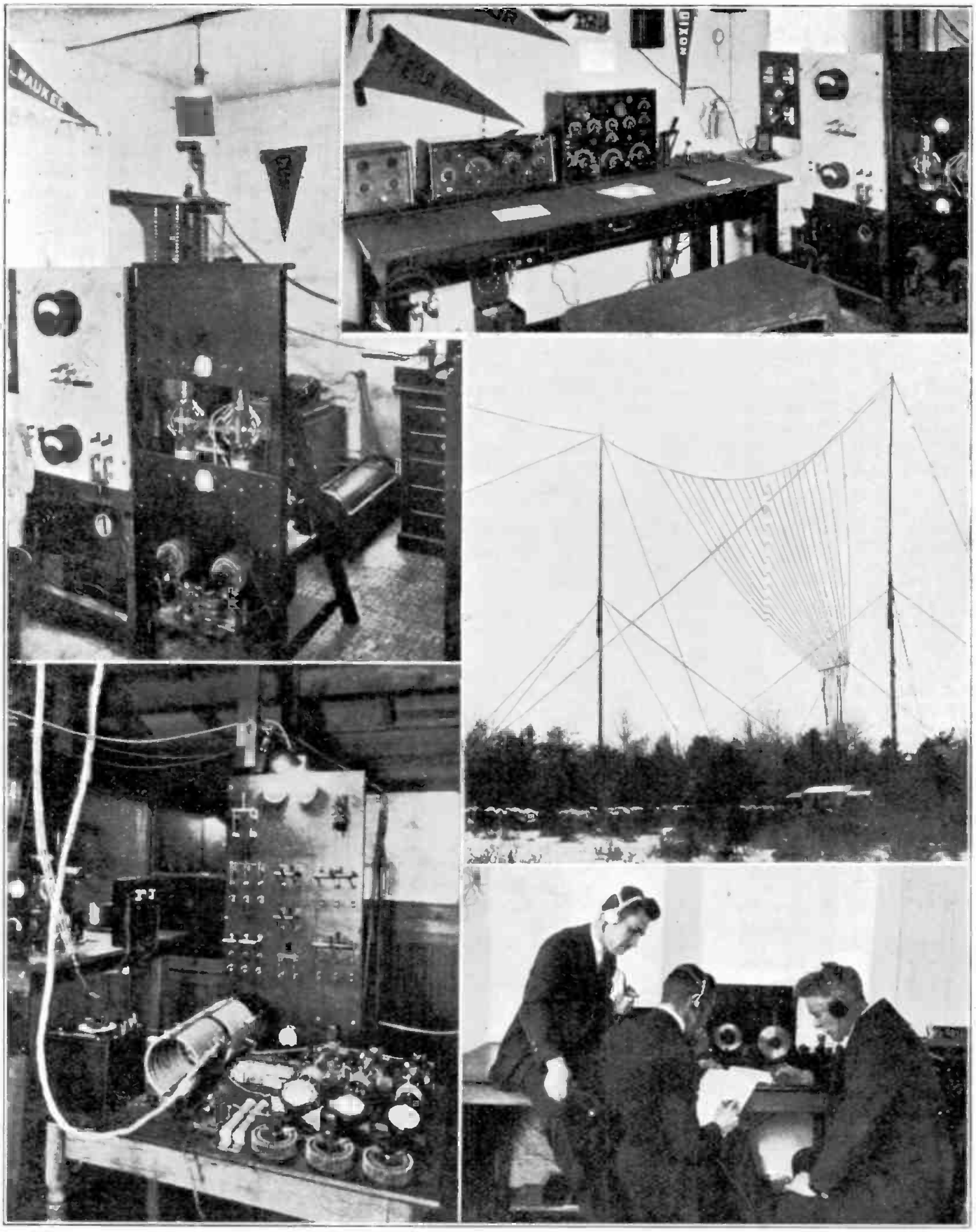
This map has marked on it the approximate boundaries of the various U.S. Inspection Districts, so that the average distance of these districts can also be estimated.

In the following table (II) is given a list of the U.S. and Canadian stations heard, together with the names of the station owners, and the address and location of each station. This table gives only those stations that have been heard making individual transmissions at the correct times, and whose code words have been verified, as only these stations were included with their owners and addresses in the schedule sent over from the American Radio Relay League.

TABLE II.

List of U.S. and Canadian Stations reported in Great Britain and Holland during "Individual" periods, the Codes being verified.

Call Letters.	Name of Owner of Station.	Address.	Town.	State.
1 AGK	S. K. Hefferman	28½, Grove Street	Salem	Massachusetts.
1 AHZ	H. N. Dole	27, Columbus Avenue	Haverhill	Massachusetts.
1 AJP	N. Bishop	Box 336, Yale Station	New Haven	Connecticut.
1 ASF	L. F. Sise	31, Power House Road	Medford	Massachusetts.
1 AZW	H. Toumajanian	70, Broadway	Newport	Rhode Island.
1 BCF	L. G. Cushing	—	S. Duxbury	Massachusetts.
1 BCG	M. Cronkhite	—	Greenwich	Connecticut.
1 BDI	F. E. Handy	412, Hannibal Hamlin Hall.	Orono	Maine.
1 BEP	F. L. Vanderpoel	—	Litchfield	Connecticut.
1 BET	College of the Holy Cross	(Dept. of Physics)	Worcester	Massachusetts.
1 BGF	P. O. Briggs	52, Girard Avenue	Hartford	Connecticut.
1 BKQ	Worcester Co. Radio Association.	776, Main Street	Worsester	Massachusetts.
1 CJA	G. E. Nothnagle	176, Waldemare Avenue	Bridgeport	Connecticut.
1 CMK	P. H. Bloom	682, East Street	Holyoke	Massachusetts.
1 CNF	St. Mark's Radio Club	—	Southboro	Massachusetts.
1 FB	L. G. Cumming	83, Marlboro Street	Boston	Massachusetts.
1 GV	H. H. Tilley	119, Pratt Street	Providence	Rhode Island.
1 XM	Massachusetts Institute of Technology.	—	Cambridge	Massachusetts.
1 YK	Worcester Polytechnic Institute.	—	Worcester	Massachusetts.
1 ZE	I. Vermilya	24, Allen Street	Marion	Massachusetts.
2 AFP	G. Milne	142, Totowa Road	Paterson	New Jersey.
2 AHO	Eastern C. W. Association	150, Coit Street	Irvington	New Jersey.
2 APD	C. F. Muchenhoupt	317, Church Street	Poughkeepsie	New York.
2 AWF	E. Wirsing	33, Quail Street	Albany	New York.
2 AWL	R. S. Johnson	—	Red Bank	New Jersey.
2 AYV	N. van Heuvel	413, Magnolia Street	New Brunswick	New Jersey.
2 BML	A. B. Tyrell	—	Riverhead	Long Island.
2 BNZ	E. A. Dickinson	10, Hawthorne Place	East Orange	New Jersey.
2 BQU	H. Kuch	Bertha Place, Grymes Hill	Saten Island	New York.
2 BRB	E. M. Glaser	845, East 13th Street	Brooklyn	New York.
2 CKN	B. M. Francisco	12, North Jay Street	Schenectady	New York.
2 CQZ	R. M. Morris,	827, Cross Avenue	Elizabeth	New Jersey.
2 EL	H. H. Carman	—	Freeport	Long Island.
2 GK	A. G. Kastenmeyer	417, Paige Street	Schenectady	New York.
2 GR	J. M. High, Jr.	Riverdale-on-Hudson	New York City	New York.
2 HJ	H. J. Hasbrouck, Jr.	—	Port Chester	New York.
2 HW	A. M. Hanna	1211, Hatters Street	Troy	New York.
2 KF	H. D. Selvage	45, Durand Place	Irvington	New Jersey.
2 LO	N. D. Dunham	103, South 1st Avenue	New Brunswick	New Jersey.
2 NZ	E. R. Raguse	151, Main Street	Tottenville	Long Island.
2 UD	W. B. Ross	1957, 61st Street	Brooklyn	New York.
2 XAP	H. R. Mimms	Box 592	Troy	New York.
2 ZK	G. C. Cannon	183, Drake Avenue	New Rochelle	New York.
2 ZL	J. O. Smith	3, Corona Avenue	Valley Stream	Long Island.
3 ABF	R. T. Shaw	1914, Park Avenue	Wimington	Delaware.
3 AUU	W. M. Lamb	—	Petersburg	Virginia.
3 BG	P. C. Peterson	Ashland Avenue and Hood Road.	Falcroft	Pennsylvania.
3 BGT	C. S. Risley	Rumson and Ventnor Avenue.	Atlantic City	New Jersey.



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By Courtesy of the American Radio Relay League

1. Transmitting equipment at **9QN**, *Chicago. This station has been heard in Holland.* **2. 8AQO,** *at Cazenovia, New York.* *3. Receiving apparatus at* **9QN**. *4. Fan aerial of* **1ZE,** *Marion, Mass.* *5. Taking the reports from* **MUU** *and* **UFT**. *Left to right, K. B. Warner (Secretary, A.R.R.L.), F. H. Schnell (Traffic Manager, A.R.R.L.), Hiram Maxim (President, A.R.R.L.).*

TABLE II.—*Continued.*

Call Letters.	Name of Owner of Station.	Address.	Town.	State.
3 BIJ	W. R. Selden	201, Franklin Street	Richmond	Virginia.
3 BLF	R. Hofman	202, N. Addison Street	Richmond	Virginia.
3 BNU	O. A. Hiskey	22, W. Fairview Street	Bethlehem	Pennsylvania.
3 CC	C. W. Weber	Huntingdon Road	Abingdon	Pennsylvania.
3 CG	V. M. Wintermute	47, Spring Street	Newton	New Jersey.
3 FS	C. G. Benzing	2425, S. 12th Street	Philadelphia	Pennsylvania.
3 NH	W. G. Butterfield	—	Plainfield	New Jersey.
3 XM	H. J. Hemphill	233, Pyne Hall	Princetown	New Jersey.
3 YO	Lafayette College	Radio Club	Easton	Pennsylvania.
3 ZW	W. A. Parks	1220, Jackson Street	Washington.	—
3 ZZ	A. A. Kubiac	54, Burtis Street	Craddock	Virginia.
4 BY	J. E. Hodge	143, Hull Street	Savannah	Georgia.
4 EA	A. W. Parker	—	New Bern	N. Carolina.
4 EB	B. W. Cochran	—	Palmetto	Georgia.
4 ID	J. H. Robertson	600, W. Council Street	Salisbury	N. Carolina.
4 KM	T. K. Rush	22, Cherry Street	Atlanta	Georgia.
5 FV	J. De Witt	1812, 15th Avenue S.	Nashville	Tennessee.
5 XK	P. Stout	1621, Riverside Drive	Knoxville	Tennessee.
6 ZZ	H. L. Gooding	—	Douglas	Arizona.
8 AQO	C. B. Meredith	Fernwood Farm	Cazenovia	New York.
8 ATU	J. K. Marcus	87, Kelly Street	Rochester	New York.
8 AWP	S. W. Woodworth	425, Brownell Street	Syracuse	New York.
8 AWZ	C. L. White	—	Stockdale	Ohio.
8 AXC	E. Manley	214, 5th Street	Marietta	Ohio.
8 BFM	C. J. Sonneberger	919, Beardsley Street	Akron	Ohio.
8 BK	H. G. Squires	14001, Ardenall Avenue	E. Cleveland	Ohio.
8 BNJ	W. Black	6256, Rohns Avenue	Detroit	Michigan.
8 BPL	S. J. Hutchinson, Jr.	1914, Delaware Avenue	Swissvale	Pennsylvania.
8 BXH	H. C. Hedges	35, 12th Avenue	Columbus	Ohio.
8 IB	R. C. Higgy	73, E. Frambes Avenue	Columbus	Ohio.
8 KG	J. W. Kidd	404, Lafayette Street	Niles	Ohio.
8 ML	F. M. Murphy	Grand Division and Warner Road.	Cleveland	Ohio.
8 OW	A. Mag	4212, Penn Avenue	Pittsburgh	Pennsylvania.
8 SP	A. G. Kisner	Box 428	Fairmont	W. Virginia.
8 UE	N. Schafer	32, Broadway	Lancaster	New York.
8 XE	Penn State College	—	State College	Pennsylvania.
8 YD	Shaw Technical School	—	East Cleveland	Ohio.
8 ZAF	R. C. Bohannan	1188, Willard Avenue	Columbus	Ohio.
8 ZW	E. W. Weimer	1033, Main Street	Wheeling	W. Virginia.
8 ZZ	C. E. Darr	137, Hill Avenue, Highland Park.	Detroit	Michigan.
9 AUL	L. C. Smeby	1504, W. Broadway	Minneapolis	Minnesota.
9 DYN	D. and M. Koerner	—	Kempton	Illinois.
9 FM	S. J. Blum	702, Shukert Buildings	Kansas City	Missouri.
9 XAC	R. Karlowa	5000, Brady Street Road	Davenport	Iowa.
9 ZN	R. H. G. Matthews	332, S. Michigan Avenue	Chicago	Illinois
9 AL	A. H. K. Russell	11, Pinewood Avenue	Toronto	Ontario, Canada.

A further instalment of this summarised report of the Transatlantic Tests will be included in our next issue.

The Research Laboratories of the General Electric Company at Wembley.

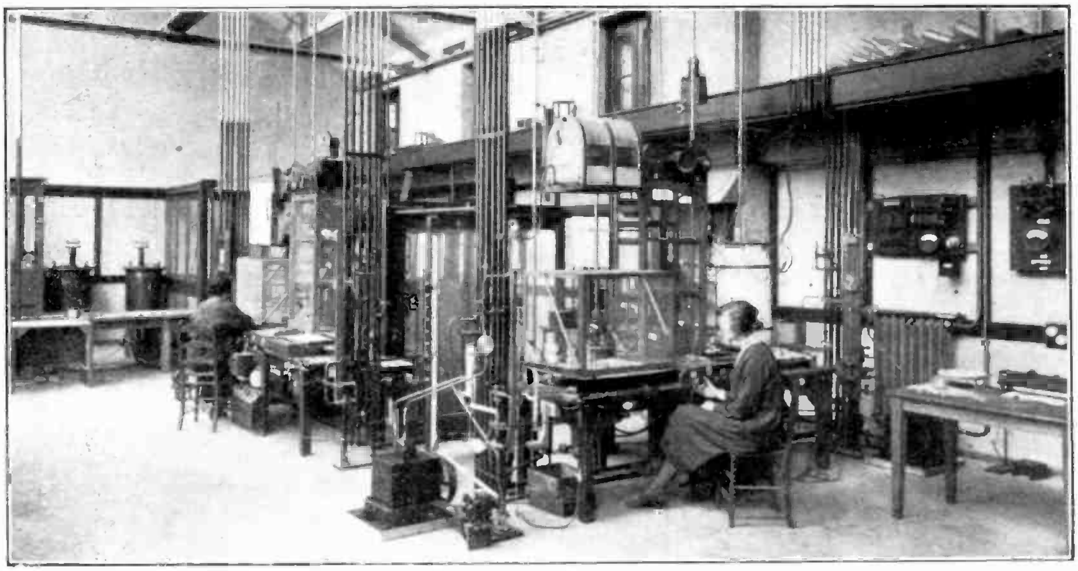
THE new research laboratories of the General Electric Company, Ltd., situated in Wembley, Middlesex, were formally opened on February 27th by the Rt. Hon. Lord Robert Cecil, K.C., M.P. A description of the arrangement of the laboratories is considered to be of special interest, as they probably represent the largest electrical research department in this country, and approach in magnitude those controlled by the large electrical manufacturing establishments in the United States.

The laboratories are divided into a number of departments according to the class of investigation carried on, and a brief description of the many sections is given below.

Each laboratory, apart from the interesting equipment installed for a number of routine tests, was arranged with demonstration equipment for indicating the progress made by the company in the design of all classes of electrical gear.

In the vacuum physics laboratory were demonstrated a number of attractive experiments relating in particular to gas filled lamps, and an instrument was exhibited which is used for determining the most suitable arrangement of filament both as to length and formation.

Adjoining this laboratory is a lamp development section. Here is established complete manufacturing plant for producing all types of lamps, adjoining which is the Valve Department, and, as regards general manufacturing processes, may be regarded as a development of the Lamp Department. A complete description of the manufacture of thermionic valves by the M.O. Valve Company was given in a recent issue,* and the accompanying photograph shows a large transmitting valve in the process of being exhausted. This department is equipped with elaborate test tables for examining the valves manufactured in the laboratory. Special attention is being given to the design and manufacture of the dull emitter type of valve, having thorium treated filaments. The dull emitter filament requires a voltage of 1.6 and a current of 0.36 amperes, whilst the ordinary receiving valve of similar dimensions requires a voltage of 4 and a current of 0.7 amperes, or more than four times that of the dull emitter. Owing to the marked oxidising properties of the thorium treated filaments, special precautions have to be taken in manufacture in order to obtain a very high degree of vacuum. A method of obtaining a suitable vacuum has been developed and valves are being produced which have



The Valve Research Department.

*P. 641. August 19th, 1922.

very long working lives, frequently as high as 5,000 hours.

The electrical laboratory contained a number of interesting exhibits and, to the wireless experimenter, the thermionic repeater apparatus was especially attractive. By means of this apparatus it is possible to carefully investigate distortion as may be produced in valve amplifiers, and great attention can consequently be given to the design of equipment intended for distortionless amplifying at voice frequencies.

Passing from the electrical room, the generating sub-station was visited in which were to be seen a number of machines used for producing electrical power for use throughout the laboratories. Installed in this room also are a number of pumps which are coupled up to pipe lines extending throughout the building, and enabling apparatus to be roughly exhausted before being connected to more elaborate pumps for producing high vacuum.

Metal and wood-working workshops adjoin the main building and are liberally equipped with machines for instrument manufacture.

A microscopy laboratory is also to be found and is engaged chiefly in the examination of thorium and other filaments.

A laboratory is provided for the study of metallurgy as applied to lamp filament manufacture, and experiments were in progress in this laboratory demonstrating how fine wire filaments were manufactured.

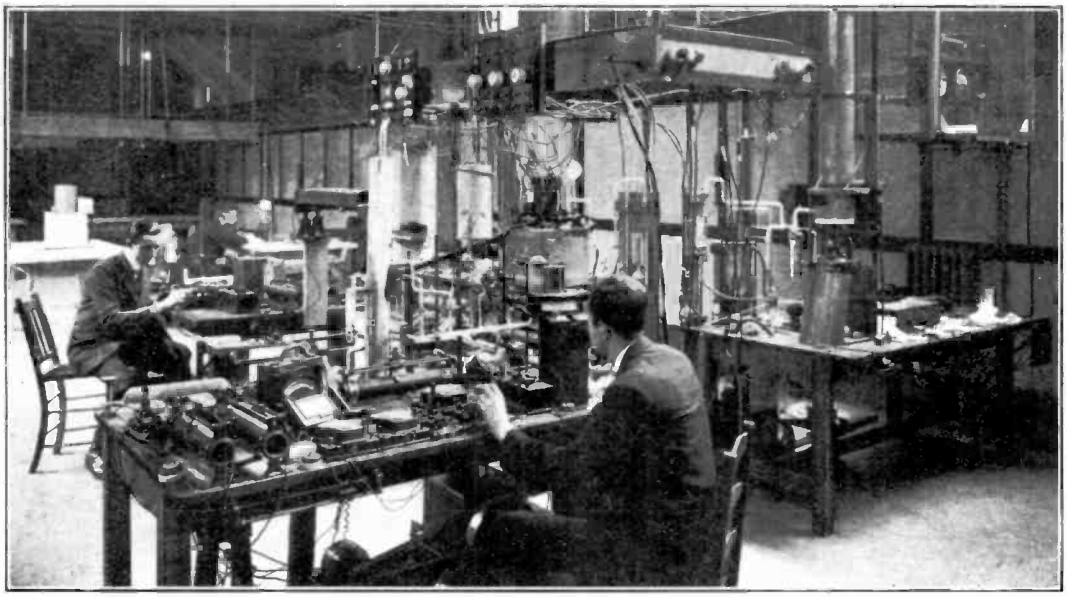
Glass making and glass examining laboratories are to be found in which investigations are carried out concerning all the physical properties of glass,

Two other laboratories are devoted to the investigation and manufacture of various types of primary batteries, and test racks are arranged for investigating the properties of the various types under working conditions.

Other laboratories are arranged for testing the life of lamps and for carrying out colour determinations.

Adjoining the latter department is a laboratory devoted to research in the design and application of neon gas filled lamps, and it is interesting to learn that the manufacture of neon tubes for the rectification of high potential currents, such as are used in wireless transmission, is contemplated. A novel type of oscillograph is exhibited here consisting of a rotating tube, the electrodes of which were slightly separated in order to distribute the glow. The simplicity of this apparatus should bring it within the sphere of the amateur worker when more details relating to its construction become available.

The General Electric Company, Ltd., are to be congratulated on the setting up of such a well-equipped research department, which is in the hands of the able research engineer, Mr. Clifford C. Patterson, while conversations with his staff indicated that they were possessed of the fullest expert knowledge of the work in which they are engaged.



A corner of the Electrical Laboratory.

Notes

The Bamberger Tests.

Reports continue to reach us of the reception of the test broadcast transmission on February 24th from **WOR**, the Bamberger station, New York.

One of the notably successful attempts was that of Mr. D. W. Pugh, of Ealing, who heard the whole transmission distinctly with the use of a single valve employing reaction.

Other amateurs whose nocturnal vigil was rewarded by the reception of **WOR** were as follows :—

Mr. Brian A. Butt, Kingston-on-Thames. 1 H.F., detector.
Mr. W. R. Stainton, Leigh, Lancs. Detector, 1 L.F.
Mr. A. S. Gosling, Nottingham. 1 H.F., detector.
Mr. T. E. Hamblett, St. Helens, Lancs. 1 H.F., detector.
Mr. Henley, London. 3 valves (Burndept Ultra III).
Mr. Pool, Newton Abbott. 3 valves (do. do.)
Mr. A. G. Yates, Lincoln. 1 H.F., detector, 1 L.F.
Mr. F. Wiseman, Jun., Buxton. Detector, 2 L.F
Mr. A. G. Saunders, Runcorn, Cheshire. Detector 2 L.F.
Mr. C. J. Flint, Stafford. Detector, 2 L.F.
Mr. R. D. S. Hodgins, Egerton, Kent. 2 H.F., detector.
Mr. R. Hardy, Nelson, Lancs. 1 H.F., detector, 1 L.F.
Mr. H. D. Pope, Swindon, 1 H.F., detector, 1 L.F.
Mr. H. A. Brooke, Maldon, Essex. 1 H.F., detector, 1 L.F.
Mr. Graham Hunt, Torquay. 2 H.F., detector.
Mr. John R. Jones, Victoria Park, E.2. 1 H.F., detector, 1 L.F.
Mr. G. Trice, Godalming. 2 H.F., detector.
Mr. R. T. Wright, Chiswick. Detector, 2 L.F.
Mr. Tucker, Loughborough. 4 valves (Burndept Ultra IV).
Mr. R. J. Wood, Halifax. 2 H.F., detector, 1 L.F.
Mr. I. W. Woodrow, Lowestoft. 1 H.F., detector, 2 L.F.
Mr. W. Douglas Clague, Gateshead-on-Tyne. 2 H.F., detector, 2 L.F.
Mr. Jas. Hawley, Musselburgh, N.B. 3 H.F., detector, 1 L.F.
Mr. H. J. Galliers, Brighton. 4 valves (Burndept Ethophone V Broadcast Receiver).
Mr. Thos. Ball, Cannock.
Mr. W. Pratt, London, W.1.

2 LO Programme in U.S. Newspapers.

A New York telegram announces that, as a matter of course, the newspapers now publish the programme of **2 LO**, the London Broadcasting station, in common with the principal American stations. London has been included in consequence of the broadcasting by a Newark, New Jersey, store on February 23rd, of a radio concert in which items from London, Paris and even Berlin, were heard.

Birmingham Heard in Canada.

On February 18th, says the *Times*, a message sent out by the Birmingham Broadcasting station was picked up by Mr. Humphrey Marshall, of London (Ontario).

Parliamentary Proceedings not to be Broadcast.

That he did not think that the Hon. Member's proposal was desirable was Mr. Bonar Law's reply on February 26th to Mr. Tillett (*Lab.*, Salford, N.), who asked whether the Prime Minister would consider the practicability of arranging for the proceedings of the House to be broadcast.

The Experimental Licence.

In the House of Commons on February 20th, Mr. Neville Chamberlain stated that the issue of experimental licences, for which applications were being received in very large numbers from persons who did not appear to be *bona fide* experimenters, was at present subject to some delay, but he hoped to make arrangements which would obviate it.

British Broadcasting Heard in Sweden.

At Lund, in the South of Sweden, approximately 700 miles from this country, Dr. G. Alb. Nilsson states that he is able to receive all the British Broadcasting stations with only one valve, with reaction, and an antenna of moderate size. Every word can be understood. With the addition of a two-valve note magnifier, speech and music can be heard in a large room. On the same set, he adds, using one detector and two L.F., but with a single wire of 25 feet stretched across the floor, the British Broadcasting stations can be heard one or two feet from the telephones.

Broadcast Concerts from Italy.

The possibility that listeners-in will soon have an opportunity of hearing wireless concerts direct from "the land of song" is indicated by the announcement that the Italian Government has been authorised to allow the building of wireless telegraph and telephone stations by private companies.

The Conscience of the Listener-in.

That owners of unlicensed home-made sets are not such unmitigated "pirates" as is suggested in some quarters is reflected by the report that the British Broadcasting Company is receiving, almost daily, remittances of "conscience money" from anonymous sources. The company refuses, however, to collaborate in the alleviation of stricken consciences, for the money so received is regularly handed to a number of deserving charities.

Comprehensive.

Advertisement in local paper: "House to let, furniture effects, wireless (one valve), etc., £250 all in."

Cardiff Tries Lower Wavelength.

In consequence of complaints by listeners-in to **5 WA** of interference by Newcastle and Manchester, the new Welsh Broadcast Station, on February 21st, reduced its wavelength to 353 metres. Although this is rather low (the lowest in the broadcast band), it is believed that the change will give satisfaction. Further tests will be made, however, if trouble is still experienced, so that the complete elimination of other stations may be attained.

Broadcasting Difficulties in Shanghai.

That any wireless sets imported would be seized as contraband of war, was the information received from the Shanghai Customs Commissioner by an American Company which had announced the intention of inaugurating a wireless broadcasting service.

Imperial Wireless Chain.

An announcement is made from Ottawa from which it would appear that the Canadian Government has decided not to participate in the Imperial Wireless Chain Scheme.

According to the *Central News*, the Department of Marine has issued a licence to the Canadian Marconi Company for the operation of a station on Vancouver Island, with a nominal range of 7,000 miles. This will enable communication to be made with Australia, Japan, Montreal and Great Britain.

Manchester Wireless Convention.

A Convention will be held on Wednesday, March 21st, at the Albion Hotel, Piccadilly, Manchester, under the auspices of the Manchester Wireless Society in connection with the forthcoming wireless exhibition organised by Messrs. Bertram Day & Co., Ltd., to be held in the Burlington Hall, Burlington Street, Manchester, from March 17th to 24th inclusive.

All members of wireless societies are invited. Visitors are requested to meet at the exhibition before 4.30 p.m. on that day, or at the Albion Hotel not later than 5 p.m. Tea will be served between 5 p.m. and 5.45 p.m., and the meeting will commence at 6 p.m. prompt.

Dr. Hodgson, M.D., F.R.C.S., L.R.C.P. (President) will occupy the chair, and a discussion will be invited on various subjects appertaining to amateur wireless.

Suggestions for the agenda should reach the Hon. Secretary, 2, Parkside Road, Princess Road, Manchester, not later than March 12th.

It is requested that as many as possible will attend.

Any further particulars may be obtained from the Hon. Secretary.

THREE NEW BOOKS.

A NEW publication which will be readily welcomed by all whose interests turn to wireless constructional or experimental work, has this week made its appearance, and is entitled " The Amateur Book of Wireless Circuits."* The author, Mr. F. H. Haynes, is known to readers of this journal by his contributions under the heading of "Experimental Station Design," and on a number of other practical subjects. On the 107 pages are to be found 111 reliable circuits, each accompanied with such working advice as may be needed in the practical application of the arrangement shown. The book is progressively arranged so that the beginner will at once find circuits to meet his needs, and he may look ahead and frame the lines on which his set may develop. The inclusion of such circuits as accumulator charging by a variety of methods from A.C. and D.C. mains, wavemeters, and ex-Government apparatus, renders the book most helpful. Many pages are devoted to useful switching systems making use of Dewar and other switches, and types of break jacks available on the British market. By turning over the pages of this valuable book it is possible rapidly to gain a knowledge of the best modern radio practice, from all types of crystal sets to telephony transmitters of moderate power.

Although booklets and cards of instruction are issued with every broadcast receiver, possessors of these instruments are often desirous of knowing more about the apparatus, feeling that with a little more instruction they could get far better results. With the object of satisfying this desire, the Wireless Press, Ltd., has just issued a useful sixpenny book entitled " Your Broadcast Receiver and How to Work It."† The author, Mr. Percy W. Harris, is known to readers of this journal and has endeavoured throughout the book to give practical hints and tips that can be applied at once by every reader. The text of the book is accompanied by a number of interesting photographs of English and American broadcasting stations, and should prove helpful to the large number of broadcast listeners who do not desire to trouble themselves with the study of theory.

The recent highly instructive and interesting articles by Dr. J. A. Fleming, the eminent scientist, which have been appearing during the last few months in this journal, have been reprinted in book form, and readers ought certainly to possess themselves of one of these interesting volumes.* Dr. Fleming, the inventor of the valve, is well known to our readers for his clear exponential powers and lucid descriptions and the interesting way in which he describes his pet theme—the valve and its application to Wireless—is well known to all. His articles, it will be remembered, dealt in a most complete and concise manner with Wireless Telephony, and were entitled " Electrons, Electric Waves and Wireless Telephony."* In the first chapter Waves and Wave Production are extensively dealt with, followed by a chapter on Waves in Air, showing many novel and yet simple methods of measuring and recording them. Descriptions of atomic structure, electrons and molecules have a chapter to themselves under the title of " The Structure of Atoms," leading up to a chapter on Electromagnetic Wave Forces and Radiation. The Production and Detection of Long Electric Waves introduces a chapter on Telephony and Speech Transmission, and the last chapter (there are seven in all) deals with the principles of Wireless Telephony, with its problems and special features, concluding with the present activities in the science as exemplified by radio broadcasting in England. The edition, clearly printed and handsomely bound, will, we understand, be ready for sale during the coming week.

* " The Amateur's Book of Wireless Circuits." By F. H. Haynes. Post free, 2s. 10d. The Wireless Press, Ltd.

†" Your Broadcast Receiver and How to Work It." By Percy W. Harris. Post free, 8d. The Wireless Press, Ltd.

* " Electrons, Electric Waves and Wireless Telephony." By Dr. J. A. Fleming, M.A., F.R.S. Post free, 8s. 3d. The Wireless Press, Ltd.

Correspondence

To the Editor of The Wireless World and Radio Review.

Sir,—I read with interest a recent letter in your Correspondence column dealing with a frame aerial.

As I am also getting very good results from one, I should like to state my experiences, in the hope that they will be of interest to some of your readers. The frame is approximately four feet six inches square, or some six feet across the diagonals, with the diagonals vertical and horizontal.

It is wound with No. 16 gauge copper wire in two sections, the wires are spaced approximately ½ in. apart on ebonite combs, as described in Mr. Coursey's book, "The Experimenter's Handbook."

Each section consists of eight turns and will tune, with a 0·001 condenser, from about 325 to 750 metres. The two sections in series with the same condenser gives me somewhere between 900 to 1,500 metres.

Results when using five valves (two H.F. tuned transformer coupled, detector, and two low frequency amplifiers) are as follows :—

British Broadcasting. Very loud and clear telephony from London, Birmingham and Manchester, under favourable conditions, and using two pairs of phones in series, it is quite possible to make reception too loud for comfort and *this without distortion*. There is no noticeable difference in the strength of any of these stations now, though they have varied considerably in the past. London and Birmingham are some 200 miles from here, and Manchester nearly 300.

Hague Telephony. This is received at quite readable strength, but owing to jamming from a C.W. station, there is a fair amount of distortion. There is no difficulty in tuning in.

I am almost afraid to put the next heading down, but it is really true. Anyway, I have received American telephony of quite readable strength on the frame with five valves arranged as above. On the mornings of the 24th and 25th December respectively, I heard **WZY** and **WJZ** and was able to follow the programmes fairly well. **WZY**, the station of the General Electrical Co., Schenectady, is by far the best that I get on my outside aerial. I have frequently followed his speech with the telephones on my knees.

Croydon and Le Bourget telephony is easy, Lympne rather more difficult. I have a good outside aerial, and so am able to make a comparison. The frame I should say is about a valve-strength weaker than the outside aerial, or perhaps it would be more correct to say between one and two-valve strength.

No reaction coil is employed in either case, the set oscillating very easily to any wavelength by tuning the transformers; in fact on short wavelengths I have to use the potentiometer freely.

I have yet to hear my first atmospheric with the frame and its directional properties give some selectivity. The chief trouble is stray capacity effects, long handles for tuning being absolutely necessary; in fact, for American telephony I prefer to sit well away from the instrument table and operate the controls with a walking stick. When tuned critically, shifting the 'phones (H.R.) on one's head is often sufficient to lose the signal or induce howling.

But for English Broadcasting such fine tuning is not at all necessary.

I trust these facts may induce some of your readers to experiment on these lines, for I believe there is a big field here yet only partly explored.

I can assure your readers that I do not consider either the above results or my instruments exceptional, but that I feel sure that anyone else working on these lines will get similar results.

Edgar R. Kelman.

Guernsey, Channel Islands,
January 1st, 1923.

To the Editor of The Wireless World and Radio Review.

Sir,—The points raised by Mr. L. F. Fogarty in his letter to *The Wireless World and Radio Review* in connection with the subject of H.T. electrolytic rectifiers, are interesting ones. In particular, I hardly expected that my use of four banks of rectifier cells and an ordinary transformer instead of two banks of cells and a split-winding transformer would pass unchallenged. Although only half the number of cells is required for a given voltage where the centre-tapped transformer is used, I maintain that this method is not very convenient for general experimental purposes. The centre-tapping must be exactly half-way on the secondary, both as regards resistance and inductance; this practically prohibits tapping various voltages off the secondary as the balance would be upset thereby. On the other hand, the cells are so cheaply and easily made that the use of twice the number with an ordinary transformer does not present much objection.

Mr. Fogarty's experience with ammonium phosphate seems to be less fortunate than my own. The pure salt only should be used if the best results are desired, the difference between pure and commercial ammonium phosphate being quite as great as that existing between chalk and the proverbial cheese. With regard to the electrolyte creeping and corroding the brass connectors, I find that the paraffin oil stops this entirely. I totally disagree that any decomposition of the paraffin takes place, even at heavy loads; paraffin being chemically inert to anything but the most powerful oxidizing agents, such as chlorine or fuming sulphuric acid. I have a rectifier of 40 cells with strip electrodes 1 cm. wide immersed in a solution of pure ammonium phosphate, covered with a layer of paraffin which has been performing heavy duty since it was made up over a month ago. Amongst other things it has been supplying an experimental Chaffee gap, which takes nearly 0.2 amp. at over 500 volts. The electrolyte is still quite clear, practically no sediment has formed and no appreciable creeping has taken place. The only noticeable thing is a slight decrease of the paraffin in each cell due to slow natural evaporation.

Scrupulous cleanliness of the surfaces of the aluminium electrodes is essential, and for satisfactory working the area of the aluminium electrode in each cell should be so proportioned that the current density is of the order of 10 milliamps. per square centimetre.

I have had no opportunity of making oscillographs of the rectifier output.

E. H. Robinson.

The recent letter from Mr. Robert Tingey and reply from Dr. J. A. Fleming on the matter of Transatlantic transmission has aroused many readers to express opinion on the subject, and cast their vote for or against the theory put forward. In short, Mr. Tingey put forward the suggestion that the many high-power Transatlantic stations set up strains in the ether which act as "carriers" for the low power amateur and broadcast transmissions, and facilitate the bridging of the great distance by the small stations. Dr. Fleming, in his reply, set aside the theory, explaining that it was contrary to the properties of ether strains to react upon one another in their progress. To facilitate the formation of a correct idea on wave motion in the ether he gave the analogy of ripples on an ocean surface tossed by storms. To this comparison very many readers take exception, and perhaps with some justification, as waves in the ocean are not in all respects analogous to those in the ether, excepting, of course, that it is a fact that interaction by the waves of large amplitude acting as carriers for those more feeble and of other frequencies does not occur. Owing to the limitations in space, it is not possible to give publication to many letters which have come to hand, and to publish some without others would hardly be fair to the writers or help the reader in forming a true conception of the subject.

Calendar of Current Events

Friday, March 9th.

Sheffield and District Wireless Society.
At 7.30 p.m. At Dept. of Applied Science, St. George's Square, Elementary Class conducted by Mr. J. G. Jackson, B.Sc.

Leeds and District Amateur Wireless Society.
Lecture: "Experiences with an Experimental Receiving Installation." By Mr. J. Croysdale.

Radio Society of Highgate.
At 7.45 p.m. At the 1919 Club, South Grove. Lecture: "Measuring Instruments used in Wireless." By Mr. G. A. V. Sowter, B.Sc.

Sunday, March 11th.

From 3 to 5 p.m. Concert from **PCGG**, The Hague, on 1,050 metres.

Monday, March 12th.

At 9.20 to 10.20 p.m. Dutch Concert from **PCGG**, The Hague, on 1,050 metres.

Ipswich and District Wireless Society.
At 8 p.m. At 55, Fonnereau Road. Lecture by Mr. R. Crombie.

Wireless Society of Hull and District.
At 7.30 p.m. At the Signal Headquarters. Lecture by Mr. Lax.

Tuesday, March 13th.

Plymouth Wireless and Scientific Society.
At 7.30 p.m. General discussion and questions on wireless.

Wednesday, March 14th.

Halifax Wireless Club and Radio Scientific Society.
Lecture by Mr. A. F. Carter, A.M.I.E.E.

Edinburgh and District Radio Society.
At 8 p.m. At R.S.S.A. Hall. Lecture: "Some Legal Observations on Wireless Telegraphy." By Mr. A. B. Noble, W.S.

Thursday, March 15th.

At 9.20 to 10.20 p.m. Dutch Concert from **PCGG**, The Hague, on 1,050 metres.

Stoke-on-Trent Wireless and Experimental Society.
Lecture: "Simple Radio Receivers." By Mr. F. J. Goodson, B.Sc.

Luton Wireless Society.
At 8 p.m. At Hitchin Road Boys' School. Practical Work and Demonstration.

Thames Valley Radio and Physical Association
At 8 p.m. Lecture: "The Problems of Short Wave Reception." By Mr. Maurice Child.

Derby Wireless Club.
At 7.30 p.m. At the Shaftesbury Restaurant. Lecture: "Accumulators." By Mr. E. F. Clarke, B.A., B.Sc., A.M.I.E.E.

Friday, March 16th.

Sheffield and District Wireless Society.
At 7.30 p.m. At Dept. of Applied Science, St. George's Square. Lecture: "Design and Construction of Receivers." By Mr. W. Burnet.

Leeds and District Amateur Wireless Society.
Lecture: "The Construction of a Tuner." By Mr. G. P. Kendall, B.Sc. (Vice-President).

Radio Society of Highgate.
At 7.45 p.m. At the Highgate 1919 Club, South Grove. Lecture: "Elementary Theory of Wireless Reception, Part I." By Mr. H. Andrews.

Saturday, March 17th.

Manchester All-British Wireless Exhibition. At Burlington Hall, Burlington Street. Opening Day (March 17th to 24th.)

BROADCASTING STATIONS.

Regular evening programmes, details of which appear in the daily press, are now conducted from the following stations of the British Broadcasting Company:—

London	2LO	369 metres.
Birmingham	5IT	420 ,,
Manchester	2ZY	385 ,,
Newcastle	5NO	400 ,,
Cardiff	5WA	395 ,,
Glasgow	5SC	415 ,,

FRENCH BROADCASTING TIMES.

Eiffel Tower. 2,600 metres. 11.15 a.m. weather reports (duration 10 mins.) 6.20 p.m., weather reports and concert (duration about 30 mins.) 10.10 p.m., weather reports (duration 10 mins.).

Radiola Concerts. 1,565 metres., 5.5 p.m. news; 5.15 p.m. concert till 6 p.m.; 8.45 p.m. news; 9 p.m., concert till 10 p.m.

L'Ecole Supérieure des Postes, Télégraphes et Téléphones de Paris. 450 metres. Tuesdays and Thursdays, 7.45 p.m. to 10 p.m. Saturdays, 4.30 p.m. to 7.30 p.m.

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THIS AMPLIFIER magnifies signals, speech or music, without distortion, and is of considerable interest to amateurs and scientific investigators. This magnification is much greater than that obtained from a two-valve amplifier. In construction, this instrument is much more robust than other relays.

This instrument satisfies the urgent demand for a reliable, inexpensive amplifier, which the most inexperienced amateur can use, and which the most experienced requires. The necessary transformers are included in the base.

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(High Resistances for either size 2/6 to 5/- extra)

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120 ohms input -	£6 0 0
2,000 ohms input -	£6 2 6
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Questions and Answers

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 questions 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) Each communication sent in to be accompanied by the "Questions and Answers" coupon to be found in the advertisement columns of the issue current at the time of forwarding the questions. (4) The name and address of the querist, which is for reference and not for publication, to appear at the top of every sheet or sheets, and unless typewritten, this should be in block capitals. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." (5) 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.* (6) **Where a reply through the post is required, every question sent in must be accompanied by a postal order for the amount of 1s., or 3s. 6d. for a maximum of four questions.** *(7) Four questions is the maximum which may be sent in at one time.*

"X" **(Kent)** *asks* (1) *Whether the circuit submitted is correct.* (2) *How many coils would be required to cover the complete range of wavelengths.* (3) *Should it be expected that a cage type aerial would give an increase in the signal strength.* (4) *What is meant by a power valve, and how is it connected to a receiver.*

(1) The diagram of connections is correct. We would point out, however, that the reaction coil, being coupled with the secondary circuit, may cause oscillating energy to be generated in the aerial circuit, and care should therefore be taken. (2) 14 coils of the type referred to will be required if you wish to receive signals over the whole wavelength range. (3) We do not think you should expect to receive a great increase in signal strength by substituting for your present aerial a cage type aerial. (4) A power valve is a valve which operates according to the same principles as an ordinary receiving valve, but the emission is greater, and a higher anode potential may be used. It is connected in the circuit in the same manner as the ordinary receiving valve, and provision is made for supplying its anode circuit with a potential of 200 or 300 volts, according to the particular valve used.

"C.J.C." **(York)** *submits particulars of his receiver and asks why no signals are received.*

The diagram submitted is quite correct, and good results should be obtained. We suggest you commence looking for the fault by examining the aerial and earth. The aerial should of course be insulated at each end, and should be well away from the walls of the house. The aerial should preferably be about 30 to 40 ft. high. The earth connection should be as short as possible, and should make contact with a good ground connection; it may be either a water-pipe or an earth plate. The latter may be a sheet of galvanised iron 5′ or 6′ long and 2′ wide, to which the wires are soldered. If this is buried at a depth of 2′ or 3′ you will have a good earth. The L.T. battery should be increased to 6 volts. If you have a friend who has a wireless receiver, perhaps you could try your receiver when connected with his aerial and earth. When purchasing H.F. transformers great care is necessary, otherwise very poor results are obtained, especially if, as is often the case, the transformer is poorly made and the primary and secondary wires are in contact. We assume, of course, that the tuning coils are the right size and enable you to tune to the required wavelength, and that the telephone transformer is connected in the right direction.

"VARIO" **(Cambridge)** *asks* (1) *Referring to the circuit Fig. 2, page 548, January 20th issue, would it be more efficient to use variometers in the anode circuit in place of the tuned coils.* (2) *Would capacity reaction, used as indicated in the diagram submitted, be suitable.* (3) *With reference to a jamming eliminator (particulars of which are submitted) should it be expected that signals would be reduced if it is used.* (4) *Is one permitted to use the Armstrong super-regenerative receiver in connection with a small frame aerial to receive broadcast transmissions.*

(1) If desired, variometers may be used in place of the tuned circuits, but it is not altogether recommended because tuning adjustments become very difficult. (2) Capacity reaction may be used as suggested. A small condenser having a maximum value of 0·00005 mfds. may be connected between A and B as indicated in your diagram. (3) Provided the eliminator mentioned is properly constructed fair results will be obtained, but it should not be expected that any wonderful improvement will take place, because it will not. The tendency, as suggested, is to shunt away useful energy, and one is generally better without such an arrangement. (4) We believe the P.O. will grant permission for an experimenter to use the Armstrong super-regenerative receiver in conjunction with a frame aerial but not for the reception of broadcasting.

"L.B.C." **(Bedford)** *asks* (1) *For particulars of windings of L.F. transformers.* (2) *May wire similar to the sample submitted be used.* (3) *May 8,000 ohm telephones be used in conjunction with a telephone transformer, the latter being wound for 180 ohm telephones.* (4) *Is an experimenter who holds an experimental licence permitted by the P.O. to use reaction coupled with the closed circuit coil for the reception of broadcast transmissions.*

(1) The proposed design for L.F. transformers is quite suitable. We suggest you make the bobbin 3″ long. The primary winding should be wound

with 15,000 turns of wire as sample submitted, and the secondary with 40,000 turns of No. 44 S.S.C. (2) The sample of wire submitted is No. 39. (3) The purpose of a transformer is to match the impedance between the ode circuit and the telephones. 8,000 ohm telephones should therefore be connected directly in the anode circuit, and the

"H.G." (Sheffield) *submits a diagram of his receiver and asks* (1) *For a diagram of a suitable L.F. amplifier.* (2) *The gauge of sample of wire enclosed.*

(1) A suitable diagram is given in Fig. 2. (2) The larger sample of wire submitted is No. 34 S.S.C., and the finer wire is No. 42 enamelled.

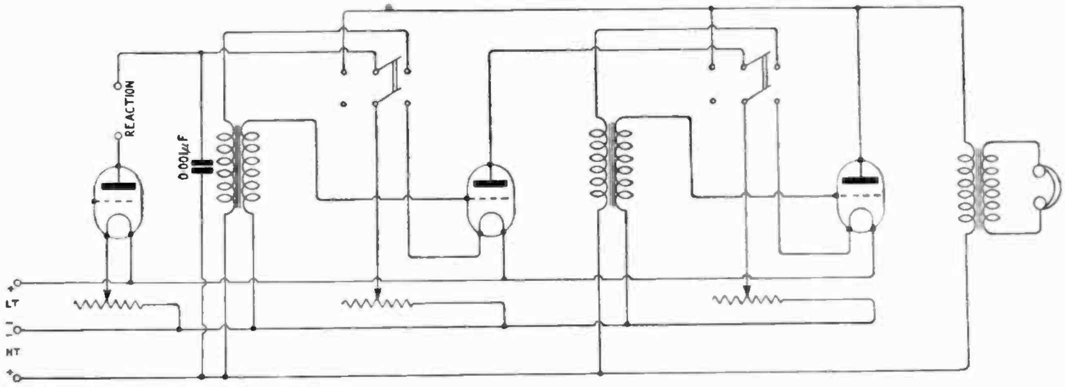

Fig. 1. *The circuit shows the switching of two note magnifying valves.*

180 ohm telephones should be connected to the secondary winding of the transformer. (4) The holder of an experimental licence is not permitted to use reaction when listening to the broadcast transmissions unless the reaction wire is coupled in such a manner that oscillating energy may not be set up in the aerial circuit.

"A.T.N." (Surrey) *refers to the three-valve experimental diagram given in the issue of October 28th, and asks for a diagram showing how to add one note magnifier.*

The diagram is given in Fig. 1.

"J.McK" (London, W.) *asks* (1) *Whether under the circumstances he should adopt a different method of tuning because it is difficult to tune out local broadcast transmissions.* (2) *What kind of tuner is recommended.*

(1) and (2) We suggest you use a three-coil holder, one coil being for the aerial circuit, one for the closed circuit, and the other for the reaction coil. When listening to the broadcast transmissions the reaction coil may be short circuited. The method of connecting a three-coil holder is given in most issues of this journal. With this combination you will find it possible to tune out the transmissions of the local broadcasting stations.

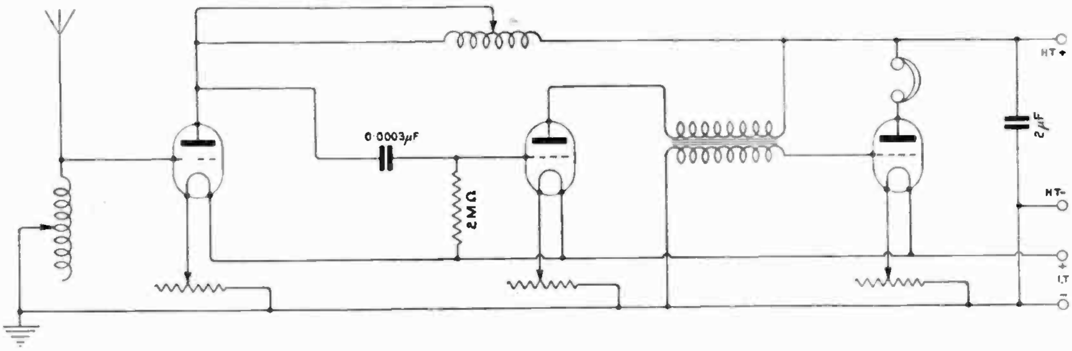

Fig. 2. *A three-valve receiver with* 1 *H.F.*, 1 *Detector and* 1 *L.F. valves. The H.F. valve is coupled with a self-tuned anode coil and a grid condenser and leak.*

"J.G.P." (Oldham) *submits a diagram of his receiver and asks whether it is suitable.*

The diagram submitted is quite suitable, and very good results should be obtained. The aerial tuning condenser should have a maximum value of 0·001 mfds. and the anode condenser 0·0002. The remaining condensers have the usual values.

"P.P." (Yorks) *asks* (1) *For the dimensions of a small transformer which will give 30 volts 2 amps.* (2) *Can we recommend a suitable book.* (3) *What would be the suitable dimensions for a transformer to give 200 volts 50 milliamps.*


MARCONI SERVICES

(1) A suitable transformer would have a primary winding of 230 turns of No. 24 D.C.C. wire. The secondary would have 32 turns of No. 18 D.C.C. The core should be 2″ × 2″ and the former should be 3″ long. (2) We do not know of a suitable book. (3) As the primary voltage is 230 and you require a secondary voltage of 200, the most economical method would be to use resistances to reduce the voltage of the mains by 30. If, however, you wish to use a transformer, the primary would have 460 turns of No. 36 D.C.C., and the secondary 410 turns of No. 24 D.C.C. The core should be 2″ × 1″, and the bobbin may be 2½″ long.

"J.W." (Ilford) *asks* (1) *For criticism of his receiver.* (2) *Whether it would be an improvement to connect a variable tuning condenser across the anode coil.*

(1) The diagram submitted is quite correct except that the small coil shown connected in series with the telephones is not required. The receiver is very simple and straightforward, and may be recommended if you are a beginner. (2) A tuning condenser is not required to tune the anode coil, but if you have a small condenser by you, you should certainly try whether adjustments are made easier with the aid of the condenser.

"NEW READER" (Smethwick) *asks* (1) *For a diagram of a two-valve receiver with crystal rectification.* (2) *For suitable values.* (3) *What results should be obtained.*

(1) and (2) A suitable diagram is given in Fig. 3. Suitable values are indicated. (3) You should certainly hear broadcast transmissions and any other stations which are transmitting with sufficient power.

"SANDY" (Ramsgate) *asks* (1) *With reference to the H.T. battery, does the current actually travel from the filament to the plate, i.e., from the negative of the H.T. to the positive of the H.T.* (2) *May he erect an aerial wire across the street without permission of the local authority.* (3) *When a three-coil holder is used, is there any particular ratio of coils which gives best results.*

(1) If a moving coil ammeter were connected in series with the H.T. battery, it would be found that the plus terminal of the instrument should be connected with + H.T. The filament of the valve should certainly be considered as the source of electricity, and when the anode is made negative by the electrons from the filament, it would appear that positive electricity flows from the battery to neutralise the charge on the plate. (2) We think the local authorities would not object to your erecting an aerial across the street provided it lies 20′ above the road. We suggest you communicate with the local authorities and ask for their permission. (3) When using a three-coil holder, it will be found that when the aerial tuning condenser is in series with the A.T.I. the largest coil is the aerial coil and the smallest the reaction coil. The closed circuit coil will be an intermediate size. The size of the reaction coil, however, depends very largely upon the wiring of your receiver.

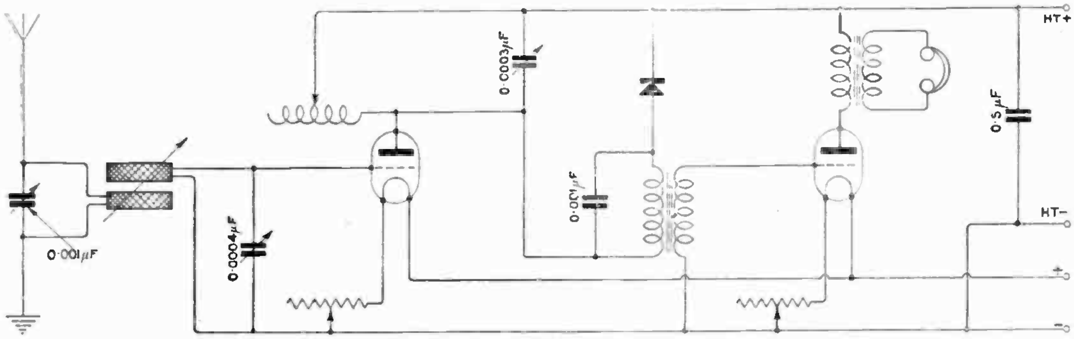

Fig. 3. The diagram shows the connections of a receiver which has one H.F. amplifying valve, crystal rectifier, and one note magnifier. The anode circuit of the first valve contains a coil which is tuned with a condenser to the wavelength of the signal. Good amplification is obtainable with a receiver wired to this diagram, and its simplicity should appeal to those who have but recently taken an interest in reception. The circuit is ideal for the reception of broadcast transmissions and its range would be of the order of **80** *miles.*

"LEAD-IN" (Halifax) *submits a diagram of a receiver and asks* (1) *For criticism.* (2) *How could Dewar type switches be connected for the purpose of cutting out the first and last valves when required.* (3) *What is the difference between a power valve and a note magnifier valve.*

(1) The diagram submitted is quite suitable, although it might be better to connect the aerial tuning condenser and A.T.I. in series when receiving short wave signals. A 0·001 mfd. fixed condenser should be connected across the primary winding of the transformer connected in the detector valve circuit. It would be better if you used a telephone transformer with a 0·001 condenser connected across the primary. We suggest you test the telephones for continuity as it would appear that they are faulty. It should not be necessary to connect the fingers across the telephone terminals in order to hear signals. (2) The method of connecting switches for cutting out valves is given in most issues of this journal, and we would refer

you to them. (3) The power valve is one which is capable of dealing with more power than the ordinary receiving valve, *i.e.*, the H.T. potential connected to its anode, and the filament emission are both greater than in the case of the "R" valve. The connections of a power valve are the same as those for a receiving valve. If you propose to use a power valve as the last valve of your note magnifier, a separate H.T. tap should be provided, and you will find it necessary to include a few cells in the grid circuit.

"NOVICE" (Notts.) *asks* (1) *For diagram of a three-valve receiver.* (2) *If the components used in the construction of the receiver were stamped "B.B.C.," would it be necessary to obtain an experimenter's licence.* (3) *If the receiver were constructed according to the diagram given in reply to* (1), *would any patents be infringed.*

(1) See reply to **"H.G." (Sheffield)**, p. 782. (2) If you construct the receiver yourself, it will be necessary to obtain an experimenter's licence before it is used. (3) The method of connecting valves given in the diagram is covered by patents. You are, however, permitted to wire up a receiver according to the diagram given, if the receiver is for your own experimental use.

"H.F.G." (Huddersfield) *asks* (1) *Whether a certain combination of crystal and valves is recommended.* (2) *Is the diagram submitted suitable.* (3) *What is the highest voltage which should be connected to the filament of a new "R" type valve.*

(1) We do not recommend the combination suggested. (2) The diagram submitted is quite correct and is very suitable for a beginner. It would be better, of course, if the anode winding were tuned with a variable condenser instead of with the aid of the slider, but you should try this for yourself, and notice whether the signal strength is increased or not. You may find it an advantage to connect a variable condenser having a maximum capacity of 0·001 mfds. in series with the aerial coil. (3) 4 volts may generally be safely applied to the filament of an "R" valve when it is new, and sometimes a little over 4 volts may be used.

"D.W.M." (Burton-on-Trent) *asks whether we can suggest a receiver which has been described and which would meet his requirements.*

We would refer you to the articles by Mr. Bull which appeared on page 667 in August 26th issue, and page 720, September 2nd issue of this journal. This receiver has one H.F., one detector and one L.F. valve. Switches are provided for the purpose of regulating the number of valves in circuit.

"E.C." (Sheffield) *asks* (1) *With reference to Fig. 4, page 550, January 20th issue of this journal, is the reaction effect increased when the anode coil is brought closer to the aerial coil.* (2) *Is energy likely to be transferred to the aerial circuit if proper care is not taken.* (3) *May the grid leak be connected across the grid condenser, or must it be connected between the grid and L.T.+.*

(1) The reaction effect is increased when the reaction coil is coupled tighter with the aerial coil provided the reaction coil is correctly connected. If the connections are reversed, the signals will be reduced in strength when the coupling is increased. (2) If care is not taken oscillating energy will be transferred to the aerial circuit. (3) The grid leak should be connected as shown in the diagram, *i.e.*, between the grid and + L.T.

"J.S.A." (Wavertree) *asks for the dimensions of suitable reaction coils for use between various wavelengths.*

The dimensions depend largly upon the wiring of your receiver. One coil will probably be sufficient and would be more convenient than a number of coils. A suitable coil would be 3″ in diameter and 4″ long, No. 30 D.C.C. with 8 tappings.

"F.W.G." (Finchley) *submits a diagram of his receiver and asks* (1) *Whether the connections are suitable.* (2) *Whether he may expect good results if the receiver is used in conjunction with a frame aerial.* (3) *Would the signals be loud enough to operate a loud speaker.* (4) *Could the D.C. mains be used to supply the anode circuits of the valves.*

(1) The diagram of connections submitted is quite correct, and is a standard circuit. Results, however, will not be satisfactory when a frame aerial is used, because all the valves are L.F. connected. When a frame aerial is used it is generally necessary to employ two H.F. connected valves. The method of connecting is given in all issues. (2) The reaction coil is shown coupled to the aerial coil, and unless care is taken, oscillating energy may be transferred to the aerial circuit. (3) It should not be expected that a receiver of this kind will successfully operate a loud speaker when connected with a frame aerial unless H.F. connected valves are used. (4) In connection with this question we would point out that, as the supply of energy is direct current, you cannot use transformers as suggested for the purpose of stepping down the voltage. We suggest you use a high resistance across the mains, and tap off the voltage required. A large condenser should be connected across the mains, and an iron core choke put in circuit in the positive lead of the valves. We would refer you to the article entitled "Methods of Deriving Valve Currents from Public Supply Mains," by F. H. Haynes, in the issue of June 17th, 1922.

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Prices as we go to press, Friday, March 2nd :—

Marconi Ordinary	.. ..	£2	14	0
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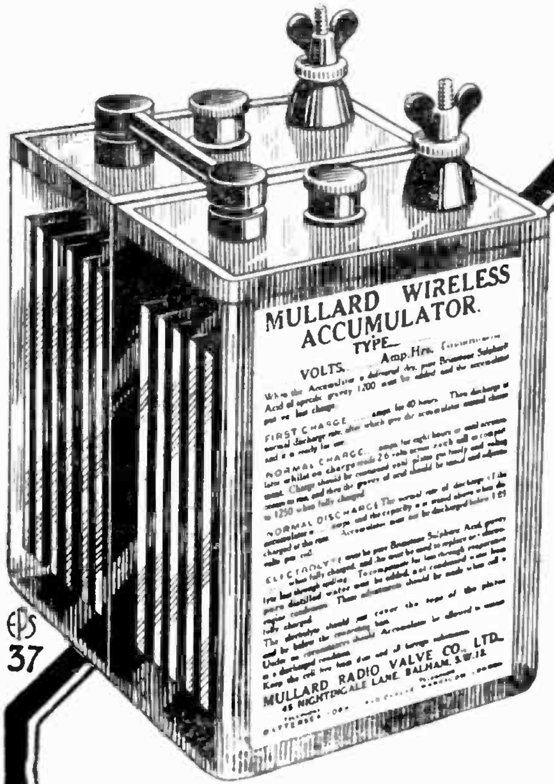

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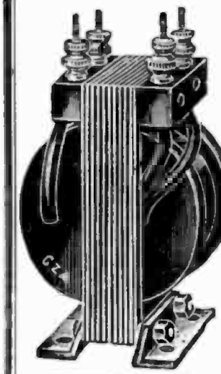

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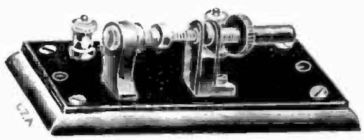

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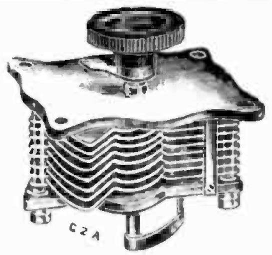

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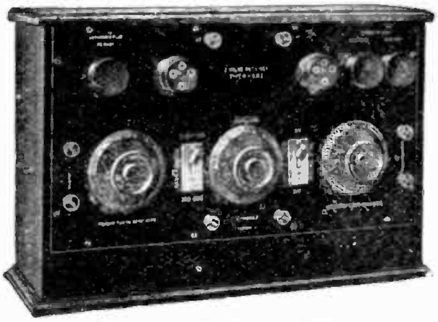

Two-Valve Broadcast Set, No. M.H./B.R.2.

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The price of this set is £18 18 0

The accessories necessary are as follows :—

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Telephones from £1 each	1	0	0
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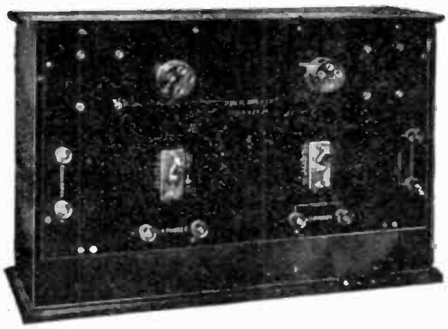

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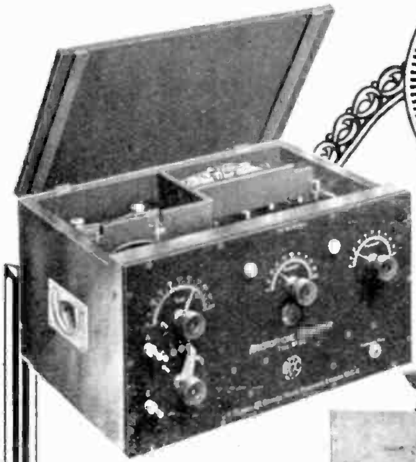
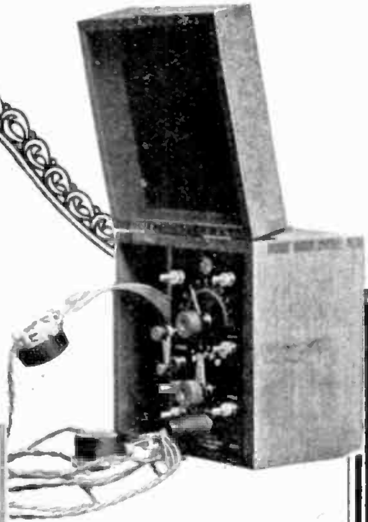
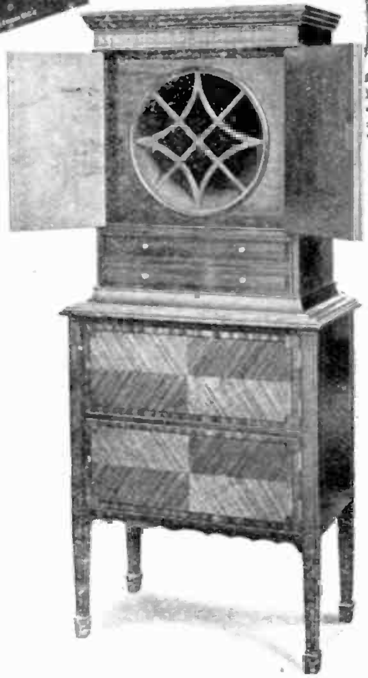




ARISTOPHONE CABINETS



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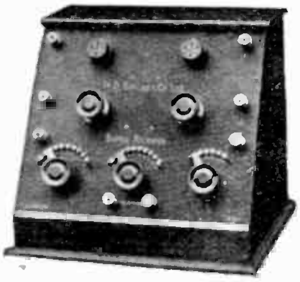

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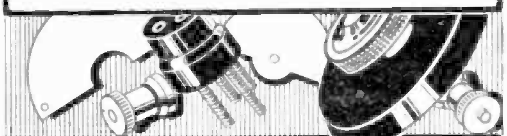

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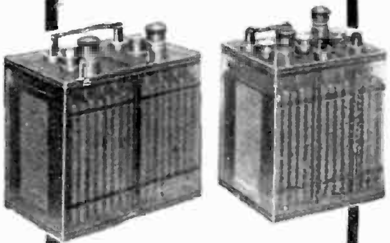

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W.P.5	6	20 „ „	1	1	6	5	0
W.P.6	6	40 „ „	1	10	0	5	3
W.P.7	6	60 „ „	1	18	6	5	10
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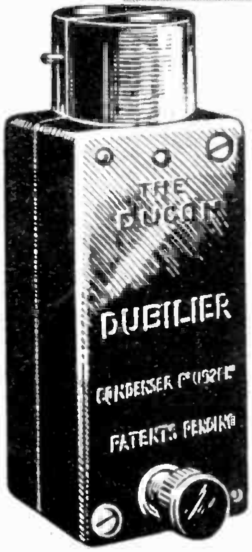
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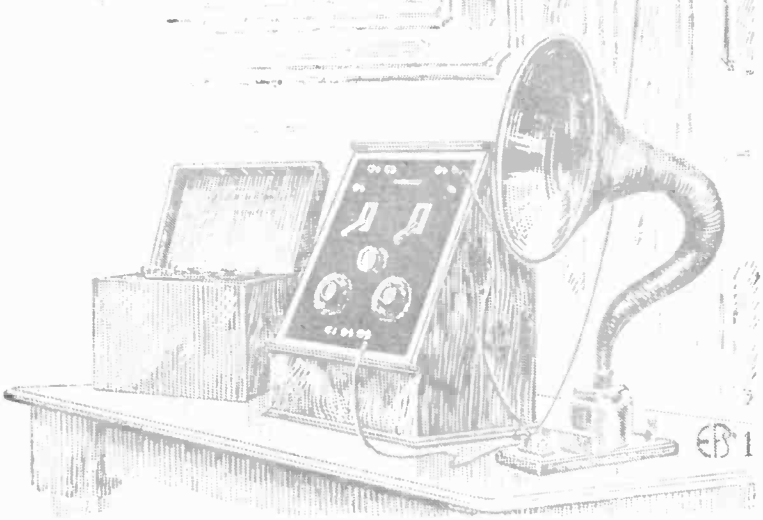

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February 14th, 1923.

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The set is situated over 60 miles from 2LO, and this station can be heard on an "Amplion" Junior all over the house, and as much as thirty yards away from the house when the window is open.

In view of the satisfaction, and fair business way in which you have treated us, we have pleasure in enclosing herewith cheque in settlement, which we should be glad if you would acknowledge in due course. Yours faithfully,

"The Old Mill" Motor Works,
R. J. Harford.

M. B. Mackae & Co.,
Wireless Supplies,
12, Friar Street, Reading.

M. Byles
F. A. McDonnell
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Dear Sirs,

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1 Reliaphone No. 4.
2 Pairs Headphones.
1 60V. Battery and plugs.
2 Insulators.

The Reliaphone is working exceedingly well, and good results are obtained from London and Birmingham. We shall be glad to receive the Brown Loud Speaker at an early date, and trust you will endeavour to send same at your earliest convenience.

Yours faithfully,
M. B. Macrae & Co.

E. D. Botwright,
Eight years' Practical Wireless Experience.

G. Collett,
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Mint Walk, Croydon.

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Dear Sirs,

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We consider this the finest single-valve set we have had through our hands, and are strongly recommending it to our clients. We have personally worked a Loud Speaker with this set, in this district 13 miles from London.

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p.p. Electrical & Radio Supplies.
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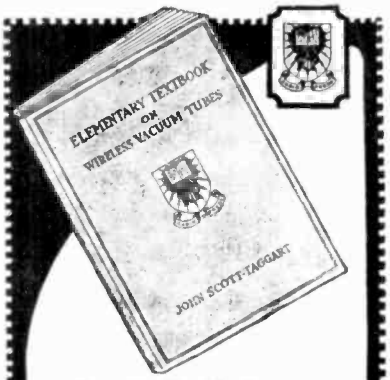

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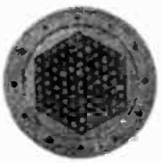

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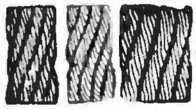

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* 6 A D 9/s	6			2	14	0
** 2 A D 9/c	2			1	0	0
** 4 A D 9/c	4	70	35	2	0	0
** 6 A D 9/c	6			3	0	0
B L 240	2			1	4	0
B L 440	4	80	40	2	8	0
B L 640	6			3	12	0
B L 255	2			1	7	6
B L 455	4	110	55	2	15	0
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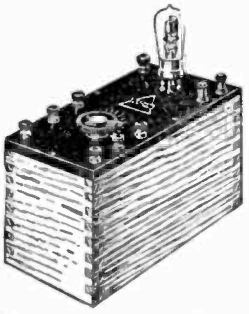

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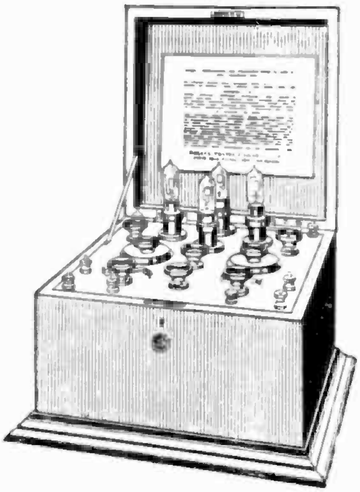

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THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN
A MAGAZINE DEVOTED TO WIRELESS TELEGRAPHY AND TELEPHONY

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THE WIRELESS WORLD AND RADIO REVIEW

THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN

No. 187 [No. 24 Vol. XI.] MARCH 17TH, 1923. WEEKLY

"5 WS."

THE SUCCESSFUL TRANSATLANTIC TRANSMITTING STATION OF THE RADIO SOCIETY OF GREAT BRITAIN.

By PHILIP R. COURSEY, B.Sc. (Eng.), F.Inst.P., A.M.I.E.E.

THE subject of this evening's lecture bears mainly on the Transatlantic Tests, which, as you are probably aware, were held at the end of December last. These tests followed previous tests which had been arranged between the radio amateurs of America and Great Britain in previous years, although the recent tests were on a much larger scale than those which had been held before. They were organised more in advance, rendering possible the making of more complete arrangements, so as to include France, Switzerland, Belgium and Holland, as well as Great Britain. In previous years it had been America, Canada and Great Britain only.

The tests were marked, as compared with previous years, by a very great measure of success. Success had been obtained before, but on by no means such a big scale. Better results were anticipated on this occasion because the amateurs in this country had for some time been experimenting to a great extent with reception on 200 metres, 180 metres and short waves generally. Reports had also come in from time to time to the effect that signals from United States amateurs were being heard in this country, but up to the first day of the Tests I certainly had not, and I think no one else had, any idea of the magnitude of the results that would be obtained.

[A short summary was then given of the results obtained. The report of these results is now being published elsewhere in these columns.]

The main object of this meeting to-night is to deal with the second part of the Tests. The first ten nights were devoted to transmission from the other side, the second part were devoted to transmissions from Europe to America. The French transmitted and we transmitted for the six-hour period of each night from midnight to 6 a.m., this total period being divided up into two three-hour periods, which were taken in turn by France and Great Britain. On the first night we took the first three hours and the French took the second. The second night the French took the first and we took the second three-hour period, and so on alternately. In that way it was hoped to give the two countries as fair a chance as possible for the transmissions, as undoubtedly the transmission over the Atlantic varies at different times of the night, being best about 3 to 4 a.m., while also the transmission qualities vary from night to night so that by transmitting alternately in this way we hoped to give a reasonably fair distribution of the available time.

By the results achieved during the first part of the Tests we showed the Americans that we knew how to receive their signals, while in the second part of the Tests we tried to show them that we could transmit as well. Last year they sent a representative over to us to show us how to work on 200 metres (at least that is what they said). This year we have been trying to show them that we know.

The ordinary amateur licence, as you know, is for about 10 watts, and with that power it was not thought that we should stand much chance in transatlantic transmissions. However, the

Paper read before the Radio Society of Great Britain, 21st February, 1923.

Post Office were kind enough to grant a number of special permits to several of the more prominent experimenters in this country to use increased power for the purposes of the Tests, and I think we owe to the Post Office our thanks for the generous way they treated us in this respect. This Society was granted a special permit to use up to 1 kW for the purpose of these transmissions, and a few of us set to work to put up a special station for the purpose.

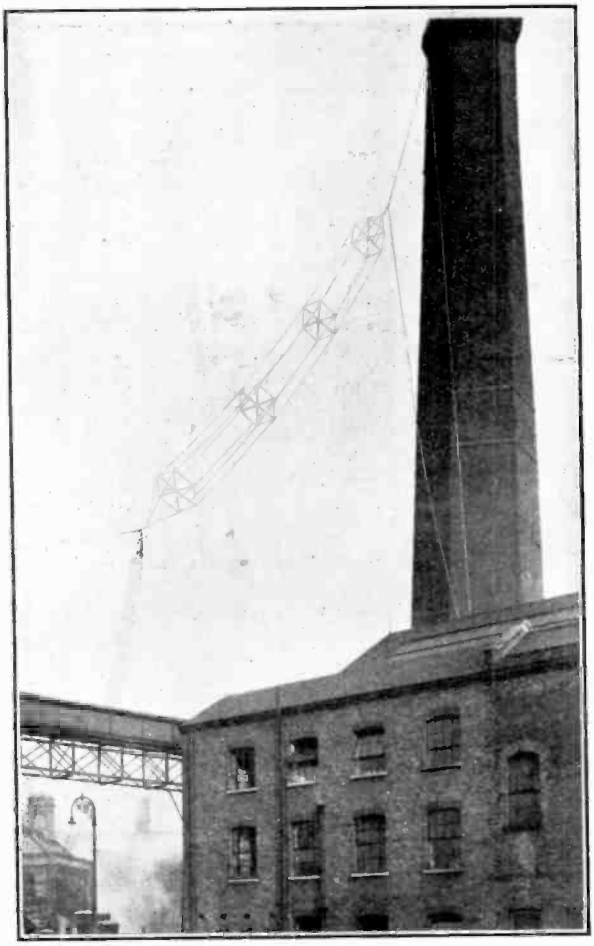


Fig. 1. The site of **5 WS**, *showing the aerial suspended from the chimney.*

The question of a site was a difficult one. We naturally did not want to purchase ground or rent ground for the purpose of a test lasting less than a fortnight, and many tentative feelers were put out to find a suitable spot where someone would be good enough to lend us some space, and also if possible to lend us some power. After a number of attempts at finding a suitable location, we eventually obtained permission from the County of London Electric Supply Company to use their generating station at Wandsworth, and also to use the chimney of that generating station for supporting our aerial. We were also fortunate in finding close at hand a disused hut belonging to the Metropolitan Water Board, and were able to obtain permission from the Board to utilise this for the purpose of housing our apparatus. The hut was quite near the base of the chimney, so that we were able to erect an almost vertical aerial.

The Society had not the necessary equipment for the Tests, so that we approached several of the radio manufacturers to see if we could borrow suitable parts, and a number of manufacturers generously responded and loaned us apparatus for the purpose. The valves being the most important item, they had to be considered first of all. Four valves were required, two rectifiers and two oscillators, and these were lent to us by the M.O. Valve Company, Ltd.; filament rheostats and transformers loaned by the Zenith Manufacturing Company; and aerial wire and insulators by Messrs. Leslie McMichael, Ltd. The generator and transformers for obtaining our high voltage to feed the oscillator valves were loaned by Messrs. R.M. Radio, Ltd.; the driving motor for the set, some condensers and sundry other things were lent by the Dubilier Condenser Co., Ltd.; grid leaks were supplied by the Zenith Manufacturing Co., and Messrs. Gambrell Bros. Inductances were lent by Messrs. McMichael, Ltd., the Radio Communication Co., Ltd., and the Dubilier Condenser Co., Ltd. Accumulators and H.T. batteries were lent by Messrs. McMichael, Ltd., and a receiving set by Mr. Maurice Child.

These, I think, cover the main parts of the set and the main parts of the apparatus which we collected together. The time available for putting up the station was very limited, and it eventually came down to the last two or three days, when the set had to be thrown together and got into operation.

The second part of the tests, in which these transmissions took place was due to commence in the early hours of Friday morning, December 22nd, 1922. On the previous Saturday we started to put the apparatus together. The parts had all been collected in the experimental laboratory of the Dubilier Condenser Co., Ltd., and they let us use their premises and workshop facilities for putting the apparatus together, assembling the parts and generally fitting things up before taking them down to Wandsworth. We thought it best to assemble the parts as much as we could, to avoid the difficulty of doing it in a rather confined space, with few tools or other equipment available. We therefore, on the Saturday previous to the tests, started to put the parts together. The frame for the valves was fixed up and the transformers fixed. (See illustrations which follow), and eventually on the Tuesday afternoon (December 19th) the apparatus was moved down to Wandsworth. On the Tuesday evening we arranged the apparatus there and joined up the circuits. On the Wednesday evening there was a meeting of this Society and nothing further was done until late on Thursday night, when we got the set tuned up ready to start transmitting at 2.15 a.m. on the Friday morning, December 22nd.

We were a little bit worried at first because we thought we were not getting enough aerial current, but when we came to work things out we concluded that we were getting the energy into the aerial all right, and the fact that we were able to transmit across the Atlantic was evidence of the fact that we had the energy there.

Fig. 1 is a photograph taken on the location where we put the apparatus up. The chimney of the Power Company's station can be seen very prominently, the 200 ft. chimney stack of brick forming a very convenient support for the aerial. The station was situated in the Causeway, Wandsworth, being the Wandsworth station of the County of London Electric Supply Company. The upper part of the aerial was made up of a six-wire cage, the length of the cage being approximately 94 feet, the spreaders were of bamboo, and were about 6 ft. 6 ins. long each. The upper ends of the six wires were all brought together and attached to three porcelain insulators connected in series. These were attached to a rope which you can see in the photograph coming down from the top of he chimney. We employed a firm of steeplejacks to fix a pulley block to the top of the chimney before the aerial was constructed. At the junction point on the left of the picture we used three more insulators, and the same six aerial wires were carried right through to the down leads which were arranged on small hoops about 12 inches in diameter. The down leads came straight down to the hut in which the apparatus was located. The roof of the hut can just be seen in the lower left-hand corner of the photograph. The left-hand end of the aerial cage was pulled away by a rope running from the insulators to the end of the coal conveyor which can be seen crossing the photograph.

In many ways the site was not ideal, and there were only two, or perhaps three, features to recommend it; these were the high point of support for the aerial, the availability of supply current for the set, and the proximity of the river for a good earth connection. In other respects it possesses many disadvantages. The proximity of the power station was not good for reception, and the proximity of all this metal work was by no means good for transmission.

In the photograph the coal conveyor can be seen. It extends from the base of the stack and runs over the roadway to the river on the other side. There were also many other metal obstructions in the neighbourhood which we expected would screen the station, and probably did so to a considerable extent. These included some gasometers, which can be seen in the background of the picture.

This metalwork and a number of telephone and power wires which were strung about overhead in several directions probably screened the transmission quite a lot, but we were able to utilise some of them by making our earth connection to the coal conveyor. We found it an extraordinarily good earth. I do not know what the actual resistance to earth was but it was apparently quite low. For this connection we strung four wires from the conveyor, which was about 40 feet above the ground, and spread them out in a fan over the roadway so that they formed in that way to a certain extent something in the nature of a screen or counterpoise (although not an insulated one), as well as an earth connection.

We were able to get very much more current into the " coal conveyor " earth than when we used an ordinary earth connection. Six wires were also taken down to a water main which passed underneath the station, and a copper strip was also run out down to the river and connected to some brass plates buried in the mud of the river bed. Altogether then we had three earth connections, and we tried various combinations in order to get the best earth system. We found that each time we put one on we got more current, so that evidently each was doing some work, but the " coal conveyor " earth, I think, did the most.

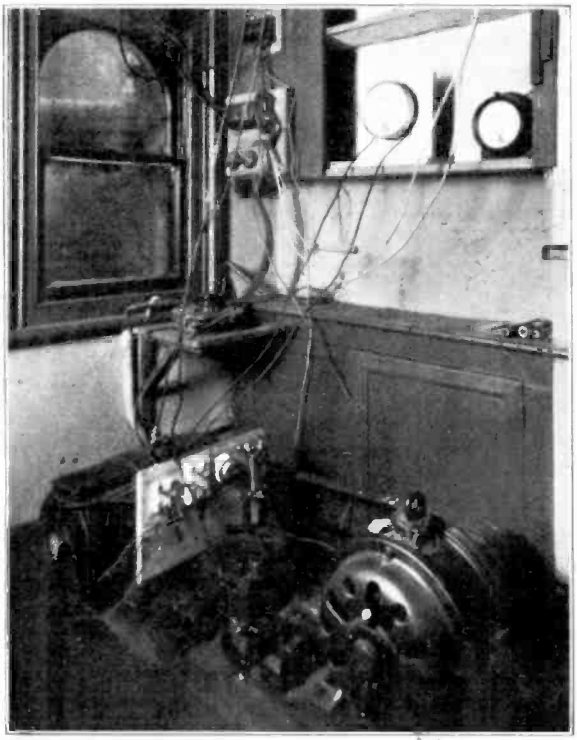


Fig. 2. The generator unit with driving motor.

We used them all in parallel for the actual transmissions.

The lead-in to the station was made through an insulator fixed into one of the windows of the small hut. We used a Dubilier mica insulator for that purpose. It was one which had been tested up to about 15,000 volts on C.W., and it was mounted in the middle of a sheet of ebonite which we fitted into a wooden frame in the window. That gave us a good lead-in with very little losses.

Having arranged the aerial and the earth connections, the next consideration was the source of the power supply. The Power Company connected us on a pair of leads to their " station auxiliaries " switchboard at about 230 volts, 50 cycles alternating, and we used a 3 H.P. induction motor run off that supply to drive the generator used for feeding the set. The generator was primarily a rotary converter, one of Newton's make, designed for a ship's wireless set to carry a rotary spark gap at one end of its shaft, and arranged for 100 volts D.C. input and 100 volts A.C. output at 350 cycles. We fixed a pulley in place of the rotary spark and drove the machine by a belt from the 3 H.P. induction motor. The output of the generator was used to feed the step-up transformers. By driving the machine in this way we obtained also 100 volts D.C. from the dynamo and used it to excite the alternator field as well as for battery charging. We fitted up a change-over switch to enable us to throw the machine over quickly from the running to the charging position because between transmissions we needed to charge up our batteries very quickly, and therefore a quick throwover was very necessary. Fig. 2 shows the arrangement of the generator with the driving motor, and Fig. 3 the connections. When the D.P. throw-over switch is in the lower position we had the normal running conditions in which the D.C. dynamo field is connected directly across the D.C. armature making a shunt wound dynamo to give 100 volts D.C., and the field regulator is joined into the circuit of the alternator field. That gave us the normal running position and we obtained our 350 cycle supply from the slip rings of the machine, getting voltage control by means of the main field regulator.

For battery charging we put in a double pole throw-over knife switch straight off the D.C. machine armature and put the throw-over switch in the upper position which interrupted the alternator field and put both field regulators into the field circuit of the D.C. generator, enabling us to get a better control of the voltage which was necessary for charging the batteries. This was a very simple arrangement, but it served our purpose and gave us all the current we wanted. By means of the field regulator on the machine we could control the input to the valves, and so control the aerial current of the set. The 350 cycle current was used to feed two step-up transformers which were supplied with the set, being part of a ship's wireless installation. They were two transformers manufactured by Messrs. Hamilton Wilson for 350 cycles for 100 volts input and 6,600 volts output, the 6,600 volts being controllable of course by means of the field regulator of the generator. The two transformers were connected with their primaries joined in parallel and the secondaries in series, so as to use two-wave rectification.

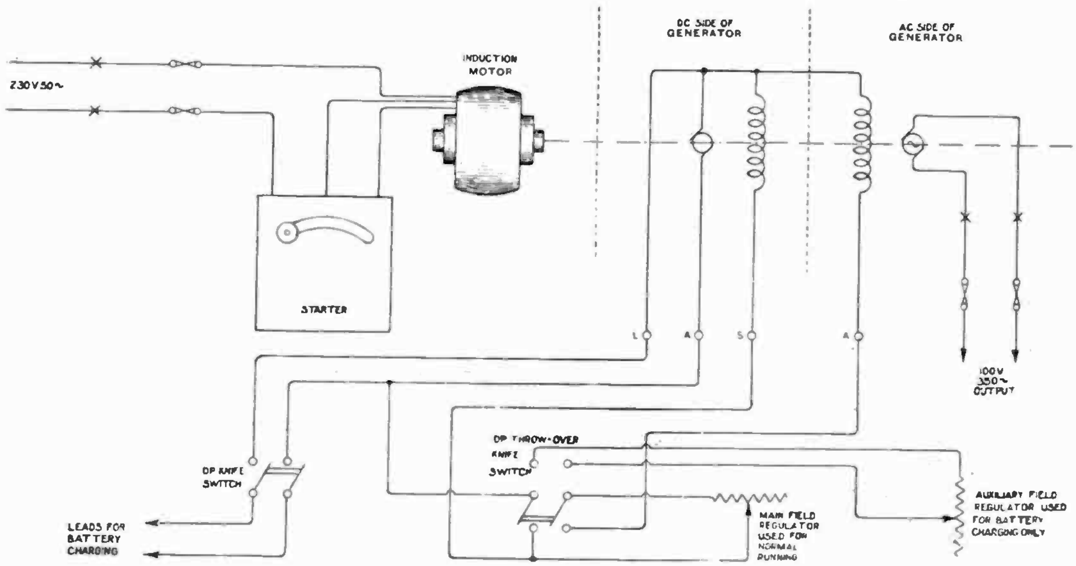


Fig. 3. Connections of generator unit.

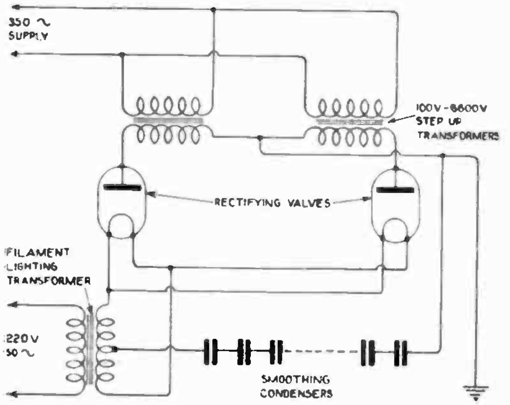


Fig. 4. The Rectifying circuit.

The rectification circuit was of quite an ordinary type, one valve being used for each half wave (Fig. 4). The filaments of the valves were joined in parallel and were eventually fed from a step-down transformer fed off the 220 volts 50 cycle supply. We had no available transformers to run off the 350 cycle supply, but we light d the filaments from the 50 cycle supply and used a centre tap on the 20 volt filament winding so as to get rid of the effects of the 50 cycle supply on the output.

The smoothing condenser consisted of a number of 1 microfarad condensers connected in series, and joined the junction point of the H.T. transformer windings and mid-point of the filament transformer winding as shown. Ten 1 microfarad condensers were used in series, each condenser having been tested at 1,500 vol s D.C. Since, however, surges always occur in smoothing circuits, we thought we were on the safe side to allow for a 100 per cent. factor of safety over the test voltages—safety being most desirable when carrying on experimental work. Hence the actual capacity of our smoothing condenser was 0·1 microfarad. That does not seem very much, but with the 350 cycle supply, the frequency being fairly high, the smoothing was quite reasonably effective. Actually there was some ripple left which was audible for some distance on a simple detector valve without any heterodyne circuit, but this ripple was not large enough to be serious.

(*To be concluded*)

The Olympia Exhibition

SOME NOTES ON THE WIRELESS SECTION.

AT the time of writing, the *Daily Mail* Ideal Home Exhibition at Olympia is in full swing, and the special section devoted to Wireless exhibits, to which brief reference has already been made in previous issues, is attracting a large amount of interest.

In addition to the Wireless Section, with stands of all the principal manufacturers' apparatus, there is a hall devoted to the reception of broadcast transmissions from the London Broadcasting station, where accommodation is provided for an audience of about 1 000. This affords an opportunity for those unacquainted with broadcast reception, to appreciate its possibilities and attractions as an adjunct to the home.

The Wireless Exhibition is, of course, primarily arranged in the interest of those who are new to wireless, and are taking it up solely for the reception of the broadcast programmes, but the Exhibition is, nevertheless, a feature of attraction to everyone interested in wireless, whether amateur and experimenter of long standing, or one only new to the subject. Such an Exhibition affords a splendid opportunity for those who contemplate purchasing wireless apparatus, to make a selection from amongst a choice of all the best that is produced in this country, and there is no more effective guide to the choice of apparatus than that which is the result of comparison. It is, however, difficult to indicate where comparisons between the apparatus of various makers can be drawn, since all the sets and components exhibited are for the most part of a uniformly high standard both in design, and workmanship. Very valuable information, particularly to the experimenter, can be obtained from a visit to the Wireless Section, and a careful survey of the apparatus exhibited. A number of new ideas are introduced into sets on view, some of which will undoubtedly be new to the experimenter, whilst the enormous variety of designs for receivers will provide much food for thought.

We illustrate here some of the sets and apparatus on view, but this represents only a very small proportion of what there is to be seen. The Radio Society of Great Britain is represented at one of the stands, where comfortable chairs are available, and literature relating to the Society. Members are cordially invited to bring their friends here where they will have the opportunity of resting during their visit to the Exhibition, and those who are in a position to do so, may bring prospective members to complete forms of application for membership which are at hand for their use.

For those who desire to know something of the past activities of the Society, there has been reprinted from a past issue of this Journal a History of the Society, illustrated with photographs of those who have been actively engaged in its development.

Space does not permit of dealing in detail with the exhibits of the various firms, but points of special interest which may be noted are the extended use by certain firms of the low temperature valves, where, of course, the principal advantage lies in the fact that accumulators are not required, substantial size dry batteries sufficing for the filament current.

On many of the broadcast receivers it is noticeable that an adjustable reaction is introduced, though of course so arranged that it does not pass the point of oscillation. Unit sets, some of new design, are to be seen on one or two stands, whilst elaborate sets embodying new principles are being shown for the first time by one or two firms. On one stand there is exhibited a crystal and single-valve broadcast receiver where the valve functions both as high frequency and low frequency amplifier. There are to be seen a large number of component parts, some of which embody new ideas, though for the most part the Exhibition specialises in complete receivers for broadcast reception.

Various publishers of wireless literature are represented, and on the stand where this Journal is displayed, an invitation is extended to readers to avail themselves of the services of one of the editorial staff for advice and help relating to their apparatus.

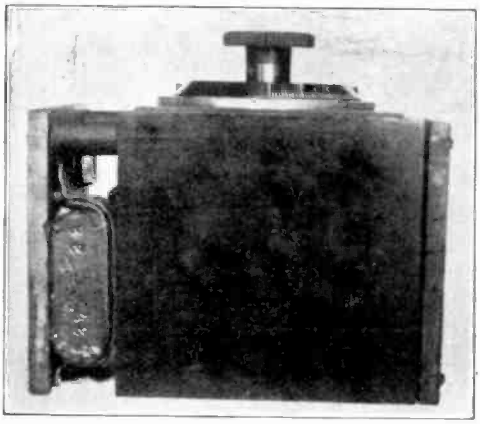
1 2 3 4 5 6 7 8

1. The Marconi Scientific Instrument Co., Ltd. 2. Dubilier Condenser Co., Ltd. 3. Graham & Co., Manufacturers of the "Amplion." 4. The Marconiphone Co., Ltd. 5. Loud Speaker by the Automatic Telephone Manufacturing Co., Ltd., and Receiving Apparatus by Ashley Radio, Ltd. 6. Burndept Ltd. 7. General Radio Co., Ltd. 8. Metropolitan-Vickers Co., Ltd.

The Construction of a Short Wave Wavemeter.

A USEFUL INSTRUMENT FOR ADJUSTING THE RECEIVING APPARATUS.

BETTER than adjusting the crystal detector by means of the signals it is desired to receive, is to employ a small buzzer actuated near to the receiving apparatus. Thus if a buzzer is connected to a dry battery, it is possible to vary the contacts of the detector until the buzzing noise is heard in the telephones, and when this is done, it is only necessary to wait for the transmission to commence, while varying the tuning adjustments, if the setting for the particular station from which reception is desired is not known. Such an arrangement is very useful for testing if everything is in order in a valve receiving set, should the location or design of receiver not permit of the tuning in of ship stations for proving that the apparatus is in working order.



The Buzzer Wavemeter.

The combination of a battery and buzzer with a tuning circuit, such as a coil of wire and variable condenser, is capable of serving a dual purpose, firstly of testing the sensitiveness of the crystal or valve and secondly of adjusting the tuning devices to the wavelength on which it is desired to receive. The instrument is called a "buzzer wavemeter" and its construction is quite simple.

It is necessary to procure a variable condenser of good construction and preferably contained in a wooden box and having a value of 0·0007 microfarads, a small buzzer, usually to be obtained in a nickel-plated case, and measuring about 1½in. × 1in., a dry battery of the type employed in pocket lamps, a few miscellaneous brass screws and pieces of wood, a card inductance of the type described on page 734 of the issue of March 3rd, and some wire for connecting up. The essential tools are a small saw and a screwdriver and other tools likely to be very helpful are a hand brace with small twist drills, a vice and a file.

It is not proposed to deal with the construction of the variable condenser in the present article, as the subject has already been exhaustively dealt with in this journal * and moreover the actual design of this component will depend so much on the dimensions and the number of the available parts. If the thickness of the spacing washers is ⅛ in. and the plates No. 22 S.W.G. in thickness, then about 20 fixed and 19 moving plates will be required. Get bushes if possible to support the spindle where it passes through the ebonite end plates, and what is most important in this instance, is to make sure that there is not the slightest play on the spindle. If the condenser is made up by the reader or is one purchased unmounted, it will require mounting in a wooden box as indicated in Fig. 1. Two holes are to be made in each of two opposite sides of the box to permit of two wires from the two sets of plates passing through.

The battery and buzzer may be secured to a piece of wood which is equal in size to one of the sides of the box. The buzzer is of course attached with screws, whilst the battery is held in position by means of strips of tin cut with a pair of scissors from a scrap tin box or perhaps better still, by means of strips of soft leather. A small wooden arm pivoting about a screw will serve as a switch by pressing the long spring connector of the battery up against a piece of bent brass, or more simply, a screw.

The short spring of the battery is joined to one terminal of the buzzer, whilst the brass

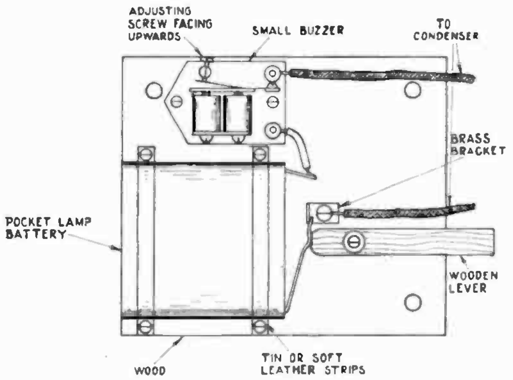
*"Wireless World and Radio Review," p. 581, August 5th, 1922.

stop or screw, and the other terminal of the buzzer are connected to the two leads coming from the condenser on the side to which the battery and buzzer are attached. The method of joining up is indicated in Fig. 2.

The inductance card is cut from a post-card by pricking through, and is wound full with No. 28 double cotton covered wire. It is connected to the two free condenser leads and clamped to one of the sides of the condenser box.

Spacing pieces of wood will be required for attaching the battery and buzzer board to the box, or better still, short pieces of ebonite tube and No. 2 B.A. screws and nuts as shown in Fig. 1 may be used. The adjusting screw of the buzzer must be accessible and may necessitate the discarding of the cover.

As to operation, it will be found that the buzzer operates when the lever presses the spring against the screw. Switch the buzzer off and adjust the crystal on a strong signal or the nearest broadcasting station. Now, without making any change in the setting of the tuning handles of the receiver, set the buzzer in operation and turn the condenser until the buzz can be heard in the telephones at its loudest.



Method of assembling buzzer and battery.

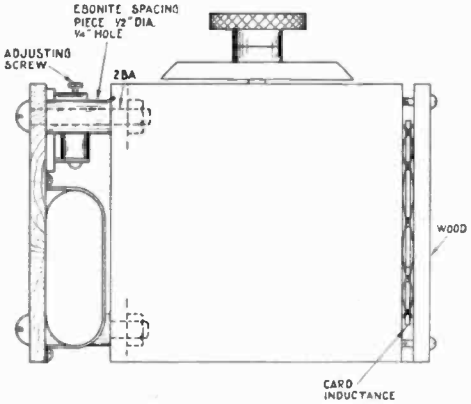


Fig. 1.

Buzzer, battery and inductance attached to box of variable condenser.

Mark the setting of the condenser and the position indicates the wavelength of the transmitting station on which the test was made. On future occasions when it is desired to tune in the station it is only necessary to set the condenser to the mark, adjust the crystal and vary the tuning, until the buzz is heard at its strongest. Similarly a number of marks can be made on a paper scale, attached to the dial of the condenser, for tuning to a number of stations. The instrument is equally useful with a valve set for the purpose of tuning as just described.

If the reader is a member of one of the many wireless societies existent throughout the country, he can very probably take his instrument along on an evening devoted to practical work and calibrate against a reliable wavemeter.

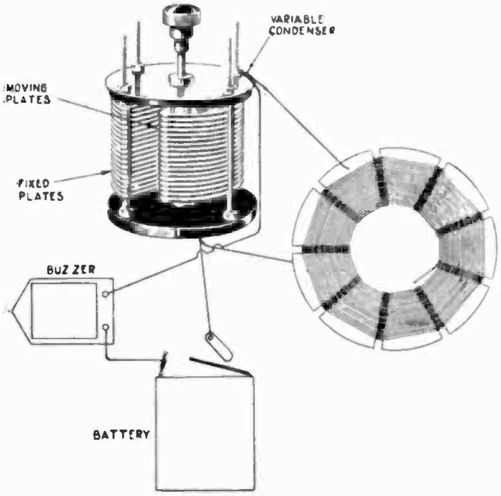


Fig. 2. The Connections. The inductance is here shown exactly ½ full size.

WIRE TABLES: Some Valuable Data for the Experimenter.

S.W.G.	Diameter Bare.		Diameter S.S.C.		Diameter D.C.C.		Ohms per 1,000 yards.			Comparison between diameters of—		
No.	Inches.	Mm.	Inches.	Mm.	Inches.	Mm.	Copper Wire	Manganin	Eureka.	S.W.G.	B.W.G.	B. & S.G.
14	·080	*2·032*	·086	*2·20*	·091	*2·30*	4·784	120	133·9	·080	*·083*	·0641
16	·064	*1·626*	·070	*1·80*	·075	*1·90*	7·478	186	209·4	·064	*·065*	·0508
18	·048	*1·219*	·053	*1·346*	·056	*1·42*	13·28	332	371·8	·048	*·049*	·0403
20	**·036**	***·9144***	**·040**	***1·017***	**·044**	***1·118***	**23·62**	**591**	**661·3**	**·036**	***·035***	**·0320**
22	·028	*·7112*	·032	*·812*	·036	*·915*	39·05	976	1,093	·028	*·028*	·0253
24	·022	*·5588*	·026	*·660*	·030	*·762*	63·24	1,581	1,770	·022	*·022*	·0201
26	·018	*·4572*	·022	*·559*	·026	*·660*	94·48	2,362	2,645	·018	*·018*	·0159
28	·0148	*·3759*	·019	*·483*	·023	*·585*	139·8	3,495	3,914	·0148	*·014*	·0126
30	**·0124**	***·3149***	**·017**	***·432***	**·021**	***·533***	**199·1**	**4,977**	**5,575**	**·0124**	***·012***	**·010**
32	·0108	*·2743*	·015	*·381*	·019	*·432*	262·5	6,562	7,350	·0108	*·009*	·0079
34	·0092	*·2337*	·013	*·330*			361·7	9,042	10,128	·0092	*·007*	·0063
36	·0076	*·1930*	·011	*·280*			530·0	13,250	14,840	·0076	*·004*	·005
38	·006	*·1524*	·0095	*·241*			850·3	21,257	23,808	·0060	—	·004
40	**·0048**	***·1219***	**·008**	***·203***			**1328·0**	**33,200**	**37,184**	**·0048**	—	**·0031**
42	·004	*·1016*	·007	*·177*			1913·0	48,825	53,564			
44	·0032	*·0813*					2988·0	74,700	83,664			
46	·0024	*·0610*					5313·0	132,825				
48	·0016	*·0406*						303,000				
50	**·0010**	***·0254***										

In the table particulars are given of the diameter of bare wire, and wire with single silk and double cotton covering. From the latter data, the number of turns per inch or centimetre which may be wound is readily determined. To take an example, No. 22 D.C.C. is 0·040 inches in diameter and it should be expected that $\frac{1}{0{\cdot}044} = 22$ turns of this wire will be wound in one inch. Of course a slight deduction in the number of turns should be made in the case of those who are not expert at winding coils. If the winding is to be with No. 22 S.S.C., $\frac{1}{0{\cdot}04} = 25$ turns should be wound in one inch. Wire as ordinarily purchased slightly varies in diameter measured over the insulation, but apart from this slight irregularity, with the aid of the tables it is possible for those who are not familiar with wire gauges, or who have no measuring instrument such as a micrometer to determine the gauge of wire they may have. The wire should be wound upon a small diameter rod, and the number of turns in a one-inch length counted. The covering of the wire is easily determined by inspection. If the wire has been tightly wound, and there are say 45 turns, and the wire has a single silk covering, the diameter of the covered wire is $\frac{1}{45} = {\cdot}022$ in. From the tables it is evident the wire is No. 26 S.S.C.

The resistance per 1,000 yards of copper and resistance wires given in the 8th, 9th and 10th columns are useful in that one is able to closely estimate the length of wire in a coil, and hence its resistance. As an example suppose a potentiometer is required. A potentiometer has a resistance generally of the order of 450 ohms, and No. 36 manganin or Eureka resistance wire will be used. In the case of the Eureka wire, from the tables No. 36 has a resistance of 14,840 ohms per 1,000 yards or 14·8 ohms per yard. The length required for the potentiometer is then $\frac{450}{14{\cdot}8}$ or 30·4 yards. If the rod upon which the wire is to be wound has a diameter of one inch, its circumference is 3·14 inches. The total number of turns is the total length of wire in inches divided by the circumference. Hence 30·4 yards = 1,094 inches, and the number of turns $\frac{1094}{3{\cdot}14}$ or 348 turns. The wire will wind 90 turns to the inch, and the length of the potentiometer will be nearly 4 inches.

The last columns give a comparison between the diameter of American and British wire gauges.

The Antennæ.

THE TRANSMITTING STATIONS RADIATING SYSTEM.

(*Continued from page* 652, *February* 17*th issue.*)

TURNING now to practical details, it is proposed to indicate how the constants of the antennæ may be arrived at. The simplest methods only will be described, as it is not worth while to take great pains with elaborate methods when the instruments available to most experimenters are only accurate to within several per cent.

The Measurement of Antenna Resistance.

The method to be described makes use of the experimenter's transmitter. The arrangement is given in Fig. 1. Here we have the aerial circuit, which includes a calibrated hot-wire ammeter or thermo-couple, the aerial tuning inductance of the transmitter proper and a key or switch arranged to short circuit the variable resistance R when required. The resistance R may be a number of short lengths of Eureka resistance wire connected in series. The wire should be fairly fine, in order that its high-frequency resistance shall not greatly exceed ts direct cu rrent resistance. No. 34 "Eureka" wire is suggested, which has a resistance of 10·13 ohms per yard, and will carry 100 milliamperes without reaching a temperature of 100° F. The total resistance available should be about 20 ohms. The coil L should be connected to take the place of the aerial coil normally used when transmitting. The small coil L_1 is for the purpose of providing coupling with the aerial coil, and should be only just large enough to provide a small aerial current—50 or 60 milliamperes will be a suitable value. The condenser C is used to tune the closed circuit and should be of the oil dielectric type to safely withstand the voltage. It may be necessary to include a little resistance in this circuit. To take measurements the transmitter is switched on, and the wavelength of the closed circuit adjusted to the wavelength upon which it is desired to take the measurements. The coupling between L_1 and the aerial tuning coil is loosened until ammeter A_1 shows a small reading, and the coupling is then fixed; it is not changed while resistance measurements are being taken. The current A_2 and A_3 should remain fairly constant throughout the tests. The reading A_1 is taken and recorded. The key shunting the resistance is opened, and the resistance varied until the ammeter A_1 records about half its previous value. Calling the latter reading A_R and the value of the resistance R ohms, the antennæ resistance

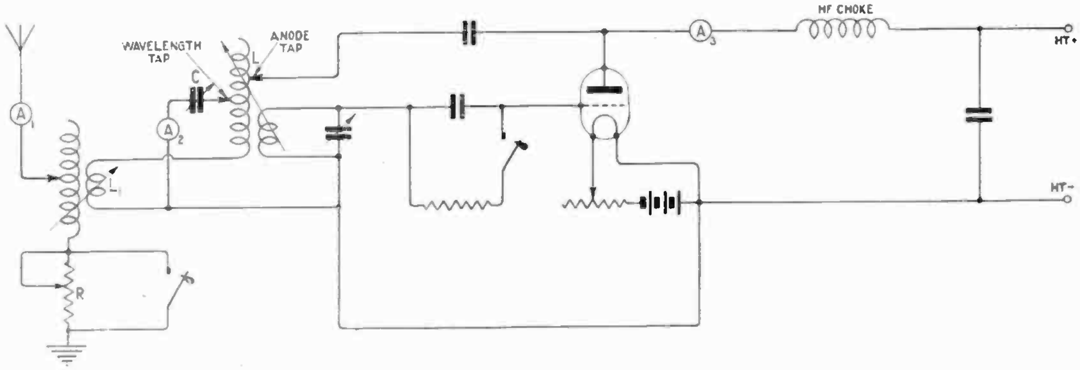


Fig. 1. The diagram gives the connections of a transmitter loosely coupled to the aerial circuit. The grid circuit comprises a coil tuned with a condenser, and is connected through a grid condenser to the grid. When the key is pressed the grid leak circuit is closed and the valve is capable of generating oscillations. The H.F. choke is to prevent the oscillating energy passing through the condenser connected across the H.T. supply.

is given by

$$R_{antenna} = \frac{A_R \times R}{A_1 - A_R}$$

As an example suppose

$$A_R = 20MA,\ A_1 = 40MA.$$

$R = 150$ ohms, then

$$R_{antenna} = \frac{20 \times 15}{20} = 150 \text{ ohms.}$$

It will be noticed the resistance of the antenna is equal to that of the added resistance in the above case because the current with the resistance in circuit was exactly half that with the resistance short-circuited. If, therefore, the resistance R is made continuously variable, and we use a hot-wire milliammeter, it is not necessary that the ammeter be calibrated. The reading with the resistance in circuit should be made equal to half the reading when the resistance is out of circuit. The antenna resistance is then equal to the value of R. A number of readings should be taken at different wavelengths and a curve plotted, showing the resistance at the wavelengths at which the antenna is likely to be used.

THE MEASUREMENT OF ANTENNA RESISTANCE AND CAPACITY.

Another method which may find favour with some experimenters uses the arrangement of Fig. 2. Here we have an ordinary transmitter, which is coupled to the aerial in the usual manner. The only alteration required in order to take measurements is the inclusion of a switch S, condenser C and resistance R. The condenser and resistance may be identical with those used in the previous tests. The ammeter A_1 is of the hot-wire type and does not need to be accurate. The milliammeter A_3 is a direct current instrument and a moving coil instrument is suggested. With switch S to the right, the transmitter is tuned up in the usual way to the wavelength desired. The milliammeter A_3 will give a steady deflection which should be noted. Reading A_1 should be taken. The switch S is now thrown to the left and adjustments of C and R made until the currents indicated by A_1 and A_3 are exactly as before. The resistance R is then equal to the antenna resistance, and the capacity of C is the capacity of the antenna at the wavelength of measurement. The essential point to remember is that the transmitter once adjusted should be left alone, and only the switch and dummy circuit adjusted. A number of readings should be taken as before and a resistance wavelength curve plotted. It will be noticed the resistance of the condenser should really be known and added to that of R to give the correct result, but generally this additional resistance may be neglected if the resistance is well designed. Its resistance should not exceed an ohm or thereabouts.

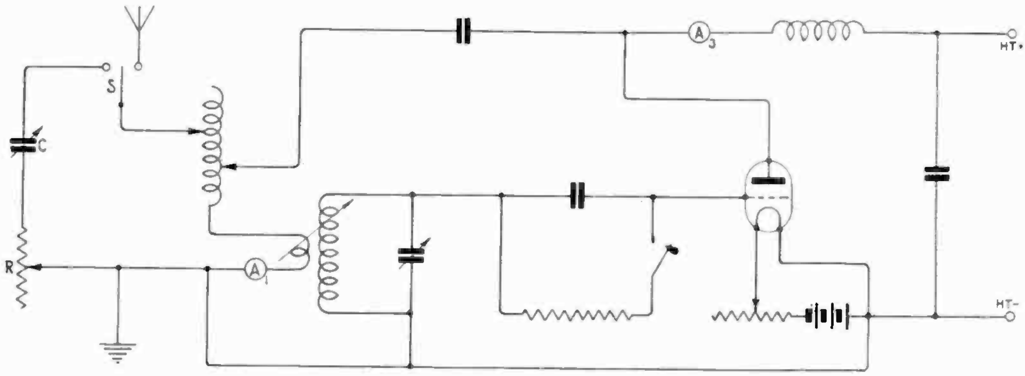


Fig. 2. Here the aerial circuit is directly coupled with the valve generator. The transmitter is the same in principle as that given in Fig. 1.

MEASUREMENT OF NATURAL WAVELENGTH.

The transmitter is loosely coupled with the aerial circuit which has a single turn of wire included in it as well as the ammeter. The arrangement given in Fig. 1, modified to Fig. 3, may be used. The transmitter is adjusted to the frequency of the aerial circuit as indicated by the maximum aerial current. The coupling between the single turn and L_1 is made as loose as possible, consistent with reliable readings. The aerial circuit is then removed and the wavelength of the oscillations generated measured with a wavemeter.

The antenna inductance may be calculated from the values of capacity and wavelength obtained by using the well-known wavelength formula.

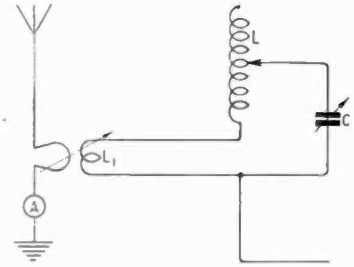


Fig. 3. The coil L and variable condenser C form part of the oscillating circuit LC of Fig. 1. The remainder of the circuit not shown is the same as Fig. 1, but here the aerial circuit includes a hot-wire ammeter and a single turn.

MEASUREMENTS WITH A WAVEMETER.

A coil of one turn of the antenna wire is coupled with a few turns of the circuit A, Fig. 4, which in turn is coupled with the aperiodic detector circuit comprising a larger coil, crystal detector and telephones. The wavemeter, which is set to generate oscillations, is coupled to a single turn of the antenna

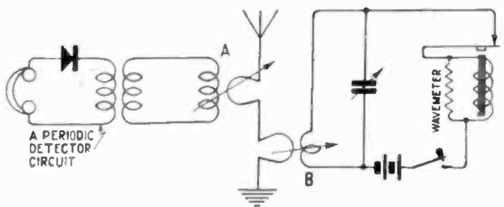


Fig. 4. The figure shows the arrangement of apparatus when a wavemeter and a detector and telephone circuit are employed to determine the natural wavelength of an antenna. The method may also be used to determine the natural wavelength and the capacity of the antennæ, whether used for transmitting or receiving purposes.

wire, as indicated at B. When the wavemeter is generating oscillations a sound will be heard in the telephones. The wavelength of the oscillations generated are varied until a maximum sound is heard. The reading of the wavemeter at this setting gives the natural wavelength of the antenna. If now an inductance coil of known value is inserted in the antenna circuit and the measurement taken again, we can calculate the approximate capacity of the aerial. If the wavelength with the coil is, say, 600 metres, and the inductance of the coil is 300 microhenries, the capacity, calculated from the formula

$$\lambda \text{ metres} = 1885 \sqrt{LC} = \cdot 00034 \text{ mfds.}$$

A number of measurements of amateur antennæ show the resistance at 400 metres to average 20 to 30 ohms. The average capacity is ·0003 mfds.

From these figures it is evident great improvement is possible, and it is intended in the following sections to describe antenna suitable for small power transmitters.

TYPES OF ANTENNA.

The antenna used by experimenters fall under one of the following headings as a rule, inverted L, T, vertical, or fan. Each is

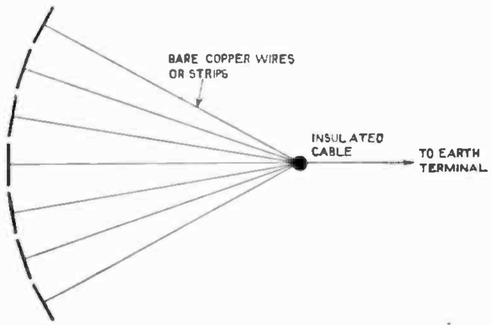
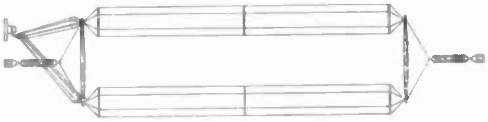


Fig. 5. A suggested earthing arrangement very suitable for those who have a licence permitting the use of up to 1 kW. of power input to the transmitter.

suitable and the correct choice depends largely upon the conditions which confront the experimenter.

If there is plenty of open space available, no doubt the T type of antennæ will give best results. The vertical and fan types should only be chosen when the area available is small.

A suitable height would be between 60 and 70 feet. The flat top should preferably be in the form of cages, and it is suggested a double cage antenna, with the two cages, spaced 14 feet apart, will be most suited to the needs of experimenters. The cages may be constructed of 6 or 8 wires, secured to wooden hoops 4 feet in diameter. Three hoops in each section would be suitable. The down leads should be in the form of a rat-tail, and be run so that it is several feet away from buildings except where it is secured to the lead-in insulator. Lead-in insulators of the type illustrated are recommended; the same figure shows suitable aerial insulators. Suitable conductors were mentioned in the first portion of the article.



The figure gives an outline of a cage, inverted L type aerial. Those who expect to generate up to about 100 watts in the aerial circuit would find a single cage satisfactory.

The lower capacity, which may be an earth connection, counterpoise, or a combination of each, is worthy of serious consideration, as it is here that one should look for the cause of most high-resistance antennæ. A water-pipe is often used as the earth. The connection between the earth terminal of the receiver and the earth should be large and well soldered.

The photograph illustrates a number of aerial and lead-in insulators. Those insulators which have a long leakage surface are generally the best.

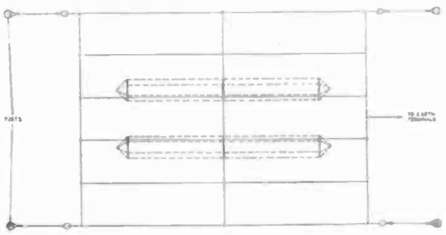


Fig. 6. The counterpoise consists of a copper wire network insulated from the earth and raised several feet above it. The dotted outline of the top flat portion of the aerial will give an idea of the relative dimensions.

In cases where the use of a water-main carries with it the use of a long earth lead, it is advisable to construct an earth. An earthing scheme is shown in Fig. 5. Copper wires are laid out

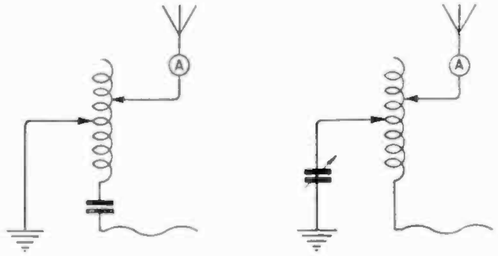


Fig. 7. An earth connection may be combined with the counterpoise in the manner indicated in the figure. The correct connection to be employed depends essentially upon the transmitter connections, and the experimenter will have no difficulty in adapting the arrangement to meet his own needs.

symmetrically with the aerial wires and are soldered to zinc, or even galvanised iron plates, at the distant end of the aerial. A total of 6 or 7 wires buried about 3 feet should, if possible, be used. In this way the resistance is reducible to something of the order of 10 ohms.

When space is available, the use of a counterpoise is to be strongly recommended. With a good counterpoise, the antenna total resistance may be reduced to the order of 4 or 5 ohms. A counterpoise is constructed by suspending 6 or 7 feet above the earth a network of wires with an area 100 per cent. greater than that of the antenna top. To prevent losses through the counterpoise, the wooden supports which are generally used should be fixed several feet away from the nearest wires, as shown in Fig. 6, and the wires well insulated.

Multiple Earths.

It will often be found the antenna resistance is increased when several different earth connections are connected together at the transmitter. This appears to be due to lack of balance, resulting in the antenna currents being unequally divided. The fault should be guarded against.

COMBINED EARTH AND COUNTERPOISE.

It is possible by tuning to combine the earth and counterpoise connections and so take full advantage of each. The arrangement is shown in Fig. 7, the difference between the two connections shown being to suit the connections of the transmitter. The circuit is tuned to the required wavelength, using the counterpoise connection alone. Then the earth is connected, and its point of connection is varied until connecting or disconnecting the earth with the tuning inductance does not change the wavelength. The capacity of the counterpoise and the inductance between the counterpoise and earth connection are then in tune. The arrangement is very effective in reducing antenna resistance.

Radio for the Deaf

By P. J. RISDON.

This short article is of special interest in view of the recent attention drawn to the possibility of deaf persons listening to broadcasting.

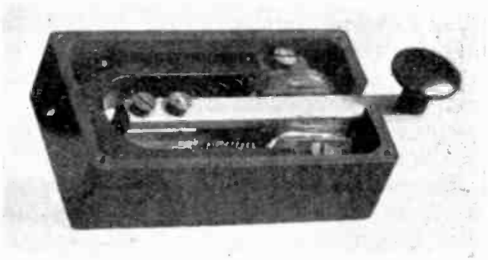
A YEAR or two ago an instrument was invented that is now arousing world-wide interest. The inventor is Mr. S. G. Brown, of London, and the invention is known as the Ossiphone—derived from the Latin word "os" or "ossis," a bone, and the Greek word "phone," meaning sound. It is no less, as its name implies, than an instrument *that enables one to hear through one's bones.*

The writer has tested the ossiphone in a variety of ways, both in connection with the ordinary telephone, and with another instrument known as an aural box.

The ossiphone is quite small and can be carried in the waistcoat pocket. It comprises a little ebonite case containing an electro magnet of the horseshoe pattern, between the poles of which an iron bar is fitted that can be made to vibrate. It contains no accumulator or dry cells, the electro magnets being energised by current from the telephone batteries when used as a telephone receiver, or from dry cells in the aural box when employed for carrying on a *viva voce* conversation.

The aural box and ossiphone together take the place of the old-fashioned ear-trumpet and other appliances commonly used by deaf persons. In the former there is an opening, developing into a curved horn shape, and diminishing in size to where it joins up with a microphone. Connections between the ossiphone and aural box or telephone are made by means of small plugs and sockets to which ordinary flex may be attached. Dry cells in the aural box provide electric current for the microphone.

In order to carry on a conversation over the telephone, a small socket is wired up in parallel with the ordinary receiver and, for the sake of convenience, is secured to the outside of the telephone box. There is a similar socket on the ossiphone, a length of flex with a twin plug at each end connecting the two. The vibrator bar projects outside the ossiphone case, and a small ebonite button is screwed to the end of the bar. The case is held in one hand and the button is then pressed gently but firmly against the skull or finger knuckle, and by this means the vibrations of a person's voice at the other end of the line



Copyright.] [P. J. Risdon.

A device for listening by vibrations transmitted through the bones.

are conveyed through the body to the aural nerves and so to the brain, where the sensation of sound is produced independently of the outer ear. This may be proved by stopping the ears effectually, or by putting the ordinary telephone receiver temporarily out of commission. In this way it is possible actually to hear more clearly than with the ordinary receiver, although incidentally the ossiphone constitutes an excellent duplicate receiver. It is not quite certain whether the vibrations follow the bony structure all the way, or whether the nerves compressed between the ossiphone knob and the bone, take up and transmit them. In the former case it would certainly appear that, where the bones are separated by cartilage, the vibrations must be transmitted by nerves from bone to bone. In either case, however, it is only by means of the bones that the vibrations can be communicated.

When it is desired to converse in the usual manner, one end of the flex is secured to the ossiphone, and the other to the aural box, which is placed in any convenient position near one of the speakers, who merely has to face it and to speak in an ordinary tone of voice within about eighteen inches of the opening. The other person may be seated comfortably in an armchair anywhere in the room, holding and applying the ossiphone as already described. An alternative to the ordinary vibrator is a vibrating stem, very much like the curved mouthpiece of a pipe, that may be held between the teeth; that gives equally good results, but is a less convenient method, since the ordinary vibrator can be changed from one hand to the other.

In order to appreciate the action of the ossiphone, it is necessary to bear in mind the fact that sound is an effect on the brain produced by power waves or vibrations. When a person speaks to another, the vibrations of his voice cause the ear drum of the other person to vibrate, and so to communicate the vibrations through the mechanism of the ear to the brain. If the middle or outer ear be damaged or stopped up by an excess of wax or a growth, or if the ear drum be damaged, the vibrations cannot reach the aural nerves leading to the brain and the person is unable to experience the sensation that we call sound. Ordinary appliances for the deaf are for magnifying sound waves. This, in certain cases, whilst of temporary service, may in the long run aggravate the original trouble and increase the degree of deafness. With the delicate vibrations of the ossiphone, such a result could not occur.

The value of these instruments to deaf persons depends to a great extent upon the nature and cause of their deafness. When deafness is due to what one may call mechanical affections of the outer and middle ear, in many cases the ossiphone has proved successful where all other appliances have failed. If, however, there be disease of the aural nerves leading to the brain, there is little hope of any instrument proving successful, since the aural nerves are an essential means of communication with the brain. It should therefore be quite clearly understood that it is not claimed for the ossiphone that it constitutes a certain remedy in every case of deafness.

From the foregoing description of this interesting invention, it is clear that, in all cases where it assists the deaf to hear, it will equally well enable them to enjoy broadcast wireless concerts and speech. For there is no difficulty in coupling up the ossiphone to an ordinary wireless receiving set, or in its use, in conjunction with an aural box and a "loud speaker," for the reception of music and the delights of wireless generally by many deaf persons to whom, hitherto, sound has been an almost meaningless expression

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The Radio Society of Gt. Britain.

The next meeting of the Society will be held at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C. 2, on Wednesday, March 28th, at 6 p.m., when Messrs. A. D. Cowper, B.Sc., and G. P. Mair will demonstrate super-regenerative receivers entered for the competition recently arranged by the Society.

At the meeting of the Society on Wednesday, February 28th, the following were elected as to full membership:—

John Armstrong Lakin, John Herbert Lavender, George Herbert Leslie, B.Sc., Arthur C. Bushnell, Sidney A. L. Gaubert, Alexander V. Simpson, James J. Neasmith, Major Charles H. Malden, Wilfred K. Harris, Kenneth H. Mulholland, George D. Adamson, Hardman A. Earle, Victor H. T. Inman, A. Frederick Collins, A. Howard Read, Herbert R. Smith, Alfred G. S. Barnard, Lieut. Torahiko Inada, K. Hartridge, James P. Morter, Charles R. Honiball, M.I.E.E., Arthur F. Bulgin, Lord Clive, R. Vernon Hibbert, Lawson A. Darby, Walter J. C. Powill, George Lee, R.I.M.S., Raymond Beryl, Paul L. Benson, Stanley E. Bland, Francis S. De Barro, A. E. Trehearn.

The following were elected as Associate Members: Stanley M. Hills, Arthur Remington Hollins, Edmund Gilbert Drower, Henry Field.

The Societies affiliated since the previous meeting were the following:—

The Evesham and District Radio Club, Merthyr Tydfil Radio and Scientific Society, The Worthing Radio Club, The Pudsey and District Wireless Society, Kingston and District Radio Society, Bath Radio Club, Trafalgar Wireless Society, Redditch and District Radio Society, Humber Radio Club, South Woodford Radio Society, Midland Railway (Derby) Institute Radio Society, Berkhamsted Wireless Society, Swansea and District Radio Experimental Society, Morecambe and District Radio Club, Denton and District Radio Society.

Wireless Club Reports.

NOTE.—Under this heading the Editor will be pleased to give publication to reports of the meetings of Wireless Clubs and Societies. Such reports should be submitted without covering letter and worded as concisely as possible, the Editor reserving the right to edit and curtail the reports if necessary. **The Editor will be pleased to consider for publication papers read before Societies. An Asterisk denotes affiliation with the Radio Society of Great Britain.**

Correspondence with Clubs should be addressed to the Secretaries direct in every case unless otherwise stated.

North Middlesex Wireless Club.*

Hon. Secretary, Mr. E. M. Savage, "Nithsdale," Eversley Park Road, Winchmore Hill, N.21.

The 108th meeting of the North Middlesex Wireless Club was held on Wednesday, February 7th, at Shaftesbury Hall, Bowes Park, Mr. Symons being in the chair. Mr. Dixon gave his lecture on "Various Instruments used in Wireless Work."

The Radio Society of Highgate.*

Hon. Secretary, Mr. J. F. Stanley, B.Sc., A.C.G.I., 49, Cholmeley Park, Highgate, N.6.

On Friday, February 2nd, a lecture was given by Mr. H. Andrewes, B.Sc., on "Secondary Cells."

The Hon. Secretary will be pleased to give full particulars of the Society to any lady or gentleman in the district who is at all interested in wireless, either from an experimental or broadcasting point of view.

Smethwick Wireless Society*

Hon. Secretary, Mr. R. H. Parker, F.C.S., Radio House, Wilson Rd., Smethwick, Staffs. At a large gathering of members on Jan. 26, the Secretary, who was the delegate at the last Conference of affiliated societies, gave a report of the proceedings.

At a meeting held on February 2nd, Mr. Leslie Carter, M.Inst.Mech., F.C.S., F.Inst.P. (a committee member), gave a most interesting lecture on "Non-ferrous Metals and Wireless, with Special Reference to Wireless Aerials." Judging by the discussion which followed, the lecture was greatly appreciated.

A meeting was held in the Society's headquarters, the Technical Institute, on Friday, February 9th, Mr. L. Carter in the chair. After the usual business the chairman called upon Mr. Lee to give his report on the visit to the Birmingham Broadcasting Station, **5 ZT**, kindly arranged by the Secretary.

The Belvedere and District Radio and Scientific Society.*

Hon. Secretary, Mr. S. G. Meadows, 1, Kentish Road, Belvedere, Kent.

At the twenty-first meeting of the Belvedere and District Radio Society, held on Friday, February 19th, at the Erith Technical Institute, the evening was devoted to a discussion on "The Proposed Transmitting Apparatus." The whole of the apparatus is being made by the equipment engineer.

The Cowes District Radio and Research Society.*

Hon Secretary, Mr. J. W. L. Ingram, 1, Mill Hill Road, Cowes, I.W.

The formal opening of the Society's new Headquarters, at the Gloster Restaurant, took place on Wednesday, January 31st. The meeting, being open to the public, resulted in a crowded attendance. Sir Godfrey Baring, the newly-elected President, made his first appearance at a club meeting.

A demonstration of broadcast reception followed, to the great enjoyment of the company. A five-valve set, constructed by Mr. Mugliston, was used for this purpose, and **2 LO** was successfully received.

Ipswich and District Radio Society.*

Hon. Secretary, Mr. H. E. Barbrook, 46, Foundation Street, Ispwich.

At a recent meeting of the Ipswich and District Wireless Society it was unanimously resolved to change the title of the Society to the above.

A general meeting of the Society was held on Monday, February 19th, at 55, Fonnereau Road. It was opened by Mr. Akester, Chairman of the sub-committee, who had been elected to enquire into the Society's rules.

Owing to the steady growth of the Society, the rules which had sufficed for the preceding year were found to be totally inadequate, and several amendments were made.

A meeting of the Society was held on February 12th, a lecture being delivered by the President, S. A. Notcutt, Esq., B.A., B.Sc., LL.D., whose subject was "Electricity and Magnetism and its Allied Phenomena."

The West London Wireless and Experimental Association.*

Hon. Secretary, Mr. Horace W. Cotton, 19, Bushey Road, Harlington, Middlesex. Club Rooms: Acton and Chiswick Polytechnic, Bath Road, Chiswick.

At a meeting held on February 13th, Mr. F. E. Studt gave a paper on "Elementary Principles of Wireless" (Part 1), which was very acceptable to recently enrolled members.

A concert is to be arranged shortly so that members may have a musical evening with their friends. Particulars will be announced later. The Secretary will have much pleasure in replying to all applications for particulars of membership, and objects of the Association.

The Radio Society of Highgate.*

Hon. Secretary, Mr. J. F. Stanley, B.Sc., A.C.G.I., 49, Cholmeley Park, Highgate, N.6.

A lecture was given on February 9th by Mr. F. L. Hogg on "How to get the Best Out of Your Set."

The Society has had the misfortune to lose its Vice-Chairman, Mr. L. Grinstead, who has removed from the district, and at a general meeting held on February 16th, Mr. P. H. Youngman was elected in his place.

An attractive programme for the next three months has been drawn up, and includes a special series of elementary lectures on theory of wireless reception and the construction of apparatus suitable for the reception of broadcasting. This series will start on Friday, March 16th, at the 1919 Club, Highgate, at 7.45. Meetings are held at the same time and place every Friday.

Particulars of the Society and a full programme of lectures may be obtained from the Hon. Secretary.

Exeter and District Wireless Society.*

Hon. Secretary, Mr. F. S. Valentine, 10, College Avenue, Exeter.

A lecture was given before the above Society on February 8th, by Mr. Smitham, on "The Uses of Reaction," with special reference to the requirements of the Postmaster-General.

Meetings are held on Mondays at 7.15 p.m., and intending members are cordially invited to communicate with the Secretary.

The Wireless and Experimental Association.*

Hon. Secretary, Mr. Geo. Sutton, 557, Lordship Lane, S.E.22. Assistant Hon. Secretary, Mr. G. H. Horwood, 557, Lordship Lane, S.E.22.

At the meeting of the Wireless and Experimental Association, held at the Central Hall, Peckham, on January 31st, Mr. Voigt described some experiments which he had carried out.

The meeting held at the Central Hall, Peckham, on February 14th, was so crowded that several members had to stand round the room.

More ample accommodation has at last been secured at the Camberwell Library, and the Association will "move in" as soon as possible.

Birmingham Experimental Wireless Club.*

Hon. Secretary, Mr. A. Leslie Lancaster, c/o Messrs. Lancaster Bros. & Co., Shadwell Street, Birmingham.

On February 9th, at the Digbeth Institute, a very interesting meeting was held, discussions taking place on many wireless topics and difficulties.

Sheffield and District Wireless Society.*

Hon. Secretary, Mr. L. H. Crowther, A.M.I.E.E., 18, Linden Avenue, Woodseats, Sheffield.

At the weekly meeting of the Society held on February 16th, a paper was read by Mr. A. F. Carter, of Leeds, dealing with some of the comparisons between power engineering practices and wireless work.

The Wireless Society of Hull and District.*

Hon. Secretary, 79, Balfour Street, Hull.

There was a satisfactory attendance of members at the meeting on February 12th, when Mr. J. Brazendale delivered a lecture entitled "The Construction of a Single Valve Set and Note Magnifier."

All wireless enthusiasts in Hull and District are strongly recommended to join the Society. Full particulars of membership can be obtained from the Hon. Secretary.

Hackney and District Radio Society.*

Hon. Secretary, Mr. Charles Phillips, 247, Evering Road, Upper Clapton, E.5. (Letters only.)

The Society held its usual weekly meeting on Thursday, February 15th, at its premises at the Y.M.C.A., Mare Street, Hackney, the Chairman, Mr. H. A. Epton, presiding.

After the formal business had been dealt with, when several new members were elected, three "waistcoat pocket" talks were given by Messrs. Kierman, Francis and Bell, on their experiences with radio.

The Clapham Park Wireless Society.

Hon. Secretary, Mr. J. C. Elvy, A.M.I.E.E., 12, Tavistock Street, Strand.

The seventeenth general meeting of the Society was held on January 3rd.

Mr. A. E. Radburn, the Chairman, introduced Mr. Hope-Jones and Mr. Leslie McMichael, Chairman and Hon. Secretary respectively of the Radio Society of Great Britain, who had been persuaded by Mr. Elvy to attend with a view to clearing up any questions at issue with regard to affiliation.

To allow of fullest possible attendance, Mr. McMichael graciously consented to Mr. Hope-Jones' suggestion to occupy the intervening minutes by giving an account of their activities in the Atlantic transmissions.

The Chairman of the Clapham Society then called upon the two visitors to give an exposition of the working and organisation of the Radio Society of Great Britain, and facilities that would accrue by affiliation. Both Mr. Hope-Jones and Mr. L. McMichael were subjected to a keen fire of questions, which they welcomed, all questions being answered to the full satisfaction of those present.

The visitors having taken their leave, the question of affiliation was proceeded with. The result was a unanimous decision in favour of affiliation by the members present.

The eighteenth general meeting took place on January 10th at headquarters, Mr. A. L. Beedles occupying the chair, when Mr. Gallard led a discussion for amateurs only, with the aid of blackboard diagrams, on fundamental points of wireless,

The next meeting was held on January 24th, Mr. A. E. Radburn being the Chairman.

Mr. Hurst opened discussion on affiliation preparatory to voting, and the subject was again discussed.

The Society's aerial then came under review, Mr. Daniels promising a second demonstration in the near future by his friend, Mr. Ayres, of 2 QD transmitting station, when the aerial was perfected.

At the twentieth general meeting, held on January 31st, under the chairmanship of Mr. J. G. Hurst, Mr. Richardson reported on the question of aerial improvement.

Fulham and Chelsea Amateur Radio and Social Society.

Hon. Secretary, Mr. W. Roberts, 5, Normand Gardens, S.W.6.

Mr. Roberts having applied for assistance in his secretarial duties, Mr. R. G. Smith has been elected assistant secretary.

On January 23rd, the Chairman (Mr. Witts) called upon Mr. Hayden to give a short report on the progress of the construction of the Society's aerial.

On January 20th a lecture and demonstration was delivered by the Assistant Secretary on the Armstrong Super-Regenerative receiver, single valve, with one low frequency amplifying stage.

On February 6th a demonstration of a three-valve set, one detector, two low frequency amplifiers, was given by Mr. Caola.

The Society's aerial is now ready for use, and the apparatus is in the course of construction. A programme of lectures and demonstrations is in preparation, and members wishing to participate in these should communicate with the Hon. Secretary.

Beckenham and District Radio Society.

Hon. Secretary, Mr. J. F. Butterfield, 10, The Close, Elmers End.

On February 1st the Society held its first meeting at their new headquarters, the United Services Hut, High Street, Beckenham. A demonstration was given as a suitable start off on a four-valve low-frequency amplifying set.

Mount Pleasant Radio Society.

Hon. Secretary, Mr. W. R. Fleming, 156, Upton Park Road, Forest Gate, E.7.

The above Society held a meeting at the Lecture Hall, 21a, John Street, Theobalds Road, London, W.C.1., on Saturday, February 3rd, when Mr. W. D. Keiller gave a very interesting lecture on "Induction." He commenced with the phenomena of the lines of force around a conductor, leading up to the inductive effect of the loose coupler.

The meeting terminated with a few items from **2 LO** on the Society's apparatus.

The Rhondda Wireless Enthusiasts' Society.

Hon. Secretary, Mr. R. Evans, 69, William Street, Ystrad-Rhondda, Glam.

A highly successful and well-attended whist drive and dance, promoted by the Rhondda Wireless Enthusiasts' Society, was held at St. David's Hall, Ton Pentre, on Monday evening, February 5th. This Society, which has been in existence since June, 1922, is the pioneer wireless society of the Rhondda, and has continued to hold priority both as regards the apparatus possessed, and the enthusiasm of its members. The Society meets on Wednesday evenings at headquarters, the Brodringallt Girls' School, Ystrad-Rhondda. Intending members should write for particulars to the Secretary.

Hoylake, West Kirby and District Wireless Association.

Hon. Secretary, Mr. J. D. Wood, 7, Grosvenor Road, Hoylake, Cheshire.

There was a large gathering of members of the local wireless association and their lady friends at the Green Lodge Hotel on Monday evening, February 5th, when a special ladies' night was held.

An excellent musical entertainment, consisting of humorous monologues and pianoforte and violoncello selections was provided by Mr. J. E. Corlett and his talented young daughters, every item of which was heartily applauded.

Through the courtesy of Mr. G. V. Wall, of West Kirby, who had kindly brought his large six-valve wireless receiving set with loud speaker, all present were enabled to listen-in to selections at intervals from the programme being broadcasted by wireless from **2 ZY**, the Manchester station of the British Broadcasting Company.

The Pudsey and District Radio Society.

Hon. Secretary, Mr. W. G. A. Daniels, 21, The Wharrels, Lowtown, Pudsey.

A meeting was held on Monday, February 5th, at the club room.

After the usual business had been transacted, the Chairman, Mr. F. Wild, tendered an invitation to any gentleman to give a "ten-minute" talk on some interesting subject, such as the description of their sets at home. Several gentlemen responded, and a very enjoyable evening ensued.

The question of an aerial for the use of the Society was then brought forward, and a discussion followed. At length it was decided that an aerial of the single wire type was, from the experience of those present, most suitable for the Society's requirements.

Ladies or gentlemen wishing to become members should communicate with the Secretary. The meetings are held on the first and third Mondays in the month, at 8 p.m.

Felixstowe and District Radio Society.

Hon. Secretary, Mr. E. Cork, 3, Highfield Road.

The Society is still progressing, and the receipt of the experimental licence has added interest to the busy weekly meetings.

On Friday, March 2nd, 7.30 to 10 p.m., at the Society's headquarters, a public exhibition and demonstration of wireless apparatus was given.

The North London Wireless Association.

Hon. Secretary, Mr. V. J. Hinkley, Northern Polytechnic Institute, Holloway Road, N.7.

At a meeting of the Association, held on Monday, February 5th, a lecture on "The Neon Lamp and its Use in the Production of Oscillations," was given by Mr. E. H. Robinson.

The lecturer gave a description of the construction of the lamp and its ordinary uses. He then went on to show how it could be included in a circuit to enable currents of an oscillatory nature to be produced.

On this occasion seven new members were elected.

The Ilford and District Radio Society.

Hon. Secretary, Mr. A. E. Gregory, 77, Khedive Road, Forest Gate, E.7.

On February 8th Mr. C. G. Rope lectured on "Accumulators." In view of the trouble that is often experienced with accumulators, Mr. Rope's remarks with reference to "frothing," sulphating, etc., were greatly appreciated.

Isle of Man Radio Society.

Joint Hon. Secretaries: Mr. J. S. Craine, 6, Belmont Terrace, and Mr. J. P. Johnson, 16, Hildesley Road, Douglas.

A well-attended meeting was held on February 19th, at the Secondary School, Douglas, Mr. H. Colebourne presiding. After the opening business, the chairman called upon Mr. P. J. Johnson to address the meeting on "The Valve as a Detector." Mr. Johnson illustrated his very capable address by a large number of clear diagrams.

Wireless in the Territorial Army

The following notice has been sent to The Wireless World and Radio Review *through the Divisional Chief Signal Officer, Eastern and London Commands, T.A., Lt.-Col. J. Waley Cohen, in order that it may receive publication and so be brought to the notice of our readers.*

UNDER a recent decision of the military authorities, wireless has assumed a position of great importance in the signal organisation of the Territorial Army. This development should be of considerable interest to members of the Amateur Wireless Societies. Most of these gentlemen have Post Office licences themselves or are working with friends who have them, but the great majority of these licences only allow for reception and the interception of broadcasting. Younger members of the Amateur Societies who join the Royal Corps of Signals (Territorial Army) will find there opportunities for a great deal of wireless work which should be of use to them in maintaining their own sets: and in other directions they will gain technical experience which is beyond the reach of the ordinary amateur.

Regular courses of lectures by experts, both officers and non-commissioned officers, are included in the training programmes of all Territorial Signal Units: these lectures should be of great use to the amateur.

In addition many pamphlets with information and reference to new developments circulate to T.A. Signal Units as and when they are published.

Signal Units of the Territorial Army are equipped with modern valve wireless sets of various types, and have special wavelengths reserved for them for sending and receiving. At annual training in camp, and at Headquarters throughout the year, the wireless operator gains practical experience in sending, and in tuning transmitting sets, as well as in reception and operating procedure. The practical experience of learning wireless procedure should be of considerable advantage to the amateur in helping him to unravel and distinguish the various signals which he intercepts apart from the broadcast telephony. In addition, the amateur will get opportunity to learn and practice the Morse alphabet.

The camp training, including as it does transmission and reception and the rapid erection and dismantling of stations connected with operations, should give the wireless operator great scope and interest. He learns, in addition, to charge and maintain accumulators.

A glance at the Army List will show that there are 14 Divisions and a Cavalry Division in the Territorial Army, each with its Signal Unit. When it is realised that each Division has an establishment of 25 wireless sets and 80 operators, it will be seen that there is considerable scope in the Territorial Army for the wireless amateur who is ready to help his country and is not averse at the same time to benefiting himself.

Most units still have vacancies for wireless operators, and now is a very good time for recruits to join, as the training season is just starting, and there is comfortable time to get through the preliminary training and recruit drills before annual training.

The liability for a man joining the Territorial Army is:—

4 years' service.
40 Drills in the first year.
20 Drills in each subsequent year.
Annual training in camp of 15 days.

Detailed information about the annual bounty, rates of pay during camp, scale of free uniform and equipment, etc., can be obtained at any of the Divisional Signal Headquarters given below. Any amateurs interested in the question, who care to call at any of these Headquarters, can see the types of wireless sending and receiving sets in use. It is advisable to make an appointment beforehand, by writing to the Adjutant of the Division Signals concerned.

Headquarters of Divisional Signals, Territorial Army.

London District.

2nd Cavalry Division, Duke of York's Headquarters, Chelsea, S.W.3.

56th (The London) Division, 51, Calthorpe Street, Grays Inn Road, E.C.1.

47th (The London) Division, Fulham House, Putney Bridge, S.W.16.

Eastern Command.

44th (Home Counties) Division, Drill Hall, Stamford Brook Lodge, Ravenscourt Park, W.6.

54th (East Anglian) Division, Bay Lodge, The Green, Stratford, E.15.

Western Command.

53rd (The Welsh) Division, Drill Hall, Park Street, Cardiff.

55th (West Lancashire) Division, Drill Hall, Aspinal Street, Prescot.

42nd (East Lancashire) Division, Drill Hall, Burlington Street, Manchester.

Northern Command.

50th (The Northumbrian) Division, Drill Hall, Elmgrove Terrace, Gateshead.

49th (The West Riding) Division, Gibraltar Barracks, Leeds.

46th (The North Midland) Division, Drill Hall, Phœnix Street, Derby.

Southern Command.

48th (The South Midland) Division, The Barracks, Great Brook Street, Birmingham.

43rd (The Wessex Division), The Priory, The Friars, Exeter.

Scottish Command.

51st (The Highland) Division, Fonthill Barracks, Aberdeen.

52nd (The Lowland) Division, 21, Jardine Street, Glasgow.

I cannot help feeling that a close liaison between the Amateur Wireless Societies and the Divisional Signal Unit of the District would result in much mutual benefit.

Notes

2 LO Reduces its Power.

The London Broadcasting Station states that at the request of the Air Ministry a slight reduction in power has been made for the special transmissions during the afternoon in connection with the *Daily Mail* Ideal Home Exhibition.

Important Empire Wireless Decision.

Mr. Bonar Law made a timely announcement in the House of Commons on March 6th regarding the Government's plans in connection with the projected Empire wireless chain. In replying to Mr. Hurd (Frome, U.), the Prime Minister intimated that it was not considered necessary any longer to exclude private enterprise from participation in wireless telegraphy within the Empire. Licences are therefore to be issued for the erection of wireless stations in this country for communication with the Dominions, Colonies and foreign countries. In the interests of national security, however, a similar station will be erected which will be owned and operated by the State.

The new decision of the Government will lead to considerable extensions in the activities of the Marconi Company. In a statement to a representative of the *Times*, Mr. Godfrey Isaacs said that, provided it was not held up by delay in the actual granting of the licences, the Company was ready to go ahead within 24 hours with the erection in this country of five high-power stations at a cost of approximately £2,000,000, to conduct telegraph services with all the other capitals of Europe, similar to that being carried on to-day between London and Paris.

The total sum which the Marconi Company, together with its associated companies, will now spend in erecting stations at home and abroad, will probably approach £6,000,000. The bulk of the material must come from the home country, and the company contemplates being able to give a considerable amount of employment, both directly and indirectly.

Broadcasting and Experimental Work.

The effect of broadcasting on experimental work was discussed at the usual monthly meeting of the Kensington Radio Society on Thursday, March 9th, when the members were invited by the President to express any views that they had on the subject, together with suggestions for the improvement of their conditions.

Certain proposals of a practical character were put forward, and a resolution passed that they should be submitted to the Radio Society of Great Britain, with a request that they should be considered by that Society with a view to incorporating them, together with any others that may be received from affiliated societies throughout the country, to both the General Post Office and the British Broadcasting Company.

New Army Call Letters.

The call letters **GGB** and **GGC**, we are informed, have been allotted to the army stations at Aldershot and Cologne respectively.

Radio and the Deaf.

Much interest and speculation have been aroused by the "miracles" wrought on deaf persons who have attempted to listen-in. To enable sufferers to test the results for themselves, the British Thomson-Houston Company last week placed special facilities at their disposal, and all deaf persons were invited to listen in at Crown House, Aldwych. By means of a crystal receiver and eight pairs of head phones a number of guests each day are able to hear the wireless concerts broadcast from **2 LO** between 3 and 4 p.m. It is understood that the results were gratifying in nearly every case.

London Broadcasting Heard in Massachusetts.

The British Broadcasting Company have received a letter from a correspondent in Massachusetts who claims to have picked up London **(2 LO)** on February 20th, and listened to the last musical item and the closing down.

New Zealand hears New York.

A cable has been received at Troy, New York, announcing that a concert broadcast from that place had been received in New Zealand, 9,577 miles distant.

A New Filament Resistance.

Messrs. Fuller's United Electric Co., Ltd., Chadwell Heath, in a communication addressed to *The Wireless World and Radio Review*, announce that they are patentees of a filament resistance wound on the tapering principle described in the issue of *The Wireless World and Radio Review* for February 3rd, p. 602, and that this instrument will shortly be marketed.

The Democratic Pastime.

Wireless parts are offered for sale on a number of new stalls which have taken their place among the fruit, meat, and second-hand books in Farringdon Road, London, E.C.

Ealing's Wireless Troubles.

Mystification still reigns in Ealing, it would appear, as to the origin of recent interference to broadcast reception by a local transmitter. An appropriate advertisement in the *Chiswick Times* at once evoked a strong protest from an Ealing resident who owns a transmitting set. His remarks, in which he quotes Mr. G. G. Blake's comments in *The Wireless World and Radio Review*, of February 24th, on the importance of selective tuning arrangements, were reprinted in the *Star*. "There are," he says, "only two persons in Ealing, I believe, with transmission licences, of whom I am one. I never work before 10.30 p.m., and not then if broadcasting is still going on, and I know the same remark applies to the other gentleman." Hence the mystification.

Broadcasting Regulations.

A White Paper was issued on March 7th, containing the text of the licence issued by the Postmaster General to the British Broadcasting Company for the establishing of eight radiotelephonic stations and the transmission therefrom of broadcast matter. The Paper also sets forth the terms of the agreement regarding the broadcasting of news and the agreement made with the Company by the makers of wireless apparatus. The licence to the Broadcasting Company covers the period from November 1st last to January 1st, 1925.

Broadcast Reception on Aeroplanes.

Tests were made by Mr. N. D. Bryce and Mr. G. C. Shere in conjunction with Captain Greer and Captain Game of the Instone Air Line. who kindly lent the machine, on the reception of broadcasting on aeroplanes. Using the Burndept "Ethophone V," which makes use of reaction in a manner approved by the Post Office, good reception was obtained from **2LO** at a height of 1,200 feet over Croydon.

Book Received

Rapport Annuel sur les Travaux Effectués par le Bureau Internationale de l'Heure (B.I.H.) en 1922 (3e année). Par M. G. Bigourdain. Directeur. (Paris: Gauthier-Villars et Cie, Quai des Grands Augustins, 55. Price 1 franc).

La Radiophone, Vol I. No. 1. (Brussels: 9, Rue Maximilien. Price 50 centimes).

Correspondence.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—Further to my letter of yesterday's date re the reception of **WGY** on my single valve home-made set.

I again received **WGY** between the hours of 1.50 and 3.10 a.m. this morning.

This station transmitted the Gilbert and Sullivan Opera "The Pirates of Penzance" complete.

After this transmission, which ended at 3.10 a.m., the announcer asked for criticism on the transmission and directed critics to address their communications to **WGY**, The General Electric Broadcasting Station, Connecticut, U.S.A.

Before closing down the announcer said that the outstanding feature of this week's programme, to come, will be the broadcasting of a drama by the **WGY** players.

The whole of the Opera was received perfectly word for word. During the last half hour of the transmission it was possible to hear same with 'phones four inches away from the head. My set is open to examination or demonstration to any of your representatives at any time, and I can guarantee to receive **WGY** *any night* in the week.

J. H. BRITTAIN.

SHORT WAVE TRANSMISSION.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—It may interest some of your readers to have the result of a trial I made the other day of a wavelength of 100 metres. The signals were strongly and clearly heard by a friend of mine at Geneva. The input power was 50 watts, the aerial current 1 ampere. The gear was very hurriedly rigged up, the aerial being a single wire 45 ft. long, with a rather doubtful lead-in tube; there was a bad snowstorm going on at the time of transmission. I think that if insulation had been better, and the transmitter more carefully adjusted considerably more than 1 ampere could have been put into aerial on 50 watts.

The distance to Geneva from here is about 750 miles, and the receiver used was a two-valve one.

H. H. T. BURBURY.

Crigglestone,
Near Wakefield.
February 26th, 1923.

Calendar of Current Events

Saturday, March 17th.

Manchester All-British Wireless Exhibition. At Burlington Hall, Burlington Street. Opening Day (March 17th to 24th).

Sunday, March 18th.

From 3 to 5 p.m. Dutch Concert from **PCGG**, The Hague, on 1,050 metres.

Monday, March 19th.

At 9.20 to 10.20 p.m. Dutch concert from **PCGG**, The Hague, on 1,050 metres.

IPSWICH AND DISTRICT WIRELESS SOCIETY.

At 8 p.m. At 55, Fonnereau Road. Meeting.

Tuesday, March 20th.

PLYMOUTH WIRELESS AND SCIENTIFIC SOCIETY.

At 7.30 p.m. Lecture: "The Electron Theory." By Mr. Lock.

Wednesday, March 21st.

MANCHESTER WIRELESS SOCIETY.

At 7.30 p.m. In the Council Chamber, Houldsworth Hall. Lecture: "The Story of Communications." By Dr. Hodgson, F.R.C.S., L.R.C.P.

EDINBURGH AND DISTRICT RADIO SOCIETY.

At 8 p.m. At R.S.S.A. Hall. Lecture: "X-Rays." By Mr. A. M. Martin.

HALIFAX WIRELESS CLUB AND RADIO SCIENTIFIC SOCIETY.

Lecture by Mr. P. Denison.

Thursday, March 22nd.

At 9.20 to 10.20 p.m. Dutch Concert from **PCGG**, The Hague, on 1,050 metres.

LUTON WIRELESS SOCIETY.

At 8 p.m. At Hitchin Road Boys' School. Exhibit and Demonstration. By Mr. H. S. Barber.

ILFORD AND DISTRICT RADIO SOCIETY.

Lecture: "Light-wave messages from the Stars." By Mr. Adams, F.R.A.S.

Friday, March 23rd.

SHEFFIELD AND DISTRICT WIRELESS SOCIETY.

At 7.30 p.m. At Dept. of Applied Science, St. George's Square. Elementary Class conducted by Mr. J. C. Jackson, B.Sc.

LEEDS AND DISTRICT AMATEUR WIRELESS SOCIETY.

Lecture: "Construction of Intervalve Impedance Coils." By Mr. S. Kniveton, F.R.Met.Soc.

RADIO SOCIETY OF HIGHGATE.

Lecture: "Construction of Tuners." By Mr. J. F. Stanley.

BROADCASTING STATIONS.

Regular evening programmes, details of which appear in the daily press, are now conducted from the following stations of the British Broadcasting Company:—

London	2LO	369 metres.
Birmingham	5IT	420 ,,
Manchester	2ZY	385 ,,
Newcastle	5NO	400 ,,
Cardiff	5WA	395 ,,
Glasgow	5SC	415 ,,

The Transatlantic Tests.

SUMMARISED REPORT OF BRITISH RECEPTIONS.

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

(*Continued from page 774 of previous issue.*)

The number of stations heard (with code words during the individual transmissions) from each district may be compared with the total number of entrants from that district by the figures in Table III. The number of entrants was determined by the ability of those stations to signal over at least 1,200 miles during the preliminary tests which were held in October and November last. It will be particularly noted that 29 per cent., or nearly one-third of the total number were received, the falling off in the number from the more distant stations accounting for the drop as compared with those near the Atlantic coast. The 66·6 per cent. from the first district is particularly noteworthy.

TABLE III.

Comparison of number of stations heard (verified individual transmissions), with total number of entrants.

No. of District.	No. of Stations heard (individual transmissions only).	No. of entrants.	Percentage of entrants heard.
			per cent.
1	20	30	66·6
2	24	42	57·1
3	15	26	57·7
4	5	15	33·3
5	2	37	5·4
6	1	22	4·5
7	0	4	0·0
8	21	70	30·0
9	5	70	7.1
Canada	1	8	12.5
Total . .	94	324	29

Some of the stations heard signalled to the effect that they would try radiotelephone transmission. In most of these tests it was reported that their carrier wave could be heard quite strongly, but that the percentage modulation was too small to enable the voice to be heard when the local heterodyne was switched off. In a few instances, however, reports were sent in to the effect that the 'phone transmissions were heard. The stations thus reported were :—**2 EL 2 XAP 2 ZK**

The positions of these stations, and as many as possible of those set out in Table II, are marked on the map given in Fig. 2, which is plotted to a larger scale than Fig. 1, and on a more usual projection.

In connection with these stations heard making the individual transmissions with code words, it should be noted that several discrepancies have been observed. In fact, many listeners complained of the very careless sending of some stations. For instance, **1 AGK** often sent his call as **1 AKG**, and was, in fact, accidentally reported in this manner on one occasion. **2 UD** sometimes sent his call as **D2U**, the spacing being bad, while **8 AQO**, who produced extremely powerful signals here, practically always sent his code word as **PQPPG** instead of **FQPPG**. The regularity with which these and similar errors were reported show that they did not arise from careless reception. Apparently **1 BET** only sent his proper call sign once or twice during the whole duration of the tests, since he was always reported as sending "Test Test de **UWXXI UWXXI**, etc.," **UWXXI** being his code word. Many stations also continued repeating their code words over and over again for prolonged periods before giving their call signs, and omitting all spaces between the successive repetitions of the code word. Thus listeners on this side had no idea where the code word began and ended, and several were reported with the letters in the wrong sequence from this reason.

This style of transmission caused unnecessary delays in receiving the stations, since everyone was naturally loth to tune on to another station before completing the reception of call and code word from the one, and, in the opinion of many amateurs here, more stations would have been logged if only *every* transmitter had kept rigidly to the transmission scheme :—

"Test Test Test de (call letters, 3 times) (code words, 3 times), (break sign)," repeated as often as necessary.

On the best nights of the tests the aether was so full of signals that it was not possible to log more than a small proportion of the total for the above reasons.

In addition to the above-mentioned difficulty most listeners in this country were hampered to a greater or lesser extent, depending upon their locality, by harmonics from various high-power stations. Of these, of course, the most complained of from all parts were Leafield and Northolt, with their multitudes of harmonics and "hash" bands in the short wave regions. Stonehaven was also troublesome to some, as were also the very bad spark harmonics from **FFU** (Ouessant, France) and from the short wave spark transmissions. On one occasion "SOS" calls from Niton and **FFU** on spark jammed out American signals for some time. Many listeners in the neighbourhood of London, in particular, found it quite impossible to receive anything on wavelengths near 200 metres until after Northolt had finished its press transmissions, usually about 3 a.m. Thus, to them, half the test period each night was completely spoilt.

During the "free-for-all" periods each night—*i.e.*, between midnight and 0230 G.M.T.—the successive 15-minute periods were allocated in turn to the various districts and to Canada. During these periods some of the stations made use of the code words which had been allocated to them for the individual transmissions, and these, when reported, made an additional check on the receptions. Many stations, however, were heard

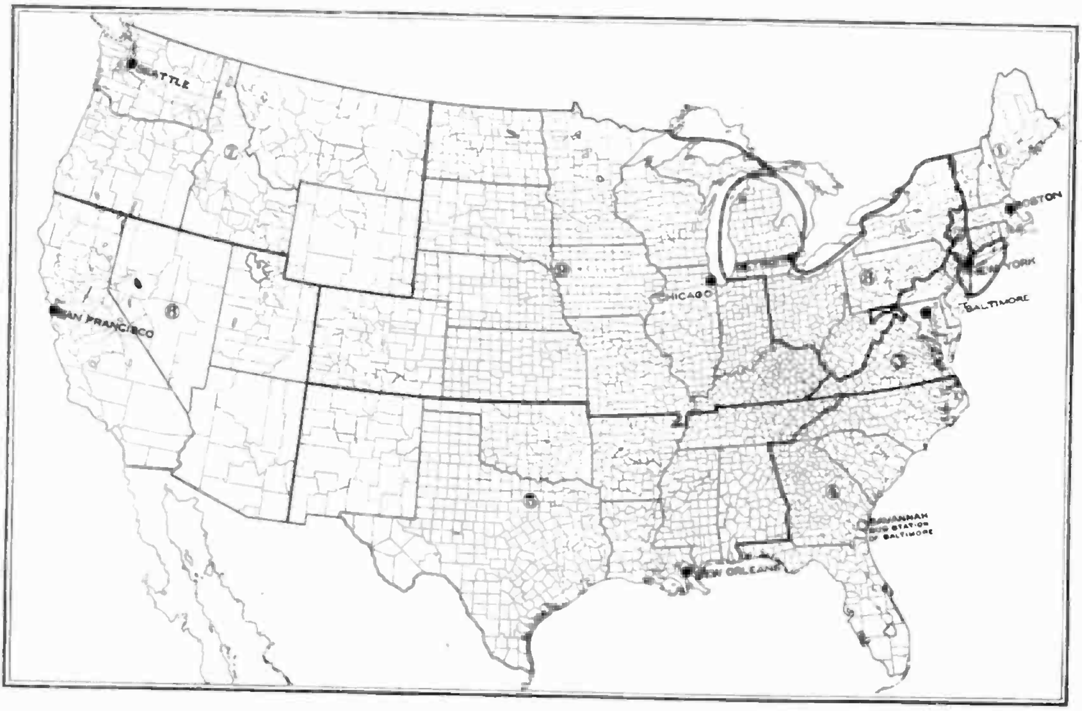

Fig. 2. A map of the United States of America showing the division into Radio Inspection Districts. The numbers prefixing the call signs of American Amateur Transmitting Stations relate to the district in which they are located.

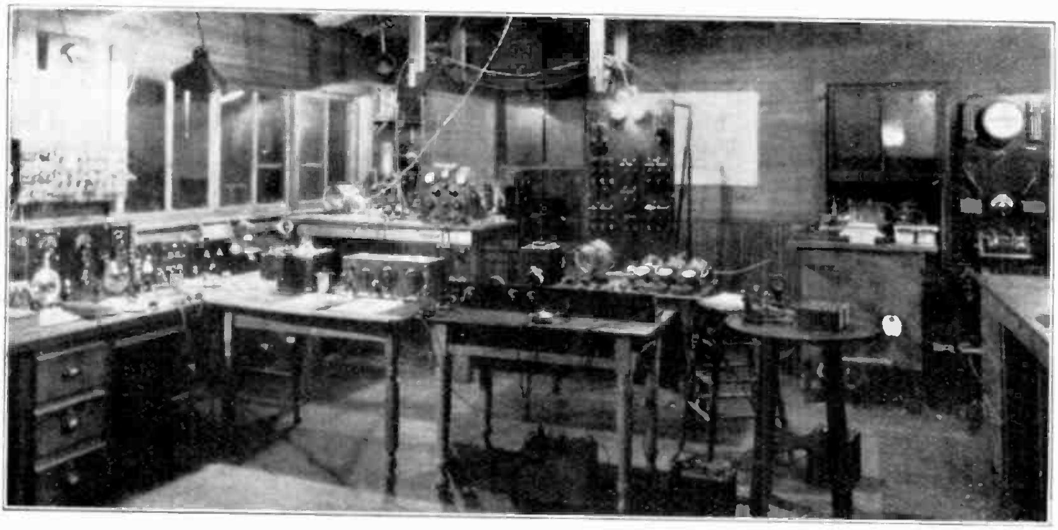

Photo: Courtesy The American Radio Relay League.

The apparatus in the centre background is that of **8 AQO**, *on the left is* **8 BSS**, *and on the right by the window,* **8XH**. *The equipment is operated by Mr. C. B. Meredith.*

TABLE IV.

Stations heard making "Test" transmissions at schedule times during the "free-for-all" periods.

In this Table the column headed "No." gives the Total No. of times that the station was reported during total Free-for-all periods during Tests, this being the sum of the number of reports from *different* observing stations on each night.

First District.

Call Letters.	No.	Call Letters.	No.
1 ADL	3	1 BW	1
1 AGK	1	1 BX	1
1 AJP	3	1 CBR	1
1 AK	1	1 CDK	1
1 AN	1	1 CKG	2
1 ARQ	1	1 CKP	4
1 ARY	1	1 CMK	9
1 ASF	1	1 CNF	2
1 AZW	2	1 CUF	1
1 BAS	1	1 GV	1
1 BCF	2	1 GX	1
1 BCG	2	1 II	9
1 BDI	6	1 KW	1
1 BDT	17	1 MV	1
1 BEP	2	1 OR	3
1 BES	5	1 TOK	1
1 BET	8	1 XK	1
1 BFQ	1	1 XM	6
1 BKA	1	1 XNT	1
1 BN	1	1 XU	1
1 BNT	1	1 YK	1
1 BRQ	5	1 ZE	2

Second District.

Call Letters.	No.	Call Letters.	No.
2 AFP	1	2 CQZ	4
2 AWF	3	2 CRB	1
2 AWL	3	2 EL	5
2 AYV	2	2 FP	15
2 BBB	1	2 GJ	1
2 BMC	1	2 GK	5
2 BML	5	2 HJ	1
2 BLP	3	2 HW	1
2 BQN	1	2 IG	1
2 BQT	1	2 KW	2
2 BQU	2	2 LO	3
2 BRB	1	2 LY	1
2 BYS	1	2 NN	1
2 CBX	3	2 NX	6
2 CHH	2	2 PR	1
2 CJN	2	2 UD	2
2 CJW	1	2 XAD	1
2 CKM	1	2 XAO	4
2 CKR	9	2 XAP	3
2 CMZ	1	2 YK	1
2 CP	1	2 ZK	3
2 CPD	3	2 ZS	2

Third District.

Call Letters.	No.	Call Letters.	No.
3 AFB	2	3 DM	1
3 AQR	2	3 HG	10
3 AUU	1	3 HQ	1
3 BF	1	3 JJ	1
3 BFU	2	3 MX	1
3 BG	1	3 OE	1
3 BGJ	1	3 SG	1
3 BGT	5	3 XM	2
3 BLF	3	3 YO	1
3 BNU	3	3 ZW	7
3 BVC	2	3 ZY	1
3 CC	2	3 ZZ	1
3 CG	1		

Fourth District.

4 EA	4	4 OI	1
4 EB	1	4 ZS	1
4 FN	1	4 ZW	1

Fifth District.

5 NK	1	5 XR	1
5 XK	1		

Eighth District.

8 AQO	16	8 BUM	7
8 ATF	1	8 BXF	1
8 AW	1	8 CJH	2
8 AWP	1	8 DKX	1
8 AXC	3	8 UE	1
8 BBT	1	8 XAE	1
8 BK	1		

Ninth District.

9 CM	1

Canadian.

3 CO	1

who did not take part in the individual transmissions and therefore had no code words. These simply sent signals in the form, "Test Test Test de (call letters 3 times)," and the only check on these receptions was that they were heard at the correct times that belonged to the particular district in which the station was situated.

In Table IV is set out a list of those stations which were heard making the above type of transmissions at the proper schedule times. Other calls—DX work, etc.—reported during these and the individual periods are not included in this table.

Many of the stations listed in the above Table (IV) were also heard making other transmissions and calling up various U.S. stations. These extra transmissions are not included in this Table.

A very good indication of the variation in the transmission quality from one night to another may be gathered by tabulating the number of observers who heard the various stations reported during the "individual" transmissions on each night of the test. This information is set out in Table V, the first column of which gives the call letters of the stations, alphabetically arranged in

TABLE V.

Summarised results of receptions of "Individual" Transmissions with Code Words.

NOTE.—In a few cases parts of the code words were jammed or incorrectly sent, or the calls were omitted, as described in the text, but these results have been included here when sufficient evidence was furnished in the report to reasonably verify the reception; D indicates reception in Holland.

Call Letters	Number of Times Reported by Different Observing Stations.										
	Dec. 12th	Dec. 13th	Dec. 14th	Dec. 15th	Dec. 16th	Dec. 17th	Dec. 18th	Dec. 19th	Dec. 20th	Dec. 21st	Total.
First District :—											
1 AGK ..	0	0	0	0	0	0	2	3	0	0	5
1 AHZ ..	0	0	0	0	0	0	0	0	1	0	1
1 AJP ..	0	2	2+D	0	0	0	0	4	1	0	10
1 ASF ..	0	0	0	0	0	0	4+D	7	2	1	15
1 AZW ..	0	0	0	0	0	1	6	0	0	0	7
1 BCF ..	0	0	0	0	0	0	6	0	4	0	10
1 BCG ..	1	2	0	2	0	0	0	0	0	0	5
1 BDI ..	0	4	11	2	0	0	0	0	0	1	18
1 BEP ..	0	2	0	0	0	0	0	2	5	0	9
1 BET ..	0	0	1+D	0	0	0	9	7	0	0	18
1 BGF ..	1	0	0	0	0	1	0	0	1	1	4
1 BKQ ..	0	0	0	0	0	0	1	0	4	0	5
1 CJA ..	0	0	0	0	0	0	1	0	0	0	1
1 CMK ..	0	0	0	0	0	0	1	0	5	1	6
1 CNF ..	0	0	0	0	0	0	4	4+D	7	0	16
1 FB ..	0	0	0	0	0	0	0	2	2+D	2	7
1 GV ..	0	0	0	0	0	0	2	4	5	3	14
1 XM ..	0	2	1	0	0	0	5+D	9	3+D	1+D	24
1 YK ..	1	0	1	0	0	0	3+D	2	1	3	12
1 ZE ..	0	1	5	2	1	2	0	1	0	0	12
Second District :—											
2 AFP ..	0	0	0	0	0	0	0	0	4	0	4
2 AHO ..	0	2	0	1	0	0	0	1	0	0	4
2 APD ..	0	0	0	0	0	0	0	0	1	0	1
2 AWF ..	1	1	5	0	0	0	7+D	3	4+D	2+D	26
2 AWL ..	0	1	7	2	0	1	6+D	7	7	8	40
2 AYV ..	0	0	0	1	0	0	0	0	0	0	1
2 BML ..	1	2	0	0	D	0	0	5	0	0	9
2 BNZ ..	0	0	0	0	0	0	1	0	0	0	1
2 BQU ..	1	0	2	0	0	0	1	1	2	1	8
2 BRB ..	0	0	0	0	0	0	0	0	1	0	1
2 CKN ..	0	0	0	0	0	0	0	0	4+D	0	5
2 CQZ ..	0	0	0	0	0	0	6	0	9	3	18
2 EL ..	2	1	2	1	0	1	3	6	8	5	29
2 GK ..	1	1	0	0	0	0	9+D	5	7+D	4	29
2 GR ..	1	3	1	0	0	0	0	0	2	0	7
2 HJ ..	0	0	0	0	0	0	0	0	0	D	1
2 HW ..	0	0	1	0	0	0	0	0	0	0	1
2 KF ..	0	0	0	0	0	0	0	0	1	0	1
2 LO ..	0	0	3	0	0	0	9	6	9+D	4	32
2 NZ ..	0	3	5	0	0	0	0	4	0	3	15
2 UD ..	1	0	0	0	0	0	2	0	1	0	4
2 XAP ..	1	0	0	0	0	0	0	3	2	1	7
2 ZK ..	4+D	2	1+D	2	1	2	2	9	0	3	28
2 ZL ..	2	0	0	0	0	0	0	2	2	0	6

TABLE V.—(*continued*).

Call Letters	Number of Times Reported by Different Observing Stations.										
	Dec. 12th	Dec. 13th	Dec. 14th	Dec. 15th	Dec. 16th	Dec. 17th	Dec. 18th	Dec. 19th	Dec. 20th	Dec. 21st	Total
Third District.											
3 AFB ..	0	0	0	0	0	0	2	3	2	0	7
3 AUU ..	0	0	1	0	0	0	4	1	3	1	10
3 BG ..	0	1	2	0	0	0	3	2	3+D	0	12
3 BGT ..	2	0	0	0	0	0	1	0	7	2	12
3 BIJ ..	0	1	0	0	0	0	0	0	0	0	1
3 BLF ..	0	1	1	0	0	0	1	0	0	0	3
3 BNU ..	0	0	0	0	0	0	0	0	6	0	6
3 CC ..	0	0	0	0	0	0	5	0	3	0	8
3 CG ..	0	0	0	0	0	0	0	0	8+D	1	10
3 FS ..	0	0	0	0	0	0	0	0	2	0	2
3 NH ..	0	0	0	0	0	0	1+D	0	1	0	3
3 XM ..	0	1	1	2	0	0	1	1	5	0	11
3 YO ..	0	0	0	0	0	0	0	1	1	0	2
3 ZW ..	1	2	1	0	0	0	3	3	6	1	17
3 ZZ ..	0	0	1	3	0	0	1	1	2+D	0	9
Fourth District.											
4 BY ..	0	1	D	0	0	0	1	0	7+D	0	11
4 EA ..	0	0	0	0	0	0	0	0	2	0	2
4 EB ..	0	0	0	0	0	0	1	0	1	0	2
4 ID ..	0	0	0	0	0	0	0	0	D	0	1
4 KM ..	0	0	0	0	0	0	0	0	4+D	0	5
Fifth District.											
5 FV ..	0	0	0	0	0	0	0	0	1	0	1
5 XK ..	0	0	0	0	0	0	1	0	4+D	0	6
Sixth District.											
6 ZZ ..	0	0	0	0	0	0	D	0	0	0	1
Seventh District.											
— ..	—	—	—	—	—	—	—	—	—	—	0
Eighth District.											
8 AQO ..	3	6	5+D	0	0	0	9	8	11	8	51
8 ATU ..	0	3	1	0	0	1	0	0	3	1	9
8 AWP ..	1	1	0	0	0	0	3	2	6	0	13
8 AWZ ..	0	0	0	0	0	0	0	0	1	0	1
8 AXC ..	0	0	0	0	0	0	0	0	6	0	6
8 BFM ..	0	0	0	0	0	0	0	0	0	1	1
8 BK ..	0	0	0	0	0	0	0	0	4	3	7
8 BNJ ..	0	0	0	0	0	0	0	0	1	0	1
8 BPL ..	0	0	0	0	0	0	0	0	1	0	1
8 BXH ..	0	0	0	0	0	0	0	1	9	1	11
8 IB ..	0	0	0	0	0	0	0	0	9	1	10
8 KG ..	0	0	0	0	0	0	0	0	1	0	1
8 ML ..	0	0	0	0	0	0	0	0	1	0	1

TABLE V.—*(continued)*.

Call Letters	Number of Times Reported by Different Observing Stations.										
	Dec. 12th	Dec. 13th	Dec. 14th	Dec. 15th	Dec. 16th	Dec. 17th	Dec. 18th	Dec. 19th	Dec. 20th	Dec. 21st	Total.
Eighth District (continued).											
8 OW ..	0	0	0	0	0	0	0	0	1	0	1
8 SP ..	0	0	0	0	0	0	3	0	4	1	8
8 UE ..	0	0	0	0	0	0	2	1	7	3	13
8 XE ..	0	1	1	0	0	0	0	0	0	0	2
8 YD ..	0	0	0	0	0	0	0	1	3	1	5
8 ZAF ..	0	0	0	0	0	0	0	0	0	1	1
8 ZW ..	0	0	0	0	0	0	0	0	3	0	3
8 ZZ ..	0	0	0	0	0	0	0	0	1	0	1
Ninth District.											
9 AUL ..	0	0	0	0	0	0	3	0	0	0	3
9 DYN ..	0	0	0	0	0	0	1	0	0	0	1
9 FM ..	0	0	0	0	0	0	0	1	0	0	1
9 XAC ..	0	0	0	0	0	0	2	0	0	0	2
9 ZN ..	0	0	0	0	0	0	D	0	D	0	2
Canada.											
9 AL ..	0	0	0	0	0	0	1	0	2	1	4

districts (this being the same list as already given in Table II), while the figures in the ten remaining columns give the number of British observers who reported the station in question. In these columns also D indicates an additional report from Holland, these reports being indicated in this manner in order to distinguish the different receiving locality. Only one of the two Dutch stations referred to at the opening of this article reported any individual transmissions with code words—the other heard only a few "DX" transmissions.

The indications of the figures in this Table (V) are, however, masked by the fact that the time of transmission from each station varied from night to night, since some parts of the night seem more favourable to transmission, and in many cases, too, to reception, in view of local disturbances from certain transmitting stations. For instance, it may be seen from Table V that several stations were heard during the early part of the tests and were not heard during the best nights—19th-21st. Reference to the transmission schedule shows that in these cases these stations were sending towards the later parts of the periods (4.30 to 5.30 a.m.) for the first days, but that on the last days of the tests they were sending much earlier, such as 1 a.m. These differences would seem to indicate a better transmission for times in the neighbourhood of 4 a.m.; but against this must be set the fact that fewer observers were listening in the early hours of the night due to excessive harmonic jamming from high power stations before about 3 a.m.

It is also interesting to note the marked difference between the number of nights on which some stations were heard as compared with others. This difference would seem to indicate that while good transmission nights, and also the best transmission times on a good night markedly affect the weaker signals, these differences in transmission quality have much less effect upon the better stations. This therefore means that the signals from the best stations were capable of being heard under almost any of the conditions met with during the period of the tests, and that improvements in the transmission quality merely affect the strength of the signals received from these stations. On the best nights and times the signals from the best stations were of extraordinary strength, **8 AQO** in particular being reported by most listeners as being of exceptional strength and readable many feet from the telephone receivers. The nights on which his individual transmissions were not heard his transmission times were earlier than 3 a.m., and therefore came in a very bad period, since during the worst nights of the tests signals were only reported during the last two hours or so before 6 a.m.

(To be concluded)

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VALVES.	
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M.O. " R "	17 6
Cossar —	15 -
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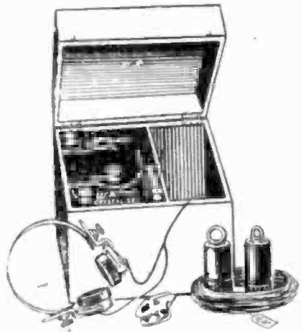

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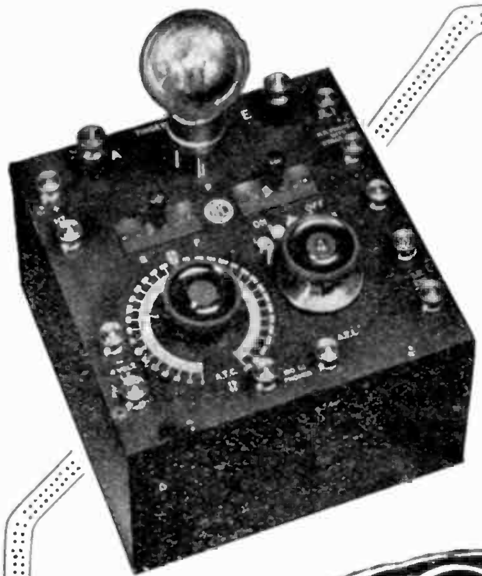

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Questions and Answers

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) Each communication sent in to be accompanied by the "Questions and Answers" coupon to be found in the advertisement columns of the issue current at the time of forwarding the questions. (4) The name and address of the querist, which is for reference and not for publication, to appear at the top of every sheet or sheets, and unless typewritten, this should be in block capitals. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." (5) 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. (6)* **Where a reply through the post is required every question sent in must be accompanied by a postal order for the amount of 1s., or 3s. 6d. for a maximum of four questions.** *(7) Four questions is the maximum which may be sent in at one time.*

"E.L.F." (Southport) *asks whether the electric lighting system of a house may be used as an aerial.*

The electric light system of a house may be used as an aerial provided proper precautions are taken. A fitment is sold by manufacturers for the purpose of plugging into an electric light socket, and we think you may rely upon this being satisfactory. The results will depend largely upon local circumstances, but if it is difficult to erect an outdoor aerial, you should certainly give this method is trial.

"R.I.R.D." (Derby) *submits a diagram of connections, and asks (1) For criticism of circuit. (2) For a diagram of a note magnifier which can be connected to his present receiver without the necessity of rewiring. (3) Is the method of connecting plug-in H.F. transformers submitted standard with manufacturers.*

(1) The diagram submitted is correct. (2) A suitable diagram is given in Fig. 1. (3) We believe most manufacturers connect plug-in transformers as indicated in the diagram submitted, but we would not like to say that the method is a standard one.

"T. H. L." (Salop) *asks (1) Why three valves, which have been used as detector valves, have burnt out during a few weeks. (2) Why great difficulty is experienced in tuning in the broadcast transmissions from London. (3) Is the addition of a few more valves suggested. (4) The tuner is provided with a three-coil holder, but only two are connected. Is it expected that, with the third coil connected, the results would be improved.*

(1) Without more information we are afraid we cannot say why you should experience trouble with the valves. We believe the method of manufacture has been changed recently, and this may account for your difficulty. (2) The receiver referred to should give very good results, and we think probably your aerial or earth connection is not quite what it might be. (3) We do not think there is any necessity for the addition of valves to your receiver. (4) Probably the addition of the third coil to your three-coil holder would be of assistance. We suggest you examine the coil holder and remove the connections so that, when the coil is inserted in the holder, it will be in series with the circuit. At present the coil holder is short circuited.

"J.W." (S.E.13) *asks for a diagram of a three-valve receiver with a three-coil holder.*

We would refer you to the diagram given on page 583, January 27th issue. It will be noticed there are three coils coupled together in this diagram, and the method of coupling three coils in a three-coil holder is the same. The closed circuit coil will be the centre coil, and the outer coils the reaction and aerial coils. The diagram is very suitable for your purpose, and switches are

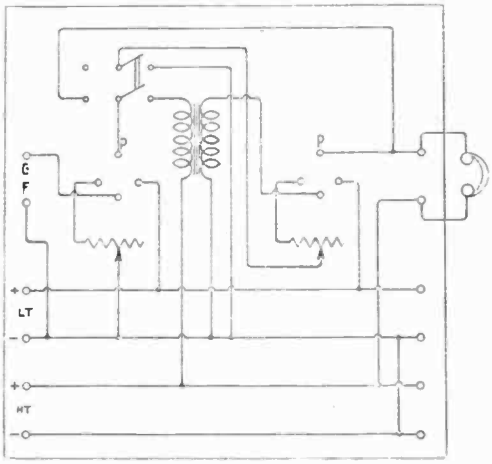


Fig. 1. Two-valve note magnifier panel. A switch is provided to cut out the last valve when required.

provided for the purpose of (1) connecting the A.T.C. or A.T.I. in series of parallel ; (2) connecting the aerial and closed circuits with the grid and filament of the first valve ; (3) connecting the high frequency valves ; (4) cutting in or out the last valve ; and (5) for reversing the reaction coil connections.

"T.W." (W.12) *asks (1) for a design of a telephone transformer to operate a 120-ohm loud speaker. (2) What gauge of wire should be used for the winding of the loud speaker.*

(1) A suitable design is given in reply to **"H.D.K." (Clapham), page 553, January 20th**

issue of this journal. (2) We suggest you wind the loud speaker with No. 34 S.S.C. wire.

"**WILK**" **(S.E.12)** *asks* (1) *Whether we could state the tuning range of the coil in his possession.* (2) *With reference to the diagram submitted, what would be suitable values for the coils A, B and C.* (3) *Is a telephone transformer necessary when it is desired to use 4,000 ohm telephones.*

(1) The coil will tune from about 200 metres up to 2,500 metres, assuming you have a full-size post office aerial. (2) The diagram submitted is quite correct, and, as you suggest, the coils A, B and C, are intended to slide one within the other. Coil C is the outer coil, and A the inner coil. Coil B slides between coils A and C. (3) If it is desired to use 4,000 ohm telephones, a telephone transformer is not required, and the telephones are connected directly in the anode circuit of the last valve.

"**H.F.**" **(Greenock)** *submits a diagram of his receiver, and asks* (1) *Whether the values are suitable.*

"**F.J.**" **(London, N.16)** *asks for a diagram of a three-valve receiver with provision for using crystal or valve detector.*

A diagram is given in Fig. 2. To use the valve detector and note magnifier, put switch 1 to the left, and 2, 3 and 4 to the right. To use the valve detector only, put switch 1 to the left, 4 to the left, and 2 and 3 up. To use crystal detector and valve note magnifier, put switch 1 to the right, 2 to the left, 3 to the right, and 4 up. To use the crystal detector alone, put switch 1 to the right, 2 and 3 to the left, and 4 up.

"**S.C.F.**" **(Watford)** *submits a diagram of his receiver and asks* (1) *Why he has difficulty in hearing the broadcast transmissions.* (2) *How may the reaction coil be connected so that it will increase the signal strength result from the reaction coil being coupled with the anode coil.* (4) *For criticism.*

(1) and (4) The diagram of connections submitted is not quite correct. The secondary circuit should be tuned with a small variable condenser with a maximum value of 0·0005 mfds. The grid leak

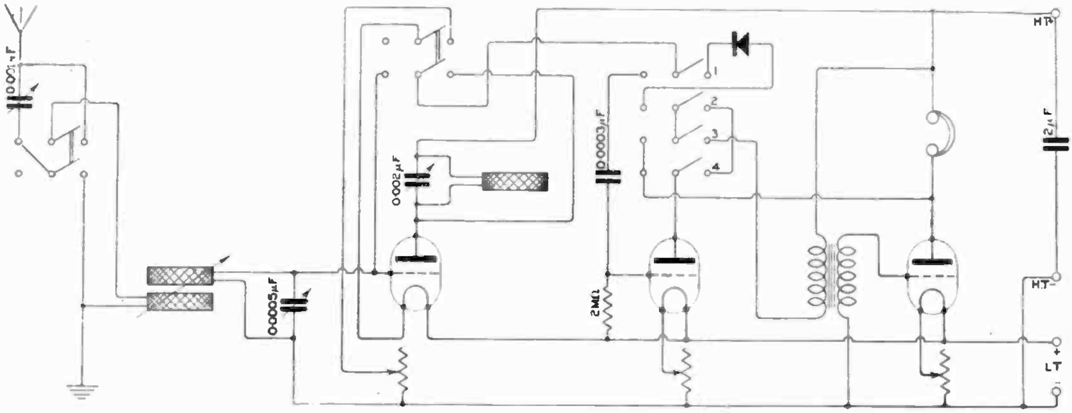
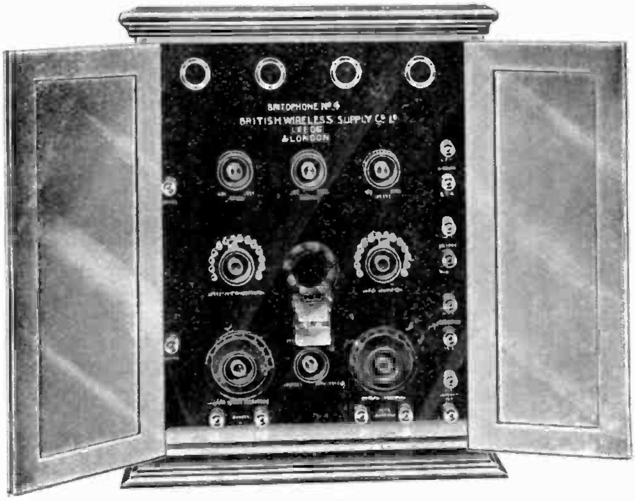


Fig. 2. A 3-valve receiver. A crystal detector may be used instead of the detector valve when required.

(2) *Should dead end switches be fitted to the coils.* (3) *Should it be possible to receive the London broadcast transmissions when a frame aerial is used.* (4) *Will the circuit meet the Post Office requirements.*

(1) The diagram of connections is correct except that the closed circuit condenser is shown connected in series with the closed circuit inductance instead of in parallel. (2) We do not think any great improvement would result from the use of dead end switches, although, if you care to try, we would suggest the switches be connected to break the 75th and 120th turns in the aerial circuit. You might try the effect of short-circuiting some of the disused turns. (3) We think you will probably hear the London transmissions, although the signal strength will hardly be loud enough unless the conditions are very favourable. We suggest you use the standard outdoor aerial. You should hear the **PCGG** transmissions. (4) We think the circuit complies with the Post Office requirements.

and condenser are not shown connected correctly in your diagram. When a tuned anode winding is used in the high frequency valve anode circuit, the grid leak should not be connected across the grid condenser, but between the grid and filament. The connection should be with + L.T. The remainder of the connections are correct. The reason why larger coils are necessary in the tuning circuit is because (1) the aerial tuning condenser is in series with the A.T.I., and (2) because no secondary tuning condenser has been used. We suggest you continue using the A.T.C. in series with the A.T.I., and use a small condenser—one having a maximum value of 0·0002 mfds—to tune the reaction coil. (2) If bringing the reaction coil closer to the closed circuit coil reduces the signal strength, the connections to the coil holder should be simply reversed. It will then be found that bringing the reaction coil closer to the closed circuit coil increases the strength of the signals. (3) If the reaction coil is coupled with the anode coil, reaction effects



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8, Corporation Street, Belfast.
26, Newport Road, Middlesboro.

may be obtained, although with the type of anode coil in use, you would find it difficult to secure the proper coupling.

"ENGINEER" (Birmingham) *asks* (1) *Are the values shown on the diagram submitted correct.* (2) *What standard book dealing with wireless reception, do we recommend.* (3) *Is it best to obtain a licence to use a receiver which has the reaction coil coupled with the aerial circuit.*

(1) The values of the condensers given in the diagram are too large. The aerial condenser should have a maximum value of 0·001 mfds., and the closed circuit condenser 0·0005 mfds. The grid leak may be 2 megohms. A 2 mfd. condenser may be connected across the H.T. battery. (2) It is a difficult matter to know which book to recommend without information concerning your present wireless knowledge. We suggest you read Bangay's "Elementary Principles of Wireless Telegraphy," Parts I and II, and then choose a standard work, such as Morecroft's "Principles of Wireless Telegraphy and Telephony." These books may be obtained from the Mail Order Department at this address. (3) We suggest you apply to the Secretary of the Post Office, London, for an experimenter's licence. We cannot say whether he will grant you a licence.

"H.H.D." (Essex) *asks whether, by using a suitable transformer and chemical rectifiers, as described in the issue of December 30th, it would be possible to charge his accumulators.*

The method of obtaining direct current from alternating current referred to is only suitable when a few milliamperes is required, and the method is not suitable for supplying heavier currents to charge accumulators. We suggest you abandon the idea, and use a special valve or mechanical rectifier. Reliable electrolytic apparatus, however, for accumulators from A.C. mains is on the market.

"J.J.H." (Waterford) *asks* (1) *For a diagram of a low power telephone transmitter.* (2) *What voltage will a Mansbridge 2 mfd. paper dielectric condenser withstand.* (3) *How to find the output of a small valve transmitter.* (4) *What would be the approximate range of a C.W. transmitter using 100 volts H.T., and a telephone transmitter using 100 volts H.T.*

(1) A suitable diagram is given in Fig. 3. The aerial coil may be a winding 6″ in diameter, of No. 16 D.C.C. About 20 turns will give you a sufficient inductance to enable you to make the correct wavelength adjustments. The wire should be spaced slightly. The reaction coil may be a winding 4″ in diameter and 2″ long, of No. 22 D.C.C. The transformer connected in the grid circuit is a microphone transformer, with the secondary shunted by a small variable condenser. The condensers used should be able to withstand the high voltages which may be generated. (2) A 2 mfd. Mansbridge condenser will probably safely withstand 100 volts D.C. They will not, however, stand up to a pressure of 100 volts when connected in an oscillating circuit. When purchasing these condensers care should be taken to see that the insulation is good, otherwise the H.T. battery will soon discharge. (3) If a 5-watt transmitting valve is used with the best adjustments you may expect to put about 5 watts high frequency energy into the aerial circuit. The amount of power required would then be about 10 watts. The efficiency of the valve is about 50 per cent. (4) This question is not clear, but with a good outdoor aerial and proper adjustments with a suitable valve, and 100 volts on the plate you should be able to transmit C.W. and telephony for a mile or two. The range as a telephone transmitter is necessarily much less than the C.W. range.

"VAMBERG" (W.C.2) *asks* (1) *What type of coil is recommended for tuning coils.* (2) *Would any advantage be gained through coupling the reaction coil with the aerial coil and anode circuit coil.* (3) *What would be suitable dimensions for a set of honeycomb coils to tune up to 1,500 metres.* (4) *Will the use of telephone jacks reduce the signal strength.* (5) *Will connections, which are 3′ long between the tuning coil and the remainder of the receiver, cause a reduction in the signal strength.* (6) *How many different anode potentials can be applied to the valves.*

(1) We suggest you use plug-in coils for the anode coils. We suggest you construct coils having the following numbers of turns: 25, 35, 50, 75, 100, 150, 200, 250, 300, 400, 500, 600 and 750. The coils should be about 1″ wide, and the smaller coils could be wound with No. 22 and the larger with No. 28 D.C.C. The former should be 2½″ in diameter. (2) We suggest you couple the reaction coil with the anode coil. There is no need to couple the aerial coils with either of the two latter coils. (3) The coils should have the dimensions

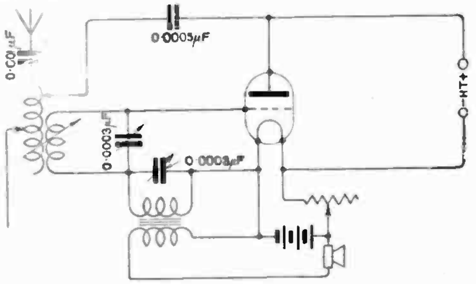


Fig. 3. Simple telephony transmitter. The minus terminal of the H.T. is connected to earth.

given in No. (1). (4) We do not recommend the use of plugs and jacks in high frequency circuits. (5) All connections, especially grid connections, should be as short as possible, and we suggest you reduce the distance between the tuner and amplifier. (6) The method of applying different H.T. potentials to the anode of the valves in the amplifier is given on page 601, Fig. 3, February 3rd issue. We would point out that only four questions are permitted.

"H.A." (Weston-super-Mare) *asks* (1) *With reference to the article described by Mr. A. J. Bull in the August issue of this journal, is the coil which is shown on the top of the instrument a reaction coil.* (2) *Will the Post Office permit the use of this receiver.*

(1) The coil which is seen on the top of the instrument is not a reaction coil. It is the anode coil, and is used for high frequency amplification. (2) We think you will have no difficulty in obtaining a licence to use this receiver.

"H.E." (S.E.23) *submits a diagram of a receiver he proposes to construct, and asks for advice.*

The condenser C.2 should have a value of 0·001 mfds., and C.1 should be variable up to 0·004 mfds. We suggest the use of one or two fixed condensers, which may be connected in parallel, combined with a 0·0005 variable condenser so that the best capacity may be obtained. The inductance coil L.1 may be a winding 4″ in diameter and 6″ long, of No. 22 D.C.C. Ten tappings should be taken. If it is desired to use a plug-in type of coil the coil may be tuned either with a condenser in series in the aerial circuit, or with the condenser connected across the coil in the usual manner. Two coils, L.2 and L.3, may be in the form of a loose coupler, or a two-coil holder holding two plug-in coils may be used. Coil L.2 may have a winding 4″ in diameter and 6″ long; No. 26 D.C.C. Coil L.3 may be 3″ in diameter and 6″ long, No. 30 D.C.C. Ten tappings should be taken from each coil. We do not recommend that coils L.1, L.2 and L.3, be in the form of a three-coil holder. With a circuit of this description a good deal of experimental work is required before satisfactory results are obtained. We would refer you to the issue of May 27th of this journal, where several circuits with constructional particulars are given, and which shows how one, two or three valves may be used for the purpose of dual amplification.

"B.D." (Cambridge) *asks (1) How to obtain reaction effects with the anode coil. (2) For criticism of aerial arrangement.*

(1) It is a rather difficult matter to secure sufficient coupling between a reaction coil and a tapped anode reactance coil of the type mentioned. However, if you wind 200 turns of No. 36 S.S.C. wire in a former 2½″ in diameter with a 1″ screw ⅛″ wide, you will obtain sufficient coupling. The reaction coil should be tuned with a small condenser having a maximum value of 0.0002 mfds. The reaction coil may have three taps equally spaced. Much louder signals should be received if the instrument is located downstairs. (2) It will be remembered that the actual height of the aerial is its height above the instrument, and not its height above the ground. If the lead-in were brought in on the bottom floor, the earth connection could be taken to the water main, and the result would be a much lower resistance earth. If possible, the free end of the aerial should be raised to a height of 40′.

"R.B." (Cheshire) *submits a diagram of his receiver and asks for advice.*

As it is required to receive over a wavelength of 200—500 metres, we suggest you use small cylindrical coils, as they are the simplest to make and are the most efficient. The aerial coil may be 4″ in diameter and 2″ long of No. 20 D.C.C., and four tappings should be taken. It is not possible to give the exact position for the tappings because we have no particulars of the capacity of your aerial, which is the factor that determines the position of the taps. The anode coil marked L.2 will be 4″ in diameter wound with No. 28 D.S.C. Tappings should be taken at the 20th, 30th, 45th and 70th turns. The reaction coil should be filled with No. 28 D.S.C. wire. The idea of the arrangement is quite suitable, although considerable experimental work will be necessary before the arrangement suggested will give satisfactory results. The condenser values given are quite suitable. You may find it necessary to use a 6-volt accumulator in place of the 4-volt shown. The anode coil of the A.T.I. should be well spaced so that they do not inter-act.

"MANTOLA SUBSCRIBER" *asks (1) Whether the diagram submitted is correct. (2) For particulars of suitable tuning coils. (3) Whether the receiver should operate a loud speaker.*

(1) We have examined the diagram of connections and the connections are correct, apart from the switch in the aerial circuit, which disconnects the condenser in one position, and in the other position the condenser is in parallel with the coil. We do not recommend the use of so many switches, because the signal strength is seriously reduced, and there is no practical advantage in using switches having so many contacts. We suggest you use switching arrangements as shown in many issues of this journal. The switches should be of the anti-capacity type, or double-pole throwover switches may very conveniently be used. The reduction in signal strength is particularly noticeable when grid circuits are switched. (2) We suggest you use basket coils connected in series. Suitable coils would have 35 turns of No. 26 D.C.C., wound upon a former 2″ in diameter. Six of these should be connected in series and mounted together, with about ⅛″ between each coil to reduce self-capacity. The connections between the coils may be taken to a switch. The closed circuit will require eight of these coils, and the anode circuit may have ten coils, each having 50 turns of No. 30 D.C.C. wound upon a 2″ former. The anode tuning condensers have a rather large value, and we suggest you use condensers with a maximum of 0·0002 mfds. The smaller the value of these condensers the better the results in general. A receiver wired according to the diagram submitted should amplify signals sufficiently to operate a loud speaker. We would point out that a loud speaker is a power operated instrument, and low frequency connected valves are required. High frequency valves are for the purpose of increasing the signal strength before rectification. A rectifier works best when signals having considerable amplitude are impressed across its input circuit.

SHARE MARKET REPORT.

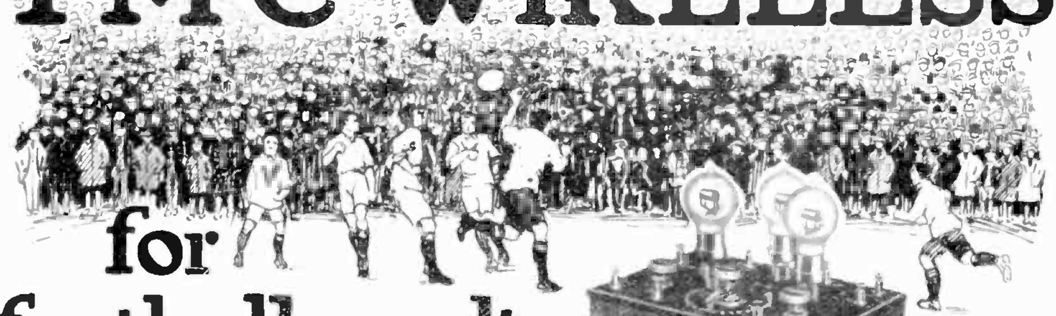
Prices as we go to press on March 9th, are:—

Marconi Ordinary	..	£2	14	0
,, Preference	..	2	7	3
,, Debentures	..	108	4	0
,, Inter Marine	..	1	8	10½
,, Canadian	..		11	6

Radio Corporation of America:—

Ordinary	..	17	0
Preference	..	15	0

T·M·C WIRELESS



for football results

A T.M.C. Wireless Set will enable you to follow your favourite team and hear the results of each match practically as soon as the match is over.

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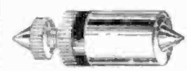

The "Everset" Crystal
No adjustment necessary
Fits any Crystal Receiver
10/- each

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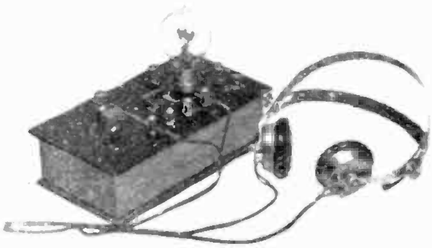

Perfectly simple in adjustment

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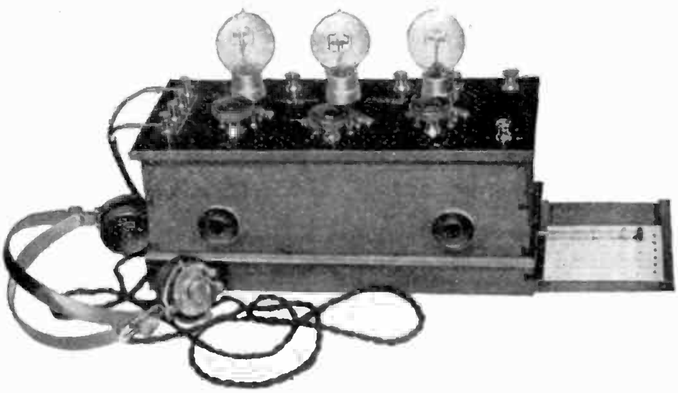

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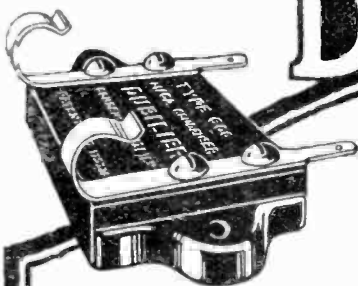

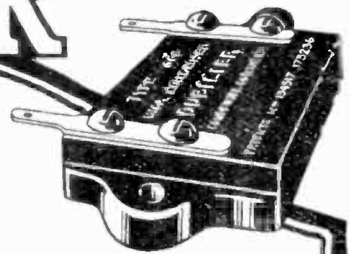

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Dubilier Mica Condenser. Type 600.

For use in wireless receivers, with or without Dubilier grid leaks.

0·0001 mfd. and 0·001 mfd.	-	2/6 each
0·001 mfd. to 0·005 mfd.	-	3/- each
Condensers with grid leaks	-	5/- each

Tested to 1,000 volts.

Dubilier Mica Condenser. Type 600a.

For close mounting in wireless receivers, space occupies 2⅜″ × ⅜″.

below 0·001 mfd.	- - -	2/6 each
from 0·001 mfd. to 0·005 mfd.	-	3/- each

Tested to 1,000 volts.

The Dubilier Condenser. Type 577,

Is a small power condenser and is suitable for either transmitters or receivers. It has extraordinary small losses and the capacity remains constant under all conditions.

From 0·0001 mfd. to 0·01 mfd. 7/6 each. Tested to 2,000 volts.

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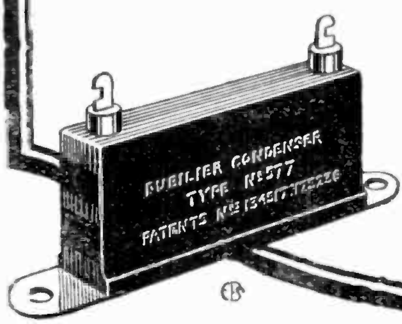

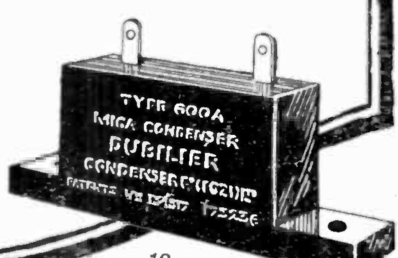

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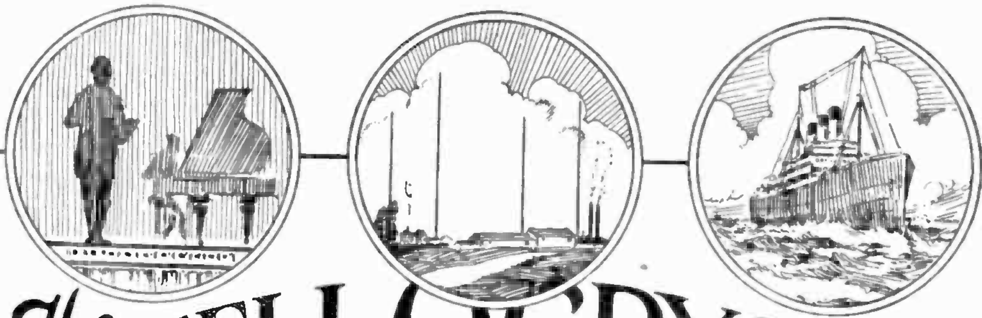
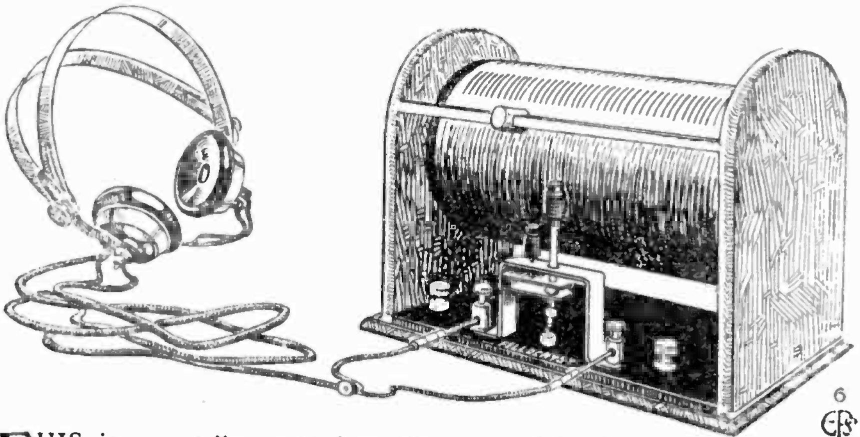


The FELLOCRYST



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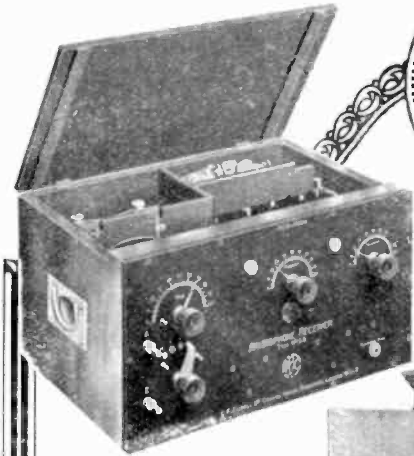
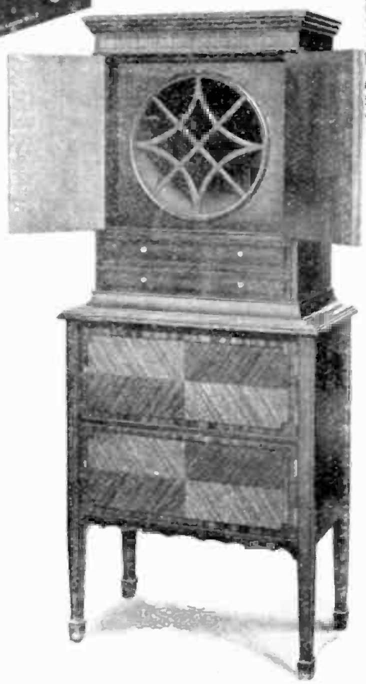
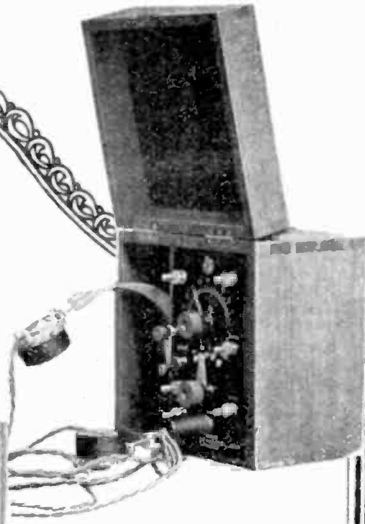




ARISTOPHONE CABINETS



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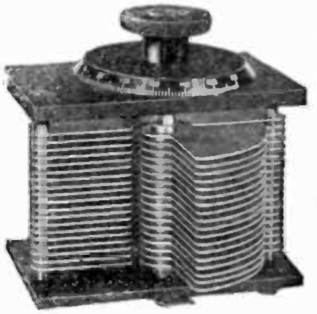

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Value in M.F.	Panel Mounting in Parts.	Panel Mounting Assembled.
·0015	15/-	18/6
·001	11/6	13/6
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Fitted with Knob, Pointer and Engraved Scale, 1/6 extra. Fitted with Knob and Bevelled Ebonite Dial 1/9 extra.
Vernier Condensers. Panel Mounting Complete
With Knob, Pointer and Engraved Scale, 3/6 each.
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All types of Sets and Sundries. TRADE SUPPLIED.

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For the Discriminating Amateur

A FEW OF OUR SPECIALITIES

SINGLE EARPIECES (complete with cord), 2,000 ohms	8/-
DOUBLE HEADPHONES (French type), 4,000 ohms	21/-
DOUBLE HEADPHONES (French type), 8,000 ohms	22/6
DOUBLE HEADPHONES (imitation tortoishell bands), 4,000 ohms	27/6
DOUBLE HEADPHONES ("Sterling" make), 4,000 ohms	32/-
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Repairs to Headphones and adjustments by competent workmen.
CRYSTAL DETECTORS, complete, good quality 2/9
LEAD-IN TERMINALS. Ebonite with Brass Terminals, splendid value, 6", 1/6. 9", 1/9. 12", 2/-.
VARIABLE CONDENSERS.

·001 mfd.	12/6
·0005 mfd.	10/-
·0003 mfd.	7/6
Vernier	5/-

ACCUMULATORS, all sizes kept in stock, charged and repaired.
WIRE, TOOLS AND SCREWS, Etc., of every description.

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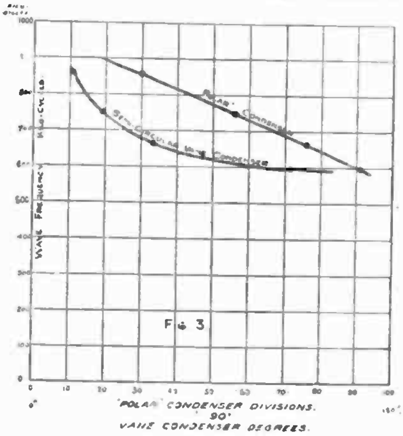
"POLAR"

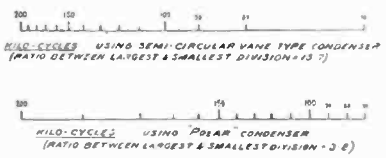
SETS
SERVICE
SIGNALS

"POLAR" VARIABLE CONDENSERS

COMPARISON OF AERIAL TUNING.



COMPARISON OF SECONDARY TUNING (USING 1 GRANIC HONEYCOMB COIL No. 300) Fig. 1.



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In addition to superiority of performance "Polar" Condensers are more compact, measuring only

3″ by 3½″ by 1″

They are made in three standard capacities, viz.,

·001
·0005 } mfd.
·0003

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Panel Mounting **14/9** post free.

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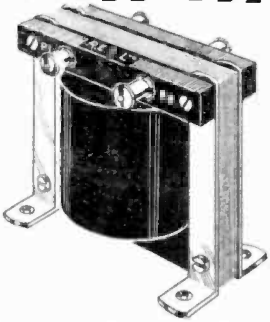

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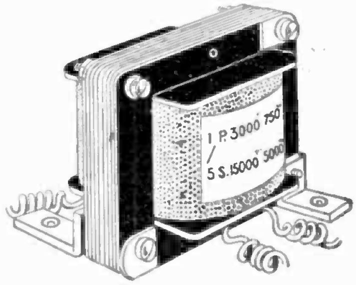

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20	1 11	4 0	4 9
22	2 5	4 6	5 0
24	3 0	5 0	5 9
26	3 6	5 6	6 6
28	4 2	5 9	6 10
30	5 2	6 6	8 1½
32	6 6½	8 2	9 0
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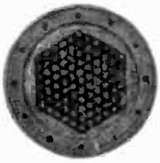

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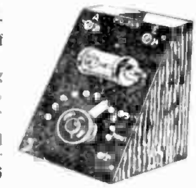

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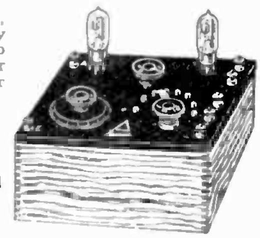

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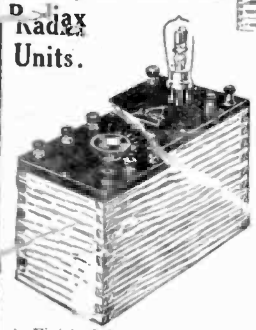

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VOL. XI, NO. 24.

See Conditions on Page 813.

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THE WIRELESS WORLD AND RADIO REVIEW

No. 188. [No. 25. VOL. XI.] 24th MARCH, 1923. Registered at the G.P.O. as a Weekly Newspaper.

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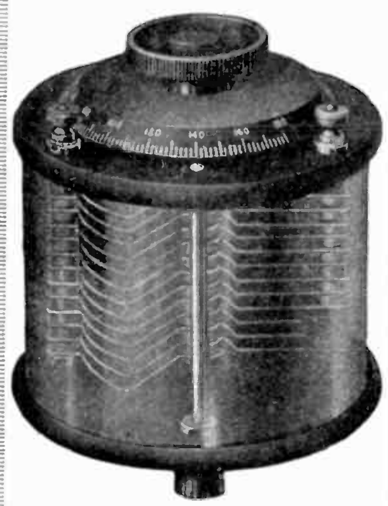

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Yours truly, A. O. FRENCH BREWSTER.

Engineers' Office, Electricity Works, Bexhill.

DEAR SIRS,
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Yours faithfully, R. C. CARTER.

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DEAR SIRS,
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THE WIRELESS WORLD
AND RADIO REVIEW

THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GREAT BRITAIN
A MAGAZINE DEVOTED TO WIRELESS TELEGRAPHY AND TELEPHONY

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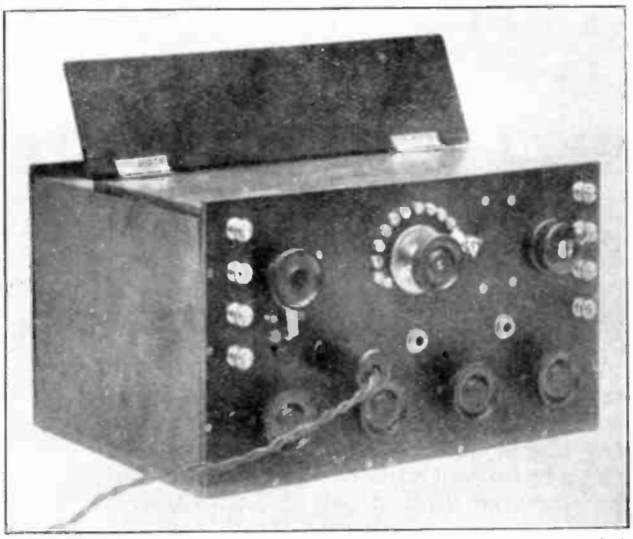
American Ideas in British Design.

THE CONSTRUCTION OF A FOUR-VALVE DETECTOR AMPLIFIER.

By Percy W. Harris.

THE instrument I am about to describe was designed and built in the endeavour to produce an efficient four-valve set which would combine simplicity of operation with compactness. In addition it incorporates two features not frequently found in British amateur - built apparatus—plug-and-jack control and concealed valves. It is not a complete receiver, as the means of tuning are absent, but it can be attached to any existing tuner and will be found a very interesting instrument to build and operate.



A Four-Valve Detector Amplifier, the construction of which is fully described in this article.

The first valve is used as a high frequency amplifier, the second as a detector and the third and fourth as note magnifiers. The coupling of the high frequency valve is of the reactance-capacity type, the anode coil being provided with twelve tappings to cover all wavelengths. While this form of coil is not quite so efficient, save on its "peaks" or optimum points, as one which is combined with a variable condenser, it is nevertheless very simple to handle and gives good results, even in the hands of the beginner.

A particular advantage of this instrument is the simplicity with which it is possible to change from one combination of valves to another. If the photographs and diagrams are examined, it will be seen that there are three plug sockets and three switches on the front of the instrument. The switch on the right is a miniature tumbler switch made of ebonite, serving to switch all of the valves on and off as required. This is an advantage when it is desired to leave the set accurately tuned to a station with the valve rheostats set at the best position for each valve. Once these positions have been found the whole instrument can be switched off, left for the night, and switched on again the next evening without the necessity of making new adjustments. This is much appreciated by unskilled members of the family who may want to hear the bedtime stories in daddy's absence.

The central switch controls the high-frequency coupling coil tappings. The wave-length ranges for each tapping are supplied with the coil and can be marked on the panel or noted in any convenient place, such as on the inside of the lid of the box. There are actually 13 studs, the first being an "off" position, which is sometimes useful for experimental work.

The left-hand two-way switch serves to switch the high frequency valve in or out. The three jacks are so wired that when the plug belonging to the telephones or loud speaker is placed in the left-hand hole we work with the detector valve (with or without the high frequency valve preceding it, according to the position of the switch), while plugging in to the central or right-hand holes brings in one or two note magnifying valves as required. There is a separate filament resistance for each valve so that those not required can be cut off, saving current.

A further advantage lies in the fact that the filament resistances can be set to suit each particular valve, a matter of some importance if one desires to use or try different kinds for different purposes. Some valves, for instance, work very well for note-magnifiers, but poorly for detectors or high frequency amplifiers, and it is well to try each valve in each circuit before forming an opinion as to its relative merits.

The terminals are marked in the diagram on this page, and explain themselves The large diagram on page 820 shows the internal connections and arrangements of components on the back of the panel and on the base of the instrument. To understand this diagram it must be remembered that it is drawn as if the panel were laid flat on the table in the same plane as the baseboard. The relative position of parts can be better understood by bending the drawing so as to bring the back of the panel vertical, leaving the baseboard flat.

Before we start the constructional work, here are the components required :—

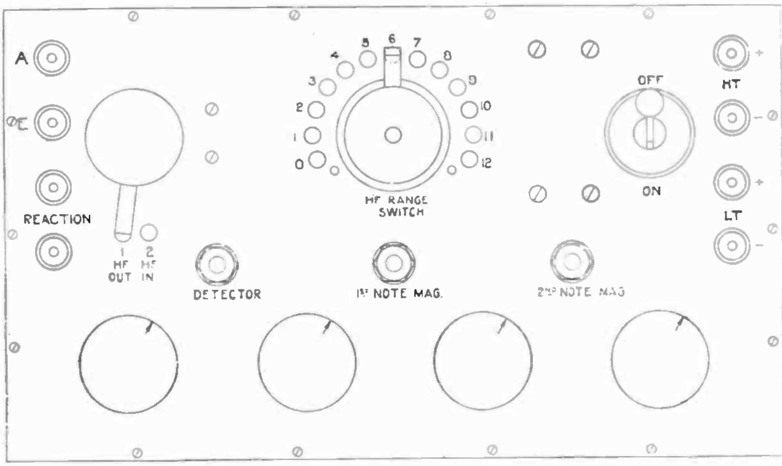


Diagram showing the layout of the panel (top).

Ebonite panel, ¼″ or ⅜″ thick, measuring 12″ by 7″. (This is the smallest possible size for the components used, and if desired it can be larger).

Ebonite strip, 10½″ by 1½″ by ¼″.

Suitable tapped anode coil.

Ten terminals.

Four filament resistances for panel mounting.

Two double-circuit jacks.

One single-circuit jack.

Two switch-knobs with arms.

Fifteen contact studs.

One miniature tumbler switch (this can be obtained from any dealer in motor accessories).

One grid leak (2 megohms).

Fixed condensers as follows (one each):
0·0003 mfds.
0·001 mfd.
0·01 mfd.

Two intervalve transformers of any good make.

Four valve sockets.

One plug for jacks.

Suitable hinged-lid box, constructed in a manner to be described.

Quantity of connecting wire (tinned) and insulating tubing.

About three dozen 6BA metal screws with nuts. (These may be about ¾″ long).

The first step is to remove the shiny surface of the ebonite with fine emery paper, working with a circular motion so as to give a smooth even finish without scratches. The edges of the ebonite should also be finished off smoothly. This can be done by glueing a strip of emery paper to a board and rubbing the edges of the panel along the abrasive surface so formed.

Now mark out the *back* of the panel with the positions of the various terminals and components. Use for this purpose a sharp "scriber," which can be purchased from any tool shop for about a shilling. With the aid of a ruler or other straight edge scratch a fine line parallel with the left and right edges at a distance of three quarters of an inch in. On these lines mark off (by means of a transverse scratch) points at ¾ in. from the top, at 1¾ ins., 2¾ ins., and 3¾ ins. These points will give the positions for the sets of four terminals on each side.

You will also need three horizontal lines, the uppermost being two inches, the second four, and the lowest five and a half inches from the top. These three lines will give you the horizontal positions for the switches, jacks and filament resistances. The thirteen point switch is placed centrally on the upper line, while the centre points of the right and left-hand switches are two inches from each side. On the middle line mark off points at the exact centre and at 2¾ ins. on each side of this, so as to give the positions for the jacks.

Other points will need to be marked off to take the fixing screws for the box, the various components and the switch points. These cannot be indicated by measurements, as they will differ for different components. Their positions are best found by laying out the components in their correct positions on the back of the panel.

As this set can be made to look very pleasing when finished, the reader is strongly advised to take pains with this initial marking out. When all the positions have been indicated, take a centre-punch (this can be bought for a shilling, or a substitute can be made from a large French nail), and with a hammer make a small depression on the exact point where a hole is to be drilled. Do not trust the drill to make a hole in the place you want, with merely a scratch to guide it—drills have a nasty habit of slipping about a sixteenth of an inch without being noticed, if there is no central depression as a guide. The use of a centre-punch is strongly advocated and will make drilling much neater and simpler than is otherwise possible.

Here is a hint which will be found helpful when it is necessary to drill holes to take fixing screws for such items as the fixed condenser, grid leak and tumbler switch. These articles will probably have holes already drilled in them, and it is then merely necessary to drill clearance holes in the panels through which suitable screws can be passed, nuts holding the screws in place. Many beginners find difficulty in drilling the holes in the exact places necessitated by the holes in the components. The simplest way is to lay the article on the panel in the position it is to occupy, and drill *through* one of the holes in the article. The drill is then withdrawn and a suitable metal screw (probably 6 BA) dropped through the clearance hole so formed, holding that end of the component in place. The second hole can now be drilled in the same way. If this is done the beginner is often saved the annoyance of finding that the holes in the panel and those in the components do not exactly coincide.

The holes to take the jacks will probably be larger than the largest drill available to the average experimenter. In this case it is well to mark out on the panel small circles of the size required, and then drill out the centres with the biggest drill available. The holes can then be enlarged with the help of a fret-saw or a round file.

The radius of the semicircle on which the studs will fall will of course depend upon the radius of the switch arm used. The separation of the studs should be just less than the width of the switch arm, or the latter will fall between the studs when the switch is rotated. To determine the points for drilling the holes for the studs, first scratch with dividers a semi-

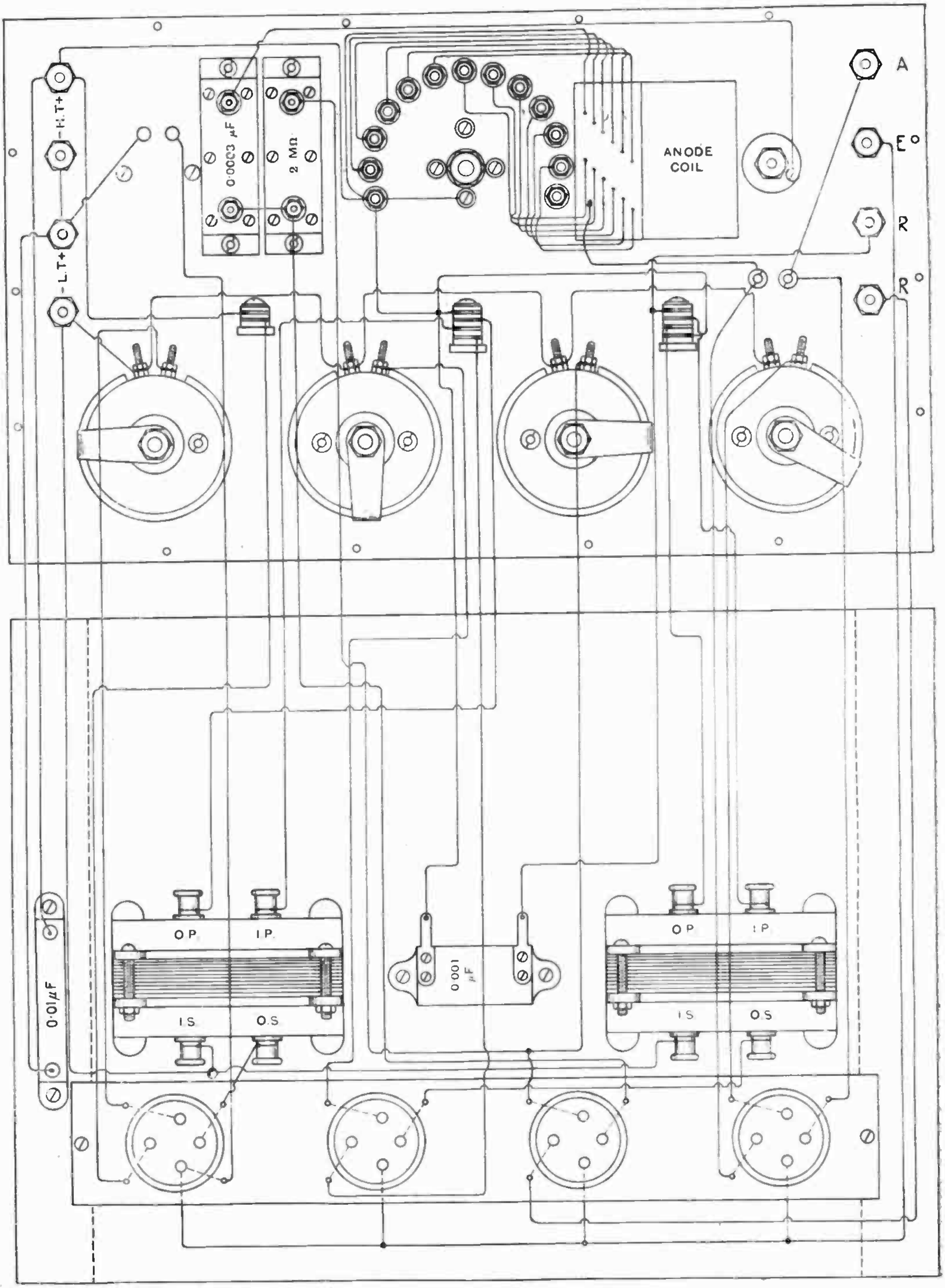


Diagram of connections for the underside of the panel.

circle of the radius of the switch arm, next mark off the point for the stud numbered 6 (this is exactly on the centre line of the panel), and then with the same dividers mark off six points on each side. This will give a symmetrical layout. As before, use a centre punch before drilling. The drilling of the holes for the two-point switch on the left of the panel will present no difficulties, nor will the drillings for the filament resistance spindles and their securing screws. For these latter adopt the procedure advocated in a previous paragraph, drilling *through* the holes in the resistance formers.

After the panel has been drilled, lay it aside and drill the strip of ebonite which is to take the valve holders. For convenience in wiring, it is advisable to drill holes around each of the valve sockets as shown in the illustration. You will see why later. The strip must have a hole at each end to take the wood screws for securing it to the base strips.

The remaining holes are for the grid leak, grid condenser and the tapped anode coil. The grid leak is wired between the grid condenser and the filament, and not across the grid condenser, so that the pattern of grid condenser which carries the grid leak in clips across it will not do. In the illustration of the back of the panel the grid leak and condenser are both made up between strips of ebonite. There is no special reason for this other than that the author happened to have these two components handy. The reader will probably use small ready-made grid condensers and a leak between clips. The holes for these are easily made as previously explained, as are the holes for the tapped anode coil bracket.

Before we can wire up the instrument it is necessary to make a suitable cabinet. This should measure (if exact dimensions of the panel described are followed) 12″ by 7″ by 8¾″ externally. The baseboard, measuring 8¾″ wide, should have fixed at each end strips of wood measuring 8¾″ by 1″ by about ¾″ thick. The length of this base should be 12″, less twice the thickness of the wood used for the side pieces, as these will be screwed to the ends and will be partly supported by the thickness of the strips which also serve to raise the valve-holders to allow room for the wiring and the projecting legs.

The back and the top are fixed in place after the panel has been fitted and the instrument wired. The top should have a hinged lid to allow access to the valves. The back is simply a suitable piece of wood which can be screwed on when required.

If the reader gets his cabinet work done for him, he should arrange for the box to be made so that the top and back can be screwed on separately, or he will have difficulty in assembling.

Assembling the Set.

Wiring up should be carried out with tinned copper wire of suitable thickness (such as No. 18 or No. 20 S.W.G.), insulating tubing being used everywhere. Owing to difficulty in handling it may be necessary to use finer wire for wiring up the tappings of the anode coil and the studs of the multi-stud switch. These leads should be kept as short as possible, if the efficiency of the tapped anode coil is not to be lost.

To begin wiring lay the big panel face downwards on the table and connect up all leads which begin and finish on the panel itself. Solder all connections, as it is not easy to tighten up nuts at a later stage if they should become loose. Be careful to keep all leads as short as possible. When these connections have been made, solder long wires to all the terminals and connections which have to be joined to the components mounted on the baseboard, generous lengths being used, as the surplus will be cut off later.

Now mount the various components which are placed on the baseboard, leaving for the moment the ebonite strip which carries the valve holders. There are two fixed condensers here, one (0·001 microfarad) in the middle and another (0·01 microfarad) secured either to the side strip as shown or, if not a vertical pattern, to the left upright piece. Be careful to place the intervalve transformers with their terminals in the positions shown.

It will now be necessary to solder lengths of wire to the terminals on the underside of the ebonite strip. These wires can be threaded through the holes around each socket and left for the moment projecting upwards, the strip then being secured by two wood screws to the end wooden strips previously mentioned.

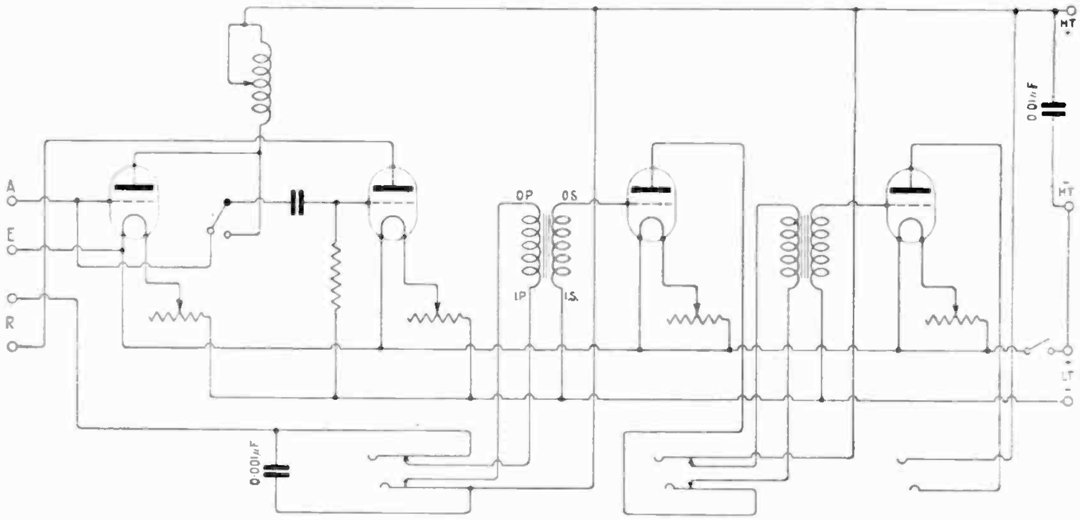
The final stages of assembly consist of securing the upright panel to the front of the cabinet, and pulling the long wires from the panel across to the terminals or points to which they are to be soldered. When the correct length of these leads has been measured, they are cut off to size and soldered in place (tubing being slipped on as usual). In some cases, such as when joining the panel to the valve sockets, one wire will be soldered to another. When this is done it will be found convenient to twist the two wires together before soldering.

The set should now be tested. This will be found quite an easy matter, as one, two, three or four valves can be used at will. If all is well the back and top can be secured in place.

Notes on Operating.

This set will need some form of tuner, which preferably should be a three-coil holder with two variable condensers (0·001 for aerial tuning and 0·0005 for closed circuit) with a series-parallel switch for the aerial condenser and a reversing switch for the reaction coil. This latter is necessary, as when the H.F. valve is cut out it will be found necessary to reverse the leads to the reaction coil. If less selectivity is required and the reader is not accustomed to the rather tricky ways of three-coil tuning, two coils can be used, but of course direct reaction on the aerial must not be used on broadcast wavelengths during broadcast hours. The reader is begged not to use it on short wavelengths *even after* broadcast hours, unless he is perfectly certain that the set is not radiating, or the poor amateur burning his midnight oil will be seriously inconvenienced by the howl set up. With the tapped anode coil is supplied a table showing the wavelength range for each tapping. This can either be marked on the panel against the particular studs (you can get the panel professionally engraved for a reasonable sum at any dealers), or the table can be gummed to the lid of the box.

No provision is made in the design for a telephone transformer, but the reader is strongly advised to purchase one and to take the leads from the telephone plug to the transformer, which can be mounted in a suitable box with terminals for telephones or loud speaker.



The circuit diagram.

The finished instrument will be found extremely simple and convenient to operate, as it is a great advantage to be able to change from one to two, three or four valves in a moment, and there is no critical high-frequency tuning. It is also economical to work, as the valves not in use can be switched off. If good quality components are used, the efficiency of the set will compare very favourably with the most expensive four-valve sets, while in size it is much more compact than most of the commercial four-valve instruments now on the market. It is not necessary to drill inspection holes or ventilating windows for the valves if the lid is left slightly raised during operation. This can easily be effected with the aid of a catch.

Wavelength Abacs.

SIMPLIFYING INDUCTANCE AND CAPACITY CALCULATIONS.

By J. A. TOMKINS, A.R.C.S., F.Inst.P.

THERE have been published from time to time in the *Wireless World and Radio Review* and elsewhere, abacs relating to the various formulæ employed in wireless telegraphy and telephony.

One of these, based on a little-known property of the conic, is due to Dr. W. H. Eccles and is described in his "Wireless Telegraphy and Telephony." It expresses the relation between the wavelength λ, the inductance L and the capacity C of an oscillatory circuit, these quantities being read off in the usual way from the alignment obtained by means of a piece of thread.

It consists of an ellipse on the major axis of which a scale of wavelengths is marked off from one vertex, while along the two arcs scales of inductance and capacity respectively are similarly described. By stretching a thread through the divisions corresponding to the values of any two of the three quantities λ, L and C, the third may be determined by observing the reading in alignment with the other two.

The relation between wavelength, inductance and capacity is given by the equation

$$\lambda = K\sqrt{LC} \quad . \quad . \quad . \quad (1)$$

where K is a constant which depends on the units employed.

If λ be expressed in metres, L in microhenrys (μH) and C in microfarads (μF) the equation is

$$\lambda = 1885\sqrt{LC} \quad . \quad . \quad . \quad (2)$$

This may be written in the form

$$LC = \left(\frac{\lambda}{1885}\right)^2 = W^2, \text{ where } W = \frac{\lambda}{1885} \quad . \quad (3)$$

whence

$$\frac{L}{W} = \frac{W}{C} \quad . \quad . \quad . \quad . \quad (4)$$

The last equation suggests the following simple abac for determining L or C :—

On a sheet of ordinary squared paper take two of the ruled lines at distances W from the top and left-hand sides. These, numbered from the top and left respectively, are the L and C scales for the given wavelength. If, then, a thread be pinned at the left-hand top corner and stretched so as to cut the two scales, the readings at these points will give corresponding values of L and C for this wavelength. Hence, if the thread be set to a given reading in one scale the required value can be read off from the other. Values of λ for the various lines can be marked at the top and side of the diagram.

For values outside those indicated it is necessary to multiply or divide by the appropriate power of ten, as described below.

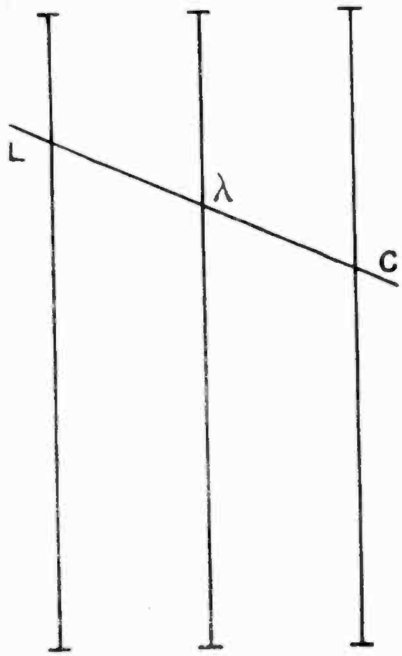


Fig. 1.

As it is not very convenient to determine λ by this method, another, which gives L, C or λ with equal facility, may be employed.

The chart shown on the accompanying page is based on the following simple principle :— Take three parallel equidistant uniform scales with their zeros in alignment and along which the values of the three quantities L, λ and C respectively are marked (Fig. 1). If then we take any two divisions L and C on the first and third scales, their join LC will meet

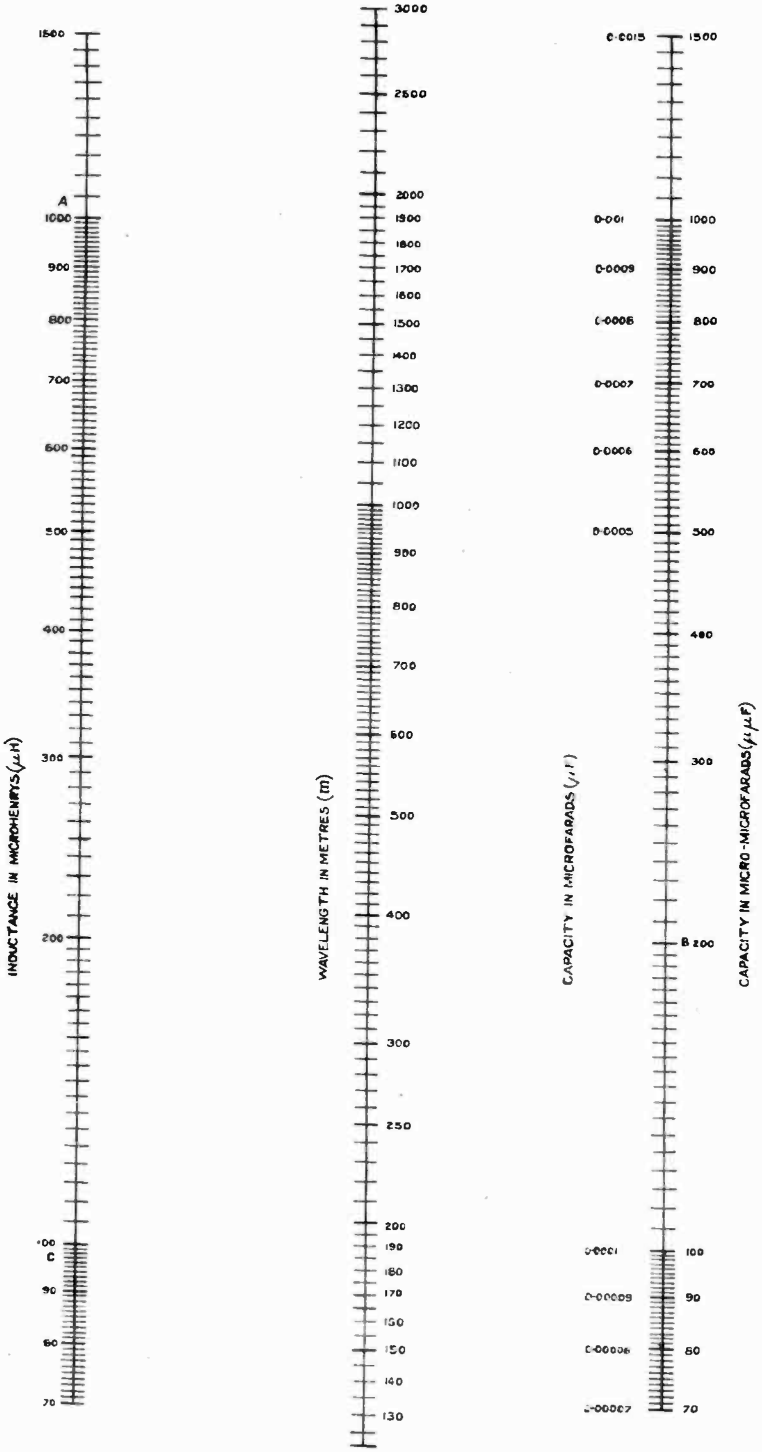

INDUCTANCE IN MICROHENRYS (μH)
WAVELENGTH IN METRES (m)
CAPACITY IN MICROFARADS (μF)
CAPACITY IN MICRO-MICROFARADS ($\mu\mu$F)
A
B
C

Fig. 2.

the middle scale at the division λ given by the equation

$$\lambda = \tfrac{1}{2}(L + C) \qquad . \quad . \quad (5)$$

We are thus able to read off half the sum, *i.e.*, the arithmetic mean, of the two quantities L and C.

Next suppose that we wish to find in a similar manner the geometric mean of the two quantities, *i.e.*, to solve the equation

$$\lambda = \sqrt{LC} \qquad . \quad . \quad . \quad (6)$$

Taking logs we get

$$\log \lambda = \tfrac{1}{2} \log L + \tfrac{1}{2} \log C \quad . \quad (7)$$

This equation can be dealt with if, instead of uniform scales, we take logarithmic scales, the divisions being marked, not with the logarithms, but with the numbers themselves, as in the ordinary slide rule.

Then the join of any two divisions L and C will meet the middle scale at the point λ, which satisfies equations (3) and (2) and therefore gives the geometric mean of L and C.

Finally, taking the usual wavelength equation

$$\lambda = 1885\sqrt{LC} \qquad . \quad . \quad (8)$$

we get

$$\log \lambda = \log 1885 + \tfrac{1}{2} \log L + \tfrac{1}{2} \log C \quad . \quad (9)$$

Here the reading required will be higher up the middle scale than that obtained in the previous case by a distance log 1885. Hence, to obtain the reading directly the whole scale may be supposed shifted down by this amount so that division 1885 of the middle scale will come into alignment with divisions 1 of the other two. Since, however, the logarithms of successive multiples of 10 differ only by unity, the decimal part being the same, so that the scales are repeated at these intervals, this operation is equivalent to bringing division 1·885 into alignment and multiplying all the readings of the middle scale by 1,000.

Convenient scales can be obtained by multiplying the readings of the L scale by 100, dividing those of the C scale by 10,000 and therefore dividing the readings of the λ scale by 10. The final result is shown in Fig. 2, in which the C scale is also marked in micro-microfarads ($\mu\mu F$), for which unit the numbers are the same as those on the L scale.

If one or both of the values lie outside the scales, the readings may be suitably altered by noting that if the numbers on the L scale be multiplied by 10^m and those on the C scale by 10^n, then the numbers on the λ scale must be multiplied by $10^{\frac{1}{2}(m+n)}$, as may be seen by equation (2).

Thus if $m = 2$ and $n = -4$, then $\frac{1}{2}(m+n) = -1$, so that the λ readings must be multiplied by 10^{-1}, *i.e.*, divided by 10, as was done to obtain Fig. 2.

Obviously $m + n$ must, for convenience, be an *even* number, to avoid the awkward multiplier $\sqrt{10}$. As examples take :—

(1) $L = 1{,}000\ \mu H$, $C = 0{\cdot}0002\ \mu F$ (or $200\ \mu\mu F$).
The join AB of these readings meets the middle scale at $\lambda = 845\ m$.

(2) $L = 100\ \mu H$, $C = 0{\cdot}0002\ \mu F$.
The join BC gives $\lambda = 267\ m$.

(3) $L = 1{,}000\ \mu H$, $C = 0{\cdot}002\ \mu F$.
These values being 10 times those in (2), the reading of the middle scale must be multiplied by 10, giving $\lambda = 2{,}670\ m$.

In a similar manner, if any two of the three quantities L, C and λ are given, the third may be found.

This abac was made by cutting strips from a sheet of logarithm paper and pasting them on a piece of cardboard. A disadvantage of this method is that the paper stretches somewhat, and, if the stretch is not uniform throughout, this would lead to slight inaccuracy.

The obvious, though longer, method, is to mark off the scales on ordinary squared paper from a table of logarithms or to transfer to a piece of plain paper, the divisions of a slide rule. But, to save all trouble, a sheet of logarithm paper could be used by merely numbering the divisions on three equidistant parallel lines if all readings on the λ scale are increased or decreased, as the case may be, by an amount corresponding to the constant distance log 1·885. This could be effected by the use of a piece of thin card or celluloid cut to length or having on it two marks at the required distance apart.

Journal of The Radio Society of Great Britain.

Some enquiries from members of the Society have indicated that they are unaware that, at the last Annual General Meeting it was announced that in future the Journal of the Society would be published in half-yearly volumes instead of more frequently as in the past. This explains why it is that copies of the Journal have not been circulated recently.

The volume for the past session, however, is now in preparation and will be circulated shortly.

"5 WS."

THE SUCCESSFUL TRANSATLANTIC TRANSMITTING STATION OF THE RADIO SOCIETY OF GREAT BRITAIN.

By Philip R. Coursey, B.Sc., F.Inst.P., A.M.I.E.E.

(Continued from p. 789 of previous issue.)

The filament lighting current was obtained from a transformer fed from the 50 cycle supply. It was, however, desirable to earth the junction point of the secondaries of the two H.T. transformers, otherwise we might subject the windings to a greater voltage than that for which they were insulated. Hence the secondary of the filament transformer must be insulated from earth for the full rectifying voltage, and we had some trouble at first in getting adequate insulation at that point. As we were somewhat pressed for time, the difficulty was overcome at first by supplying the rectifying valve filaments from accumulator batteries. We had a 20-volt accumulator battery which we fitted up on a wooden platform and some insulators to insulate it from earth, and in that way fed the filaments of the rectifying valves without any fear of breakdown to earth. It was for this reason that we had to arrange for the charge to be put back into the batteries between each transmission. The two valves each took about 5½ amperes filament current, and this needed to be put back again fairly quickly. We actually charged the batteries at 10 amperes, but difficulty arose owing to the short time of preparation beforehand, during which we pretty well exhausted the batteries, so that it was necessary to put in some charge each time before we took some out to light the valves, since we had no time to get a full charge into the battery. Mr. Fogarty, of the Zenith Manufacturing Co., Ltd., eventually made up a special transformer for us with heavy insulation between the windings, and we then got the circuit to stand up to the rectified voltage, so that half way through the tests we changed over from the battery lighting of the rectifier filaments to A.C. lighting. This made no difference to the running of the set to any appreciable extent, but eliminated the battery charging troubles.

I am explaining these things as we did them because it thus gives a better idea of how the arrangements were made, and also because I wish to show you that the set was in no way fitted in an elaborate manner. It was really a rush job put together with the idea of getting something to work rather than something nice to look at.

The oscillation circuit used was of a more or less conventional type. In the main three types of circuit were tested, and eventually transmission was effected with the third one since it was the simplest and as effective as the others. The first type of circuit was of the "anode tap" variety, with anode and grid tappings on to the aerial tuning inductance. Two T4A valves of the M.O. Valve Company were connected in parallel for the oscillators.

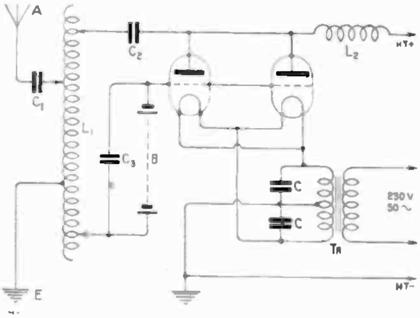


Fig. 5. First type of oscillation circuit.

Each of these valves was capable of dissipating about 450 watts on its anode, so that by limiting our input to a kilowatt nothing serious happened to the valves if they stopped oscillating, the valves being thus capable of dissipating the whole of the energy on their anodes without being damaged. The anodes just began to show red under these conditions, so that under normal working conditions when the energy was passing out into the aerial the valves were quite cold.

In the first place we used the arrangement sketched in Fig. 5, the H.T. supply being drawn from the terminals of the smoothing condensers shown in Fig. 4, through a radio frequency choke L_2 on to the anode of the oscillator valve. An adjustable potential was at first applied to the grids of the valves by means of the battery B. That was the first type of circuit employed, but as I said, at the time we were not satisfied with the aerial current, though, as we afterwards found, it was nearly as large as was obtainable from the set, so we tried other arrangements.

A series condenser was used in the aerial circuit, since the aerial is quite a large one for operating on 200 metres, its fundamental being fully 200 metres. This series condenser was 0·0005 microfarad capacity, and was designed to carry up to 10 amperes at any voltage not exceeding about 10,000 volts. At these frequencies and by using that condenser we were able to get more inductance into the aerial circuit, since by its use we considerably reduced the effective aerial capacity. It is frequently thought that the use of a shortening condenser is undesirable on 200 metres, but I do not think this is really so to any serious extent providing one does not introduce any losses in the condenser. The fact that one can get more current into an aerial by that means, means that more energy must be radiated from the aerial, since the ordinary transmission formula shows that the signal strength depends upon the product of the current at the base of the aerial and the effective height of the aerial.

For the oscillation circuit we had a choice of three inductances, one being in the form of a solenoid of copper strip about 15 ins. diameter, the strip being about $\frac{3}{8}$ in. $\times$ $\frac{1}{16}$ in. with about $\frac{3}{8}$ in. spacing. We had also one wound in strip 1 in. $\times$ $\frac{1}{16}$ in. and one similar to the one I first mentioned, but with a smaller diameter. The effect of changing from the inductance wound with $\frac{3}{8}$ in. $\times$ $\frac{1}{16}$ in. copper to the one in 1 in. $\times$ $\frac{1}{16}$ in. strip was quite marked, the heavier copper strip giving a lower resistance and appreciably more aerial current.

With this first circuit it was found difficult to prevent loss of the 200 metre energy back on to the condensers of the H.T. supply as the frequency being so high (a million and a half per second) very small capacities will draw off considerable current. Hence eventually we used the circuit shown in Fig. 6, in which the H.T. supply was connected between the valve filaments and the mid point tapping of the tuning inductance, thus keeping it entirely at a point of low radio-frequency potential. We then used a coupled circuit for the aerial through the shortening condenser, and made a separate oscillation circuit through a separate condenser C_2 (Fig. 6), which formed the oscillation circuit with the coil L_2. We could then get the valves to oscillate at the desired wavelength independently of the aerial, and then couple up the aerial circuit afterwards. As this was done the current in the oscillation circuit fell from about 25 or 26 amperes to about 5 or 6 amperes as the aerial drew the energy out of the circuit.

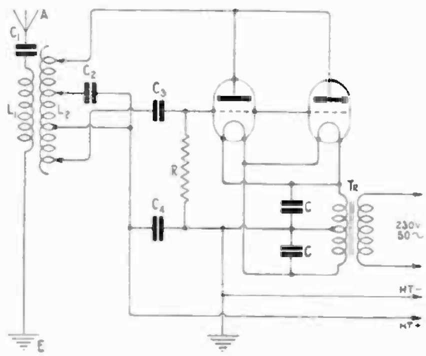


Fig. 6. Final type of oscillation circuit.

With this arrangement we eventually obtained $4\frac{1}{2}$ amperes in the aerial. This did not seem much at the time, but we took some approximate measurements of the effective resistance of the aerial and found it about 30 ohms, so that with 4·5 amperes we had something of the order of 700 watts of high frequency energy in the aerial or were therefore getting an efficiency from the valves to the high frequency energy in the aerial of something of the order of 60 per cent. These are only rough figures, as we did not take any exact quantitative measurements. Thirty ohms sounds rather high for a transmitting aerial, but as it was almost a vertical aerial, its radiation resistance might be expected to be of the order of 25 ohms. The grid condenser shown in Fig. 6 was eventually made about 0·0025 microfarad with a grid leak of 30,000 ohms.

So far I have not mentioned how we keyed the circuit. Transmission was only by means of Morse transmission, and therefore some method of keying was necessary. The commonly adopted methods are keying either in the grid circuit or in the H.T. supply to the oscillation valves. We had not the time available or the apparatus to fit up special keying arrangements with extra keying valves, etc., nor did we fancy a hand key operating on 6,600 volts, so we eventually adopted the rather crude method, but still an effective one, of keying in our main 100 volt supply circuit from the 350 cycle generator. The key rather tended to stick a little, and one or two operators had difficulty in transmitting for that reason, but on the whole the signals appeared to be quite clear cut. The charge in the smoothing condensers was sucked out very quickly by the valves, and as these smoothing condensers were fed at 350 cycles, even if two or three cycles of the 350 cycle supply were necessary to charge them up, this is quite a small period and not noticeable at ordinary hand speed Morse. The method, of course, would not be suitable with a low frequency supply, but at 350 cycles it worked quite well.

The general arrangement of the parts of the set can be gathered from the remaining photographs. Fig. 7 is a general view of the inside of the cabin. The hut we used, as can be seen, is not a very large one, and the photographer had some difficulty in taking photographs at all, but eventually obtained quite good ones. The supply from the Power Company came in at the right-hand side, and beneath it is the generator unit to which I have already referred (Fig. 2). The driving motor and the generator of this unit can be seen on the right in the background. The valves are on the framework on the left, and the lead-in can be seen behind them. The key, mounted on a convenient packing case, can be seen in the centre.

Fig. 8 shows the framework on which the valves were mounted. It is quite a rough one, knocked up from wooden strips, the frame being some 3 ft. 6 ins. high, and somewhere about 2 ft. 6 ins. square. Four valves were mounted in it, between the framework at the top and a second framework fixed about 1 ft. down. The filament lighting transformers can be seen at the base of the stand, and the rheostats were attached to the uprights. Where insulation was required it was provided by means of small strips of ebonite screwed on to the wood, and carrying screws and nuts or terminal connections. The switch mounted on the right of the framework supplied the 200 volts A.C. current to the primaries of the two filament lighting transformers. In the lower right-hand corner can be seen one corner of one of the two H.T. transformers which supplied the rectifiers. The H.T. smoothing condenser bank was on the floor, and can be seen in the background. One had to look where one trod with these things, and space being limited, it was necessary to walk warily. The milliammeter in the plate circuit of the oscillator valve was also on the floor, and can just be seen on the right of the photograph.

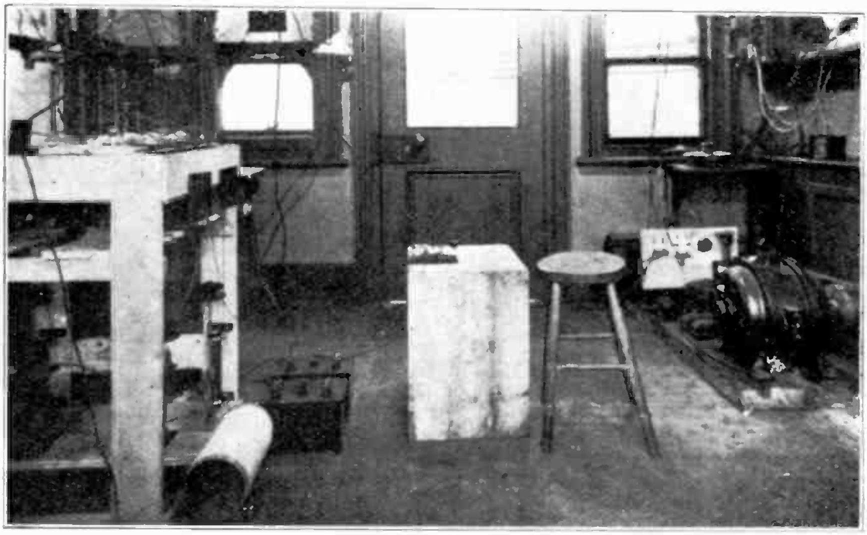


Fig. 7. General view of the interior of the station.

Fig. 9 shows the corner of the hut in which we actually produced the oscillations. The inductances I have already referred to can be seen, the lower one forming the main oscillation circuit inductance, while the upper one was in the aerial circuit. The grid leak can be seen hanging from the earth wire which is joined to the midpoint of the filament lighting transformer, and is connected at its lower end to the grid condenser. The condensers in the grid circuit, oscillation circuit and aerial circuit can be seen arranged around the inductances; the condenser standing on a porcelain insulator to keep it well away from earth is the aerial shortening condenser. An aerial ammeter was put in the circuit when required for tuning up.

These photographs may give, perhaps, just a little idea of how the set was arranged, and serve to emphasise the fact that the installation was by no means a finished one, but was just put together from whatever materials were most readily available in the time at our disposal.

Before concluding it may perhaps be worth while mentioning where the set was heard. We transmitted for ten nights at a different time period each night, and our signals were heard on four nights out of the ten by ten different American amateur stations.

They heard our code word transmissions, and practically the whole of the transmissions made on these four occasions, the signals being apparently quite good on a single detector valve.

They blame themselves for not hearing more of our signals, because their own transmitters would not stop work. So many of them were busy on 200 metres carrying on their ordinary League traffic, so that apparently reception of our signals was rendered extremely difficult through the jamming. We were heard by ten stations located in various parts —Rhode Island, Connecticut, Massachusetts, Schenectady, Pennsylvania, New York, New Jersey, and so on, mostly by stations in the neighbourhood of the Atlantic seaboard. The Americans also reported hearing 8 AB, the French station owned by M. Léon Deloy, who was reported on three nights. His code words and one hour's transmission on one night were copied. On the other two nights he was reported on a wavelength different to that on which he was transmitting, and apparently sending with a marking and spacing wave, which he was not doing. The Americans think that one of their own friends was having a joke with them on these two occasions. They also reported signals from a station 2 FZ. Now 2 FZ is a call sign which is allotted to the Manchester Wireless Society for a portable station, and we have been informed that that call sign was not used at all by the Manchester Society during the tests, and the times at which they were reported were times when they were not supposed to be working. Hence one is for the present led to the conclusion that these signals too were probably also the work of American amateurs.

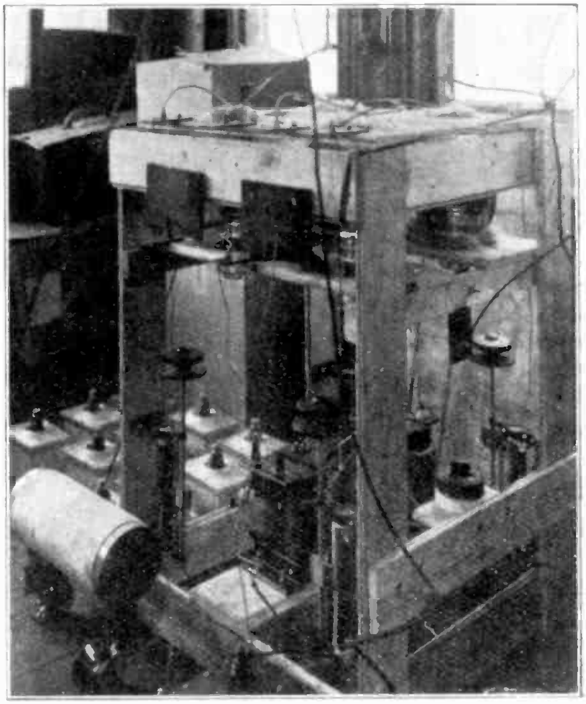


Fig. 8. The valve mounting.

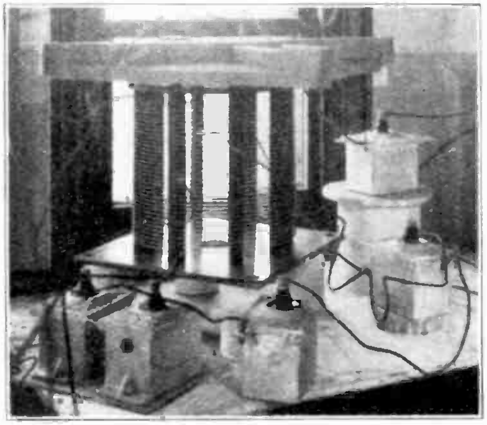


Fig. 9. The transmitting inductances and condensers.

This leaves us then with the verified receptions of 5 WS and 8 AB, 5 WS being Wandsworth station, so that we were apparently the only British station which got across with the complete code word and other transmissions.

Our signals were also reported from an operator in Iceland who listened in for a couple of nights and heard us with a single valve. We have also been reported by ship's operators from a little way outside New York.

That I think summarises the main parts of our little effort at transmitting across the Atlantic. The main object in doing so was to show the Americans that we could transmit as well as we could receive, and the fact that we did produce good signals in America, signals which were apparently readable quite strongly on a single valve circuit, shows that apparently we got the energy into the æther and that it got across. Whether it could be repeated every night over a prolonged period is another question, since these tests are by no means of a commercial nature.

Signals from American broadcasting stations are heard by amateurs in this country pretty well every night. There are, of course, bad nights when nothing comes through, but they seem to be somewhat rare at the present time. The transmission quality fluctuates a good deal, and the American Radio Relay League is quite keen on further co-operation with us as much as possible, in order to investigate the question of transmission on short waves over long distances, and to see how such transmissions vary, and when they vary; while it would also be nice to know why they vary. One puts it down to the Heaviside Layer, but that does not tell us a great deal.

The transmission of amateur signals has now been effected over many thousands of miles (one of the American stations that was heard on this side was at least 4,000 miles away). The Americans have also spanned the Pacific with their signals, having been heard off the Japanese coast, and also in the neighbourhood of Australia, so that it seems as if the various amateur organisations, if proper facilities are granted to them, can, at least under favourable conditions, transmit their short-wave signals a good proportion of the whole way round the earth if the organisations in the various countries are allowed to co-operate with one another.

(The Discussion which followed the reading of this Paper will appear in the next issue.)

Who Invented Super-Regeneration?

Readers will remember that in the issue of *The Wireless World and Radio Review* for January 20th, page 546, a letter from Mr. P. W. Harris, a contributor to this journal, was published, in which mention was made of the fact that the solicitors to Captain Bolitho had communicated with him, and referred to Captain Bolitho's patent, No. 156330, which they stated covered the principles of the super-regenerative circuit described by Mr. Harris in this journal.

In this connection, therefore, it is thought that the following letter, published in the *New York Daily Mail* recently, may be of interest to readers, since it sets forth the views of Mr. E. H. Armstrong on the matter. The letter is dated January 19th, 1923, and is addressed to the Editor, the Radio section of the *Evening Mail*. The text is as follows:—

SIR,—In your issue of January 13th last, under title of "Who Discovered Super-Regeneration?" I note you make the following statement:

"Major Edwin H. Armstrong, contrary to the announcement made public last summer, was apparently not the first to discover the principle of super-regeneration.

"That honour, judging from facts unearthed by *The Evening Mail*, belongs to John Bruce Bolitho, an Englishman."

If the editor will read my paper published in the "Proceedings" of the Institute of Radio Engineers of August, 1922*, a copy of which I am sending you herewith, he will find that his investigation was quite unnecessary as Bolitho's work is described, his British patent number referred to, and due credit given to his contribution.

If the editor will read still further he may be spared the trouble of still further investigation, as he will find that the work of another Englishman, Laurence B. Turner, who preceded Bolitho in the "trigged valve art," and upon whose work Bolitho built, is also fully discussed, and reference made to his patent.

Then, without investigation, the editor will have thrust upon him the claims of other inventors, who now, when the "farthest north" is reached and the complete theory formulated, are preparing to contest priority.

As Charles V. Logwood, through his attorneys, Darby & Darby, has now made such formal claim, we are preparing to try out the question before the proper tribunals, and the question will be definitely settled. Upon the completion of these proceedings, I will be very glad to advise you of the result.

Meanwhile, permit me to state that your account of the manner in which I made the discovery of super-regeneration is not correct, and as I have never made public the story I am at a loss to understand on what your account is based.

In all fairness may I ask that the same prominence be accorded this letter as was given to your article.

Very truly yours,
(Signed) EDWIN H. ARMSTRONG.

* For abstract, see *The Wireless World and Radio Review*, page 234, November 18th, 1922.

Wireless Club Reports.

NOTE.—Under this heading the Editor will be pleased to give publication to reports of the meetings of Wireless Clubs and Societies. Such reports should be submitted without covering letter and worded as concisely as possible, the Editor reserving the right to edit and curtail the reports if necessary. **The Editor will be pleased to consider for publication papers read before Societies. An Asterisk denotes affiliation with the Radio Society of Great Britain.**

Correspondence with Clubs should be addressed to the Secretaries direct in every case unless otherwise stated.

Huddersfield Radio Society.*

Hon. Secretary, Mr. C. Dyson, 14, John William Street, Huddersfield.

A meeting of the Society was held on Tuesday, February 13th, when Mr. George Newby delivered a lecture on "Frame Aerials and Loud Speakers." The various forms of frame aerials and their directional properties were discussed.

On Wednesday, February 21st, in the Society's clubroom, an interesting lecture on "Direction Finding as Applied to Aircraft" was given by Mr. Eskdale, of Bradford. Mr. T. Brook was in the chair. Mr. Eskdale explained the various methods used, illustrating his remarks with circuit diagrams on the blackboard.

Sutton and District Wireless Society.*

Hon. Secretary, Mr. E. A. Pywell, "Stanley Lodge," Rosebery Road, Cheam, Surrey.

Meetings are held on the second and fourth Wednesdays in the month, at 8 p.m., at the Adult School, Benhill Avenue, Sutton (near tram terminus), and all those interested in radio work in the district are invited to join.

At the meeting held on Wednesday, February 14th, a lecture was given by Mr. Bentley of Messrs. Dickie & Co., Streatham, on "The Care of Accumulators." Some of the latest types of accumulators were exhibited, together with sections of plates, and a very interesting discussion followed.

Ilkley and District Wireless Society.*

Hon. Secretary, Mr. E. Stanley Dobson, "Lorne House," Richmond Place, Ilkley.

On Monday, January 1st, Mr. E. Shackleton gave a lecture before the Society on "Inductances," the various types being treated in historical sequence and their relative advantages explained.

A general meeting of the Society was held on Monday, January 14th, at which Dr. J. B. Whitfield presided. Following the meeting, Mr. J. C. Croysdale, of the Leeds and District Amateur Wireless Society delivered his lecture on the "Armstrong Super-Regenerative Circuit."

On Monday, February 5th, an enjoyable evening was spent listening to the broadcasting programmes on a Gecophone receiver and loud speaker lent by Messrs. Francis Law, Ltd.

Wolverhampton and District Wireless Society.*

Hon. Secretary, Mr. J. A. H. Devey, 232, Great Brickkiln Street, Wolverhampton.

On Tuesday evening, February 13th, the fortnightly lecture was given by E. Blakemore, Esq., A.M.I.E.E., A.Amer.I.E.E., the subject being "The Theory of the Condenser."

Demonstrations with electrical apparatus served to illustrate the lecture, and marked appreciation of Mr. Blakemore's discourse was shown by the large audience present.

The Portsmouth and District Wireless Association.*

Hon. Secretary, Mr. S. G. Hogg, 9, Pelham Road, Southsea.

A meeting of the Association was held at the Club-rooms on February 7th with Mr. J. H. C. Harrold, A.M.I.R.E., in the chair. Mr. A. Gall, the Treasurer of the Association, gave a most interesting talk on "Hints to Amateurs."

After the lecture, an auction sale of component parts was held.

The Secretary would welcome enquiries regarding membership of the Club.

Woolwich Radio Society.*

Hon. Secretary, Mr. H. J. South, 42, Greenvale Road, Eltham, S.E.9.

On Wednesday, February 7th, through the courtesy of one of the staff of the Western Electric Company, who kindly lent a new Western Electric loud speaker and two-valve power amplifier, the members enjoyed a demonstration of the powers of the new instrument, and comparison was made with the Amplion loud speaker, kindly lent by Mr. Everitt.

The Leicestershire Radio and Scientific Society.*

Hon. Secretary, Mr. J. R. Crawley, 269, Mere Road, Leicester.

The bi-monthly meeting of the Leicestershire Radio and Scientific Society was held on Monday, February 5th, at Headquarters, the *Mercury* Office, Mr. C. T. Atkinson, President, taking the chair at 7.30 p.m.

Mr. Dyson, Vice-President, delivered his lecture entitled "How to Make an Efficient Receiver out of Scrap," explaining how the average amateur can become the possessor of an efficient receiver at a minimum cost. An appreciative discussion followed, the proceedings terminating at about 10-30 p.m.

The Society still has plenty of room for new radio enthusiasts, and full particulars can be obtained from the Hon. Secretary.

Southport Wireless Society.*

Hon. Secretary, Mr. E. R. W. Field, 26, Hartwood Road, Southport.

Great interest has been manifested in the recent American amateur tests, and two members of the Society, Messrs. Briggs and Hough, logged over 200 separate stations and 395 separate messages. Another member, Mr. Fielding, on a single valve set, has received over 50 stations. Quite a dozen members report frequent reception of American broadcasting stations, in several cases so strong that loud speakers have been used.

Over 60 persons were present at a social and whist drive held on January 9th.

On January 15th a lecture was given by Mr. J. Briggs on the "Development of a Circuit," the lecturer explaining the uses of each separate part of a set. An appreciative discussion followed.

The Manchester Radio Scientific Society.*

Hon. Secretary, Mr. H. D. Whitehouse, 16, Todd Street, Manchester.

On February 7th, a meeting of the Society was held under the chairmanship of Mr. G. G. Boullen, when Mr. J. Morris, Jr., gave his paper on "Home Constructed Apparatus and Data for Honeycomb Coil Winding."

The next meeting was held on February 14th, when Mr. Southern, of the D.P. Battery Co., Ltd., gave a paper on "Accumulators." As may be imagined, this subject proved of great interest to all present, and Mr. Southern concluded his paper with a number of useful hints for experimenters on the care of accumulators.

In the near future an interesting paper will be given by Mr. Vernon, of the G.P.O., Manchester, on "Multiplex Telegraphy as Applied to Land Line Working."

Streatham Radio Society.*

Hon. Secretary, Mr. S. C. Newton "Compton," Pendennis Road, Streatham, S.W.16.

The first annual dinner of the above Society was held upon February 14th, when 52 members and friends, including ladies, sat down to an excellent repast at the Telegraph Hotel, Brixton Hill. The Chairman of the Society, Mr. H. Bevan Swift, presided. After the toasts, the evening concluded with a concert contributed by various members and guests.

The Belvedere and District Radio and Scientific Society.*

Hon. Secretary, Mr. S. G. Meadows, 1, Kentish Road, Belvedere, Kent.

On Friday, February 16th, Mr. A. H. Norman read his paper on "The Armstrong Super-Regenerative Receiver."

Owing to the non-completion of the set forming the title of the paper, a practical demonstration was not possible, but the paper proved of great interest, diagrams of the various circuits being projected on a screen.

After the discussion, a short address given by Dr. J. A. Fleming on the "Thermionic Valve," transmitted by the London Broadcasting Station, was received on the Society's set.

The Fulham and Putney Radio Society.*

Hon. Secretary, Mr. J. Wright Dewhurst, 52, North End Road, West Kensington, London, W.14.

The above Society has been reorganised, and a new Committee formed with the intention of running the Society on up-to-date lines. At a meeting held at headquarters on Friday, February 16th, Messrs. R. H. Redmond, T. Hart Smith and E. M. Wolfe, M.B.E., were elected Vice-Presidents. A demonstration was given by Mr. Pincott with his four-valve set and loud-speaker, made by himself, and at 9.30 p.m. Mr. Hubbard, 2 XO, a member, transmitted speech and music from his station.

The Thames Valley Radio and Physical Association.*

Hon. Secretary, Mr. Eric A. Rogers, 17, Leinster Avenue, East Sheen, S.W.14.

On Thursday, February 15th, the Association met in their Headquarters at the Hut, Wigan Institute, at 8 o'clock. Mr. C. Appleton-Smith taking the chair. The Chairman called upon Mr. J. Wade (of the M.O. Valve Co.) to give his lecture on "Valves, and their Manufacture," and this proved to be both interesting and instructive.

The Association covers the districts of Barnes, Mortlake, East Sheen, Richmond, Twickenham, St. Margarets, Teddington and Kew.

Guildford and District Wireless Society.*

On Monday, February 19th, the Club assembled for the first regular meeting at their new premises (148, High Street) to hear a paper read by Mr. P. K. Turner on "Aerials and Aerial Circuits." Mr. Turner dealt very fully with his subject, devoting the greater part of his time to a consideration of the outside aerial.

The Willesden Wireless Society.*

Hon. Secretary, Mr. G. D. Wyatt, 70, Craven Park, Harlesden, N.W.10.

A very interesting meeting was held on January 30th last, when Mr. Wyatt gave an instructive lecture regarding the club's three-valve set. It was decided at this gathering that the meetings should in future be held fortnightly instead of weekly as hitherto.

On February 13th, Mr. Picker proved himself a most able exponent of the various methods of high frequency amplification, and in order to demonstrate the efficiency of those methods, kindly brought along his own set.

It is confidently anticipated that in the very near future a "bumper" lecture and demonstration will be given at the Society's headquarters at the Harlesden Public Library. Further particulars regarding this demonstration will be sent upon application being made to the Hon. Secretary at the above address.

Paddington Wireless and Scientific Society.*

Hon. Secretary, Mr. L. Bland Flagg, 61, Burlington Road, Bayswater, W.2.

A well-attended meeting of the Society was held in the Physics Theatre of the Paddington Technical Institute on the evening of February 1st, Dr. J. H. Vincent, M.A., D.Sc., M.I.E.E., being in the chair. The meeting received with interest the report of Mr. G. Turton, the Society's delegate to the Radio Society of Great Britain's Annual Conference. Designs for the Society's apparatus were submitted by Messrs. Beak and Turton, and volunteers were forthcoming to commence building.

Fine signals are reported from those of the members who have used the new aerial, and the amount of time that was devoted to its erection has been voted well spent.

A few words by the Hon. Secretary on what he had seen on his recent visit to Northolt Wireless Station brought to a close a very enjoyable evening.

The Finchley and District Wireless Society.*

Hon. Secretary, Mr. A. E. Field, 28, Holmwood Gardens, Finchley, N.3.

Several new schemes were discussed at the Society's meeting on Thursday, February 22nd, at St. Mary's Schools, when Mr. Brown took the chair, and two new committee members were elected to fill vacancies. The club set was operated and gave the usual good results.

Exeter and District Wireless Society.*

Hon. Secretary, Mr. F. S. Valentine, 10, College Avenue, Exeter.

At the meeting of the Society held at 31, Longbrook Street, Exeter, on February 12th, a lecture was given by Mr. W. Smitham on "The Principles of Wireless," in which he outlined the principles of radio transmission and reception.

"Bridge and Megger Testing" was the subject of a very instructive lecture and demonstration by Mr. Parkhouse at a meeting on February 19th. Various questions were asked during the interesting discussion that followed.

Prospective members are invited to communicate with the Secretary.

The Wireless and Experimental Association.*

Hon. Secretary, Mr. Geo. Sutton, 557, Lordship Lane, S.E.22.

The Association met at the Central Hall, Peckham, on February 7th, when a general discussion took place on such topics as appeals for wireless help, the library and subscriptions, the best resistance for a potentiometer across an accumulator, the best proportion primary to secondary for a tuner, the practical efficiencies of single, double and triple wire aerials, and multiple magnification with one valve.

Stratford-on-Avon and District Radio Society.

Hon. Secretary, Mr. E. W. Knight, 17, Park Road, Stratford-on-Avon.

The fourteenth general meeting of the above Society was held on Monday, February 12th, at headquarters, with Mr. F. A. Sleath in the chair.

A lecture on "The Single Valve Rectifying Panel" was delivered by Mr. Sleath, who dealt in a simple and concise manner with the parts required and their function. A very successful evening was concluded by switching on the club set and listening to the close of **5 IT's** concert.

"The Construction of a Variometer and Its Use" was the subject of an address by the Secretary at the fifteenth general meeting held on Monday evening, February 19th, at the Rother Street headquarters, various parts of the instrument being passed round for inspection. The winding of "honeycomb" inductances, both by hand and machine, was also dealt with. A receiving set made by a member was inspected, tested, and coupled to the aerial, good results being obtained.

Bath Radio Club.

Hon. Secretary, Old Red House, New Bond Street, Bath.

On February 6th, a special social evening was held at the Old Red House, New Bond Street, Bath, the headquarters of the Bath Radio Club. Although membership of the club is confined to men, ladies were made specially welcome to this function, and dancing was predominant among the features of the evening.

At the club meeting on February 14th, Mr. L. E. R. Boxwell, of Bradford-on-Avon, Wilts., continued his series of lectures to the members. Mr. Boxwell, whose instruction is proving so popular, dealt with the thermionic valve.

Prescot and District Wireless and Experimental Association.

Hon. Secretary, Mr. C. E. Macaulay, 55, Central Avenue, Prescot, Lancs.

The Association had a well attended meeting at the Drill Hall, Prescot, on Wednesday, February 14th, when Mr. Geo. Sutton, A.M.I.E.E., gave a lecture entitled "Electricity in Relation to Wireless."

Councillor Cross took the chair, and a considerable amount of useful business supervened on the lecture.

Radio Society of Birkenhead.

Hon. Secretary, Mr. R. Watson, 35, Fairview Road, Oxton, Birkenhead.

A meeting of the Society was held on February 15th, Mr. Hughes occupying the chair.

A lecture on the "Electronic Theory" was delivered by Mr. McKinlay, who very lucidly dealt in turn with the atom and electron, and what is really meant by an electric current.

Now that the Society has forty members, the Secretary has been asked to apply for affiliation to the Radio Society of Great Britain.

Stourbridge and District Wireless Society.

Hon. Secretary, Mr. P. Harper, 33, High Street, Lye, Stourbridge.

At a meeting held on Tuesday last it was resolved to form a Wireless Society for Stourbridge and District, some thirty persons signifying their willingness to become members.

Colonel C. W. Thomas was unanimously elected President, Major Thompson, Harboro Hall, Blakedown, and Mr. F. Smith, late senior wireless operator, Admiral's flagship, R.N., becoming Vice-Presidents. It is proposed to affiliate with the Radio Society of Great Britain.

Trafalgar Wireless Society.

Hon. Secretary, Mr. F. A. L. Roberts, 43, Adelaide Road, Brockley, S.E.4.

Meetings are held every Tuesday at 8 p.m. at Trafalgar Hotel, Park Row, Greenwich, S.E.10.

The annual general meeting of the above Society was held at their headquarters on February 13th, 1923, Mr. R. J. Stanley (President and Director of Instruction) occupying the chair, when the election of officers for the ensuing year was proceeded with.

The President introduced the question of affiliation to the Radio Society of Great Britain, several members speaking in favour of the suggestion. Ultimately the meeting decided that the Secretary be instructed to make the necessary arrangements.

Before a well attended meeting on February 20th, Mr. R. J. Stanley gave an interesting lecture on various types of tuners used in wireless reception, giving many useful hints to members constructing their own sets, following his remarks with a demonstration on the Society's crystal set, and a L.F. amplifier unit of his own make.

The Secretary would be pleased to hear from any gentlemen who would be willing to give a lecture or demonstration before the Society.

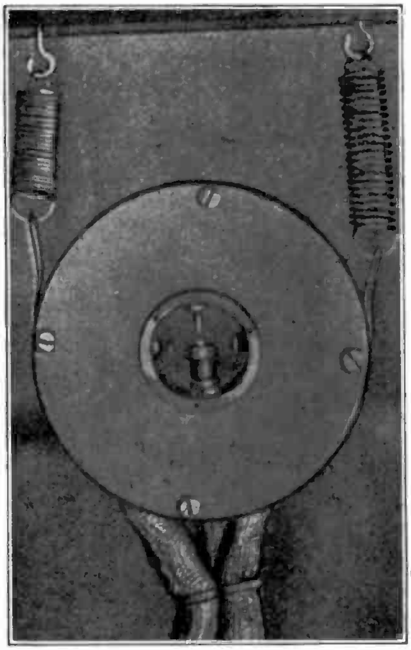
Applications for membership, which are cordially invited, should be addressed to the Secretary.

The Glow Discharge Microphone

A MICROPHONE OPERATING ON AN ENTIRELY NEW PRINCIPLE.

THE new transmitter invented by Dr. Phillips Thomas, research engineer of the Westinghouse Electric and Manufacturing Company of America, and designed essentially for broadcast purposes, is stated to practically eliminate microphone distortion, and has been used at the Westinghouse Broadcasting Station KDKA within the past few months with marked success.

The basis of the invention is the elimination of the diaphragm now used in all transmitters in practical service, which, because of its inherent inertia, is not capable of vibrating in perfect sympathy with the entire range of audible sounds. If it can transmit low notes successfully, it will fail on high notes; and *vice versa*. The ordinary diaphragm is designed with reference to the middle register, and it therefore does not transmit extremely high and extremely low notes satisfactorily. The piano is a case in point. The highest notes become a series of clicks, whilst the very bass notes are reproduced as a roar.



Photo—Courtesy. Westinghouse Electric Co.

A suspended glow discharge microphone.

In the Thomas transmitter, a minute electrical discharge takes the place of the mechanical disc. This discharge flows between two points, separated by a fraction of an inch. It is affected by sound waves, just like the diaphragm, but being non-material and having no perceptible inertia, it responds equally well to all vibrations. Hence music broadcasted by means of it is transmitted with practically its original purity.

Photo—Courtesy. Westinghouse Electric Co.

Dr. Phillips Thomas, the inventor.

Dr. Thomas has recently been experimenting with his transmitter at the Westinghouse Pittsburgh Station, and within the near future all Westinghouse Broadcasting Stations will be regularly equipped with this device.

In appearance the Thomas transmitter resembles a large watch, with the front and back covered by wire gauze. On looking into it, a point of light can be seen, caused by the flow of the electric energy against one of the terminals.

The Manchester All-British Wireless Exhibition.

THE Manchester All-British Wireless Exhibition and Convention, organised by Messrs. Bertram Day and Co., Ltd., 9-10, Charing Cross, London, S.W.1, was held in the Burlington Hall, Burlington Street, from the 17th to the 24th, and included in its programme a convention held under the auspices of the Manchester Wireless Society.

Exhibits were exclusively confined to wireless goods, apart from such items as bear directly on this industry, such as trade publications, etc. The needs of the public were very thoroughly catered for and every possible step taken to appeal to the interests of the purchasing public by means of practical demonstrations, displays and lectures. On the other hand, the educative side of the subject was not overlooked, and it may be stated that anyone with any wireless interests whatever, whether concerned solely with the trade or with wireless as a hobby or profession, found this exhibition a very excellent opportunity of obtaining first-hand information and up-to-date advice.

The Black Bess Orchestra at the Manchester Broadcasting Station.

Among the principal exhibits were the following :—

Messrs. W. C. Barraclough, 61, Bridge Street, Manchester ; Messrs. J. L. Cartwright & Co., 24, London Road, Manchester ; Messrs. Hemm & Lambert, Ltd., Camp Street, Deansgate, Manchester ; Messrs. H. Clarke & Co., (Manchester) Ltd., Eastnor Street, Old Trafford, Manchester ; Messrs. Chloride Electrical & Storage Co., Ltd., Clifton Junction, Manchester ; Messrs. E. M. Evans & Sons, Ltd., 1, Lever Street, Manchester ; Messrs. Peto Scott Co., Ltd., Featherstone House, 64, High Holborn, W.C.1; Messrs. Victoria Electrical, Ltd., 1-5, Chapel Street, Salford, Manchester ; Messrs. Telephone Manufacturing Co., Ltd., 2a, Mount Street, Albert Square, Manchester ; Messrs. Mottershead & Co., 7, Exchange Street, Manchester ; Messrs. John Roberts, 261, Deansgate, Manchester ; Messrs. British Radio Sales Co., Ltd., Stevens Buildings, Gresse Street, Rathbone Place, W.1 ; Messrs. Meager & Ratcliffe, 221, Deansgate, Manchester ; Messrs. Finnigans, Ltd., Deansgate, Manchester ; Messrs. E. O. Walker & Co., Cannon Street, Manchester ; Messrs. Stephens Brothers, 83, Stretford Street, Manchester ; Messrs. Manchester Radio Co., Ltd., 155, Oxford Street, Manchester ; Messrs. Arc Electrical Co., Trevelyan Buildings, Corporation Street, Manchester ; Messrs. Chase Motors Co., Ltd., Sandyford Square, Newcastle-on-Tyne ; Messrs. Concordia Electric Wire Co., Ltd., Trent Mills, New Sawley, Derbyshire ; Messrs. Richard Whaley, Ltd., New Islington, Manchester ; Messrs. W. T. Rawcliffe, Ltd., Salford, Manchester ; Messrs. The Wireless Press, Ltd., 12-13, Henrietta Street, W.C.2 ; Messrs. The Trader Publishing Co., Ltd., 139-140, Fleet Street, E.C.4 ; Messrs. Fullers United Electric Co., Ltd., Woodland Works, Chadwell Heath, E. ; Messrs. Northern Radio Co., 96, Arcade Chambers, St. Mary's Gate, Manchester ; Messrs. Barrett & Elers, Ltd., Wallis Road, E.9 ; O.C. 42nd (East Lancs) Divl. Signals, Captain Monks, Burlington Street Drill Hall, Manchester ; Messrs. Bertram Day & Co., Ltd., 9 and 10, Charing Cross, S.W.1 ; Messrs. Odhams' Press, Ltd., 84-95, Long Acre, W.C.2 ; Messrs. A. Franks, Ltd., 95, Deansgate, Manchester.

Notes

Midday Broadcasting.

The British Broadcasting Company has received permission from the Postmaster General for the permanent transmission of concerts between 11.30 a.m. and 12.30 p.m. from all the Company's stations.

Broadcasting in Norway.

It is proposed to erect broadcasting stations at Christiania, Bergen and Trondhjem and application for the neccessary licences has already been made by the Norwegian Marconi Company and the Morse Telegram Bureau.

Madagascar Wireless.

Work is proceeding rapidly on the construction of a high power wireless station at Antananarivo, on the central plain of Madagascar. The antenna system consists of eight pylons, 795 feet high, and when the surrounding buildings are completed they will house the fifty white members of the staff and 500 natives. The station will not be ready for several months.

A rival to the barrel organ. The latest product of Burndept, Ltd. It contains an Ethophone V, with power amplifier and two loud speakers.

The Glasgow Broadcasting Station.

A few details of **5 SC**, the new Scottish station opened on March 6th, will be of interest. The studio, which is modelled on lines similar to the other stations of the British Broadcasting Company, is situated at 202, Bath Street. The microphones are connected to a three-stage amplifier, which communicates by underground cable with the transmitting station at the Port Dundas Electricity Works. The transmitting installation is on the second floor of the electricity works tower, between which and one of the tall chimney stacks the aerial is suspended.

The opening of the Glasgow Broadcasting Station by Lord Provost Paxton. Many well-known gentlemen associated with the broadcasting enterprise can be readily recognised.

The newly appointed Director of the Glasgow station is Mr. Herbert A. Carruthers, a musician of high repute in the city. After seeing a great deal of active service in France, Mr. Carruthers came to Glasgow, when he was appointed organist in the Park Parish Church, a position he still holds. He has recently been in London studying broadcasting organisation and the compilation of programmes.

Eiffel Tower Time Signals Re-transmitted from Manchester.

The Manchester Broadcasting Station is re-transmitting nightly the time signals sent out from Paris. The Eiffel Tower wavelength being 2,600 metres, a reduction has to be effected for transmission on 385 metres. This is done automatically, and the consequent lag is only 1/300th of a second. The aerial used at Manchester for this purpose is a small one running almost underneath the main transmitting aerial at Trafford Park.

No Broadcast Concerts for the Navy Yet.

The fitting of warships with broadcast sets has not as yet been found possible by the Admiralty, says the "Navy," the organ of the Navy League. One reason, that the public expense would not be justified, is supplemented by the possibility of undesirable effects on the service apparatus, and the question is undetermined. On the other hand, the U.S. Navy Department are broadcasting monthly concerts for the benefit of the American Navy.

An International Language for Radio.

Venice will be the scene, during Easter, of an International Commercial Conference, which will discuss the need for an international language for commercial purposes. Chambers of Commerce, Rotary Clubs, and other public commercial bodies, will be sending delegates to take part in the discussions. One of the subjects to be considered will be the utilisation of Esperanto for Wireless

Telegraphy and Telephony. The need for an international language for radio will become more and more acute as the means of intercommunication between amateurs in Europe become easier, and we trust that as a result of this conference the subject will be considered seriously by all interested in radio.

Appointment of Cardiff Station Director.

Major Arthur Corbett-Smith has been appointed Director of the Cardiff Station of the British Broadcasting Company, Limited. Amongst other things Major Corbett-Smith is M.A. (Oxon.), F.R.G.S., Barrister-at-Law, Major, R.F.A., Officer de l'Instruction Publique, Hon. Secretary-General, The Naval and Military Musical Union, Editor, "The Journal of State Medicine," etc. Major Corbett-Smith is an accomplished musician, and has several operas and other compositions to his credit. He held a commission in the Army for many years, and much of his time was devoted to furthering musical and educational schemes amongst the troops.

A Correction.

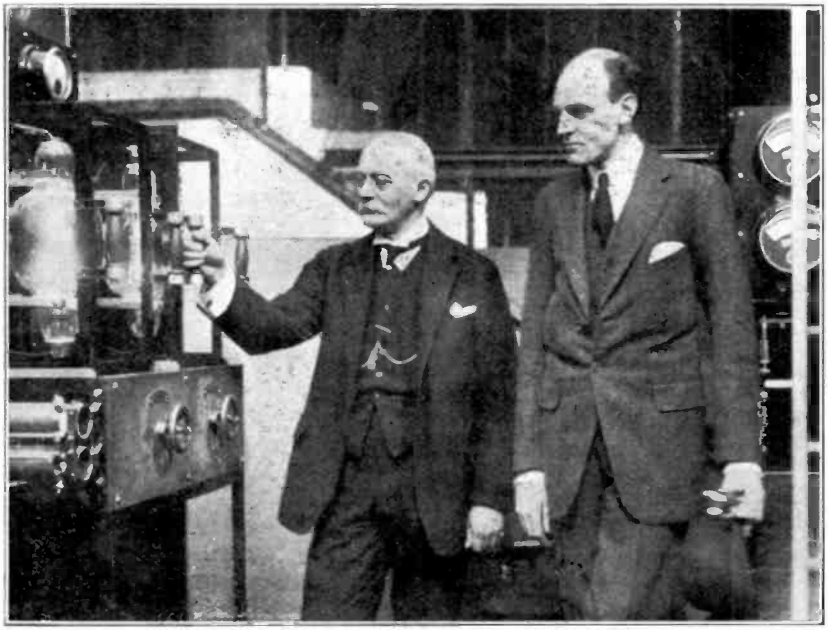
We have been asked to state that, in the advertisement of the British Wireless Supply Company, appearing on page xxii of the March 10th issue of this journal, it should have been made clear that the words "Indoor Aerial" apply only to Newcastle and Manchester.

Marconi Wireless at Motor Club's Rally.

For some considerable time the Marconi Company have been perfecting their wireless receiving set for large cars. A Daimler car was present for demonstration purposes at the opening rally of the Junior Car Club held last Saturday at Burford Bridge Hotel, when many members of the Club listened in while travelling at speed. The results were excellent in every way, the broadcasting from 2 LO being received quite well. By arrangement with Wireless Equipment, Ltd., 2 OM very kindly gave two special transmissions.

New Sterling Instruments.

Loud speakers and power amplifiers of new design are described in an interesting catalogue (No. 347) we have received from Messrs. The Sterling Telephone and Electric Co., Ltd. The firm has also issued an attractive catalogue (No. 348) dealing with its extensive range of receiving units.



Lord Gainsford, Chairman, and Mr. J. C. W. Reith, Managing Director of the British Broadcasting Co., Ltd., at the new Glasgow station.

Interference in the Twickenham District.

The Thames Valley Radio and Physical Association is conducting a campaign in the Twickenham district in an endeavour to get in touch with some stations which are causing interference. They ask for the co-operation of all interested in wireless in this district, and hope to obviate the trouble by inducing those new to wireless to join the association and thereby acquire a better acquaintance with the proper manipulation of apparatus.

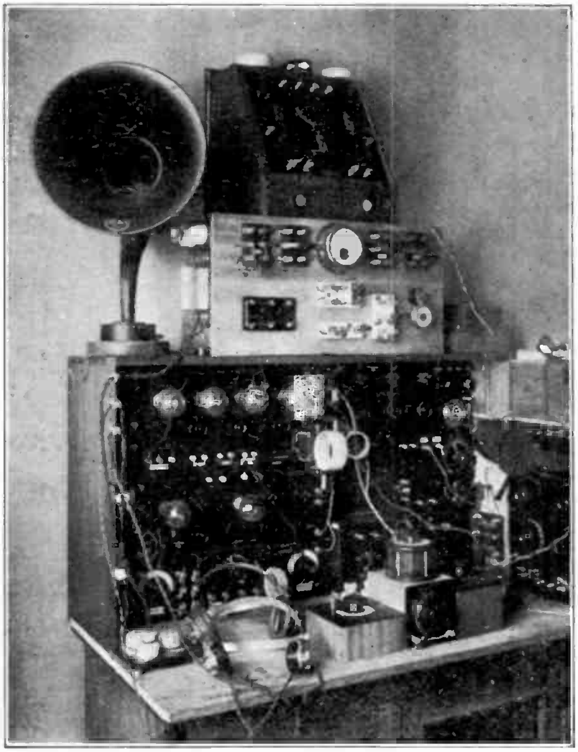
Book Received

"STERKSTROOM" (Holland: s'-Gravenhage; Amalia van Solmstraat 2-4). Price, 80 centimes. A twice-monthly periodical devoted to electricity in all its applications.

Correspondence.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—The enclosed is a photograph of my home-made receiving set, which contains two panels—a four and a five-valve—built entirely on the lines of your article "Refinements in Receiving Circuits," of February 3rd, 1923. The only part not constructed by myself is the Burndept Ethophone III, which stands on the top of the switchboard. The complete set contains: one three-valve panel, one D. and two L.F.; one four-valve, one H.F., one D., two L.F.; and the five-valve, two H.F., one D. and two L.F. The three tuners are two loose couplers and one double circuit with reaction. The condensers are of 0.001, 0.0003, 0.0002 and vernier, which are brought to plug sockets and can be used in any combination over the whole set. In the same manner any tuner can be connected in circuit with any valve panel. The sockets are at the back of the condenser block and do not show in this photograph. The switchboard naturally controls the H.T. and L.T. and local grid cells to the various panels, and all accumulators and batteries are kept in the back of the switchboard, out of sight. The "Brown" speaker can be used either with or without the Brown relay which can be seen to the right of switchboard. Telephone transformer is on left of the board and either high or low resistance telephones can be used.



The five receiving installation belonging to Mr. R. F. Lamport of 21, Church Street, Croydon.

R. F. LAMPORT.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

SIR,—I note with interest letters by Messrs. Deloy and Tingey in to-day's issue, and should like to make a few comments.

With reference to the suggestion of prefixing the initial letter of the name of the country in front of the call letters, it will be realised that this method greatly increases the necessary call length. Take American **5 ZADA** (an actual station) and **8 RRX**. We get **A 5 ZADA** de **F 8 RRX**! Apart from the wrist exercise, the chances of getting a complete call sign from a very long distance U.S. amateur such as the above **5 ZADA**, are greatly diminished, as any who have listened to U.S.A. stations know, for the longer the call sign the harder it is to read, especially when Northolt is on. In the *Q.S.T* mentioned it was proposed to alter the "de" interval into the initial letters of the countries of the respective stations, first the called and then the calling station, *i.e.*, **5 ZADA** af **8 RRX**, They point out, however, that this is a breach of the law, which says that "de" should be used. Why not, then, call as follows: **5 ZADA** de af **8 RRX**?

This sounds rather lengthy, but is not so bad as it looks. When the "de" is omitted we are again likely to be put off into thinking that we are hearing a high power station harmonic, sending code.

I expect someone else has a better suggestion, and I hope we will hear about it.

With reference to Mr. Tingey's remarks, the following may be of interest. My station is just far enough from the Northolt nuisance for me to be able to work while he is on. Immediately he stops transmitting faint signals are doubled in strength, whether they are actually on a harmonic or not. On the last night but one of the reception tests, when so many U.S. stations were heard, everyone noticed how few harmonics were present. Also, for the short period during which Northolt worked, almost nothing was heard. It would be interesting to hear from someone near a high-power pure C.W. station, as matters are complicated by the arc and its "mush."

You may possibly be interested in the following test results recently obtained. About a fortnight ago, at 0100, while listening for U.S. amateurs and broadcasters, I heard **OMX** Amsterdam working, and, merely to show a friend how my transmitter worked, I called him. I was greatly surprised to get a reply, and we were able to work for some time though fading was bad. He was receiving me on one valve. Transmitter here was putting 0·195 into a 38-ohm aerial on 200 metres (earth lead 70 ft. long), or 1·52 watts output. Since then the aerial resistance has been reduced to 12 ohms by means of a counterpoise, so that about two-thirds of this power was wasted in ohmic losses, so that the effective power was just about 0·5 of a watt, the distance being 290 miles. The input was about 5 watts, owing to the use of an unsuitable valve without a grid leak, the set having been rigged up to work with a friend, who was also staying up, about 300 yards away. I think this is a record, so hats off to Holland!

With reference to the reception of U.S. broadcasting, I picked up a station, evidently in the U.S.A., on about 365 metres on February 3rd, 1922, at 2140 p.m., during a five-minute interval at 2 LO The song, by a soprano, "Coming Thro' the Rye," was heard, after which the announcer said that the singer would speak, which she did. Then 2 LO started again. My "score" so far is as follows: First telephony heard for half-an-hour. October 15th, 1922, 0015 a.m., for half-an-hour; complete programme but no call. From December 10th, 1922, to date, telephony heard on 32 occasions, WJ 2 30 times, WGY 25 times, with call letters (reports of some of this made to Mr. Coursey with trans-atlantic report). Receiver: two valves in first two cases (one rectifier, one L.F.,) and all subsequent occasions, one H.F. tuned anode and one rectifier (reaction to anode coil). Aerial crossed by phone wires. Earth lead 70 ft. long.

I hope these particulars will interest you, and I hope to see more discussion on the first two questions.

Yours faithfully,

FREDERIC L. HOGG. (2 SH)

Calendar of Current Events

Friday, March 23rd.

MANCHESTER WIRELESS SOCIETY.
At 3.30 p.m. At the Albion Hotel, Piccadilly, Manchester (Wireless Convention). Lecture: "Methods of Reducing Interference in Wireless Sets." By Prof. Marchant, D.Sc.

SHEFFIELD AND DISTRICT WIRELESS SOCIETY.
At 7.30 p.m. At Dept. of Applied Science, St. George's Square. Elementary Class conducted by Mr. J. G. Jackson, B.Sc.

LEEDS AND DISTRICT AMATEUR WIRELESS SOCIETY.
Lecture: "Construction of Intervalve Impedance Coils." By Mr. S. Kniveton, F.R.Met.Soc.

RADIO SOCIETY OF HIGHGATE.
Lecture: "Construction of Tuners." By Mr. J. F. Stanley.

BELVEDERE AND DISTRICT RADIO AND SCIENTIFIC SOCIETY.
Lecture: "Aerials and Earths." By Mr. H. H. Smith.

Sunday, March 25th.

From 3 to 5 p.m. Dutch Concert from **PCGG,** The Hague, on 1,050 metres.

Monday, March 26th.

From 9.20 to 10.20 p.m. Dutch Concert from **PCGG,** The Hague, on 1,050 metres.

IPSWICH AND DISTRICT WIRELESS SOCIETY.
At 8 p.m. At 55, Fonnereau Road. Lecture by Mr. C. A. Jamblin.

ASHTON-UNDER-LYNE AND DISTRICT RADIO SOCIETY.
At 8.15 p.m. (Particulars of venue available from Secretary). Lecture: "X-Rays." By Dr. Brice (of Dukinfield).

Tuesday, March 27th.

WEST LONDON WIRELESS AND EXPERIMENTAL ASSOCIATION.
At Acton and Chiswick Polytechnic, Bath Road, Chiswick. Lecture by Mr. O. S. Puckle.

GRAYS AND DISTRICT RADIO SOCIETY.
At 7.30 p.m. At the Victoria Hall, High Street. Ordinary Meeting.

PLYMOUTH WIRELESS AND SCIENTIFIC SOCIETY.
At 7.30 p.m. Lecture by Mr. K. S. G. Monk.

Wednesday, March 28th.

HALIFAX WIRELESS CLUB AND RADIO SCIENTIFIC SOCIETY.
Elementary Mutual Instruction evening.

EDINBURGH AND DISTRICT RADIO SOCIETY.
At 8 p.m. At R.S.S.A. Hall. Lecture on "Electrical Power Meters." By Mr. J. A. Beveridge.

WOOLWICH RADIO SOCIETY.
At 8 p.m. At the Y.M.C.A., Woolwich. Demonstration of X-Rays. By Mr. A. G. Beeson.

Thursday, March 29th.

From 9.20 to 10.20 p.m. Dutch Concert from **PCGG,** The Hague, on 1,050 metres.

STOKE-ON-TRENT WIRELESS AND EXPERIMENTAL SOCIETY.
Annual General Meeting. Election of officers. Reading of winning student's paper.

LUTON WIRELESS SOCIETY.
At 8 p.m. At the Hitchin Road Boys' School. Practical Work and Experiments.

THAMES VALLEY RADIO AND PHYSICAL ASSOCIATION.
At 8 p.m. Lecture by Mr. Shaughnessy, O.B.E., M.I.E.E. (Chief Engineer, G.P.O.).

DEWSBURY AND DISTRICT WIRELESS SOCIETY.
At 8 p.m. At South Street, off Church Street. Lecture by Mr. Pettigrew (Leeds).

BROADCASTING STATIONS.

Regular evening programmes, details of which appear in the daily press, are now conducted from the following stations of the British Broadcasting Company:—

London	2LO	369 metres.
Birmingham	5IT	420 ,,
Manchester	2ZY	385 ,,
Newcastle	5NO	400 ,,
Cardiff	5WA	353 ,,
Glasgow	5SC	415 ,,

FRENCH BROADCASTING TIMES.

Eiffel Tower. 2,600 metres. 11.15 a.m. weather reports (duration 10 mins.) 6.20 p.m., weather reports and concert (duration about 30 mins.) 10.10 p.m., weather reports (duration 10 mins.).

Radiola Concerts. 1,565 metres, 5.5 p.m. news; 5.15 p.m. concert till 6 p.m.; 8.45 p.m. news; 9 p.m., concert till 10 p.m.

L'Ecole Supérieure des Postes, Télégraphes et Téléphones de Paris. 450 metres. Tuesdays and Thursdays, 7.45 p.m. to 10 p.m. Saturdays, 4.30 p.m. to 7.30 p.m.

The Transatlantic Amateur Tests.

SUMMARISED REPORT OF BRITISH RECEPTIONS.

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

(*Concluded from page 812 of previous issue.*)

These differences may be brought out by Table VI., which gives the number of nights on which the best of the stations listed in Tables II and V were heard, the figures in this Table being extracted from Table V.

The remaining stations listed in Tables II and V were only heard on one night during the tests. Hence 60 stations were heard making their "individual" transmissions for two or more nights during the tests, *i.e.*, 63·8 per cent. of the total number reported during these individual periods.

TABLE VI.

Variation in number of nights on which individual transmissions were heard from the best stations listed in Tables II and V.

2 EL	9
2 ZK	9
2 AWL	8
2 AWF	7
3 ZW	7
8 AQO	7
1 XM	6
1 YK	6
1 ZE	6
2 BQU	6
2 GK	6
3 XM	6
2 LO	5
3 AUU	5
3 BG	5
3 ZZ	5
8 ATU	5
8 AWP	5
1 AJP 1 ASF 1 BDI 1 BGF 1 GV 2 BML 2 NZ 2 XAP 3 BGT 4 BY 8 UE	4
1 BCG 1 BEP 1 BET 1 CMK 1 CNF 1 FB 2 AHO 2 CQZ 2 GR 2 UD 2 ZL 3 AFB 3 BLF 8 BXH 8 SP 8 YD 9AL (Canada)	3
1 AGK 1 AZW 1 BCF 1 BKQ 3 CC 3 CG 3 NH 3 YO 4 EB 5 XK 8 BK 8 IB 8 XE 9 ZN	2

The names and addresses of the British amateurs (and the Dutch amateur) who reported the "individual" transmissions tabulated above, are set out below in Table VII, which also gives the number of such individual transmissions heard by each throughout the Tests.

TABLE VII

British and Dutch amateurs who reported the "Individual" Transmissions in Table II.

TOTAL NUMBER OF DIFFERENT STATIONS HEARD MAKING INDIVIDUAL TRANSMISSIONS (CODES, &c.).

J. Briggs	Brank House, Ainsdale, Southport	65
Manchester Wireless Society (Receptions by W. R. Burne & A. Cash)	Manchester, Lancs.	43
B. H. C. Matthews	Hillcroft, Nore Road, Portishead, near Bristol, Somerset	38
W. E. F. Corsham	104, Harlesden Gardens, Willesden, London, N.W.10	34
D. W. Walters	4, Mansel Street, Gowerton, Swansea	31
G. J. Eschauzier	19, Parkweg, The Hague, Holland	29
E. W. Penney	34, Coldrenick Street, St. Budeaux, Plymouth, Devon	27
E. J. Simmonds	"Meadowlea," Gerrard's Cross, Bucks	24
J. A. Partridge	22, Park Road, Collier's Wood, Merton, London, S.W.19	17
H. C. Chadwick	9, Raymond Street, Bolton, Lancs.	15
G. R. Lewis and D. F. Owen	10, Lansdowne Road, Ashton-on-Mersey, Cheshire	14
R. E. Williams	29, Holborn Road, Holyhead, North Wales	13
J. Ridley	"Studley," Woodside Green, South Norwood, London, S.E.25	12
F. L. Hogg	37, Bishop's Road, Highgate, N.6	11
L. J. Leslie	Fairwater, Evesham, Worcestershire	11

TABLE VII—*continued.*

F. J. Dinsdale	14, Highfield View, Stoneycroft, Liverpool, Lancs.	10
E. C. Dorling	161, Earlsfield Road, Wandsworth Common, London, S.W.18	10
A. Higson	161, Cotton Tree Lane, Colne, Lancs.	10
F. Walker	Holly Farm House, Feltham, Middlesex	9
R. S. Elven	Hurst Lodge, Waverley Grove, Hendon	8
A. G. Gregory & W. Vernon	17, Lincoln Street, Hulme, Manchester	8
A. G. Wood, A. Neilson and H. J. Swift	112, Tulse Hill, London, S.W.2	6
C. Shearston	135, Landguard Road, East Southsea, Portsmouth, Hants.	5
J. Croysdale	5, Elm Grove, Burley-in-Wharfedale, Leeds	4
M. V. Williams	3, Holmesgrove Road, Herleage, Bristol	4
—Andrews	London	2
H. Collin	Ramsden Heath, Billericay, Essex	2
A. H. Fielding	32, Stanley Avenue, Birkdale, Lancs.	2
H. B. Grylls	Trenay Fauton, Crewe Road, Eastbourne	2
F. W. Higgs and J. S. Hobbs	45, Howard Road, Westbury Road, Bristol, Somerset	2
C. E. Morris	Southernhay, Heron Hill, Belvedere, Kent	2
A. Richardson	29, Josephine Avenue, Brixton Hill, London, S.W.2	2
C. G. Williams	22, Scholar Street, Sefton Park, Liverpool	2
D. A. Brown	24, Booth Street, Handsworth, Birmingham	1
F. Foulger	118, Pepys Road, New Cross, London, S.E.14	1
A. E. Greenslade	9, Jelf Road, Brixton, London, S.W.2	1
L. Lott	Lenshop, High Street, Burnham-on-Sea	1
C. S. Naylor	43, Hill Crescent, Longden Road, Shrewsbury	1
P. G. A. H. Voigt	Bowdon Mount, 121, Honor Oak Park, London, S.E.23	1

Further particulars of the apparatus used during these receptions will be published later, together with other particulars of the receptions.

Before closing this preliminary report, it may be of interest to give a complete list of the call signs of all the stations (U.S. and Canada) reported during the tests. This list, set out in Table VIII on the next page, includes the individual transmissions, those heard during the "free-for-all" periods at the correct times, and all other stations from which calls have been intercepted—many calling CQ, others calling other U.S. amateur stations, and carrying on DX communications, and other traffic. These have been arranged alphabetically under each district for convenience in reference.

A large proportion of these stations, apart from those heard with code words, were reported on several nights and by several different observers, but some were reported on one occasion only, and if heard through jamming there was in a few cases some slight doubt as to the accuracy of the call letters. Doubtless the American Radio Relay League will at a later date be able to advise us with regard to these when they have had time to check through the reports.

In addition to the above, signals were reported by several listening stations from **WUBA**, calling "Test" and working with U.S. amateur stations. This station is a U.S. Signal Corps station located at Camp Alfred Vail, New Jersey.

Several of the U.S. stations taking part in these Tests attempted to transmit messages to Europe in addition to making the scheduled calls of "Test, Test, Test," etc. Several of these messages were intercepted correctly, both in this country and in France, but as a general rule listeners concentrated on hearing as many stations as possible rather than on copying messages. The tests have, however, established the possibility of transmitting such amateur messages from America to Europe should occasion arise. No attempt was, of course, made during the tests to reply to such messages, but a few messages of greetings, and of similar nature were sent back to America from the British station 5 WS during the second half of the tests. Several of these messages were correctly received by U.S. amateur stations, so that to a limited extent it may be said that two-way communication has been established across the Atlantic by radio amateurs. The setting up of a definite two-way communication between the two countries—in which a message sent in one direction can be replied to at once in the other—yet remains to be done.

The most remarkable features of the tests have doubtless been, besides the large number of signals heard during the ten nights, the reception of amateur

TABLE VIII

List of Total U.S. and Canadian Stations reported during the Tests by British and Dutch Amateurs.

First District.

1 AC	1 AT	1 BET	1 BRY	1 CJA	1 FB	1 MY	1 XK
1 ACN	1 ATV	1 BFR	1 BSZ	1 CJF	1 FD	1 ON	1 XM
1 AD	1 AWL	1 BFT	1 BW	1 CJH	1 GER	1 OR	1 XN
1 ADL	1 AWP	1 BGF	1 BWJ	1 CKD	1 GV	1 OW	1 XNT
1 AHZ	1 AXE	1 BGY	1 BX	1 CKG	1 HT	1 PC	1 XR
1 AJ	1 AZW	1 BH	1 BY	1 CKP	1 II	1 PM	1 XU
1 AJI	1 BAS	1 BHR	1 CBR	1 CKR	1 IL	1 RA	1 XW
1 AJP	1 BB	1 BI	1 CCA	1 CLA	1 IT	1 RD	1 XY
1 AJU	1 BCF	1 BK	1 CDA	1 CMK	1 JR	1 SD	1 XZ
1 AJW	1 BCG	1 BKA	1 CDI	1 CN	1 KDI	1 SPW	1 YK
1 AK	1 BCS	1 BKQ	1 CDJ	1 CNF	1 KW	1 TM	1 ZA
1 AL	1 BDG	1 BN	1 CDK	1 CNI	1 LAU	1 TMS	1 ZE
1 AN	1 BDI	1 BNA	1 CDO	1 CNJ	1 LL	1 TOK	1 ZN
1 ANA	1 BDS	1 BNT	1 CDR	1 CQX	1 MIE	1 TT	1 ZT
1 ARQ	1 BDT	1 BPG	1 CES	1 CW	1 MK	1 UN	1 ZUK
1 ARY	1 BEP	1 BPH	1 CF	1 CYM	1 MO	1 VI	
1 ASF	1 BES	1 BRQ	1 CIV	1 DD	1 MV	1 WN	

Second District.

2 AB	2 AWF	2 BNZ	2 CJH	2 EI	2 KL	2 PR	2 VX
2 ACK	2 AWL	2 BQH	2 CJN	2 EL	2 KP	2 PY	2 XAD
2 ACT	2 AWP	2 BQM	2 CJW	2 FP	2 KQ	2 QU	2 XAM
2 AF	2 AWZ	2 BQN	2 CK	2 FU	2 KRQ	2 QV	2 XAO
2 AFB	2 AYV	2 BQT	2 CKD	2 FW	2 KS	2 QYX	2 XAP
2 AFP	2 BAO	2 BQU	2 CKK	2 GI	2 KW	2 QZ	2 XL
2 AFX	2 BAS	2 BRB	2 CKN	2 GJ	2 KZ	2 RC	2 XM
2 AG	2 BBB	2 BRP	2 CKR	2 GK	2 LO	2 RO	2 XMO
2 AHO	2 BDA	2 BT	2 CKS	2 GM	2 LY	2 RP	2 XRB
2 AJ	2 BDT	2 BYS	2 CMK	2 GR	2 MF	2 RW	2 XRO
2 AMD	2 BG	2 BYW	2 CMZ	2 GS	2 MN	2 RY	2 YK
2 AON	2 BGA	2 CAR	2 CP	2 GU	2 MU	2 SG	2 ZA
2 APD	2 BGO	2 CBW	2 CPD	2 HJ	2 MV	2 SH	2 ZK
2 ARF	2 BL	2 CBX	2 CQ	2 HW	2 NM	2 SP	2 ZL
2 ARS	2 BLF	2 CDO	2 CQZ	2 IG	2 NN	2 TK	2 ZM
2 ATS	2 BLP	2 CF	2 CRB	2 IS	2 NZ	2 TSU	2 ZS
2 AU	2 BM	2 CGT	2 CSL	2 KB	2 OAO	2 UD	2 ZW
2 AUM	2 BMC	2 CHH	2 DMA	2 KF	2 OYM	2 UE	2 ZY
2 AW	2 BML	2 CIM	2 DZ	2 KG	2 PQ	2 US	
2 AWA	2 BNN	2 CIN					

Third District.

3 ADT	3 BF	3 BLZ	3 CYN	3 HQ	3 MY	3 RP	3 XM
3 AFB	3 BFU	3 BMT	3 DM	3 JJ	3 NH	3 SG	3 XR
3 AP	3 BG	3 BNU	3 EU	3 KD	3 OD	3 TJ	3 YG
3 AQP	3 BGJ	3 BOB	3 FS	3 KFU	3 OE	3 UFD	3 YO
3 AQR	3 BGT	3 BS	3 GE	3 LK	3 OL	3 XA	3 ZW
3 AUU	3 BHM	3 BVC	3 GG	3 MO	3 OT	3 XBK	3 ZY
3 AYY	3 BIJ	3 CC	3 HG	3 MX	3 QO	3 XL	3 ZZ
3 BES	3 BLF	3 CG					

Fourth District.

4 AA	4 BX	4 EA	4 FB	4 ID	4 KS	4 ZS	4 ZW
4 BF	4 BY	4 EB	4 FN	4 KM	4 OI		

Fifth District.

5 AAM	5 DH	5 EK	5 IIS	5 MA	5 US	5 XA	5 XR
5 AGI	5 DQ	5 FV	5 JL	5 MX	5 WD	5 XB	5 ZA
5 BV	5 DWP	5 GBZ	5 KK	5 MK	5 WW	5 XK	5 ZB

Sixth District.

6 CBI	6 ZZ

TABLE VIII—*continued.*

Seventh District.

7 BXV	7 OE	7 BO	7 WZR	7 ZV

Eighth District.

8 AA	8 ATU	8 AZQ	8 BPL	8 BZY	8 FU	8 QT	8 XAE
8 ADG	8 AV	8 BBT	8 BSS	8 CDD	8 GM	8 SB	8 XAN
8 AIW	8 AW	8 BCS	8 BTI	8 CJH	8 GQ	8 SP	8 XC
8 AJM	8 AWP	8 BDE	8 BTV	8 CMK	8 HJ	8 SPM	8 XE
8 ANP	8 AWZ	8 BFM	8 BUM	8 CNE	8 IB	8 TT	8 YB
8 AP	8 AXC	8 BJC	8 BVL	8 CPK	8 JCZ	8 UE	8 YD
8 AQO	8 AXE	8 BK	8 BX	8 DB	8 KG	8 UF	8 ZAF
8 AR	8 AXK	8 BKF	8 BXF	8 DET	8 KM	8 UY	8 ZV
8 ASC	8 AYO	8 BLC	8 BXH	8 DKX	8 ML	8 VK	8 ZW
8 ASV	8 AZD	8 BNJ	8 BYH	8 FQ	8 OW	8 XA	8 ZY
8 ATF							8 ZZ

Ninth District.

9 AGT	9 AUL	9 BET	9 CBX	9 CR	9 EP	9 IM	9 XB
9 AN	9 AX	9 BP	9 CD	9 CX	9 FM	9 KM	9 XE
9 AMT	9 BDF	9 BRY	9 CG	9 CXP	9 GM	9 UU	9 ZN
9 ASW	9 BDS	9 BZ	9 CM	9 DYN	9 II	9 XAC	

Canadian.

3 CO	9 AL

telephone transmissions across the Atlantic. The almost nightly reception of American radiophone broadcast transmissions by British amateurs shows that there is no inherent difficulty in picking up these relatively feeble telephonic transmissions over such great distances, but the reception of amateur radiophone transmissions is a tribute to the amateur transmitters as well. The remarkable strength and steadiness of signals received from the best stations is also particularly noteworthy.

The latest information received from America after the main part of this report had been compiled indicates that signals from a number of U.S. amateur stations signalling during the tests were heard on U.S. vessels in the English Channel—several of the code transmissions during the individual periods having been picked up on single valve receivers, and the codes subsequently verified.

The French amateurs, who were also listening in, heard a large number of stations. Particulars of their receptions will be given in a later issue.

PHILIP R. COURSEY,

February 3rd, 1923.

Amateur Progress in South Africa

Recent wireless developments in other countries have greatly stimulated amateur interest in South Africa. Whereas, prior to the war, there were only a few amateurs in each province, their number had so increased by 1920 that a Society was formed, now flourishing under the name of the Radio Society of South Africa.

Modelled on similar lines to the Radio Society of Great Britain, to which it is affiliated, the Society has for its principal objects the furtherance of radio research and the promotion of intercourse between experimenters, securing members the advantages of collective representation and facilitating the obtaining of supplies.

The Society intends to maintain branches at Cape Town, Durban and Johannesburg, and the two first-named are already in existence, with a membership of 37 and 87 respectively. General meetings, at which lectures and demonstrations are given, are held monthly. The Society has been granted the Postmaster-General's licence to install a wireless station for scientific and instructional purposes.

The Cape Provincial Branch of the Society has now three affiliated branches, their aggregate membership totalling 143.

South Africa being noted for its abundance of atmospherics, amateur reception is somewhat restricted to the local stations at Slangkop, Port Elizabeth, Durban and Lourenço Marques. Many amateurs have, however, succeeded in obtaining signals from European and American stations, the French station at Saint Assize being most frequently heard.

The development of broadcasting in England is being keenly watched, and it is hoped that the time will not be very far distant when the South African amateur will be able to enjoy a regular broadcasting service. According to the latest information Johannesburg has been offered the loan of a broadcaster, and prospects are considerably brightened.

Questions and Answers

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) Each communication sent in to be accompanied by the "Questions and Answers" coupon to be found in the advertisement columns of the issue current at the time of forwarding the questions. (4) The name and address of the querist, which is for reference and not for publication, to appear at the top of every sheet or sheets, and unless typewritten, this should be in block capitals. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." (5) 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.* **(6) Where a reply through the post is required every question sent in must be accompanied by a postal order for the amount of 1s., or 3s. 6d. for a maximum of four questions.** *(7) Four questions is the maximum which may be sent in at one time.*

"HOPEFUL" (Surrey) *asks (1) Whether we can give details of a tapped wire frequency transformer to tune from about 300 to 1,200 metres. (2) For a diagram showing how a single valve H.F. panel may be connected.*

(1) A variable high frequency transformer was described in the issue of September 23rd, and full constructional details are given. The ebonite former is 2″ in diameter, and the slots are ½″ deep and 1/16″ wide. There are eight slots and four tappings for the primary and secondary winding. Each slot in the former should be wound with 90 turns of No. 40 S.S.C. copper wire. The slots are all wound in the proper direction, and the connection between each slot is taken to one stud of the four-stud switch. The primary should be tuned with a small condenser having a maximum value of about 0·00001 mfd. (2) A single valve high frequency panel is given in Fig. 2 on the next page.

"STICKER" (Bristol) *is having trouble with his receiver, and asks (1) Whether we can suggest anything which will help him. (2) Have we any suggestions with regard to the earth or counterpoise.*

(1) and (2) The diagram of connections is correct, but we would point out that a condenser should be used in series with the aerial when it is desired to receive the broadcast transmissions. This will give you a slightly larger potential across the detector valve. As your aerial is rather badly screened and the earth lead long, we suggest you use one high frequency valve before the detector valve. The method is given in most of the issues of this journal. The earth connection should be as short as possible, and should make contact with an earth plate much larger than the one you are using, if it is at all possible. We suggest you use a sheet of galvanised iron or something equivalent, with dimensions about 2′ by 3′. The counterpoise should be built, if possible, a few feet above the earth. We do not recommend constructing the counterpoise immediately below the aerial, as sketched in the diagram submitted, because the effective height of the aerial is so greatly reduced. The lower end of the counterpoise should be dropped as low as it is convenient for you to make it.

"VICEROY" (Eastbourne) *asks (1) Whether the diagram submitted is correct. (2) What wavelength would a 4″ coil tune to when connected with a 0·0005 mfd. condenser and an ordinary Post Office aerial. (3) What would be a suitable coil to use in the anode circuit of the high frequency valve.*

(1) The diagram is correct. (2) and (3) You have unfortunately omitted to state the length of the coil and the gauge of wire with which it is wound, but we suggest the short wave coil be a coil 4″ in diameter and 4″ long, wound with No. 20 D.C.C., with six tappings. The long wave coil may be 4″ in diameter and 8″ long, wound with No. 26 D.C.C. with 18 tappings. The anode coil may be 4″ in diameter and 4″ long, wound with No. 28 D.C.C. for the short wavelengths, and for the longer wavelengths 4″ in diameter and 8″ long, wound with No. 34 D.C.C. The smaller coil should have 10 tappings and the larger coil 18. You will be able to tune up to a wavelength of about 10,000 metres.

"E.H." (Sweden) *asks (1) For criticism of circuit submitted. (2) Whether an A.E.G. type E.V. 173 valve will work well as a high frequency valve, and if so, what voltages should be applied.*

(1) The circuit proposed is quite suitable, and the connections are correct. For short wave work we suggest you build cylindrical coils, one for the aerial circuit 4″ in diameter and 4″ long, of No. 20 D.C.C., with eight tappings, and one for the anode circuit 4″ in diameter and 6″ long, of No. 30 D.C.C., with 12 tappings. For the H.T. bypass condenser we suggest you use 21 foils, each foil having an overlap of 4″ by 3″. The mica should be 0·002″ thick, and only good mica should be used. Waxed paper is not very suitable unless you are prepared to make up two or three condensers and connect them is series. (2) We believe that this type of valve gives satisfactory results in H.F. circuits. We would refer you to the diagram Fig. 2, page 614, February 3rd issue, and Fig. 1, page 613, February 3rd issue.

"C.W.P." (S.E.1) *asks whether his earth connection is suitable.*

We suggest you earth your receiver with a wire having the same dimensions as the aerial wire. A good earth connection is essential. The waterpipe earth is probably suitable if the distance between the point where the wire is soldered to the waterpipe and the point where the waterpipe enters the ground is not great. It may be better to bury an earth plate, which may be a sheet of galvanised iron about 2′ by 3′, to which the earth wires are soldered. The suggested earth in the window box is not at all suitable.

"**ADANA**" **(Battersea)** *asks* (1) *With reference to the reply to* "**A.G.L.**" **(Sutton Coldfield)** *in the January 27th issue, could another diagram be given showing the connections when a high frequency transformer is used.* (2) *Are the other component values the same when the transformer is substituted for the tuned anode coil.*

(1) and (2) The diagram is given in Fig. 1, and suitable values are indicated.

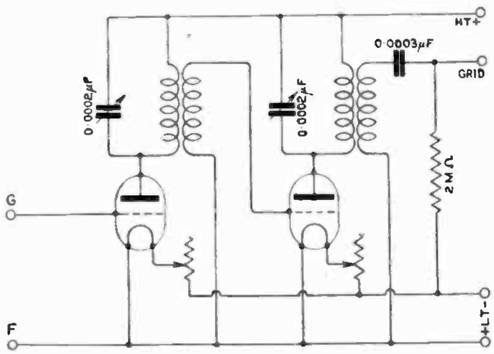


Fig. 1. A 2-valve H.F. amplifier. The valves are transformer coupled.

"**E.R.S.**" **(Hammersmith)** *asks for a diagram of a H.F. and L.F. panel to use in conjunction with the detector panel, diagram of which is submitted.*

The diagram is given in Fig. 2.

(1) We understand the Post Office regulations apply to the use of reaction only. They are not concerned with the number of valves used. The reaction must be so used that oscillating energy cannot be set up in the aerial circuit. (2) We cannot recommend a set which will receive the American concerts, but it should be borne in mind that the reception of American concerts is in the nature of a freak—that is, something which cannot be repeated with the slightest unfavourable conditions, and no signals would be received in daylight. However, if you wish to try, we suggest you use the receiver given on page 453, Fig. **3**, December 30th issue of this journal. The diagram shows the connections of a five-valve receiver—four H.F. and one detector. We suggest you use an outdoor aerial.

"**E.McD.**" **(Manchester)** *refers to a diagram in the issue of November 18th, and asks* (1) *Whether basket coils may be used for the primary and secondary inductance.* (2) *What would be suitable coils.* (3) *What would be a suitable coil for use in the anode circuit, as marked with an arrow in the diagram submitted.*

(1) We suggest you connect three small basket coils, each having thirty turns, wound upon a former 2″ in diameter, for the aerial circuit. The coils should be wound with No. 22 D.C.C. The closed circuit inductance may consist of three coils, each having 45 turns of No. 26 D.C.C., wound upon a former 3″ in diameter. The anode coil may be a winding of No. 30 D.C.C., wound upon a 3″ former. We suggest you use a cylindrical coil 4″ in diameter and 3″ long, with six tappings.

"**E.R.**" **(Tottenham, N.17)** *refers to the Reinartz tuner described on page 89, May 13th issue, and asks the gauge of wire used in the coils.*

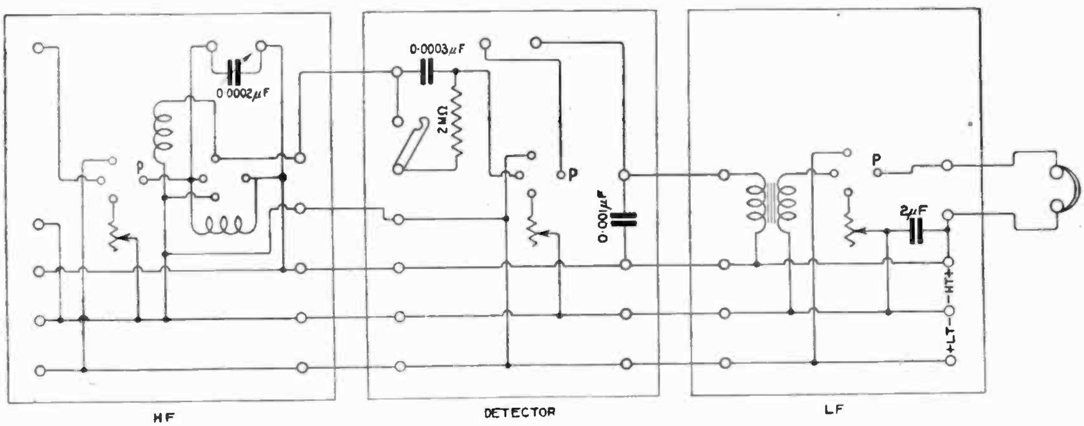


Fig. 2. The diagram shows a H.F. panel coupled to a detector panel and followed by a note magnifier. The windings shown in the first panel are those of a H.F. transformer.

"**A.J.**" **(Manchester)** *asks* (1) *What are the restrictions laid down by the P.M.G. concerning the use of valves in valve receivers.* (2) *What sort of receiver would be suitable for the reception of American concerts, using a frame aerial.*

No. 26 D.C.C. is used in the coils of the Reinartz tuner described on page 89 of May 13th issue. We would refer you to the description of a Reinartz receiver given on page 604 in the issue of February 3rd.

"J.S.M." (Norfolk) *asks* (1) *For windings of an anode coil which, together with his tuning condenser, will tune up to* 1,200 *metres.* (2) *What would be the best value of a small variable condenser to be used to provide capacity reaction.* (3) *How may two potentiometers be connected for the purpose of controlling the first three valves and the detector valve. It is desired to use a large negative potential.* (4) *What would be suitable windings for an iron core transformer to step down from* 110 *volts to* 6 *volts.*

(1) The anode coil may be a winding 4″ in diameter and 6″ long, of No. 32 D.C.C., with 12 tappings. (2) The condenser which is to be used to provide capacity reaction may have a maximum value of 0·0005 mfds. It would probably consist of one moving and two fixed plates. (3) The method of connecting potentiometers is given in several recent issues. In particular we would refer you to the connection given in Fig. 1, page 601, February 3rd issue. When it is required to apply voltages of the order of 30 volts to the grid, a potentiometer is not essential. It is better to take tappings from the cells. (4) The primary winding of the transformer may consist of 350 turns of No. 22, and the secondary should consist of 21 turns of No. 16 D.C.C. The core of the transformer should have a cross section of three square inches. A resistance on the primary side as suggested would control the output. As it may be required to use more than six volts on the secondary side, we suggest you wind an extra 10 turns, making a total of 31 turns, with a tapping at the 21st.

"M.A.H." (Stoke Newington) *asks* (1) *How many turns of No.* 40 *S.S.C. wire, wound on a former containing eight slots,* ⅛″ *wide and* ⅜″ *deep, will be suitable for a high frequency transformer to tune between* 100 *and* 30,000 *metres.*

We suggest you wind 200 turns for the primary and secondary winding in each slot. You will not, however, find that the results are very satisfactory, and we suggest you use a special high frequency transformer for short wavelengths. A transformer with eight slots, four for the primary and four for the secondary, will be suitable. The bobbin may be 2″ in diameter, and the slots ½″ deep and $\frac{1}{16}$″ wide. Ninety turns should be wound in each slot, and four tappings should be provided for the primary and secondary.

"A.F.C.B." (S.W.) *submits particulars of a transmitter, and asks whether the values are correct.*

The dimensions suggested are quite suitable, and with a normal Post Office aerial would tune over the wavelength range desired. The proposed tuner is quite suitable.

"J.S." (N.10) *asks* (1) *How many basket coils will be required to tune from* 180 *to* 12,000 *metres.* (2) *May the coil above or below the A.T.I. be used for the reaction coil.*

(1) We suggest you wind eight basket coils and connect them in series. The coils should be spaced ⅛″ apart to reduce the self-capacity. We suggest you wind three coils having 60 turns of No. 26 D.C.C. upon a former 2″ in diameter, and the remainder, having 90 turns of No. 26 D.C.C., upon a former 2½″ in diameter. The 0·001 mfd. variable condenser should be used in series on short wavelengths, and in parallel when receiving longer wavelength signals. The connections between the coils should be brought to the studs of a switch. (2) We suggest you wind basket coils for the reaction, and mount them so that the coupling is variable.

"E.H." (Nottingham) *refers to the diagram given on page* 129, *October 28th issue, and asks* (1) *Whether the five coils shown should all have the same dimensions.* (2) *If the coils should have different sizes, what relationship should they bear one with the other approximately.* (3) *What size duolateral coils should be used for the broadcast wavelengths.* (4) *What stations of interest should be received with a receiver of this description.*

(1) (2) and (3) The coils shown should not have the same dimensions. When receiving the broadcast transmissions the aerial tuning condenser will be in series with the A.T.I. The A.T.I. should be approximately a No. 75 coil, and the closed circuit coil No. 50. The anode or high frequency transformer coils should be No. 75 coils. The reaction coil will probably be a No. 25 coil. It should be borne in mind that the anode or high frequency transformer coils should tune to the same wavelength as the closed circuit. (4) You should receive the transmissions from the British broadcasting stations, and also the transmissions of amateurs in your neighbourhood. You would, of course, hear the French transmissions if you cared to tune up to that wavelength.

"L.G.C." (Newark) *asks for a diagram of a receiver suitable for receiving the broadcast transmissions and also the connections, so that the low frequency valves may be connected to operate a loud speaker.*

We would refer you to the diagram Fig. 4, page 615, February 3rd issue. Switches are provided so that the number of valves in circuit may be cut out when not required. Another suitable diagram is given in Fig. 4, page 418, December 23rd issue.

"A.T." (Rotherham) *asks* (1) *What wavelength range will be covered by the high frequency transformer which he has constructed.* (2) *What would be a suitable coil for use in the anode circuit of a high frequency amplifier to tune between* 150 *and* 3,000 *metres.* (3) *Will the self-capacity of Dewar type switches be of sufficient magnitude to prohibit their use in the high frequency portions of circuits.* (4) *Could particulars be given so that condensers having the following values may be constructed—* 0·05, 0·025 *and* 0·021 *mfds.*

(1) The wavelength range over which you will be able to tune will depend largely upon the self-capacity of your receiver, but we suggest from 100 to 4,500 metres. (2) A suitable tuned anode coil would be 4″ in diameter and 6″ long, wound full of No. 32 D.C.C., with 15 tappings. The reaction coil may be constructed to revolve inside the 4″ tube, and should contain 100 turns of No. 32 D.C.C. (3) It is not a very good practice to connect Dewar type switches in the high frequency portions of wireless receivers, but there is no objection to using special anti-capacity type switches, which may be purchased. The ordinary Dewar type switch is quite useful for switching the low frequency portions of wireless receivers. (4) The condensers could be made up as follows (mica 0·002″ thick):—

0·5	mfd.	51 foils with an overlap	..	12 × 8·5 cms.
0·25	,,	51 ,, ,, ,,	..	8·5 × 6 ,,
0·05	,,	26 ,, ,, ,,	..	5 × 4 ,,
0·025	,,	13 ,, ,, ,,	..	5 × 4 ,,
0·01	,,	7 ,, ,, ,,	..	5 × 4 ,,

"O.H.M." (Bloemfontein) *submits a diagram of his receiver, and asks* (1) *Why results are unsatisfactory.* (2) *How many plates should be used in construction of* 0·01 *mfd. fixed condenser.* (3) *For a circuit diagram showing how to cut out H.F. and L.F. amplifiers.*

(1) The diagram of the tuning panel is correct; also the connections of the amplifier. The probable reason why you do not hear signals is due to the tuning arrangements not being properly proportioned. We cannot help you much without a knowledge of the wavelength of the signals you wish to receive. If "R" type valves are used the L.T. should be 6 volts and the H.T. 90 volts. (2) A 0·01 mfd. fixed condenser may consist of 17 plates, each plate having an overlap of 2″ × 1″. The mica should be 0·002″ thick. (3) Diagrams showing how high and low frequency valves may be cut in or out are given in most issues of this journal. Why not choose a circuit and rewire your receiver according to the connections given. A large number of suitable circuits have appeared in the last few issues.

"G.R.E.C." (Coulsdon) *asks* (1) *With reference to the circuit given on page* 883, *September 30th issue what would be a suitable reaction coil to be coupled to the secondary of the first H.F. transformer.* (2) *How would three potentiometers be connected, one for the H.F. valve, one for the detector, and the other for the L.F. valve.* (3) *What is a suitable size for the variable condenser which tunes the primary winding of the H.F. transformers.* (4) *Which valves are recommended.*

(1) We suggest you wind 150 turns of No. 38 S.S.C. on a former 2½″ in diameter containing a slot ¾″ deep and ⅛″ wide. The reaction coil should be fitted so that it will slide close to the surface of the plug-in transformers. (2) Potentiometers are quite easily connected. They should be joined across the L.T. battery, and the grid connections of the H.F. valves should go to the sliding contact of one potentiometer. The grid leak of the detector valve, instead of going to the plus or minus L.T. should go to the sliding contact of the second potentiometer. The sliding contact of the third potentiometer should be connected with the filament connection of the L.F. transformers. The method of connecting potentiometers is given in most issues. In particular we would refer you to page 601 January 3rd issue. (3) The primary of the H.F. transformer may be tuned with a variable condenser having a maximum value of 0·002 mfds. (4) We suggest you use "R" type valves.

"E." (Northumberland).—With reference to the diagram submitted we would point out that this is a theoretical diagram, and many practical features are absent. If you have not had previous experience with this type of super-regenerative receiver, we think it would be better if you constructed a receiver from particulars given in this journal from time to time. In particular we would refer you to the article which appeared in the issue of September 2nd, page 711, and the articles by Mr. Harris in the issues of October 21st and 28th. In the diagram referred to, the coils L_1 and L_2 may be an ordinary tapped loose coupler. The coil L_3 is a reaction coil. The circuits A and B are coupled with the valve, so that a frequency of the order of 30,000 cycles per second is produced. The circuit A should therefore contain a large variable condenser and a large coil. It would be found difficult to remove a continuous hum from the receivers because of the absence of choke coils and filter circuits. In addition, a receiver of this kind must not be connected with an open aerial, but with a frame aerial, which must not exceed a certain size.

"R.B." (Falkirk) *asks* (1) *For particulars of a* 10,000 ω *grid leak to be wound with No.* 30 *Eureka wire.* (2) *For dimensions of basket coils.*

(1) No. 30 Eureka wire has a resistance of 5,575 ohms per thousand yards; 70 yards wound on a cylindrical former will therefore be suitable as a potentiometer. It is not essential to use two potentiometers, although there is a certain advantage in using two potentiometers, as shown in the sketch on the attached sheet. (2) We suggest you wind the basket coil former with 35, 50 and 60 turns of No. 24 D.C.C., and for higher wavelengths use more turns with the finer wires. The exact number of turns is a matter for experiment. The three given should be suitable for use as the aerial coil, closed circuit coil, and reaction coil. The anode coils could each have 80 turns of No. 30 D.C.C. The voltage of the grid cells shown in the diagram on page 601 depends entirely upon the anode potential used, but two or three cells will be satisfactory. Only a coarse adjustment need be provided, and no potentiometer is required.

"J.R.M." (Durham) *submits a diagram of connections of his receiver and asks for advice.*

We have examined the diagram submitted, and the connections are correct. As you live so close to the Newcastle Broadcasting Station, you will find it a difficult matter to successfully tune in the transmissions from far distant broadcast stations while the Newcastle station is operating. We suggest you use a closed circuit which will give you fine tuning. To reduce noise, we suggest you connect the 2 mfd. condenser across the H.T. battery, which will reduce noises due to the internal resistance. If you are situated near the tram lines or a power plant, you may hear a noise due to induction and earth currents. The earth appears to be quite satisfactory. All connections in the receiver should be soldered and not merely held down with screws or terminals. It is quite safe to use a 6 volt accumulator with Marconi "V 24" type valves, but of course a filament resistance should be used, and a little should always remain in circuit. The capacity values are suitable, and best results are generally obtained when plug-in coils are used. The reaction coil should be coupled with the high frequency transformer. If the high frequency transformer is of the plug-in type, a reaction coil having 100 turns should be wound in a former similar in shape to the plug-in transformer, and it should be mounted so that it will move close to the face of the plug-in transformers.

"D.G." (Selby) *wishes to receive the broadcast transmissions and asks whether the diagram referred to is suitable.*

The diagram referred to (Fig. 4, page 615, February 3rd issue) is very suitable for your purpose, and you should be able to operate a loud speaker comfortably. The reaction coil, which is tuned with a 0·0005 mfd. condenser, should be coupled with the high frequency transformer. The high frequency transformer is of the plug-in type, and the reaction coil may consist of 100 turns, wound in a former similar to that of the high frequency transformer, and it should be constructed so that it will move close to the transformer, so that the coupling is variable. If it is desired, a three-coil holder may be used, in which case the reaction coil will be one outer coil of a three-coil holder. The switching arrangement shown in the figure referred to will enable you to switch out any valve except the detector valve, which of course must always remain in circuit. The switch indicated is a double-pole throw-over switch. With the switch in the left-hand position, the valve is cut out, and the filament is disconnected at the same time. Small switches may be purchased mounted on porcelain, and these should be dismantled and the switch parts mounted upon the ebonite panel. This type of switch is very serviceable, and furthermore, no losses are brought about through its use. Suitable values are given in the diagram. The grid condenser and leak should have values of 0·0003 mfds. and 2 megohms. The closed circuit condenser has a value of 0·0005 mfds. The L.T. and H.T. voltages should be 6, and variable up to 60 volts respectively.

"F." (N.22) *submits a diagram of his receiver and asks for suggestions.*

(1) The diagram submitted, in which a crystal detector is used as the rectifier is correct, and the values of the components are suitable. If the tuning condenser which was connected across the anode coil had a maximum value of 0·0005 mfds., signals should be expected to be rather weak. The tuning condenser used in this position should be as small as possible to secure good amplification, and it would be found tuning is very much sharper. The anode coil should be larger than the aerial coil. Difficulty is sometimes experienced in getting the crystal to rectify properly, and its position should be changed from one side of the transformer to the other.

"C.P." (Surrey) *submits a diagram of his receiver and asks whether the wiring and components are correct.*

We have examined the diagram submitted, and we suggest that when receiving the broadcast transmissions you short circuit the reaction coil which is coupled with the closed circuit coil. The circuit, apart from this, is correct. We suggest you wind basket coils on a former 2″ in diameter, with 13 spokes, having 40, 50, 60 and 80 turns of No. 22 D.C.C. The correct number of turns to be used will depend upon the size of the aerial. The low frequency intervalve transformer may have a primary winding of 1,000 turns of No. 42 S.S.C. wire and the secondary may be 25,000 turns of No. 44 S.S.C. wire. The primary winding should be wound on first.

"W.B.G." (Shrewsbury) *submits a diagram of a speed amplifier and asks for advice.*

We have examined the arrangement submitted, and the principle of the circuit is correct. The correct ratio of the transformer winding should be determined by experiment. If an "R" valve is used and an ordinary post office microphone we suggest a ratio of about 40 to 1, the primary winding consisting of 150 turns of No. 22 S.C.C. However, when winding a transformer, we suggest you make taps on the secondary winding, so that the step-up ratio may be varied, and the tap which gives the best results found. The core may consist of a bundle of iron wires 4″ long, built up to a diameter of ½″. The secondary winding could be of No. 40 S.S.C. copper wire. Only one battery need be employed for the valve and the microphone circuit.

"H." (Nuneaton) *has a C Mk. III type amplifier, and asks whether it may be used in conjunction with his receiving set.*

The C Mark III type amplifier may be used as a note amplifier if desired. The input circuit of the amplifier, which includes a transformer, is connected to the anode circuit of the last valve of your receiver. We do not, however, recommend the use of so many low frequency connected valves. It would be better if you rearranged the circuit, using two high frequency, one detector, and two L.F. valves. A number of arrangements are given in the journal from time to time. When using the amplifier, common L.T. and H.T. batteries may be used, provided − H.T. is connected with the same side of the L.T. battery in each case. We suggest you examine the Mark III amplifier and notice whether the H.T. minus is connected with + or − L.T., and make an alteration if necessary; but the receiver is quite simple to operate, as it is an ordinary note magnifier.

"J.M." (Southport) *wishes to receive the broadcast transmissions and asks for advice.*

We suggest you employ a five-valve receiver, comprising two high frequency, one detector and two L.F. valves. The aerial attachment referred to is often very suitable, but whether or not it would be successful in your case depends largely upon local conditions. To secure satisfactory operation, we suggest you use an aerial and a closed circuit, and use the tuned anode method of high frequency amplification. The method is explained in a number of issues of this journal, and diagrams are given from time to time. You will have no difficulty in making a suitable choice if you wish to construct the receiver also.

"W.G.M." (Bristol) *asks why he finds difficulty in receiving the London broadcast transmissions.*

We believe it is often difficult to receive the broadcast transmissions from certain parts of the country, but as you hear the transmissions from other broadcast stations we do not think you are so situated that the London transmissions should not be heard. We consider the difficulty is simply one of tuning. From the table submitted, it appears that the aerial circuit will tune down to the required wavelength, but the high frequency transformer will not. We suggest you use another transformer which will enable you to reduce the wavelength sufficiently. At present we do not think you are tuning down to 300 metres, although the ship stations are heard working. We suggest you build another transformer with a few less turns than the 180 to 300 metres transformer which you are using at present. We shall be glad to know whether the addition of the smaller wavelength high frequency transformer enables you to hear the London station, because we believe difficulty is often experienced while other broadcasting stations are in operation.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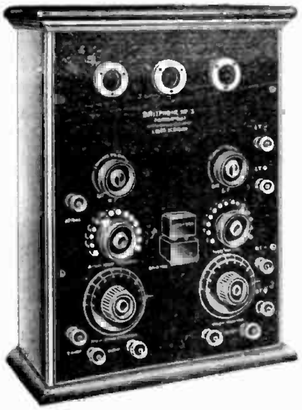

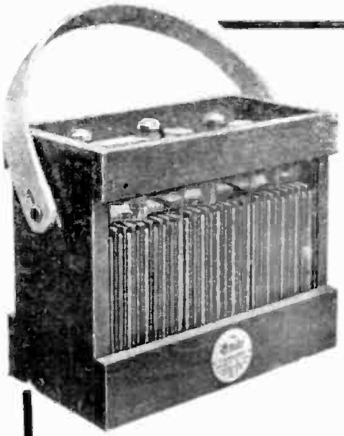

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"E.J.R." (Beds.) *submits a sketch of a relay, and asks how it should be connected to operate a Morse inker.*

Terminals D and C should be connected in series with a battery, and the Morse inker, and terminals E and B should be connected with the last valve of your valve receiver.

"P.Q." (Dingwall) *asks (1) Whether the proposed method would be suitable for making comparison tests between tapped inductance coils and plug-in coils. (2) Would the arrangement require a second condenser for the secondary circuit. (3) Could we supply the name of a firm which supplies Gambrell plug-in coils. (4) What capacity condensers would be suitable for the above arrangement.*

(1), (2) and (4) The idea is quite sound, and it should be remembered that the plug-in coils should be connected to replace the cylindrical coils. If this arrangement were carried out, no extra tuning condenser would be required. (3) The address of Gambrells Brothers, Ltd., is Merton Road, Southfields, London, S.W.18.

"A.B.D." (Cambridge) *asks (1) Whether the house lighting supply may be used for the high tension. The house is supplied with electricity from the accumulators. (2) What is the difference between a power amplifier and a low frequency amplifier.*

(1) The house lighting may be used as the H.T., although care must be taken not to earth any portion of the wireless receiver which is connected with the H.T. A large capacity condenser should be connected across the supply. (2) The difference between a power amplifier and a low frequency amplifier is principally due to the valves used. A power valve is able to control more power than an ordinary receiving valve. A higher anode voltage is used, and the energy supplied to the filament is greater. Negative volts are connected with the grid circuit.

"N.E.K.E." (London, E.5) *asks (1) Whether the proposed arrangement submitted is suitable. (2) For a diagram of a five-valve receiver—two high frequency, one detector and two L.F. valves—with swiches to cut out the valves. Three panels are required—one for the tuning arrangements, one for the high frequency valves, and the other to contain the detector and two L.F. valves.*

(1) The diagram submitted is correct, although no secondary circuit is used, and the reaction coil is coupled with the aerial coil. We suggest you use a secondary circuit and connect the A.T.I. and A.T.C. in series when receiving short wavelength transmissions. (2) A suitable diagram was given in Fig. 7 on page 646 of Feb. 10th issue.

"AMATEUR" (E.8) *asks (1) What wire should be wound on a former which he has by him to make it suitable for use as the closed circuit coil. (2) What capacity condenser would be required for the secondary circuit. (3) What is the wavelength range of the combination. (4) Would we refer him to a diagram showing the connections of one high frequency valve, crystal detector, and one L.F. valve.*

(1) We suggest you wind the secondary former with No. 28 D.C.C. and take eight tappings. The primary former should be rewound with No. 24 D.C.C. and 20 tappings should be taken. (2) The secondary circuit should be tuned with a condenser having a maximum value of 0·0005 mfds. (3) The wavelength range of the tuner is approximately from 100 to 8,000 metres. (4) A suitable diagram is given on page 614, Fig. 2.

"E.E.G." (Hants) *submits a diagram of connections and asks (1) Whether the circuit is correct. (2) How may the circuit be modified to prevent the liability of energy being radiated. (3) Can the balanced crystal method of detection be employed to reduce the risk of jamming. (4) What type of valve would be suitable for use with a receiver wired according to the diagram.*

(1) and (2) The diagram is quite correct, but it is not necessary to couple the aerial coil with the tuned anode coil. The two coils should be well separated. In this way you need not fear that energy will be radiated. If reaction effects are desired, we suggest you connect a reaction coil in the anode circuit of the L.F. valve. (3) With a circuit of this description, it will not be found necessary to use balanced crystals. (4) "R" type valves may be used throughout.

"C.E.P.W." (Ealing) *submits particulars of a number of tuning coils and asks (1) To what wavelength they will tune. (2) How many turns are to be wound on a 2" former for a 300/500 H.F. transformer. (3) Is the secondary coil and three-coil tuner larger than the A.T.I.*

(1) The coils will tune to the following wavelengths:—600, 1,800, 3,500 and 5,000 metres. (2) We suggest you wind the primary and secondary with 180 turns of No. 36 S.S.C. wire. (3) When the aerial tuning condenser is connected in series with the A.T.I., it is found that the A.T.I. is larger than the secondary tuning inductance. When the aerial tuning condenser is in parallel with the A.T.I. the closed circuit inductance may be a little larger.

"F.M.W." (West Hartlepool) *asks (1) How many hours it is safe to discharge the accumulator. (2) What method may be employed to determine whether the accumulator is discharged. (3) Using four 16 candle power carbon filament lamps in parallel connected with 230 volt D.C. mains, approximately how many hours should the accumulator be left in charge.*

(1) The accumulator should not be discharged for longer than about 30 hours. (2) The accumulator is discharged when the voltage per cell drops to 1·8, and should immediately be taken from the circuit and placed on charge. (3) The accumulator would have to be connected for 50-60 hours. We suggest you employ larger candle power lamps; for example, four 50 candle power would allow a much larger charging current to flow through the accumulator and the charging rate would be reduced to about 25 hours. The instructions given by the makers of the cells should be carried out.

"N.B." (Broughty Ferry) *asks (1) What is the usual ratio between the turns of the primary, secondary, and reaction coils as usually connected in a three-coil holder. (2) Is there a formula for calculating the wavelength of a coil. (3) Is there a suitable formula for calculating the inductance of frame aerials.*

(1) If the aerial tuning condenser is in series with the A.T.I., the latter will be the largest coil; the secondary coil a little smaller, and the reaction coil will have a size depending upon the ease with which oscillation will be generated. Generally the reaction coil is the smallest coil of the three. (2) The inductance of a frame aerial should be calculated

with the aid of any of the inductance formulæ. The inductance of a frame aerial is largely affected by the spacing of the wires. We would refer you to a book entitled "The Calculation and Measurement of Inductance and Capacity," by Nottage. (3) We would refer you to an article on frame aerials which will shortly appear.

"NO GOOD" (West Kensington) *asks* (1) *Whether the diagram submitted is correct.*

We have examined the diagram of connections submitted, and provided the tuning arrangements are satisfactory, the circuit should work well. You may find it an advantage to use a grid condenser having a value of 0·0003 mfds. with a grid leak of 2 megohms. The grid windings of the L.F. transformers should be connected between L.T. minus and the grid.

"F.E.B." (Brixton Hill) *asks* (1) *If the aerial is well insulated at each end, is it necessary to insulate the aerial mast which is made of metal.* (2) *Should metal aerial masts be provided with lightning arresters.* (3) *Which is the most economical method of adding a lightning conductor to a metallic mast.* (4) *Is a wooden mast considered more efficient.*

(1) It is not necessary to insulate the aerial mast from the ground, but it is generally advisable to insert insulators in the stays which are fastened with the aerial. One or two insulators will be sufficient in each stay wire. (2) and (3) It is not necessary to provide a lightning conductor to a metal aerial mast. (4) From a wireless point of view there is not much to choose between a metal and a wooden mast. If a transmitter is used with an aerial which is supported by a metal mast a small loss may occur, but the loss is not serious

"W.H.D." (Felixstowe) *submits a diagram of his receiver and asks* (1) *How to stop a severe cracking noise which is heard in the telephones.* (2) *Whether improvements can be made to the wiring.*

(1) and (2) We have examined the diagram of connections and the circuit is correct. The cracking noise is probably due to the H.T. battery being run down. A large condenser with a value of the order of 2 to 4 mfds. should be connected across it. If this does not cure the trouble, we suggest you try a new H.T. battery. Noises are often due to faulty ebonite, and we suggest you roughen the ebonite surface.

"I.C.S." (The Hague) *asks* (1) *Why the tuned anode method of coupling H.F. valves with reaction coupled with the aerial circuit is stated, in a book on circuit diagrams, to give poor results when used for reception on C.W. signals.* (2) **2 LO** *transmissions are received with one-valve and a small aerial. Is it probable that the addition of one H.F. connected valve with the tuned anode coupling, and one L.F. valve, will amplify the signals sufficiently to operate a loud speaker.* (3) *Is it correct that* **PCGG** *is heard in London when only a single valve receiver is used.*

(1) We disagree with the statement contained in the book of circuit diagrams referred to. It will be found that the receiver is very suitable for the reception of C.W. signals. (2) If the signals received by your single valve receiver are heard loudly in a pair of head receivers, in general two-note magnifying valves will be required to produce the same strength of signal from a loud speaker. The addition of the H.F. connected valve will increase the signal strength for rectification, and the note magnifier will magnify the L.F. signals. You will probably find that the increase in signal strength will enable you to satisfactorily operate a small loud speaker such as would be sufficient to provide music throughout a small room. (3) The **PCGG** transmissions have been received in London with the use of a single valve receiver, but you may be sure the signals are rather weak and reception is not at all of a practical nature, *i.e.*, the adjustments have to be very critically made, and the least disturbance is sufficient to wipe out the signals entirely.

"H.K." (Gorleston-on-Sea) *is having trouble with his receiver and asks* (1) *Can we suggest a remedy.* (2) *How may the earth wire be shortened.* (3) *For a diagram of connections showing how one H.F., one detector and two L.F. valves are connected.* (4) *How may interfering spark signals be removed.*

(1) and (2) We think your trouble is due to such a long earth wire. We suggest you construct an earth yourself, or, if this is not possible, try and arrange for a counterpoise which may be two or three wires running the full length of the aerial and insulated from the earth. They could be arranged about eight feet above the ground. With the earth connection you have at present the signals are sure to be very weak, and you would probably find that signals of the same strength could be obtained if a well designed frame aerial were used. (3) A suitable diagram is given in Fig. 6 on page 645 of Feb. 10th issue. The H.F. cut-out switch and the provision for plug-in telephones into either of the L.F. valves can be dispensed with. (4) With the proper use of the three-coil holder, and with the H.F. valve anode circuit tuned sharply, you should not experience interference due to spark station.

"THEBES" (East Grinstead) *submits a diagram of a receiver, and asks if the circuit is correct.*

The diagram of connections is not correct. The H.F. valves should be added between the A.T.I. and the detector valve as shown in the diagrams which appear in most issues of this journal.

"G.O.B." (London, E.C.2) *submits a diagram of connections, and asks* (1) *Whether the circuit is suitable.* (2) *Should switches be fitted for cutting out valves when listening to near-by transmitting stations.*

(1) The circuit is quite correct and is a standard one. It is advisable to use switches for the purpose of cutting out valves when listening to strong signals. The arrangement is given in most issues of this journal. We would point out that the closed circuit tuning condenser should have a maximum value of 0·0005 mfds., not 0·001 mfds.

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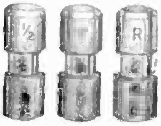

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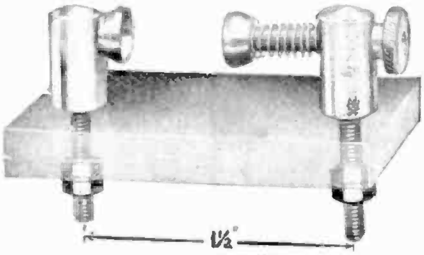

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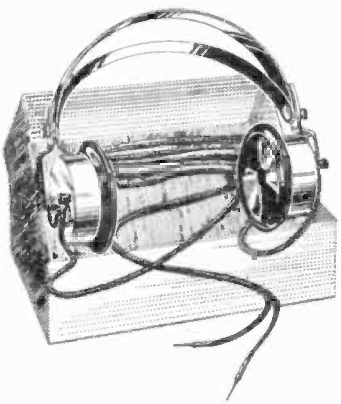

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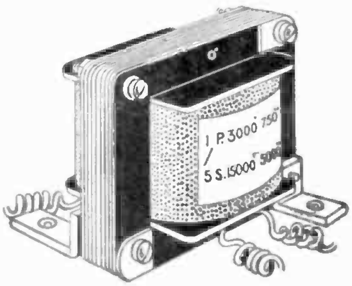

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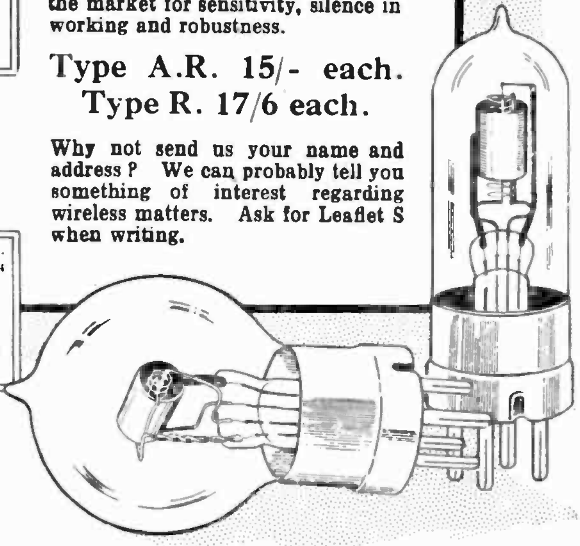
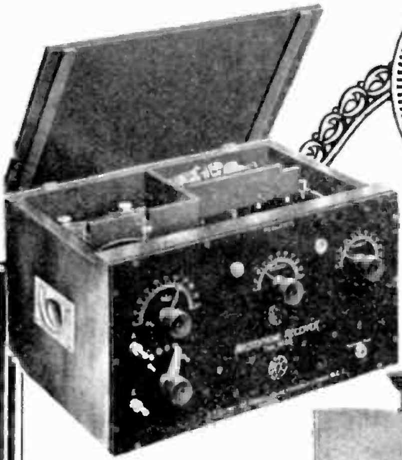
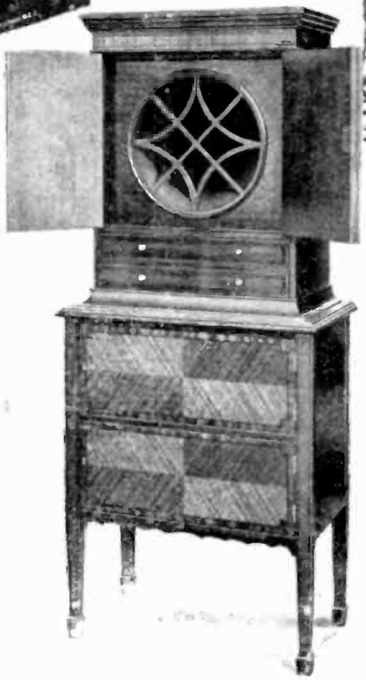
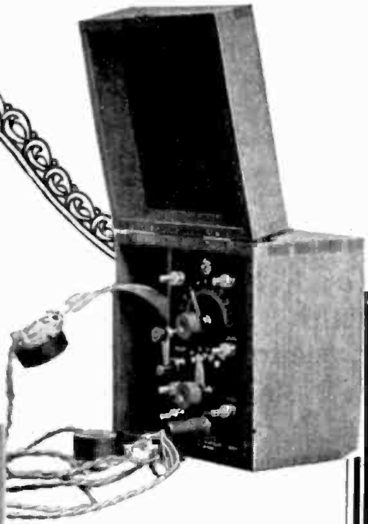


ELWELL WIRELESS



ARISTOPHONE CABINETS





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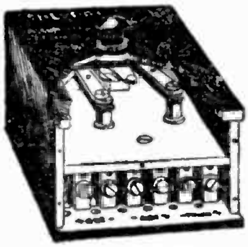

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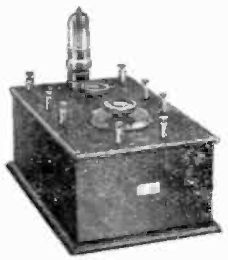

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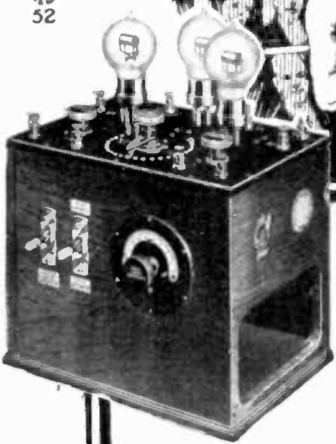

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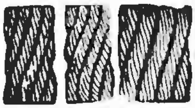

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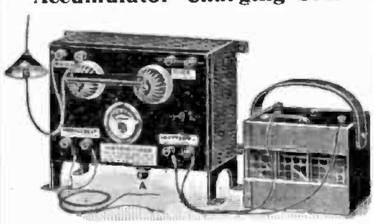

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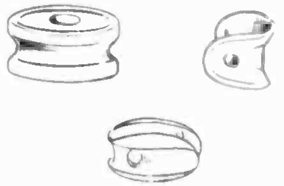

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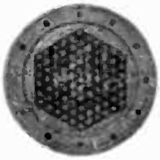

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VOL. XI, NO. 24.

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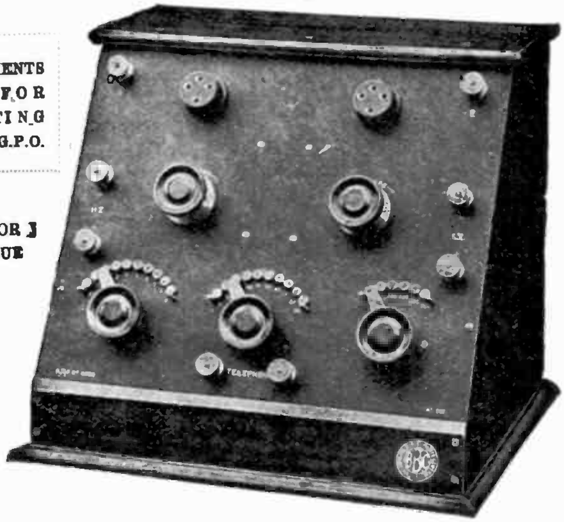

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31st MARCH, 1923. THE PRICE 6D. NET.

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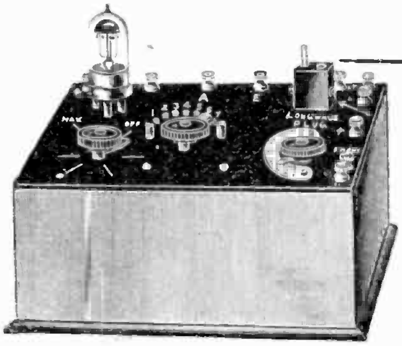

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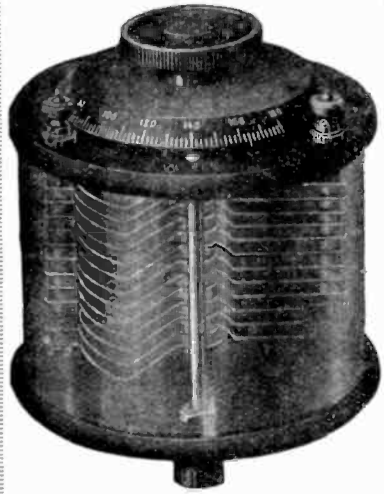

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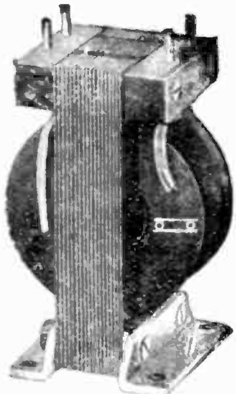

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A MAGAZINE DEVOTED TO WIRELESS TELEGRAPHY AND TELEPHONY

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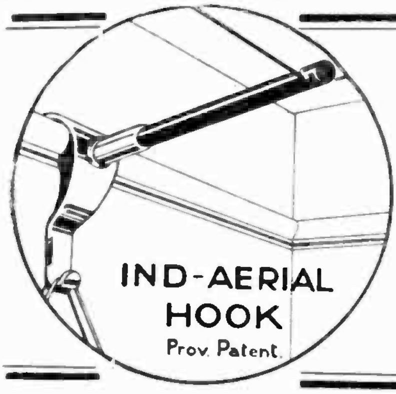

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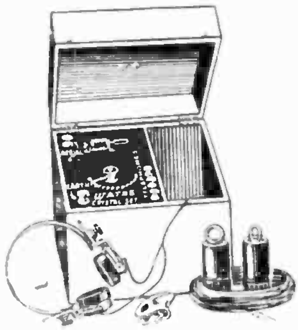

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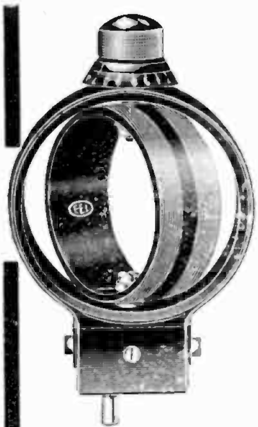

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THE
WIRELESS WORLD
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THE OFFICIAL ORGAN OF THE RADIO SOCIETY OF GT. BRITAIN

No. 189 [No. 26. Vol. XI.] MARCH 31st, 1923. Weekly

The Spark Transmitter System of the Eiffel Tower.

IMPROVEMENTS IN THE COMMON SPARK GAP AND OF THE SIGNALLING SYSTEM.

By E. M. Deloraine, Ing., E.C.P.I.

A SHORT description of the spark transmitter of the Eiffel Tower was given in *The Wireless World and Radio Review* for December 9th. Lately the operation of the spark gap has been improved by the addition of an auxiliary synchronous rotating gap.

Open Gap.

The open gap discharger is operated as follows :—

A high voltage is impressed across the gap, and across a capacity-inductance circuit in parallel, by the secondary winding of a step-up transformer. As the primary circuit is in resonance, the voltage across the spark gap rapidly increases until the gap breaks down, and a high frequency oscillatory discharge of the condenser takes place. This is due to the fact that after breakdown, the gap offers only a small resistance to the passage of currents, because of ionisation phenomenon and of the presence of metallic vapours from the electrodes.

As the gap must be conducting only during the passage of a high frequency discharge, it is necessary to have some means of restoring the previous state of high resistance. Generally an air blower is used which causes deionisation, carries away the metallic vapours and cools the sparking surfaces. The ideal spark gap is, in effect, simply a switch, " making " for a very short time to allow the oscillatory discharge of the condenser, afterwards " breaking " to permit the charge of the condenser.

A high power spark gap does not permit of this ideal. The state of the electrodes is essentially variable, the wear is not uniform, so arcing and irregular discharges take place. The result is that the spark note instead of being clear and musical, is irregular and scratchy.

Synchronous Rotating Gap.

The operation of such a gap is very different from the plain spark discharge. A toothed wheel is clamped on the alternator shaft, the teeth offering the minimum gap space when the voltage is maximum. The gap breaks down regularly at a frequency determined by the spacing between teeth. The gap space increases rapidly immediately after the discharge, thus preventing arcing.

In addition to these points, the rotary motion of the wheel helps considerably to cool the electrodes.

With this type of gap, the tone of the spark is pure, musical, and of constant pitch, if the alternator speed is constant. However, for very large power the wheel would be of such a size that it is not practicable to use a rotary gap. Furthermore, it is necessary to have the alternator very close to the high-frequency, high-voltage circuit and this is often inconvenient.

M. P. Laut, engineer of the station, thought that it would be convenient to continue the desirable properties of the rotary gap system with the open gap, and to this end the author collaborated with him in the experiment.

PRINCIPLE.

A small synchronous rotary gap is rigidly fastened to the alternator shaft working with an output power of 1 kW. The high frequency output is indirectly coupled to a tuned circuit which is reacting on the main open gap at the other end, in such a way as to give a secondary spark across the open gap for every spark on the synchronous rotary gap

AUXILIARY CIRCUIT.

The circuit comprises (see Fig. 1): (*a*) A primary circuit with a self inductance and a condenser C1, and the synchronous spark gap. The condenser C1 is fed by the transformer immediately below it, the primary winding being connected in series with a resistance and a tuning inductance across the output terminals of the main alternator.

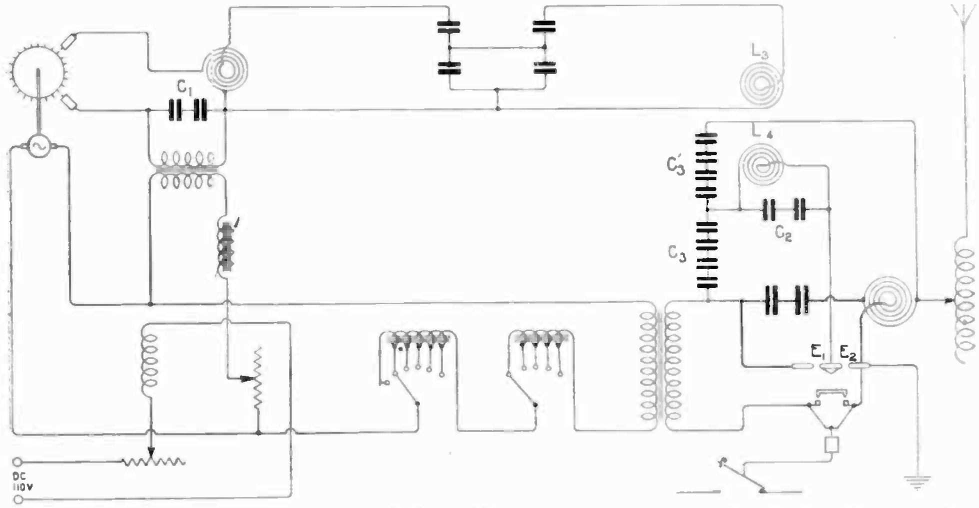


Fig. 1. The transmitting circuit at the Eiffel Tower, showing the main oscillatory circuit and the spark actuating oscillatory circuit.

The distance between electrodes of the open gap is increased so that the main discharge cannot normally take place. But when the resistance of the gap is considerably decreased by the secondary spark induced by the synchronous spark gap, the open gap breaks down and the main discharge takes place. The obvious result is that the main spark is working regularly like a rotary gap.

MAIN OSCILLATORY CIRCUIT.

The only modification in the ordinary circuit, as previously described, is that the spark discharger has two gaps instead of one, the two sparks being in series (see Fig. 1). The spark gap is shown in Figs. 2 and 3. It is essentially a system of three rotating electrodes. The centre one always rotates in the same direction and is insulated by its support. The two external electrodes have an alternating movement as they are connected by flexible copper tapes to the two plates of the condenser. A strong current of air supplied by a Roots blower is directed on each spark thereby cooling the electrodes and preventing the formation of arcs.

(*b*) An intermediate circuit consists of a condenser bank and inductance, L3, which is coupled to L4 of the primary and secondary circuits. The intermediate circuit is tuned to an oscillatory frequency, which has no relation at all to the frequency of the oscillatory circuit, the wavelength being about 500 metres.

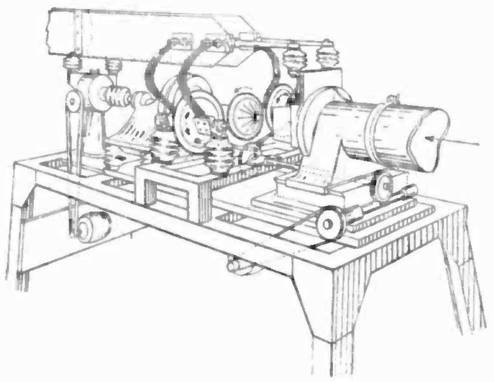


Fig. 2. The spark discharger, showing the two gaps.

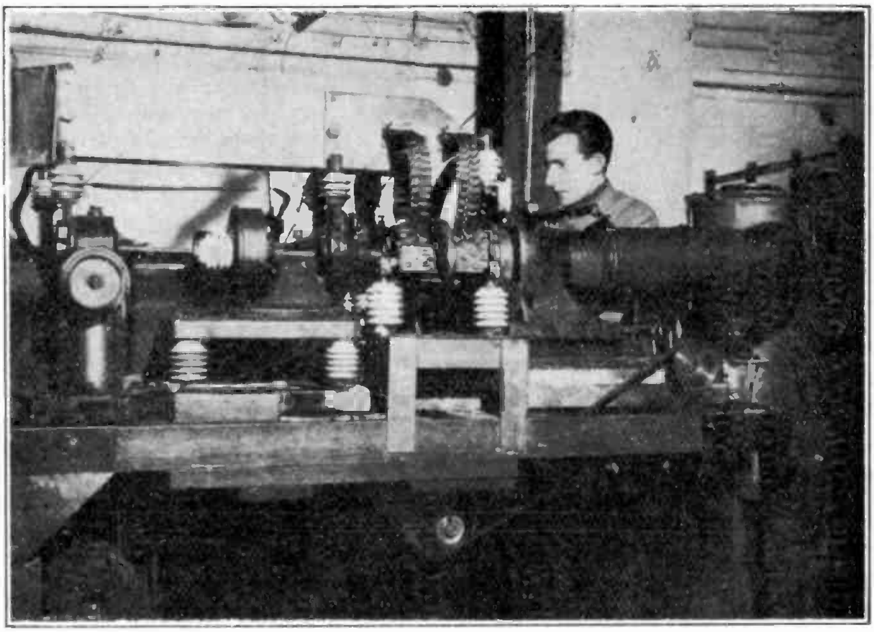


Fig. 3. The spark gap, with ventilated revolving electrodes, and arranged so that the total sparking distance is synchronously broken down by the discharge a condenser bank separate from the main oscillator.

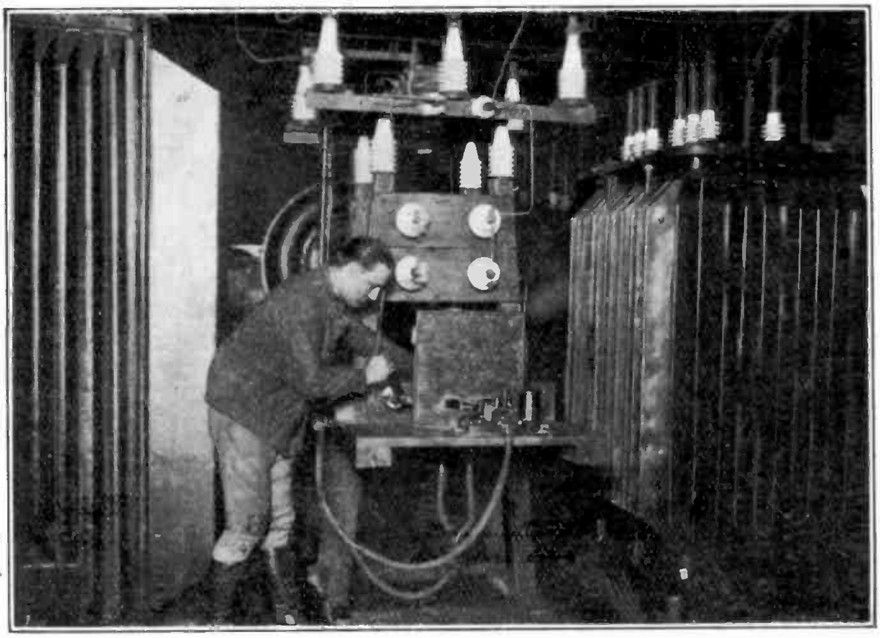


Fig. 4. The pneumatic relay, used for signalling in the high tension circuit. The arc caused by breaking the circuit is extinguished by compressed air.

The secondary circuit comprises a self induction L4, and condensers, C2 having a capacity of 0.001 mfd. and C3 and C'3 having a capacity of 0.01 mfd. and connected in a bridge arrangement to the main circuit as shown in the figure.

OPERATION.

The system of condensers is symmetrical, the pressures across the two gaps E1, E2 are equal. When C1 discharges we get a sudden peak of high frequency voltage across E1 and E2. The gap having the lower resistance breaks down and a group of condensers is discharged, say C2, C3. The total resistance of the double spark gap is sufficiently decreased to allow the total discharge of the condenser C1 to take place.

ADVANTAGES.

The spark is regular and of a musical tone, although the spark gap is a device of comparatively small dimensions. The field of the alternator may be increased or decreased, and the energy in the antenna varied accordingly, without affecting the frequency and the quality of the spark.

SIGNALLING.

The signalling system in the field current of the alternator does not allow of the use of very short signals, because of the self inductance of the circuit. Furthermore, it is necessary to include a second relay on the synchronous spark gap, otherwise the main spark would still be passing.

It has been found preferable to make use of a contactor working in the high tension side of the step-up transformer. This is a pneumatic Creed relay (Fig. 4). The morse key acts on a polar relay which opens or shuts a compensated control valve working the main valve and the piston.

The field current of the alternator is constant, the contactor being inserted in series with the high tension supply, the arc being blown by a strong jet of compressed air. This system of signalling gives very much better signals and enables the speed of working to be increased.

Audio-Frequency Reaction.

A PRINCIPLE WORTH INVESTIGATING.

By H. M. THEAKER, A.M.I.E.E.

WE are very familiar with the reaction principle as used in our high frequency circuits, but applying the principle to the low frequency circuits has not received much attention. Before describing the method adopted mention might be made of the double magnification system which has been treated fully in previous numbers of *The Wireless World and Radio Review.*

A simple diagram of connections is shown in Fig. 1. This requires a second low frequency transformer in the anode circuit which passes the low frequency impulses through the valve after being rectified. The condenser "C" is required to pass the high frequency current from the secondary tuned circuit to the valve which is acting as a rectifier, and also a low frequency amplifier.

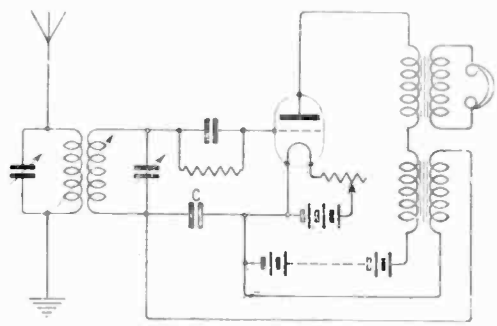


Fig. 1.

Consider now Fig. 2 in which the first valve acts as a rectifier, and the second one as a low frequency amplifier with the reaction principle applied to it. TR_1 is the usual intervalve transformer, and in the anode circuit the telephone transformer, also a transformer of about half the size of TR_1 is arranged in series. The secondary of this transformer is connected in series with the secondary of TR_1 to produce the low frequency reaction effect. If the transformer in the plate circuit of the second valve is too large, continuous low frequency oscillations will be set up, but by adjustment of the windings or arrangement it is possible to get maximum effect without distortion of signals. This can be done by regulating the value of the H.T., adjusting the grid potential or filament current,

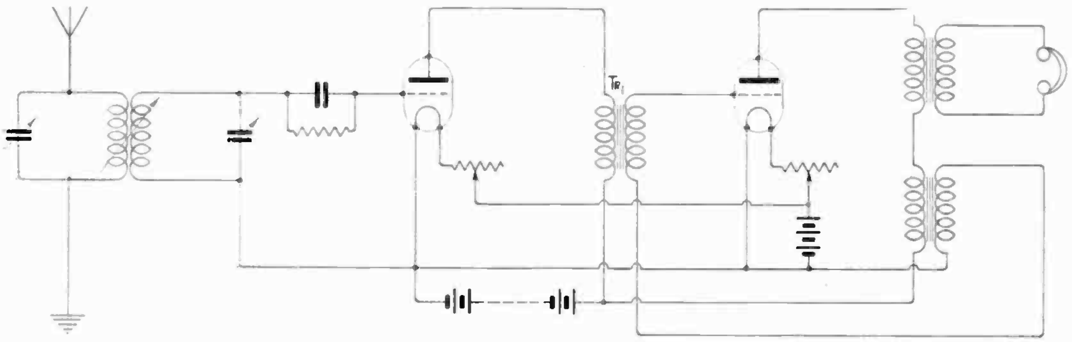


Fig. 2.

or by connecting across the primary of the second transformer a condenser of about 0·01 mfds. capacity, an iron cored choke coil, or a high non-inductive resistance.

Fig. 3 shows a similar circuit using a special intervalve transformer consisting of three windings, the third, or reaction winding being wound over the secondary. The primary and secondary are similar to the ordinary type of intervalve transformer, but with a ratio 1 to 1, whilst the reaction winding has about half the number of turns.

This circuit, in use, can be regulated to give very good results.

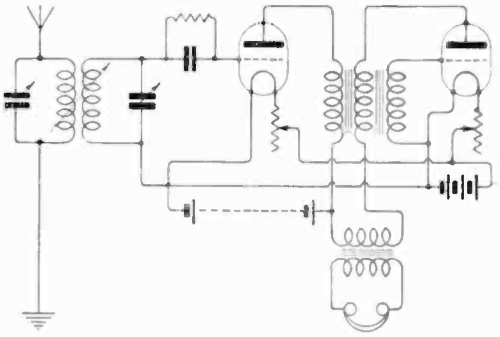


Fig. 3.

Simultaneous Amplification.

A FURTHER DEVELOPMENT IN DUAL AMPLIFICATION CIRCUITS.

By A. D. COWPER, M.Sc., A.I.C.

THOSE readers who have been intrigued by the method of simultaneous (or dual) amplification, associated with the name of Mr. P. G. A. H. Voigt,* may be interterested to learn that it has proved, with a similar circuit, perfectly feasible to hear Transatlantic telephony, under favourable circumstances, on the loud speaker with *two valves* only, though of course it is not exactly noisy.

The very successful transmission of the voice of Miss Edith Bennett from the Newark (New Jersey) Broadcast Station, about 5.30 a.m. G.M.T., on Saturday, February 24th, came through in the midst of a fearful welter of jamming and heterodyne, clearly audible to more than one hearer a short distance from the loud speaker in a quiet room; very distinct and the words of the announcer all but readable amidst the din, on the head-phones.

On the same circuit, in a N.W. suburb of London, all the British broadcasting stations, also Hague and Paris Radiola concerts, come in well, jamming permitting, on the loud speaker, on two valves; though, of course, another valve as note magnifier is more comfortable sometimes for several listeners. (Twin 40 ft. P.M.G. aerial, moderately well situated).

With an absurdly small frame aerial, 2 LO at 13 miles, and nearer amateurs are up to loud speaking strength, and Birmingham pleasant on the telephones.

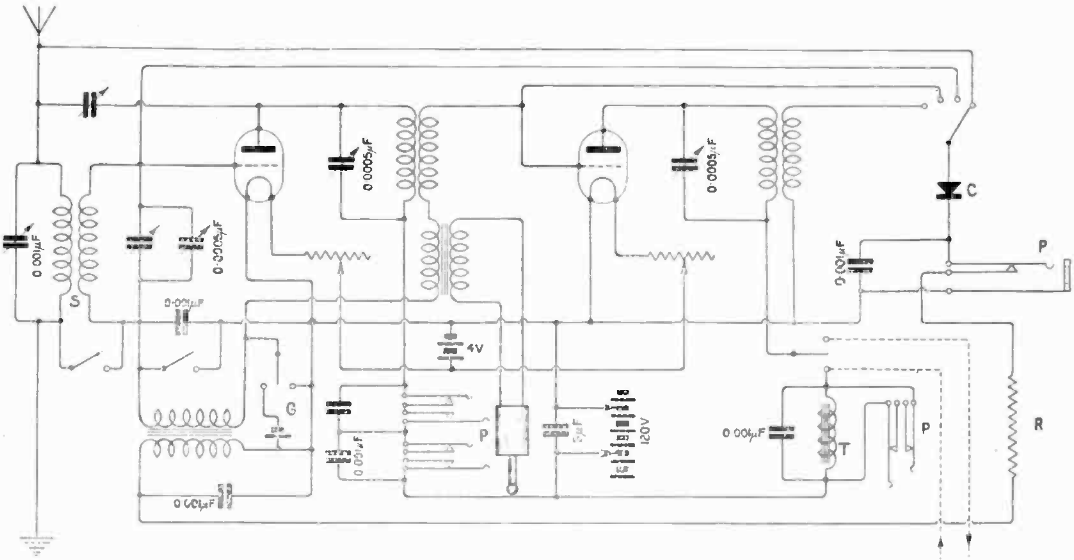
The circuit was developed by the writer from a suggestion given by French T.S.F. army experiments, and an inspiration from one of the single-valve circuits given by Mr. Voigt, and differs in some details from that recently described by him in this Journal.

* *Wireless World and Radio Review*, p. 250, May 27th, 1922.

A spider-coil loose coupler is used (fixed 2-in. centres); tuned low resistance spider coil H.F. plug-in transformers, giving good selectivity; two low frequency transformers (following French practice); and in particular a special radio-choke filter-circuit between the crystal rectifier and the first L.F. transformer, to shunt off any H.F. current that escapes an imperfect crystal. The last is, in the writer's opinion, quite essential to avoid that distressing persistent howling to which a simultaneous amplification circuit is notoriously addicted, and which makes "searching" at times a painful ordeal. With this filter, and the merest trace of electrostatic reaction from the plate of the first valve to the top of the A.T.I., the receiver can be made to oscillate quietly and manageably over a considerable range. The provision of variable H.T. supply is also found essential.

However, with four tuned circuits and six condensers to tune, it is not an easy circuit to operate unless a calibrated buzzer wavemeter is available.

The actual amplification, measured by Prof. Fleming's method, is roughly 100 times normal good crystal reception (2 LO speech), with two good "R" valves. By actual comparison, the writer has shown that on broadcast transmissions, with a tiny frame aerial, the efficiency of this circuit just surpasses that of the single valve Armstrong Super-regenerative Circuit, if the latter is limited to an ordinary "R" valve. With a power valve the Armstrong circuit has it; and is infinitely simpler to operate.



The simultaneous amplification circuit providing two stages high-frequency amplification; crystal rectification; two stages of low-frequency amplification.

S. Spider-coil loose coupler; fixed at 2 ins. centres. C. Synthetic galena crystal detector. R. Radio-frequency choke (¾ oz. No. 32 enamel wire, low-capacity pile-wound on small bobbin). G. Grid-bias cell of 1·4 volts. P. Plugs and jacks. T. Auto Transformer, for 4,000 ohm telephones or L.S. (2 ozs. No. 40).

Switches allow: "stand-by" straight crystal reception.

Loose-coupled crystal reception.

Ditto, with one or two stages L.F. amplification.

One stage H.F. amplification, followed by crystal rectification; with or without reaction.

Two stages H.F., do.

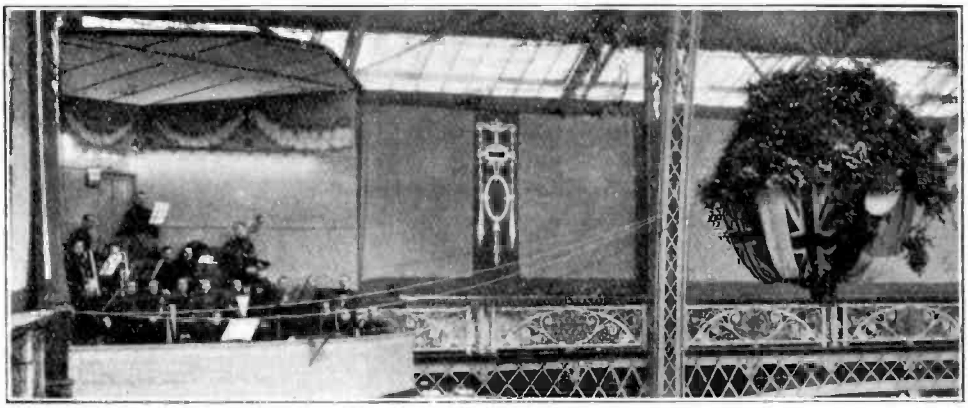
Two stages H.F., followed by crystal rectification, and one or two stages L.F. amplification.

Reactance to point of steady oscillation when required.

Switch in front of last telephone jack allows extra note magnifier to be interposed at will.

Rectification on valve alone by grid bias cell and filament temperature adjustment, followed at will by note magnifiers.

Ditto, preceded by H.F. amplification.



The bandstand and one of the sound projectors in the main hall.

The Latest Application of the Loud Speaker.

PUBLIC ADDRESS SYSTEM AT THE IDEAL HOME EXHIBITION.

VISITORS to the previous *Daily Mail* Exhibitons will doubtless go to the Ideal Home Exhibition this year prepared for something novel, but they will perhaps hardly expect to find novelty actually on the doorstep. Such is the case, however, for even before entering Olympia the observant visitor begins to marvel, for orchestral music is heard, and yet no performers are visible.

This feature is provided by the Western Electric Public Address System, which is one of the recent applications of the thermionic valve, and by its aid the music from the bandstand in the gallery of the Main Hall is reproduced throughout the main hall, the New Hall, the Gardens, the Pillar Hall, and the Vestibules.

The complete equipment is under the control of an operator, and the degree of loudness from any one particular projector can be adjusted according to circumstances. To enable this to be accomplished to the best advantage a system of telephones is arranged whereby a person listening in a remote corner can communicate with the operator and arrange for the apparatus to be adjusted as desired. Only in this way is it possible to secure the natural effect, and any attempt to amplify the sound to an unnatural degree, as so often attempted, results in more noise rather than music.

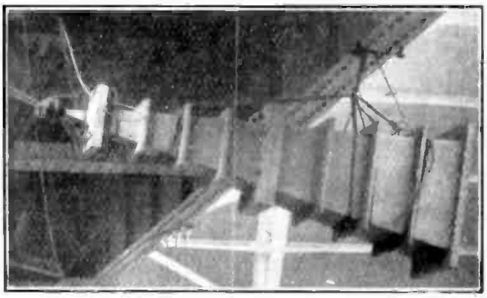
The Public Address System, as its name implies, has been primarily designed to aid public speakers.

The system consists essentially of three distinct portions—the microphone, the amplifier, and the loud speaking projectors which throw the required volume of sound over the area to be covered. The microphone is designed so that the natural period of

The Microphone.

vibration of the diaphragm is well above speech and music frequencies, so that resonance of the diaphragm at these frequencies is avoided, resulting in pure reproduction. It is sensitive to speech at distances from three to eight feet.

The amplifier, together with the associated batteries and power board, are situated on the



One of the sound projectors.

balcony just to the rear of the orchestra. The amplifier consists of four stages of amplification, the first two stages being voltage amplification, the third stage current amplification, and the final stage power amplification. The power valves in the final stage are connected in a special differential circuit to minimise distortion. It is constructed in panels, the cabling from the microphones being brought on to one panel which is provided with means of switching to any desired microphone. It also contains telephone apparatus to enable the operator of the amplifier to get into touch with his observers.

Another panel contains the apparatus associated with the first three stages of amplification, that is, two stages of voltage amplification and a stage of current amplification as explained above. It is on this panel that the total output from the system is regulated by means of a potentiometer situated between the first and second stages.

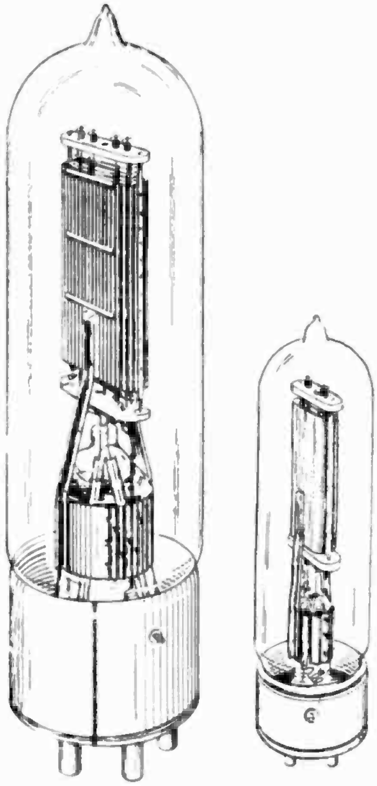
An additional panel contains the necessary measuring instruments, and is provided with plugs and cords so that the current in any part of the system may be measured by plugging into jacks provided on the amplifier panel for this purpose.

The volume indicator is a valve detector device which measures the alternating current power in the system by means of a deflection on a galvanometer, and enables the proper transmission level of the system to be maintained.

The power amplifier receives the output from the first amplifier and increases the power available to such a value as to operate the projectors at the required volume to cover the area served by the projectors.

Finally there is a control panel provided for adjusting the volume in the individual projectors to the desired value.

The arrangement of the projectors for serving the entire exhibition is as follows :—Four projectors serve the Main Hall, these being suspended above and slightly forward of the orchestra. A single fibre horn serves the Gardens, and is mounted in the corner nearest the orchestra. The New Hall is covered by two fibre horns mounted in the centre



The Western Electric Co.'s amplifying valves. Types 212A and 211A.

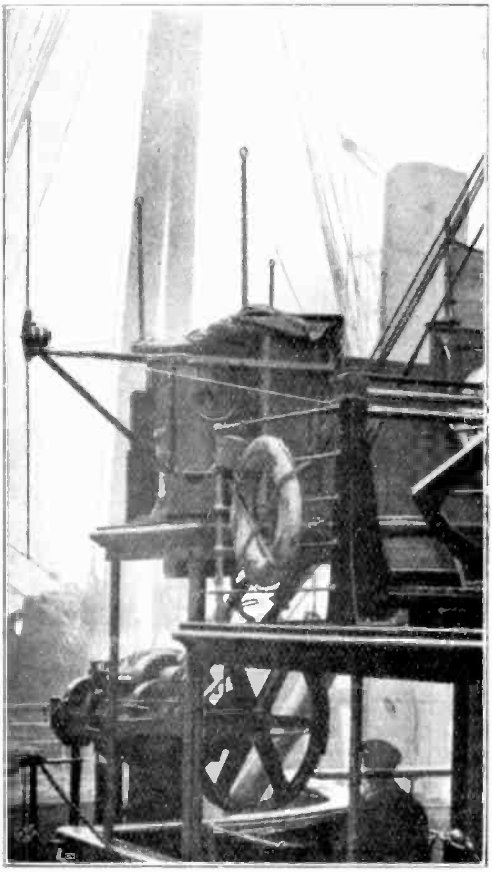
at one end. A single projector with fibre horn serves the Pillar Hall. At the Hammersmith Road entrance, and also at the Addison Road entrance, a projector with a small curved horn is fitted, the total volume required in these cases being much less than in the main buildings.

The loud speaking projectors are of the balanced armature type, combining sensitiveness with the ability to handle comparatively large currents.

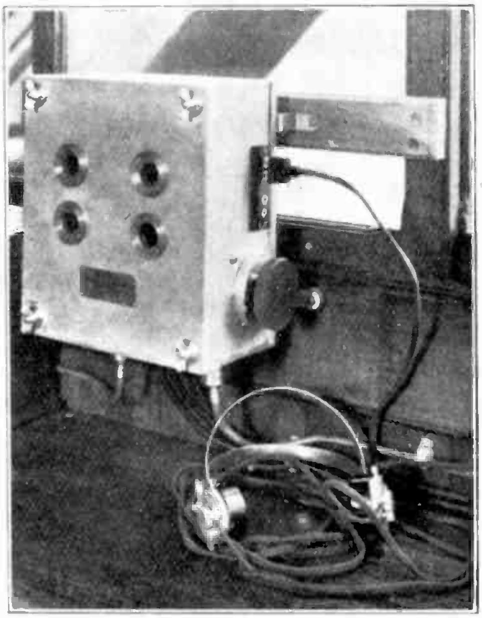
Directional Wireless as an Aid to Navigation

THE first vessel to benefit by the "wireless lighthouse" established by Marconi's Wireless Telegraph Co., Ltd., on Inchkeith Island, in the Firth of Forth, is the s.s. "Royal Scot," owned by the London and Edinburgh Shipping Co., Ltd. This boat, which is employed on the London and Leith service, has been fitted with a special type of wireless receiver which will detect the signals sent out by the "wireless lighthouse" and enable the navigating officer to pick his way through the dangerous channels of the Firth of Forth in the thickest fog.

The "Royal Scot" has just returned to Leith after her first round trip to London with this apparatus on board, and reports that the "lighthouse" signals were received perfectly during the whole time the vessel was within range, and that the ship's officers were easily able to use the apparatus.



Wireless Beam Receiving Antennæ on s.s. Royal Scot.

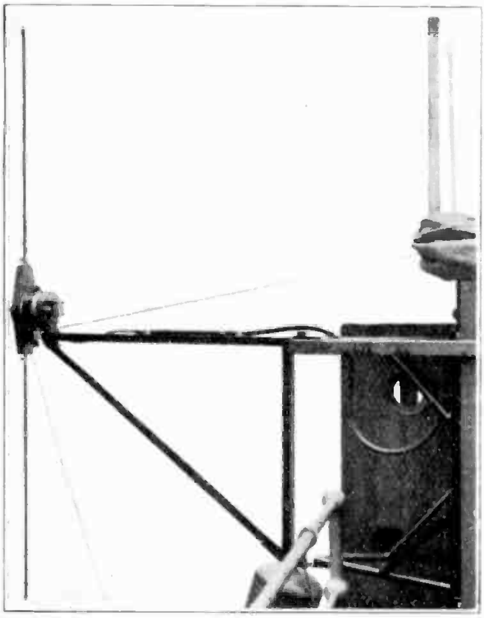


Wireless Beam Receiving Apparatus in Chart House.

The "wireless lighthouse" on Inchkeith Island is the first of its kind; but it is possible that similar stations will be established in other dangerous channels. For instance, the Farne Islands are situated in a particularly dangerous spot, and vessels which shape their course from these islands find great difficulty in localising the fog-horn.

Of importance to ship owners is the fact that this device will frequently enable their vessels to save a tide.

The receiving apparatus is extremely simple. Only one handle has to be operated. This switches the gear into use and is also calibrated so as to give a very fair indication of the distance from the shore in addition to the actual bearing. Thus the navigating officer can determine whether he is inside or outside his course.



Marconi Wireless Beam Receiving Antennae on Ship's Bridge.

The transmitter sends out a directional wireless beam which gives a distinctive signal as it passes through each point of the compass.*

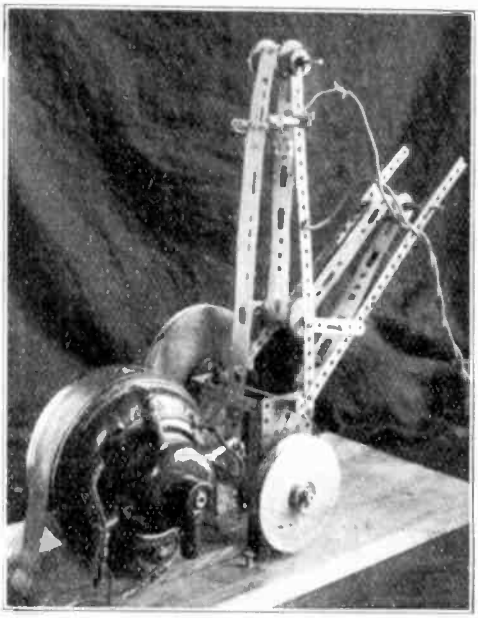
A conspicuous feature of the transmitting station is a metal framework tower, some 30 feet high, supporting four metal arms. These in turn support a series of vertical wires. The whole revolves on a circular base, driven by an electric motor. The frame is, in effect, an electric reflector and the ether strains are projected so as to sweep round the surrounding sea in just such a way as a light would from a lighthouse. Thus, instead of fixing a point by visual means, the result is obtained aurally, and is in no way interfered with, whatever the weather conditions may be.

A point of very great interest in connection with the apparatus is the fact that its development may be regarded as a reversion in ideas to the earliest known form of transmission of wireless waves. In effect the apparatus is more akin to the original system devised by Hertz than any subsequent wireless system introduced. Marconi in his early work made use of long waves on account of the increase in range which was thereby obtained, and as a result of later developments along these lines the importance of a system employing very short wavelengths became obscured. There are, however, many advantages in short wave working, and the comparatively short range of the transmitter is now largely compensated for by the enormously increased sensitiveness of modern valve receiving apparatus, apparatus such as was not dreamed of at the time that the development of the present long wave systems for commercial purposes was commenced.

The London and Edinburgh Shipping Company is to be congratulated upon its enterprise in installing the first commercial Beam Receiver.

* A technical description of the apparatus appeared in the issue of May 20th, 1922.

AN AMATEUR DEVICE FOR AUTOMATIC TRANSMITTING.



Photo—Courtesy, American Radio Relay League.

Those who took part in transmissions in the Transatlantic Tests found that to keep on sending out the same test message was rather a tiring performance. Our illustration shows one method adopted by the owner of the successful American amateur station 1 BGF. The arrangement consists of a continuous band of paper tape punched with the required message in morse characters. The band is passed between contacts by means of rollers, motor driven, and the keying circuit is thereby opened and closed to order.

Wireless Club Reports.

NOTE.—Under this heading the Editor will be pleased to give publication to reports of the meetings of Wireless Clubs and Societies. Such reports should be submitted without covering letters and worded as concisely as possible, the Editor reserving the right to edit and curtail the reports if necessary. **The Editor will be pleased to consider for publication papers read before Societies. An Asterisk denotes affiliation with the Radio Society of Great Britain.**

Correspondence with Clubs should be addressed to the Secretaries direct in every case unless otherwise stated.

The Belvedere and District Radio and Scientific Society.*

Hon. Secretary, Mr. S. G. Meadows, 1, Kentish Road, Belvedere, Kent.

The twenty-third general meeting was held at the Erith Technical Institute, on Friday, February 23rd, at 8 p.m., and was chiefly devoted to a discussion on a suggestion put forward by Mr. E. Walker regarding wireless applied to railways.

On Saturday, February 24th, the first trial transmission was made from the Society's headquarters. Messages were sent out in Morse code, and were received very satisfactorily.

Liverpool Wireless Society.*

Hon. Secretary, Mr. Geo. H. Miller, 138, Belmont Road, Anfield, Liverpool.

The usual bi-monthly meeting of the above Society was held on Thursday, February 22nd, 1923, at the Royal Institution, Colquitt Street, Liverpool. Mr. E. B. Grindrod occupied the chair.

The theory and principles of amplification were exhaustively dealt with in a lecture by Mr. A. J. Haining to a record attendance, his explanations being given in language that was understandable to all.

Applications for membership should be addressed to the Hon. Secretary.

Wireless and Experimental Association.*

Asst. Hon. Secretary, Mr. G. H. Horwood, 557, Lordship Lane, S.E. 22.

The future meetings of the Association at Peckham will be graced and brightened by the presence of ladies.

The "return thanks" of our Vice-President, Sir Frederick Hall, Bart., M.P., was read. The wireless beginner is to have a special half hour of his own every week in future.

Bradford Wireless Society.*

Hon. Secretary, Mr. J. Bever, 85, Emm Lane, Heaton, Bradford.

A meeting was held at headquarters at 7.45 p.m. on February 23rd, the Vice-President, W. C. Ramshaw, Esq., being in the chair.

A short and interesting description of a method of charging accumulators from A.C. mains by means of a chemical rectifier was given by Mr. Mitchell. This was followed by a short address on "Spark Transmitters" by Mr. Whiteley, which was much appreciated.

Birmingham Experimental Wireless Club.*

Hon. Secretary, Mr. A. Leslie Lancaster, c/o Lancaster Bros. & Co., Shadwell Street, Birmingham.

An unusually entertaining and instructive lecture was given before the above Club on February 23rd by Mr. Abbott on the subject of "Wireless Procedure."

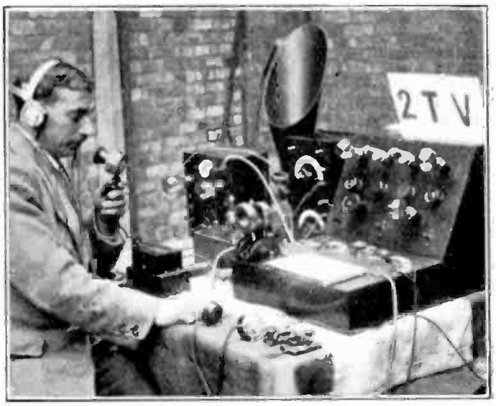
The lecturer traced the origin of many of the ship and shore station call signs in regular use, and devoted a considerable part of the lecture to wireless "slang" signals in regular use by operators in the mercantile marine.

The Wembley Wireless Society.*

Hon. Secretary, Mr. W. R. Mickelwright, 10, Westbury Avenue, Alperton, Wembley, Middlesex.

On February 1st the President, Mr. C. R. W. Chapman, lectured on "Symbols," and on February 8th Mr. H. E. Comben, B.Sc., gave a very detailed paper on "A Crystal Set." At each of the lectures a précis of the paper is handed to members present, and this is found to be very useful for reference at the discussions which are held the week following each lecture.

Mr. A. F. H. Baldry, A.M.I.R.E., the Hon. Asst. Secretary, has recently been successful in receiving American stations.



The Experimental Transmitting and Receiving Station of Mr. E. W. Wood of Northampton.

The Ilford and District Radio Society.*

Hon. Secretary, Mr. A. L. Gregory, 77, Khedive Road, Forest Gate, E.7.

On February 22nd Mr. A. J. Thompson delivered a lecture on the "Magnetic Detector and Multiple

Tuner," dealing very thoroughly first with the working of both instruments.

Bishop's Stortford and District Amateur Wireless Association.*

A public demonstration of wireless telephony was given by members of the Society at the Junior Club, Bishop's Stortford, on Tuesday, February 27th, when a large audience listened with interest to the broadcast programme from the London station. Mr. W. A. Field, President, gave a short description of the indoor aerials, valves, and other apparatus.

The Kensington Radio Society.*

Hon. Secretary, Mr. John Murchie, 2, Sterndale Road, W.14.

On Thursday, February 15th, at 8.30 p.m., the postponed monthly meeting of the Society was held at headquarters, 2, Penywern Road, Earl's Court.

Dr. Gordon Wilson gave an address on the management of a Mark III two-valve receiver, and demonstrated this set with a Brown relay and Amplion "loud speaker." Excellent signals were received on outdoor, indoor, and Ducon aerials.

The Hon. Secretary will be pleased to furnish particulars of the Society to anyone desirous of joining.

Eastbourne and District Radio Society.*

Hon. Secretary, Mr. W. F. G. West, Bridle Gate, Willingdon, Sussex.

The Society is now flourishing, and lectures are being held every fortnight in the Technical Institute, Eastbourne. Full particulars of membership can be obtained from the Hon. Secretary.

The Manchester Radio Scientific Society.*

Hon. Secretary, Mr. H. D. Whitehouse, 16, Todd Street, Manchester.

On Wednesday, February 21st, the members and friends present were favoured by another visit of Mr. Bell, of the Metropolitan-Vickers Electrical Co., Ltd., Trafford Park, Manchester, this time accompanied by Mr. Wright, whose voice is familiar to listeners-in round Manchester. These gentlemen gave a very interesting talk, illustrated with lantern slides, on "Studies and Programmes,"

The Leicestershire Radio and Scientific Society.*

Hon. Secretary, Mr. J. R. Crawley, 269, Mere Road, Leicester.

At a meeting of the Society, held on Monday, February 19th, Mr. Atkinson gave his promised description of a three-valve receiver of his own design and construction.

Further members are required for this Society, and also students, who must be under the age of 18 years. The Hon. Secretary will be pleased to give full particulars to those interested. The meetings are held fortnightly on Monday evenings, at headquarters, Vaughan College, 8, Chatham Street, Leicester.

Wolverhampton and District Wireless Society.*

Hon. Secretary, Mr. J. A. H. Devey, 232, Great Brickkiln Street, Wolverhampton.

The Society held its usual fortnightly meeting at the A.J.S. Assembly Rooms (kindly lent by Mr. Harry Stevens) on Tuesday, February 27th, when a lecture on "Valves, and the use of High and Low Tension Batteries" was given by Mr. Harold Taylor (**2 KQ**).

Huddersfield Radio Society.*

Hon. Secretary, Mr. C. Dyson, 14, John William Street, Huddersfield.

On February 23rd and 24th the Society held a very successful wireless exhibition in the Lecture Hall of the Y.M.C.A., 14, John William Street, Huddersfield.

On both days a number of items, including broadcast concerts and short lectures on wireless subjects were introduced during the proceedings, and contributed greatly towards the enjoyment of the visitors, who numbered over 400.

The Radio Society of Highgate.*

Hon. Secretary, Mr. J. F. Stanley, B.Sc., A.C.G.I., 49, Cholmeley Park, Highgate, N.6.

Of the three or four British amateur transmitting stations received in America during the recent Transatlantic Tests, it is with pleasure that we have to report that one of these stations is owned and worked by a member of this Society. The station referred to is **2 SH**, owned by Mr. F. L. Hogg.

A special series of elementary lectures is now being given, full particulars of which may be obtained from the Hon. Secretary.

Leeds Y.M.C.A. Wireless Society.

Hon. Secretary, Mr. N. Whiteley, Central Y.M.C.A., Albion Place, Leeds.

A meeting was held at headquarters on February 12th, Mr. R. Toynbee presiding, when Mr. Whiteley gave his paper on "Radio Transmission," which was much appreciated.

The Society's four-valve set is now almost completed, and it is hoped that the licence will be to hand by the time the set is ready for operation.

Whitby and District Radio Club.

Hon. Secretary, Mr. R. Barry, 14, Abbey Terrace, Whitby.

A whist drive and dance was held on February 12th at Messrs. E. Botham & Sons' Café. A novel feature was a dance to music transmitted from **5 NO.**

Sunbeam (Moorfield) Wireless Society.

Hon. Secretary, Mr. C. E. Beresford, Moorfield Works, Wolverhampton.

The membership of the Society, which now totals 66, is confined to employees of the Sunbeam Motor Car Company. An experimental licence has been applied for, and the club set ordered, and when these come to hand work will begin in real earnest. The Company is heartily in sympathy with the movement, and has provided club, class, and demonstration rooms on a generous scale.

It is intended to install a workshop for the use of members for experimental work, and classes of instruction in wireless, electrics and Morse are in course of preparation.

Morayshire Radio Society.

Hon. Secretary, Mr. D. G. Leslie, C.R.A., 2, Culbard Street, Elgin.

On Thursday, February 8th, Mr. J. S. Souter, A.I.E.E., President of the Morayshire Radio

Society (which was inaugurated on January 23rd), gave a lecture on "Wireless Telegraphy and Telephony" to an audience of between five and six hundred in the Parish Church Hall, Elgin.

At the close of Mr. Souter's interesting lecture the audience were able to listen to speech and music from Birmingham, Newcastle, Manchester and London.

Croydon Wireless and Physical Society.

Hon. Secretary, Mr. B. Clapp, A.M.I.R.E., Meadmoor, Brighton Road, Purley.

At a meeting of the Croydon Wireless and Physical Society held at the Central Polytechnic, Croydon, on Saturday, February 3rd, Mr. J. H. Reeves, President of the Kensington Radio Society, gave an interesting lecture on "Some Experiments with Semi-Aperiodic H.F. Transformers."

A keen discussion followed the lecture.

The Secretary, will be pleased to furnish intending members with particulars.

Oldham Lyceum Wireless Society.

Hon. Secretary, Mr. G. Halbert, 16, South Hill Street, Oldham.

On Thursday, February 8th, a lecture was given on "Condensers," by Mr. H. H. Wareing, Principal of the Oldham Municipal Technical School.

The Society entered its new headquarters, St. Thomas's Schools, Coppice, Oldham, on Thursday, February 15th.

A campaign has been started for the enrolment of new members, and those interested are invited to write to the Hon. Secretary for particulars of membership.

The Overland Radio Association.

Hon. Secretary, Mr. N. D. Cumming, 30, Overport Drive, Berea, Durban.

The attention of amateurs in South Africa is drawn to the above Association, which was founded a year and a half ago. The Society is recognised by the Postmaster-General, and has been granted authority to recommend its members for experimental licences. At present there are thirty members, some of whom reside in remote parts of Zululand.

Meetings are held on Friday nights, and papers of practical and theoretical interest are periodically read. Buzzer practice takes place on Monday nights, proficiency in Morse being very desirable in South Africa, there being as yet no broadcasting.

Applications for membership should be made to the Hon. Secretary.

The Wireless and Scientific Society of Bridlington.

Hon. Secretary, Mr. A. R. Horspool, "Darley," Marton Road, Bridlington.

This Society, which held its first meeting in August of last year with a membership of sixteen, now has a membership of over thirty.

On Tuesday evening, February 6th, Capt. W. E. Dennis, of Hull, lectured on "Wireless for the Amateur and Broadcasting." At 8.30, by special arrangement of Captain Metz, the Eiffel Tower commenced to transmit an excellent twenty minutes' concert for the special benefit of the Society.

All prospective members should communicate with the Hon. Secretary.

A Society for Rye.

A Society has been formed at Rye, under the name of "The Rye and District Radio Society."

A meeting was held on February 12th, when Mr. W. E. Philpott gave a lecture on "The Elementary Principles of Wireless Telegraphy and Telephony."

Prospective members are invited to write to the Hon. Secretary, Mr. W. E. Philpott, 18, Eagle Road, Rye.

Watford and District Radio Society.

Hon. Secretary, Mr. F. A. Moore, 175, Leavesden Road, Watford.

The first annual general meeting of the above Society was held at headquarters (The National Schools) on Friday, February 9th, and officers were appointed for the ensuing year.

On Friday, February 16th, Mr. Christie gave a lecture on the Morse code and some very useful hints on how to attain a high speed.

The Beckenham and District Radio Society.

Hon. Secretary, Mr. J. F. Butterfield, 10, The Close, Elmers End, Beckenham.

The exhibition of members' and trade sets, organised by the Society, was a great success, and many good ideas were revealed in the construction of the amateur exhibits. During the evening broadcast selections were received on a four-valve set constructed by a member.

The new headquarters of the Society are at The Hut, High Street, Beckenham.

Dewsbury and District Wireless Society.

Hon. Secretary, Mr. Fred Gomershall, A.S.A.A., 1, Ashworth Terrace, Dewsbury.

The Society gave a very successful demonstration at the Highfield Chapel, Earlsheaton, on Tuesday, February 13th.

The Secretary complains of the unsatisfactory attendances at recent meetings, and urges the members to take advantage of the valuable discussions which are a feature of the Society's activities.

St. Bride Radio and Experimental Society.

Institute Manager, Mr. R. J. Berwick, Bride Lane, Fleet Street, E.C.4.

A very interesting and instructive evening was spent by members of the Society on Wednesday, February 21st, when the President, Capt. H. Riall Sankey, C.B., C.B.E., R.E. (Ret.), M.Inst.C.E., occupied the chair. The proceedings opened with an admirable lecture by the President, in which he explained in non-technical language the rudiments of Wireless Telephony.

This was followed by a short demonstration and general meeting, when the Formation Committee gave an account of their stewardship; draft rules of the Society were submitted to the meeting and approved; permanent Committee and officials elected; and meeting nights arranged, alternate Mondays at 7.30 p.m., commencing March 5th.

Visitors and prospective members will be cordially welcomed at any of the meetings of the Society.

Sale and District Radio Society.

Hon. Secretary, Mr. H. Fowler, "Alston," Old Hall Road, Sale.

The above recently formed Society, having now secured very central and convenient premises in School Road, Sale, intends to hold an exhibition of amateur made wireless apparatus, on the first Saturday in April, at which the formal opening will take place. The lecture and reading rooms are now ready for use, and the workshop and experimental room are being thoroughly equipped with benches, tools, stores, etc.

Should the Society be successful in obtaining an experimental license, it is intended to equip the premises with an efficient aerial and receiving set.

In the meantime applications for membership will be welcomed by the Hon. Secretary.

Walton-on-Thames and District Amateur Radio Society.

Hon. Secretary, Mr. N. V. Webber, Walton House, Walton-on-Thames.

The second general meeting was held at headquarters on February 19th, at 8 p.m., with R. V. Somers-Smith, Esq., J.P., in the chair.

At the conclusion of business regarding the election of officers, the Technical Adviser demonstrated and explained a non-radiating receiver (H.F. rectifier and L.F.), and impressed on all present who held experimental licenses, the importance of using such a circuit while experimenting during broadcast hours.

South Shields and District Radio Club.

Hon. Secretary, Mr. J. A. Smith, 66, Salmon Street, South Shields.

The first general meeting was held on February 23rd, at the Club's headquarters, Edinburgh Buildings, 34, King Street, South Shields.

In his address, the Chairman recalled the commencement of the Club, when the inaugural meeting was attended by nine of the Club's present members. Since that time, barely six months ago, rapid and sound progress had been made. Foremost of all being the obtaining of a transmission licence (the call sign allotted being **5 QI.**)

The election of officers next took place, resulting, among others, in the appointments of Sir Jas. Readhead, Bart., as Patron, and H. R. Cullen, Esq., M.A., A.R.C.S., as President.

Meetings are to be held at headquarters every Friday at 7.30 p.m., and the premises are open during the day and evening, to members who hold keys.

Merthyr Tydfil Radio and Scientific Society.

Hon. Secretary, Mr. Davies, 5, Pantysellog Terrace, Pant, Dowlais.

At the meeting of the Society held on Wednesday, February 21st, it was decided to make application for affiliation to the Radio Society of Great Britain. It was also agreed that the Society should construct a new receiver (five valve) in place of the existing three-valve, the receiver to be designed on the unit system, employing a two H.F. detector, and two L.F. valves.

Intending members are invited to any of the weekly meetings (Wednesday evenings at 7 p.m., at the Cafarthfa Castle School).

NEW SOCIETIES.

Chorlton-cum-Hardy.

A wireless society is being formed at Chorlton-cum-Hardy, Manchester, and applications for membership from all wireless enthusiasts in the district will be warmly welcomed. All communications should be addressed to Mr. Maurice C. Booth, 4, Chatsworth Road, Chorlton-cum-Hardy, Manchester.

Farnborough, Hants.

Mr. J. E. Catt, A.M.I.E.E., A.I.R.E., "Melrose," Alexandra Road, South Farnborough, Hants, would be pleased to hear from any amateurs who would give support to the formation of an amateur wireless society for the district.

Harpenden.

It has been decided to form a Society under the title of the Harpenden Radio Society, to be affiliated in due course with the Radio Society of Great Britain. Particulars of membership can be obtained on application to the Hon. Secretary, Mr. Percival A. Anscombe, Wellington House, Harpenden, Herts.

Worthing.

At a meeting held at the recreation room of the Central Fire Station recently, under the chairmanship of Dr. H. Leeds Harrison, it was decided to form a wireless society to be known as the Worthing Radio Society. Mr. R. N. Oates was elected Hon. Secretary, and Mr. E. A. Jemmett, Hon. Treasurer.

St. Albans.

The St. Albans and District Radio Society was formed on February 27th. All who are interested and who reside in the district are invited to communicate with the Hon. Secretary, Mr. J. H. Holderness, 8, Westview Road, St. Albans.

Seaforth.

A society has been formed under the title of the Seaforth and District Radio Society. Applications for membership should be addressed to the Hon. Secretary, 237-9, Crosby Road, Seaforth, Liverpool.

Leyton.

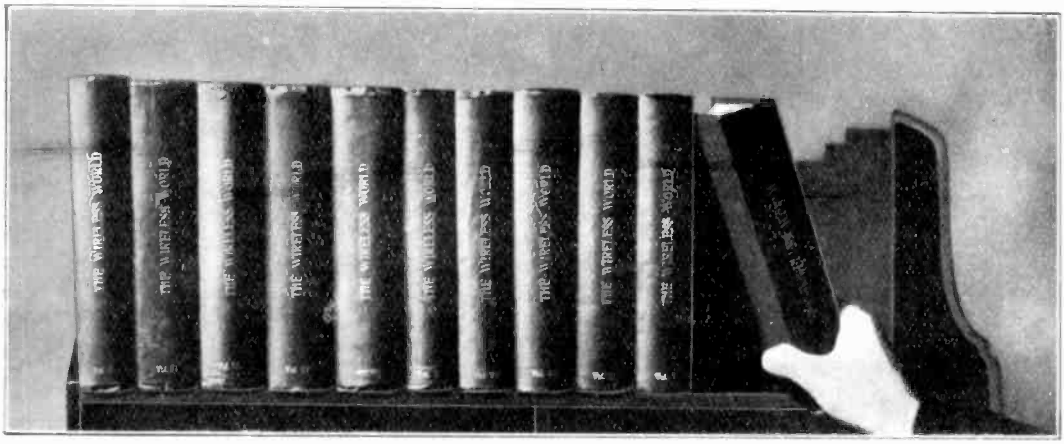
The Leyton and District Wireless Club was formed on March 14th. The President and Chairman are E. R. Alexander, Esq., M.P., and W. Bassett, Esq., respectively. The Society begins with a membership of over 50. Prospective members are invited to communicate with the Hon. Secretary, Mr. W. G. Peacocke, 73, Frith Road, Leytonstone, E.11.

Sydenham and Forest Hill.

A radio society bearing the name Sydenham and Forest Hill Radio Society, with the chess room of the Greyhound Hotel, Sydenham, as headquarters. Particulars of membership can be obtained from the Hon. Secretary, Mr. Chas. F. Field, 20, Knighton Park Road, Sydenham, S.E.26.

Loughborough.

At a meeting held on February 27th it was decided to form a radio society. Particulars of membership can be obtained from Mr. W. J. Tucker, 1, Charnwood Road, Loughborough.



1913—1923

Another Volume Added to Our Bookshelf

THE present issue marks the close of the XIth volume of *The Wireless World and Radio Review*, and the completion of a year's record of weekly numbers.

During the currency of each volume it is our endeavour to gauge the requirements and wishes of our readers, and with each new volume we have endeavoured to introduce those features which our observations and the kindly criticisms of our readers have indicated to be desirable.

With our next issue, to bear the date of April 7th, therefore, will be included some special features which we feel sure will be appreciated.

Whilst it is not intended here to give details of the contents of forthcoming issues, it may be mentioned that the outstanding attraction will be practical articles for the amateur and experimenter, with all necessary information to help and guide both the new and the advanced readers in the practical application of wireless principles.

A point which we desire to emphasise in this connection is the value which is to be attached to descriptions of the work of individual readers which we look forward to having the opportunity of publishing for the benefit of others. Those who have ideas to pass on are cordially invited to forward them for publication so that *The Wireless World and Radio Review* may become more than ever the wireless journal of the amateur and experimenter through the medium of which he can describe new ideas and new circuits embodied in his experimental work.

The policy of the Journal to keep up to date in recording new developments in all fields of wireless telegraphy and telephony will be fully maintained in order that readers may rest assured that progress both in commercial and amateur work will be promptly and accurately brought to their notice.

Due in large measure to the enormous increase in the popularity of the subject dealt with in our pages our circulation continues to build up with astonishing rapidity. One of the direct results as affecting readers is that the Publishers are able to make a reduction in price of the Journal approaching the pre-war figure. The price will accordingly be 4d. per copy, commencing from our next issue, instead of the present price of 6d. The subscription rates will also fall from 28s. per annum to 20s. post free.

Photographing Wireless Apparatus

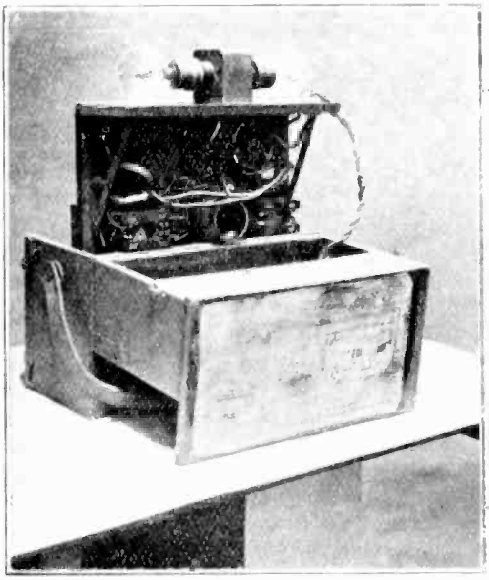
By D. Charles.

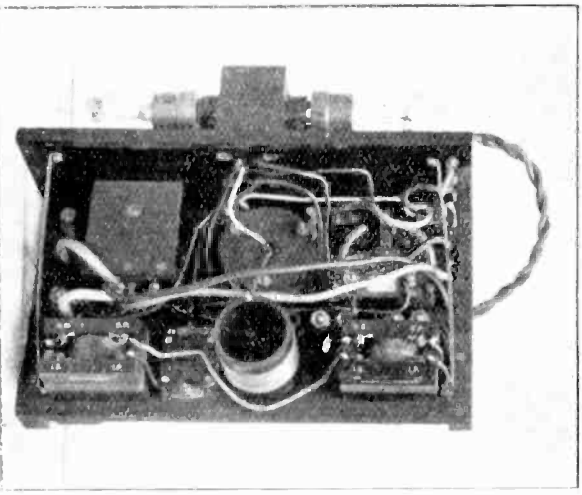
THAT babies should not be easy to photograph everyone realises, because obviously the little beggars won't keep still, but when you have a thing that will stay where it is put till further orders, there seems nothing more to do than to point the camera at it and expose the plate or film for the length of time decided to be correct. The supposition is so very general that whatever may be in front of the camera must necessarily be faithfully recorded.

Unfortunately such is not the case, and if I may be permitted to describe first certain peculiarities and limitations of photographic technique, and afterwards to show how these matters are brought into play when dealing with wireless apparatus, the reader will be able to adapt the information thus imparted to any particular case.

If the photograph is to illustrate a technical article or lantern lecture, or for some kindred purpose to describe the apparatus in all its varied detail, not only is it necessary to adopt the most careful procedure, but it comes as a surprise to many what a lot of extra thought and care is entailed in producing a picture that will tell all the story over one that will just pass muster. It is really a matter of critical observation, and if the reader knows what he wants to show, the following notes should enable him to obtain it.

A photograph consists of a number of steps of light and shade, ranging from almost white to almost black. A plate of the "special rapid" class can render a very long range of such tints; it has been said as many as two-hundred-and-fifty odd steps, each one distinguishable from the one before it. Now very few printing processes, unfortunately, will do anything like a tenth of this. You may have noticed in some holiday "snap" that although it has a most attractive appearance generally, and although the cloud forms and the muslin frocks of the ladies are perfectly rendered, yet the hair under their large hats and the shadows of the near-by rocks and trees are seen when examined closely to consist of mere patches of detailless black. If the negative be printed so as to preserve this lost detail, the lighter areas referred to will be blank paper. If, on the other hand, the negative had been developed less far, so that the "high-lights" could be printed before the "shadows" are clogged





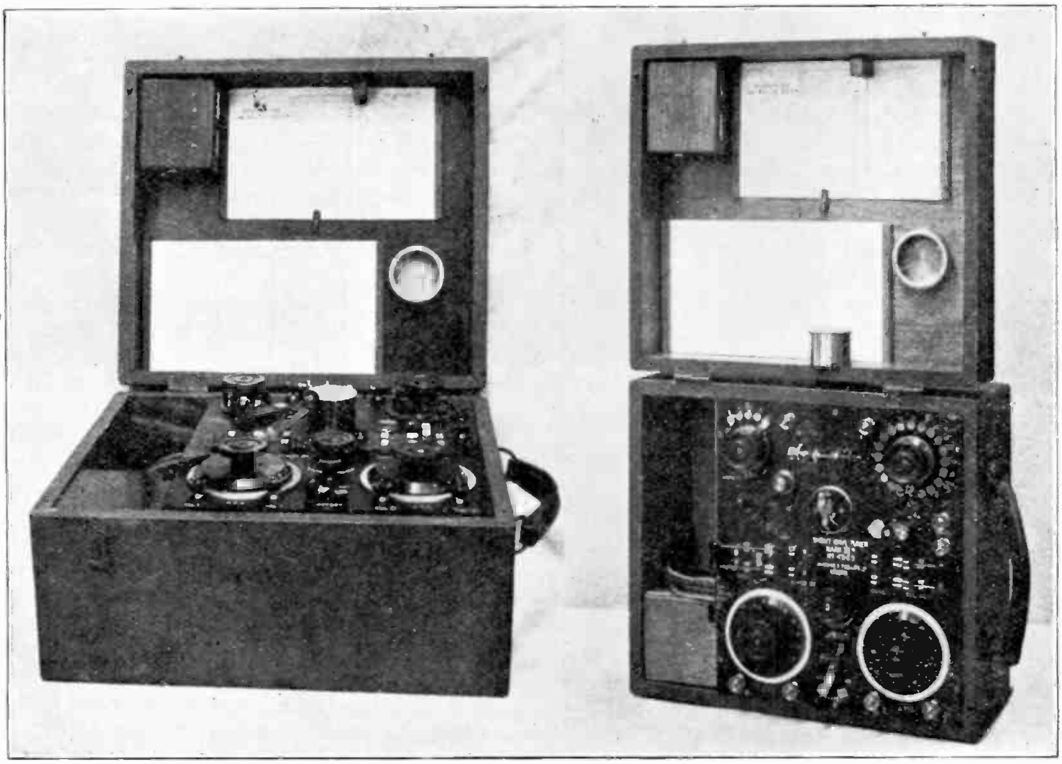
Apparatus kindly loaned by Messrs. Leslie McMichael, Ltd.

up, the "high-lights," *i.e.*, the clouds and the frocks, will not exhibit the brilliance that the actual subjects do in nature; that is to say, they will appear somewhat flat or "dirty," and the shadows, although showing more detail, are far less rich than one could wish. It sometimes, but rarely, happens that a print is obtained that shows every detail and graduation of the original subject and still looks bright and in every way technically satisfying to the most critical eye. In such a case it is always obvious that the negative was correctly exposed and developed, and was made of the correct strength for the particular printing paper used.

If the reader will take the trouble to acquaint himself with a sound method of ensuring correct exposure and development, so as to get a good negative every time, he will be a very long way on the road. The best systems are explained in "Watkins' Manual," price 2s. 6d., at any photographic dealers. We still have the difficulty left that our subjects do present a most unusual range of light and shade, from the nickel-plated telephones and the finely engraved ivorine scales, down to details of black ebonite, these being situated often in the most dim recesses of the apparatus.

Fortunately it is possible to even up the apparent excessive contrast inherent in such subjects as we are considering by choosing suitable conditions of light. It is fairly obvious that if sufficient exposure is to be obtained to render the blackest details in printable shades of grey, it is essential to have plenty of light shining on to them. Sometimes it is argued that if the light is dim one can always give a longer exposure, but the result will never be the same. Probably the reader will think I have already given him enough "theory," so I will ask him to accept that statement as a fact. To give technical reasons for every statement obviously would occupy several issues of the *Wireless World and Radio Review*, but I am always prepared to prove, if required, any statement made, even if it appears prima facie to be contrary to common sense.

Even more important than plenty of light, however, is its distribution. To give an example which will for the moment take the mind from wireless, so as not to confuse the issue, it must be obvious that to photograph a negro in black clothing requires either more light or more exposure than for a fair bride in traditional array. If we complicate matters by standing the nigger in a doorway, while placing the bride in the full light of day outside we have obtained a subject that "takes all our time" to photograph successfully. This is, if a moment's thought be given, exactly what is done in many wireless instruments, with their valves and dials on top, and their interesting details of coils and wiring in their black interiors. While one could ask the bride and the negro to change places, so as to even up the light falling upon them, and so to reduce our difficulty, we cannot do the same with our apparatus, but what we can do is to place the latter so that the light may fall more strongly on the dark parts. This has been done in the case of the Mark II instrument shown in Figs. 1 and 2, as well as other things which have helped in producing the more satisfactory photograph. In No. 1 the instrument has been lifted up with the intention of showing the "works" and connections. The valves catch the top light and the shelf on which they are held casts the already dark wiring, etc., into still deeper shadow. By lifting the instrument entirely clear of its case, and standing it *on one end* with the valves on the side further from the light, we have done as much as possible to reduce the inherent contrast of the subject instead of exaggerating it as in the previous example. Still it must be noted that the range is longer than will be rendered by ordinary photographic methods, and although the details of the valves are discernible in the print, they do not show so strongly as if these were photographed separately, and probably much of this very delicate gradation will be lost in reproduction. Even with the careful method explained, the valves would still have been too strong in the negative to print satisfactorily while retaining the other portions of the picture, but this trouble was rectified by means of tissue paper, of which a piece was stretched over the printing-frame, a little distance from the negative, over the thin portions. The effect of this was to make the dark parts print more slowly, while the full strength of the light reached the valve image and got them to full strength before the remainder printed too dark. In some cases it is found advantageous to make quite a complicated "mask," in similar manner to the letterpress printer who makes an "underlay" or "overlay" for his blocks and display matter. In enlarging from negatives the same principle may be carried out by stopping the light from the weaker portions



Apparatus kindly loaned by Messrs. Leslie McMichael, Ltd.

of the negative during part of the exposure. Sometimes the fingers are used, and sometimes a bit of paper or cotton-wool on the end of a wire. Needless to say, the shield should be held at such distances from the easel that it is not in sharp focus, and should also be kept gently but continuously moving during exposure.

These dodges are regular matter-of-fact items of procedure in every professional photographic workroom, and another point that needs only mentioning to become equally obvious is that although we placed our subject on its side in order to get a more satisfactory photograph, that is no reason why the resultant print should be exhibited in such an unnatural attitude. Fig. 1 not only illustrates the pseudo-brilliance obtained by over-lighting of the "lights" and under-lighting the "shadows" (lights and shadows in photographic technical parlance referring merely to light and dark portions of the subject, irrespective of their position) but to a less extent shows how faulty exposure and development can accentuate this false, because detailless, brilliance.

At the same time it must be pointed out that this easily obtained accentuation of brightness often is a very convenient means of emphasising forms of details when photographed singly. When the point to be illustrated is the method of winding a coil, or the shape of an insulator, for instance, a little harshness of lighting, increased by a little more prolonged development of the plate, will produce the desired relief. A choice of background very often helps to give an appearance of brightness to an otherwise flatly lit subject, but let me say at once that to employ an absolutely white background (which usually is demanded of the professional) introduces a surprising amount of technical difficulty in many cases, especially where the subjects comprise polished surfaces.

In the photograph of the Mark II receiver (Fig. 1) it may be noticed that some portions are not so sharply defined as others. It must be left entirely out of consideration, in making photographs of such subjects as this, that a lens may have been purchased on account of its "rapidity." In order to obtain sharpness of detail in every plane only the smallest stops are of any use, so that no one lens is any more rapid than another in this class of work. Not only is it necessary to use a very small stop, but it is desirable to employ a lens of rather longer focal length than usual. This is because the more distant view-point that such a lens permits reduces to a minimum such apparent exaggeration of perspective as is shown in the photograph under consideration. The trouble is that the longer the focus of the lens, the smaller is the stop that will be found necessary to obtain the same " depth of focus." It may be found often that the smallest stop in the lens is not fine enough to get the required sharpness all over. In such a case one must be content with a smaller image which can naturally be enlarged afterwards in the usual way.

There are other ways in which one can make things easier for oneself, photographically speaking, and at the same time obtain a more satisfying result. Some of these ideas can be appreciated by examination of the photographs of the Mark III crystal receiver. If this be opened for use and photographed in the usual way, even with a rather long focus lens, the result is as Fig. 3. While this may be a true representation of the subject as seen, the first impression obtained is that a Mark III receiver consists mainly of a rather ugly box and two large white cards, while the stuff that really interests the wireless man is an inconspicuous jumble in the centre.

Compare this with the next illustration. Not only is every detail distinct, but as there is so very little depth of detail from front to back we can get our result with no distortion as well as with the use of a much larger aperture, and with a consequent decrease in the length of exposure. Another slight improvement has been attained in the matter of the background. A friend was asked to hold this some little distance from the table upon which the instrument was placed, and during the exposure he kept it gently moving about so that no definite image was obtained of the many creases and stains which actually it contained. There is another difference of rather greater importance. It will be noticed that in Fig. 3 the cap of the relay is practically black, as are also the terminals, except where the light strikes certain spots, so that for all anyone might know they were made of ebonite. In the next picture, however, they can be seen in their true relation. This result is obtained simply by using a colour-sensitive plate, which is not " blind," as is the " special rapid " variety, to details of red, yellow and orange tints, as every photographer knows. As a matter of fact both these plates were treated together, being developed in the same dish of solution together, and fixed together, both processes taking place in absolute darkness. Anyone who takes the trouble to master and follow out the very simple methods of standard exposure and development recommended earlier in this article need have no fear that the use of colour-sensitive plates will involve him in any extra trouble beyond the attainment of some facility in loading and unloading them in darkness. Probably he is already so used to his existing plates and slides that if the ruby light were suddenly switched off it would cause him not the slightest inconvenience. Anyone who has ever used a changing-bag has nothing to learn in this respect.

Hitherto I have dealt with the problems involved in photographing units. This is because they present the greatest difficulties as a rule. Complete installations often present their own difficulties. Frequently they are placed with their backs to the window, and in such a case the use of flashlight is practically the only way of getting a really satisfactory photograph. Where the lighting conditions are favourable, a perfect result is always obtainable by the use of a small stop in the lens and by then giving twice the exposure that would be required for that stop in photographing a normal interior subject. It occurs sometimes that some important detail of a set is rather in the shadow of some more bulky units (I am dealing here, of course, with fixed installations) or it may be there is something under the table, or in a recess, that one desires to " bring out." Apart from the good old rule of " exposing for the shadows, and letting the rest take care of itself," much may be done in such cases by using a mirror, as large as possible, to reflect light from the window into the dark corner during the exposure. The mirror must be kept moving, either continuously or intermittently, during the exposure. An acetylene cycle or motor lamp may be employed for local lighting in much the same way. In fact it is perfectly possible to make the complete photograph by artificial light if panchromatic plates are employed. Where half-watt lamps are installed the exposures should not be long, but even with incandescent gas it is quite practicable. Obviously the more and the better distributed the lamps are, and the lighter the walls of the room, the softer the lighting of the resulting photograph will be, but with electric lamps the same desirable result can be got by moving the lamps to different positions during the exposure, or even just by swinging them, so as to get some light into the dark corners. The actual length of exposure differs so much in varying conditions, and the tint of an exposure meter is not easy to judge in such artificial light, but it is not easy to over expose. I have obtained quite good results at a stop of F 11 with about five minutes' exposure in favourable conditions, but have also exposed for many hours in dark, poorly lit rooms. However, an average subject lit under ordinary home or workshop conditions should not require more than about twenty minutes if a stop of F 16 be used in the lens, and a panchromatic plate be employed. The contrasts are apt to be harsher in this evening work, but either a weaker developer or less developing time will assist towards correcting this.

The most pleasing prints of wireless gear usually are found to be those on daylight printing papers such as "self-toning," and a carefully made lantern-slide also shows a great deal more of the delicate gradations of each detail that are lost in the black and white developing processes, but prints of the latter class are those demanded by photo-engravers for reproduction as process blocks for printing in publications.

There is one factor in the success or otherwise of the illustration that is really not photographic at all, and that is merely a matter of critical observation. It is a point, however, that is frequently overlooked in practice. Just before making the exposure it is very advisable to look at the subject from just behind the camera. Then carefully to note first of all whether any detail that it is desired to show is hidden by a pair of telephones or other object of less importance. Then it is desirable to see that there is no omission of essential connections. For instance, if a person is introduced as using the set with the object of showing its proportionate size, it will be rather noticeable if the necessary accumulators are merely stood in position without actually connecting them up. That may seem a rather stupidly obvious example, but it is a mistake the writer has seen made, and there are plenty of such sins of commission or omission which may be committed under the impression that "they won't show in the photograph," but which are subsequently discovered to jump into the eye of the experienced technical man. For the sake of effect, too, it is desirable to smooth out some of the crudenesses of wiring that are apt to obtrude themselves on the eye in photographs of experimental sets, and furthermore, just to give one final glance for any cigarette ends and for that screwdriver. It is so much less trying to remove them before one makes the exposure than when one has already wasted a plate.

Experimental Station at Bath.

THE following description of the transmitting and receiving apparatus of **5 CC** at the Bath Electro-Plating Works is of interest.

The aerial system is of the twin wire, inverted "L" type, having an average height of forty feet, and Post Office regulation length, whilst the earth consists of a large copper plate buried underneath the aerial.

The aerial and earth are brought to a large double-pole double-throw switch seen in the centre of the photograph, by which changing over from the transmitting to receiving apparatus, and *vice versa*, can be quickly effected. An earthing switch for protection against lightning, when the set is not in use, is also fitted.

The receiving apparatus is of the six-valve type, two valves being high frequency amplifiers, one a detector, and the remaining three note magnifiers. Three separate rheostats are used to control the filaments of the valves. High frequency transformer coupling is used, the transformers being tapped in both primary and secondary windings to give maximum amplification on all wavelengths. A potentiometer is used to control the potential on the grids of the H.F. valves. The low frequency transformers are of a well-known make, and are specially placed to reduce howling, etc., which is so common where low frequency amplification is used. Reception can be carried out using headphones or Brown's loud speaker and microphone amplifier.

The three-circuit tuner seen to the left of the change-over switch is of rather novel design, basket coils wound on a special former being used as inductances. Below the tuner are the three tuning condensers fitted with extension handles to reduce capacity effects. It may be mentioned here that no reaction whatsoever is used for the reception of broadcast telephony.

The transmitting apparatus is situated on the lower bench on the right. The power valve, pancake inductances and variable condensers can be clearly seen. Grid modulation is employed, and has proved generally successful under all conditions, a Western Electric microphone being used. The H.T. generator seen under the bench is of the aircraft type, and is a combined motor generator, but has

5 CC. *An Experimental Station at Bath.*

recently been replaced by a heavier machine capable of giving 600 v 250 m.a. driven by a separate motor. A large capacity condenser is shunted across the commutator to cut out the ripple and a choke coil inserrted in each lead. Telephony has been transmitted over a distance of 100 miles with this set, on a wavelength of 440 metres, and recently some successful tests have been made by linking up the land telephone to the transmitter. A small spark set has been installed as a stand-by in case of breakdown of the C.W. transmitter, and also for local work. This set works on a wavelength of 180 metres.

A series-parallel switch for the A.T.C. is to be seen between the tuner and change-over switch.

On the extreme left is a charging board for the filament batteries.

Excellent reception is carried out on all wavelengths. All the broadcasting stations working in England and also on the Continent are received, whilst Birmingham and Paris can be heard very strongly over the whole of the works. The American broadcasting stations have been received on several occasions, and have been audible over the whole room on the loud speaker.

Notes

Broadcast and Experimental Licences.

Up to February 28th, states Sir William Joynson-Hicks, 56,000 broadcast and 30,000 experimental receiving licences had been issued.

International Rules for War Wireless.

Importance is attached to an announcement from Washington that President Harding will soon propose new rules to govern the use of wireless and aircraft in war. Great Britain, France, Italy, Japan and the Netherlands are to be asked to sign an agreement putting these rules into effect. Information is not available as to the probable nature of these recommendations. Steps are to be taken to arrange for a conference between the Powers concerned.

2 LO to Move.

On Monday, March 19th, at the request of the Air Ministry, the British Broadcasting Company cancelled the mid-day concert from the London Station. It has been found that the broadcast transmissions from **2 LO** interfere with reception at the Air Ministry Station in Kingsway, the distance between the two stations being little more than one hundred yards. To obviate this difficulty, the British Broadcasting Company is searching for a more convenient site, probably in the City, to which **2 LO** can be moved.

Wireless Talks to Girl Guides.

Official information regarding the Girl Guides will be transmitted from all stations of the British Broadcasting Company every Thursday evening at 6.45.

Parliament and Empire Wireless Licences.

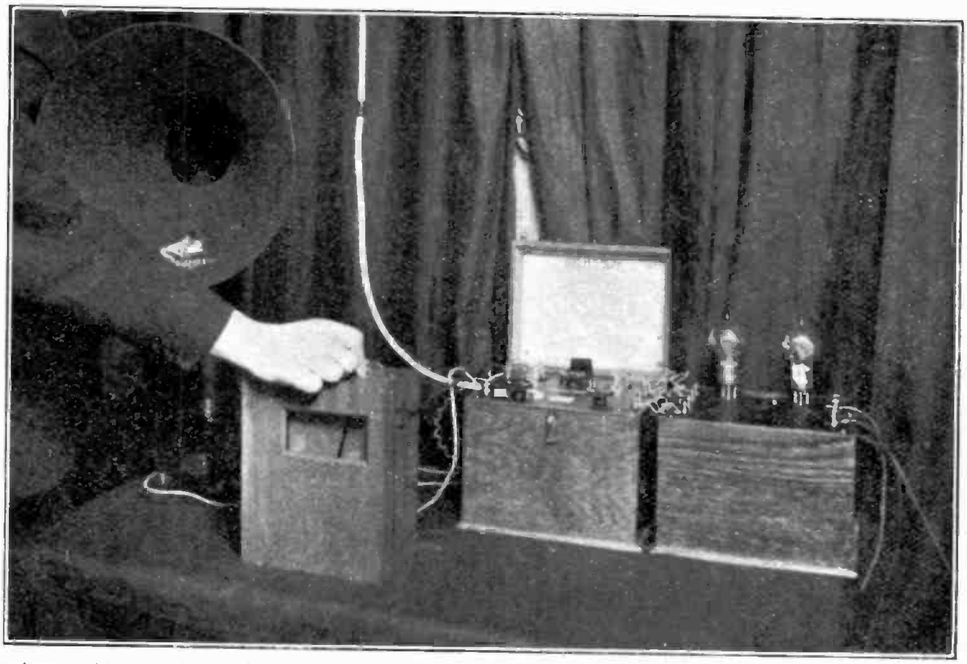
In the House of Commons on March 14th, in answer to a question by Mr. Ramsay Macdonald, Major Barnston stated that the provisions of the licences had not been settled, but that when completed they would be laid on the table of the House. The Government was not prepared to provide a special opportunity for discussion, but the question could be raised on the Estimates.

New Austrian Wireless Service.

An Austrian Marconi Company, with a capital of £130,000, will be formed very shortly, the company having obtained permission to erect and operate a station in Vienna. This station will communicate with all foreign countries, and the service is expected to commence in a few weeks. The Marconi Company is also taking over all the Austrian stations built during the war, in return for which the State will be granted shares to the extent of £40,000, payable in pounds sterling.

The Wireless Institute of Australia.

Whole-hearted support on the part of members has led to the indubitable success of a movement to improve the Institute's status in the community. It is now claimed that the prestige of the Institute is sufficient to place it among the principal scientific societies of the Commonwealth. The Patron of the Society is Senatore Marconi, who has held the position since the termination of the war.



Five minutes for a penny. A new "penny-in-the-slot" machine which can be affixed to any valve set. It is understood that its use in public houses renders a music license unnecessary. The device is a product of Messrs. The Tower Carriers, Ltd.

Of late, as in this country, radio has seized the popular imagination in Australia, and, due in no small degree to the efforts of the Wireless Institute, the authorities have wisely taken steps to cope with the amateur position. Extremely liberal facilities have been accorded all genuine experimenters, and prospects are bright.

The Hague Concerts.

Some doubt having arisen as to the exact times of transmission of the concerts from Holland, we give below particulars of the transmissions as kindly supplied by the organisers, Messrs. Nederlandsche Radio-Industrie.

Wavelength, 1,050 metres.

Sunday.—3 to 5.40 p.m. Concert with orchestra.

Monday.—8.40 to 9.40 p.m. Concert and announcements.

Thursday.—8.40 to 9.40 p.m. Concert by different vocalists under the auspices of the Dutch Wireless Society.

Special announcements concerning future arrangements are made every Sunday after 5 p.m., in English, Dutch and French.

The Monday concerts are sometimes transmitted on 1,300 metres, notice of this being given on the previous Sunday.

Exit the Gold Watch.

To commemorate the completion of 25 years' service, Mr. Gilbert Campbell, M.B.E., was presented, by the officials and workmen of the Wallsend Slipway and Engineering Company, with a wireless receiving set. This marks a new and significant departure from the conventional gold watch presentation.

Photo, Barratt's

Wireless Set in an Easter Egg. A novelty constructed by a young North London enthusiast.

A New Book on Valve Set Construction.

To build an efficient valve station is the ambition of every enthusiastic beginner. Before this can be accomplished, however, it is necessary that the incipient experimenter should have a working knowledge of the principles of valve operation and the components which go to make up a set. Such information, in tabloid form, is now available in a compact little book by Mr. Philip R. Coursey, B.Sc., F.Inst.P., A.M.I.E.E., entitled, "How to Build Amateur Valve Stations," just issued by the Wireless Press, Limited. (1s. 6d. Post free, 1s. 8d.).

Wireless at Sandhurst.

The authorities at Sandhurst Military College have installed a wireless transmitting and receiving station.

By courtesy of the A.R.R.L.

Miss M. Adare Gamhausen, an active American wireless enthusiast. Her station is **3 BCK**. *She is the author of several constructional articles published in America.*

Wireless Instruction for Electrical Engineering Students.

A scheme of technical instruction in wireless is to be incorporated in the electrical engineering courses at Cardiff Technical College. The view taken by the Technical Instruction Committee is that wireless apparatus now comes essentially within the purview of any electrical engineer and consequently instruction calculated to enable students to handle any set of apparatus, and in some cases to carry out investigations, will be automatically included in the ordinary courses.

Portuguese Colonial Wireless.

Work on the establishment of wireless communication between Portugal and the Portuguese Colonies will be begun next month, when the erection of high power wireless stations will be proceeded with. The operations, under a contract with the Marconi Company, are to be completed within three years.

Official Radiotelephony in Denmark.

The little island of Bornholm, in the Baltic, which, says the *Times*, has hitherto had no telephonic connection with the rest of Denmark, will shortly be in regular official communication by wireless telephone with Copenhagen. The distance is about ninety miles.

An Omission.

Owing to an oversight the initials of Mr. W. James were omitted from his recent contribution entitled "The Antennae."

The New P.M.G.

Sir W. Joynson-Hicks began his duties at the General Post Office on Monday, March 19th, when he received a deputation of wireless manufacturers, on the subject of the broadcasting agreement.

Compulsory Ship Wireless at Malta.

In future every British sea-going passenger ship, registered in Malta, of 1,600 gross tonnage and upwards, will be required to carry wireless while within a port of the Islands of Malta. The rule will also apply to foreign ships of the same categories. The Governor has power to enforce these regulations under a new Ordinance entitled: "The Merchant Shipping Wireless Telegraphy Ordinance, 1923."

S.O.S. Stops Broadcasting.

An incident in broadcasting of a kind which has not occurred in this country, took place in New York City on February 6th. A peremptory QRT order was issued by the U.S. Navy and all broadcasting abruptly stopped. The cause was an S.O.S. signal received from a vessel in distress 800 miles off the coast of France.

Tuition by Radio.

Correspondence Schools will have to look to their laurels if the latest experiment in wireless proves successful. On Wednesday, March 21st, for the special benefit of three Sheffield schools, General Ferrié, whose name is well-known to readers of this Journal, gave a wireless reading in French of a fable and a poem. The latest method of teaching languages will be watched with interest.

South Africa's Wireless.

The capital of the South African Wireless Company has been fixed at £500,000, says a Reuter telegram from Capetown. The Marconi Company will own four-fifths of the capital and South Africa the remainder. The obtaining of a site has presented some difficulty and the receiving station may be within range of gunfire from the coast, but the transmitting station must be free from such risk. Provision is made for a new agreement permitting the South African Company to use Marconi patents free of payment.

Home Charging of Accumulators.

Messrs. Ward and Goldstone, the well-known Manchester firm of electrical engineers, have issued a useful four-page pamphlet dealing expressly with their apparatus for the charging of accumulators under varying conditions, including charging at home from electric light mains.

The pamphlet, which will be of great interest to all those amateurs who contemplate dispensing with the garage and "doing the job themselves," can be obtained from the branch offices of the firm at 8a and 9, Great Chapel Street, Oxford Street, London, W.C.1., and Mercantile Chambers, 65, Bothwell Street, Glasgow, or direct from the head office, Frederick Road, Pendleton, Manchester.

Radio Research in Great Britain.

Proof is not wanting of the patient and methodical work in the field of radio research which has been carried on in this country by the British National Committee for Scientific Radiotelegraphy. The proposals of this committee, prepared for consideration at last summer's conference of the Union Radio Scientifique, at Brussels, afford interesting reading.

Many phases of the science which have been investigated are enumerated, and in each case the proposals of the Committee are appended. The first item is the measurement of the strength of an electromagnetic field at receiving stations. The measurement at different stations of the strength of the U.R.S.I. signals is principally to ascertain the law of the propagation of energy on a completely scientific basis. In this connection it is suggested that simultaneous observations using accurately calibrated apparatus would be of much more value than observations at a single station, and it is proposed that an organised system of simultaneous observations should be arranged by all countries ready to co-operate in this scheme.

Another subject dealt with is the maintenance of radio standards and improvements in the method of radio frequency measurements. This work is carried out at the National Physical Laboratory in collaboration with the Radio Research Board. The standards, which include those of capacity, inductance and wavelength, are in constant use, and have been brought to a very high point of accuracy. The value of intercomparing national standards of frequency is emphasised, and it is proposed that the question be discussed with the object of coming to some practical arrangement for the purpose.

A summary is given of the results obtained from observations on the direction and intensity of atmospheric disturbances and their daily and seasonal variations. Observations were made by an aural method at the same time each day, the average number of atmospherics heard being 80 per minute. The mean direction of arrival of the greatest disturbance was 153° (measured from north as zero), with a diurnal variation of 60° range and a seasonal variation of 100°. The aural method of observing has now been replaced by a continuously recording method, and the fitting of other stations in the British Isles and abroad with similar apparatus is contemplated.

Investigations have been made as to the causes of error of bearings of transmitting stations on land and sea at different receiving stations, with special reference to those errors which may be due to the local conditions existing at or near the receiving station. The errors have been classified as follows :—

(1) Instrumental.

(2) Those produced by local site variations.

(3) Those caused by variations of the Heaviside and other ionised layers, by the waves crossing rough country, or by refraction at coast lines, etc., and

(4) Those influenced by the system of transmission, or by the configuration or orientations

of the aerial or earth systems of the transmitting station.

Direction finding observations, it is proposed, should be made at continental stations with radiogoniometers comparable in accuracy to those now in use in Great Britain. It is also suggested that, if the northern countries agree, special observations be taken at stations within or near the arctic circle, where effects of the aurora, especially with reference to its height, could be noted.

The Heaviside layer has been the subject of study. The height of the layer is not known in temperate regions, nor is it known if the layer is as constant in form as it appears to be in the tropics. It is proposed, therefore, that experiments should be made by night to determine the power received at a number of stations along a great circle extending to 4,000 or 5,000 km. at least.

Correspondence.

To the Editor of THE WIRELESS WORLD AND RADIO REVIEW.

Re CHEMICAL RECTIFIERS.

SIR,—With your permission I would like to make one or two observations on Mr. Isenthal's letter appearing in your issue of February 17th, otherwise a mistaken impression may be produced in the minds of your readers.

In a catalogue of these devices compiled by Mr. Isenthal about 1913, at a time when, by his own computation, his experience was of twenty-eight years duration, he says :—

> "Some fourteen years ago we handled the 'Nodon' Valve, and in consequence of certain inherent defects we afterwards discontinued its use and brought out the 'Grisson' Valve, which in itself was mechanically and electrically an improvement on the previous type. We very soon recognised that this could be greatly improved, and we then introduced our own 'Grid' type, which gave us a vast deal of experience in the construction of such apparatus. The defects which still attached to the Electrolytic Rectifier were, the gradual heating up of the electrolyte, the consequent deterioration and failure of the valve, and the necessity of using four cells for the purpose of utilising both half waves of the current.
>
> "Comparatively recent work on the part of several experimenters have resulted in much improvement on these points.
>
> "We are fully aware that when bringing the new construction to the notice of our clients, many misgivings will undoubtedly have to be removed before the confidence of early users of similar but faulty constructions can be regained."

The foregoing should suffice to show that at no far distant date Mr. Isenthal was still hopeful, both on the scientific and financial side.

Having admitted the existence of experimenters and improvements in 1913, it is impossible to deny a continuance of this work on Rectifiers, for the pages of the *The Wireless World and Radio Review*, and other scientific publications show on the contrary that a vast amount of investigation has been done.

During the last four years in particular, M. A. Codd has brought the resources of his knowledge and an up-to-date laboratory to bear on this particular subject with remarkable success, but this result has only been obtained by patient and laborious work, consisting, in brief, of oscillographic tests with various chemical combinations, various sizes of electrodes, etc. I am sure Mr. Codd does not claim to have worked through every known salt which will produce a rectifying action, neither could this be done in one lifetime.

On the occasion of my lectures to Radio Societies in various parts of the country, I have shown amongst others, chemical rectifiers of considerable efficiency and of extremely convenient design, and at my recent lecture to the Associates of the Radio Society of Great Britain on March 16th last, I demonstrated one of these Rectifiers, not only charging accumulators, but also serving to supply energy direct to the anode circuits of valves used for the reception of telephony. In both types the polarisation difficulty regarded by Mr. Isenthal as important has been entirely overcome.

In conclusion I submit it to be rather presumptious to condemn the chemical rectifier in its most modern form without full investigation or, at least, careful enquiry.

L. F. FOGARTY.

Books Received

"The Practical Electrician's Pocket Book, 1923." (S. Rentell & Co., Ltd. 3s. net).

"Wireless Component Parts and How to Make Them." Edited by Bernard E. Jones. ("*Amateur Wireless*" *Handbooks*. Cassell & Co., Ltd., La Belle Sauvage, E.C.4. 1s. 6d. net.)

"A Beginner in Wireless." By E. Alexander. (Drane's, Danegeld House, Farringdon Street, E.C. 3s. 6d. net.)

Catalogues Received.

Messrs. Maritime Stores, Ltd., 18, Billiter Street, London, E.C.3. 301 pages + lxviii. Embracing a wide range of marine goods, and of special interest to those requiring aerial tackle.

Messrs. Richard Melhuish, Ltd., 50, 51, 84, Fetter Lane, London, E.C.4. Metalworkers' Catalogue (No. 20), 562 pages, and Catalogue of Wood Workers' Tools, etc. (No. 21), 338 pages. Both catalogues are of great interest to all wireless amateurs who construct their own apparatus, and an extensive choice of all classes of hand and machine tools is offered.

FOURPENCE.

In consequence of the enlarged circulation now enjoyed by "The Wireless World and Radio Review," the Publishers have pleasure in announcing that they are now able to reduce the price of the Journal to 4d., as from the April 7th issue, which is the first number of the new volume.

Calendar of Current Events

Tuesday, April 3rd.

MANCHESTER WIRELESS SOCIETY.

At 7.30 p.m. In the Council Chamber. Houldsworth Hall. Discussion.

Wednesday, April 4th.

HALIFAX WIRELESS CLUB AND RADIO SCIENTIFIC SOCIETY.

Lecture: "Induction Coils and Transformers." By Mr. M. F. Farrar.

Thursday, April 5th.

ILFORD AND DISTRICT RADIO SOCIETY.

Lecture: "H.F. Currents." By Mr. A. Landsler, L.D.S., R.C.S. (Eng.).

DERBY WIRELESS CLUB.

At 7.30 p.m. At the Shaftesbury Restaurant. Lecture: "Modern Inventions." By Mr. E. J. Allen.

Friday, April 6th.

SHEFFIELD AND DISTRICT WIRELESS SOCIETY.

At 7.30 p.m. At the Dept. of Applied Science, St. George's Square. Lecture: "The Effect of Capacity in W/T Circuits." By Mr. J. R. Halliwell.

DEWSBURY AND DISTRICT WIRELESS SOCIETY.

At 8 p.m. At South Street, off Church Street. Lecture by Mr. W. R. Gibbings.

RADIO SOCIETY OF HIGHGATE.

At 7.45 p.m. At the 1919 Club, South Grove Lecture: "Elementary Theory, Part II." By Mr. H. Andrewes.

BROADCASTING STATIONS.

Regular evening programmes, details of which appear in the daily press, are now conducted from the following stations of the British Broadcasting Company:—

London	2LO	369	metres.
Birmingham	5IT	420	,,
Manchester	2ZY	385	,,
Newcastle	5NO	400	,,
Cardiff	5WA	353	,,
Glasgow	5SC	415	,,

DUTCH BROADCASTING.

PCGG. The Hague, 1,050 metres. Sunday: 3 to 5.40 pm., Concert. Monday and Thursday: 8.40 to 9.40 p.m., Concert. (Monday concerts are sometimes given on 1,300 metres, notice of this being given on the previous Sunday.)

FRENCH BROADCASTING TIMES.

Eiffel Tower. 2,600 metres. 11.15 a.m. weather reports (duration 10 mins.) 6.20 p.m., weather reports and concert (duration about 30 mins.) 10.10 p.m., weather reports (duration 10 mins.).

Radiola Concerts. 1,565 metres., 5.5 p.m. news; 5.15 p.m. concert till 6 p.m.; 8.45 p.m. news; 9 p.m., concert till 10 p.m.

L'Ecole Supérieure des Postes, Télégraphes et Téléphones de Paris. 450 metres. Tuesdays and Thursdays, 7.45 p.m. to 10 p.m. Saturdays, 4.30 p.m. to 7.30 p.m.

"5 WS."

THE SUCCESSFUL TRANSATLANTIC TRANSMITTING STATION OF THE RADIO SOCIETY OF GREAT BRITAIN.

By PHILIP R. COURSEY, B.Sc. (Eng.), F.Inst.P., A.M.I.E.E.

(Continued from previous issue.)

DISCUSSION.

The President.

Mr. Coursey and his collaborators in the Society have to be congratulated on these wonderfully successful results of their efforts. I can see that Mr. Coursey set his heart on sending as well as receiving, acting, I suppose, on the principle that it is more blessed to give than to receive. I feel sure that questions will arise for discussion. I will ask Admiral Jackson to open the discussion and later to propose a vote of thanks.

Admiral of the Fleet Sir Henry B. Jackson.

I do not propose to enter into the discussion at present, but I shall be pleased later to propose a vote of thanks to Mr. Coursey.

Capt. P. P. Eckersley.

I am most interested and appreciative of the wonderful achievements that amateurs have made. At the same time I want to put before you a certain point of view, which is the point of view of the professional towards these things. The result of these tests emphasises the extraordinarily small power used to cover enormous distances with success and many of you may wonder why the professionals build an aerial three miles long, putting in kilowatt after kilowatt and then consider they are allowing only a safe margin to bridge the distance. If the professional is asked to communicate across the Atlantic on telephony he probably employs say 200 kilowatts and a fifteen-valve receiving set, and you are doubtless wondering why he should go to these elaborate precautions to span the Atlantic when it has already been done on such small powers. The difference is in getting intelligible speech for a moment and getting good and lasting speech for twenty-four hours of the day. Mr. Coursey spoke of the Heaviside layer, and I think that the Heaviside layer is enormously helpful, but in broadcasting work the extraordinary phenomena of fading which is taking place every day is, I think, also due to the Heaviside layer. I put this point of view forward, Mr. Coursey, but not in the spirit of criticising. The attitude I emphasise is that the professional and the amateur are working from an entirely different point of view, and it is rather unfortunate that there should be this criticism of the profession.

I would ask Mr. Coursey one technical point. Mr. Coursey said his radiation resistance was 24 ohms. I do not think that is right. With 24 ohms the radiation efficiency would be something like 80 per cent., which is enormous, and has never been known. I think that the vertical aerial or its effective height might be equal to this height. As a matter of fact I think it is only about half its height. I am taking the effective height of about 30 metres; the radiation resistance is about 4 ohms, which would give you 60 watts radiation efficiency.

Mr. L. McMichael.

I do not think there is anything I want to discuss, but I desire to say that I hope everyone will realise how very hard Mr. Coursey has worked on these tests. Many of us put in a certain amount of time which was great pleasure. The whole inception of the thing, and the real hard work has been done by Mr. Coursey, and we ought to include Mrs. Coursey, who also has devoted much time to the work.

Mr. Maurice Child.

There are one or two remarks that Mr. Coursey made at the beginning of his discourse which I think I might emphasise. The first was the reference to the improvements in the reception of the signals from the American amateurs in this country this year, and he put it down to the fact that it was customary for us to carry on our work on the low power of 10 watts, that is to say, the average power allotted to amateurs by the Post Office of 10 watts, and the result of that has undoubtedly been that our receiving sets have been enormously efficient. To that extent we are indebted, of course, to the Post Office for their kindness in limiting our power for experimental work. On the other hand, however, I was rather disappointed that Mr. Coursey took the attitude that we should all feel indebted to the Post Office for allowing us to use for a short test—about a quarter of an hour or so every night—about ½ to 1 kilowatt of energy. I think that as a scientific body, working on a scientific subject, we ought to feel that we have a right to demand to use the power which is required to carry out a definite scientific experiment, and not to be expected to go down, as it were, on our knees and pray to the Post Office to allow us to use a few more watts than customary. After all, these services are important, and they belong to us as a community, and they should feel that they have to give these facilities freely when required, and not out of kindness. It is only a little point, but I wish to let my views be recorded.

There is a little technical point which Mr. Coursey touched upon which is interesting. I, with others, had a certain amount to do with the actual operating work in this station, and I amused myself periodically, when I was not actually transmitting, by carrying out a few little experiments on my own account, and I quite agree with Mr. Coursey that I had to be extremely cautious in working on that station. It was the most uncomfortable station I ever worked, with an 8,000 volt to earth accumulator on the floor. Mr. Coursey mentioned that between aerial circuit and the closed circuit inductance we used a glass plate, and that reminds me of a little point which happened there which struck me very much at the time. The glass plate was put there in the first place for insulation purposes, and was a convenient method for preventing the coils getting close to each other. One day the glass plate got punctured, and I substituted a sheet of ebonite. In the course of about a minute and a half it began to smell most horribly, and I thought I had better take it away, and in doing so got a very nasty burn, not from the current, but from the heat of the ebonite.

Subsequently we took away the glass sheet, and managed to support the coil in the air, with enormously increased efficiency in the aerial circuit. A point which is of interest to us working on transmitting circuits is this, that using a 200 metre wavelength, you want to be very cautious not to use any other material than air for winding the coils on.

Mr. G. G. Blake.

I do not know that I have anything really that I can add to this. I would rather like to amplify the remarks made by Mr. McMichael as to the amount of work which I noticed Mrs. Coursey did in collecting all these results.

The President.

One or two things occur to me in connection with this discussion. The professional referred to by Mr. Eckersley is of course very stiff and conservative. He takes a formula like the Austin formula, which has been demonstrated in a rough way and only on long wavelengths, and he tries putting various values for wavelengths in that formula. He may arrive at a result such as that if 3,300 metre waves travel across the ocean with a certain amount of loss in the daylight, then the 300 metre waves will travel across with about 2,000 times that loss, and therefore it seems hopeless to attempt transmission with short waves. That formula has only been confirmed in connection with wavelengths considerably greater than 300. But it may be that for say 600 metres and less the formula encounters a different set of conditions, and it looks rather as if that might be the case. I daresay some of you were here in this room a week ago when Dr. Nicholls described the experiments made by the Western Electric Company between Long Island and London in transoceanic telephony. He showed two curves, one of them the daylight curve, the other the night curve, and the formula of Austin was correct for the daylight results on long waves of 5,000 metres, but the formula did not correspond well with the night results until you left out part of it. The curious physical result was that these waves appeared to travel across the Atlantic in the night as if they were moving on a flat earth and there was no absorption, that is, as if there was no curvature.

Well, that is very remarkable, but the short wave results which Mr. Coursey and his collaborators have got seem to show that more than that happens when the waves are short, that is to say that the upper atmosphere does really come in, and that reflection assists the transmission, because the waves seem to travel much better than they would on a flat earth. It looks as if the sky did do something in the way of helping these short waves across, and I think the subject is well worth following up, because conservative professionals will have to be converted before anything powerful and extensive can be done.

A vote of thanks was then proposed by Admiral of the Fleet Sir Henry B. Jackson and seconded by Mr. Maurice Child.

Questions and Answers

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) Each communication sent in to be accompanied by the "Questions and Answers" coupon to be found in the advertisement columns of the issue current at the time of forwarding the questions. (4) The name and address of the querist, which is for reference and not for publication, to appear at the top of every sheet or sheets, and unless typewritten, this should be in block capitals. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume." (5) 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. (6)* **Where a reply through the post is required every question sent in must be accompanied by a postal order for the amount of 1s., or 3s. 6d. for a maximum of four questions.** *(7) Four questions is the maximum which may be sent in at one time.*

"E.W.H." (Edinburgh) *asks questions relating to the receiver diagram given on page 601, February 3rd issue.*

The diagram referred to on page 601 in the issue of February 3rd is, of course, covered by patents, but one is allowed to build a receiver wired according to this diagram for one's own experimental use. The set may not be sold, however. The transformers shown in the diagram are low frequency—that is, from the right hand side of the diagram the three transformers shown are low frequency. Connected in the anode circuit of the first valve is a plug-in coil and, coupled with this coil is the reaction coil. A telephone transformer may be purchased from any of the advertisers in this journal. Low resistance, that is, 60 ohm telephones, should be used.

"A.D." (Leven) *wishes to build a receiver, and asks for suggestions.*

We suggest you use a five-valve receiver comprising two H.F., one detector and two L.F. valves, with an additional power valve connected to operate the loud speaker. The aerial should be as high as possible, and the length must not exceed 100′ from the free end to the earth terminal, by the Post Office regulations. A number of suitable diagrams are given in this journal from time to time. If you are thinking of building the instrument yourself we shall be glad to refer you to a suitable diagram if you have any difficulty in making a choice yourself.

"I.R." (Watford) *submits sample stampings which he proposes to use in the construction of inter-valve transformers, and asks for particulars.*

We are afraid we cannot give you the number of turns for the windings of the L.F. transformer, because the number of turns depends very greatly upon the method of winding, the amount of insulation used, and so on. The No. 40 S.S.C. wire is very suitable for windings of the transformer. The stampings are of suitable size, and we suggest you wind the bobbin one-third full of wire for the primary winding, and then fill the bobbin with the secondary winding. This winding will give a ratio of approximately 2 to 1, and a very satisfactory transformer should result.

"J.G." (Edinburgh) *refers to the diagram given on page 867 in the issue of September 30th, and asks for advice.*

If the diagram given on page 867 of the issue of September 30th has been carefully followed the receiver should give good results. If the receiver works well with the high frequency valve disconnected we suggest the reaction coil connections are not correct. If you have made the reaction coil so that it rotates through 360 degrees, of course this fault cannot exist. The probable cause of the trouble is that the anode circuit does not tune to the same wavelength as the aerial circuit, and we suggest you reduce the capacity of the anode tuning condenser. In addition, one or two tappings should be taken off the anode coil, with the object of changing the constants of the circuit so that the wavelength range may be adjusted. While experimenting, it would perhaps be better if you short-circuited the reaction coil. The method of tuning is rather difficult to explain. We suggest you adjust the aerial circuit with only a valve detector in circuit. Then connect the high frequency valve and make alterations to the anode circuit until the signals are heard. The H.T. voltage should be about 60 volts, and the L.T. 6. The high frequency valve will not work properly unless the filament is sufficiently bright.

"V.L.N." (Cheshire) *asks what is a T.V.T. unit.*

The T.V.T. unit referred to on page 830 of No. 26, Volume X, of *The Wireless World and Radio Review*, may be purchased from dealers in ex-Government wireless stores. The T.V.T. unit is simply an induction coil with a make and break. The primary circuit contains an accumulator, the make and break, and the primary of the induction coil. The secondary circuit contains the secondary winding of the induction coil. The secondary winding should be connected with the rectifier valves and smoothing apparatus. A spark coil such as is suggested could no doubt be made to operate satisfactorily, provided care is taken not to allow the secondary voltage to become excessive. The circuit of this instrument is given on p. 96 of the Amateurs' Book of Wireless Circuits by F. H. Haynes.

"F.F." (S.E.18) *submits a diagram of his receiver, and asks (1) Is the diagram correct. (2) Which coils should be used for A.T.I., reaction and C.C.I. (3) Are the B.T.H. type valves useful. (4) May a common L.T. and H.T. battery be used when an L.F. amplifier is connected.*

(1) We have examined the diagram submitted, which is correct except that the anode tuning condenser has rather too large a value. A

0·0001 mfd. condenser would be quite suitable if it is desired to receive broadcast transmissions. (2) If a set of Burndept concert coils is purchased the largest coil, No. S 4, should be used in the anode circuit, S 3 in the aerial circuit, and S 2 in the closed circuit. The same ratio holds whichever type of coil it is desired to use. (3) The B.T.H. type of valve as a rule gives very good results when used in any portion of a valve receiver. In general, however, " R " type valves give better results as low frequency amplifiers. (4) When connecting up the receiver to the low frequency amplifiers, a common H.T. and L.T. may be used. It is advisable to examine the amplifier and make sure that the —H.T. is connected with +H.T. in the manner shown in the diagram submitted, otherwise the L.T. battery will be short-circuited.

" A.C." (South Wigston) *asks* (1) *Whether the diagram submitted is correct.* (2) *For particulars of a coil marked A in the diagram, which is the anode coil.* (3) *Would honeycomb type coils having the dimensions given be suitable for use in this receiver for the reception of broadcast transmissions.* (4) *Is the proposed aerial suitable.*

(1) We have examined the diagram of connections submitted and they are correct. The coil marked A in your diagram may be a cylindrical coil 4″ in diameter and 4″ long, wound with No. 30 double silk-covered wire. There should be 16 tappings. (3) The proposed honeycomb type coils are quite suitable for use with the receiver. (4) The aerial will be satisfactory, provided the lead-in wire is kept well away from the sides of the wall. It should not be held against the wall for a distance of 24′ as suggested.

Ltd., in which all values are indicated. The principle of switching is given, and you will have no difficulty in making connections to a five-valve receiver. (2) The suggested former is too small. To cover the wavelength range desired we suggest you use a coil 4″ in diameter and 6″ long, wound with No. 33 S.S.C. wire; 18 tappings should be taken. (3) It is better to use a separate rheostat for each valve instead of using one rheostat to control the filament temperature of two or more valves.

" VARIOMETER " (Chesterfield) *asks* (1) *Whether the diagram submitted is correct.* (2) *What is the wavelength range of the circuit given when the coils have the values submitted.* (3) *What should be heard when one uses this receiver.* (4) *Could a diagram be given which will cover all wavelength ranges.*

(1) We have examined the diagram submitted, which is correct, and is quite a standard circuit. It has appeared a number of times in these columns. (2) The wavelength range of the receiver will be from approximately 200 to 800 metres. (3) We cannot say what signals you will receive on this receiver. This will depend upon your skill in tuning, and upon the power of the transmitting stations. You will probably hear the British broadcast transmissions and ship stations. (4) Most of the diagrams given in these columns, in which plug-in coils are used, are quite suitable for receiving signals having any wavelength. It is not possible to construct a variometer which alone would enable you to cover a wide wavelength range such as suggested. We suggest you use plug-in coils in the manner shown in the diagrams given in these columns.

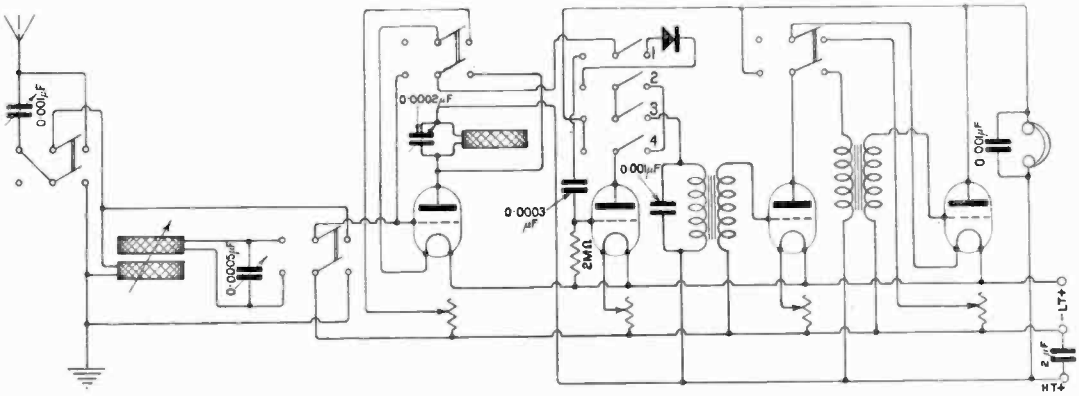


Fig. 1. This diagram gives the connections of a four-valve receiver with switch for connecting or disconnecting the H.F. and L.F. valves. Other switches are connected so that a crystal may be used instead of the valve detector.

" T.H.J." (Derby) *asks* (1) *For diagram of a five-valve receiver comprising two H.F., one detector and two L.F. valves, using a three-coil holder, and with the tuned anode method of high frequency amplification. Switches are to be provided for cutting out the H.F. valves, and telephone jacks for the L.F. valves.* (2) *Will the former, particulars of which are submitted, when wound with wire, be suitable for use as the anode coil.* (3) *Is it necessary to use a separate rheostat for each valve.*

(1) We would refer you to the many diagrams arranged for this purpose in " The Amateurs' Book of Wireless Circuits," price 2s. 6d., Wireless Press,

" C.J.S." (London, N.22) *asks* (1) *For a diagram of a receiver comprising one high frequency, one crystal detector, and one L.F. valve, with switches so that the receiver may be used as a crystal receiver, crystal and H.F. valve, crystal and L.F. valve, H.F., crystal and L.F. combination, or two-valve receiver—that is, with a valve detector and high frequency amplifier.* (2) *What would be the turn ratio of three honeycomb coils suitable for use in the primary and secondary and tuned anode circuits of the receiver.* (3) *The aerial is a double wire inverted L type; it is used indoors. Would it be an advantage to connect another two wires to the flat top of the aerial.*

(4) *Does a tuned anode coil couple with the secondary coil when a three-coil holder is used. If not, where is it connected.*

(1) The diagram given in Fig. 1 will allow you to use the following combinations:—1. With switch 1 to the left and switches 2, 3 and 4 to the right, the valve detector with note magnifier is used. 2. With switch 1 to the left, switches 2 and 3 up, and switch 4 to the left, the valve is used as a detector alone. 3. With switch 1 to the right, and switches 2 and 3 to the left, and 4 up, the crystal is used with the note magnifier. 4. With switch 1 to the right, switches 2 and 3 to the left, switch 3 to right and 4 up, the crystal is connected to the telephones. The high frequency valve is controlled by a separate switch. (2) We cannot give the turn ratios of the honeycomb coils exactly. If a No. 75 coil is used in the anode circuit, No. 50 coils should be used in the closed circuit. The coil which is used in the aerial circuit will depend upon whether the aerial tuning condenser is used in series or parallel with the A.T.I., which may be a No. 75 coil or a No. 35. (3) We do not think much would be gained by the addition of two more wires to your aerial. (4) The anode coil should not be coupled to the three-coil holder. It should stand quite apart from the aerial and closed circuit coils.

be as short as possible and should make connection with a good earth.

"G.E.B." (Manchester) *asks* (1) *With reference to the three-valve receiver given in the article entitled "Experimental Station Design," in the issue of October 28th. 1922, could the connections be given showing how a set may be connected for changing over from the valve detector to a crystal detector.* (2) *Could a diagram be given showing how a frame aerial may be connected in place of the outdoor aerial.*

(1) and (2) The diagram is given in Fig. 2. See reply to **"C.J.S." (London, N.22.).**

"E.A.P." (Leeds) *asks* (1) *For a diagram of a three-valve receiver comprising one detector, and two L.F. valves, with switching arrangements so that one of the L.F. valves may be thrown over to the high frequency portion of the circuit and become a H.F. amplifier.* (2) *At what frequency does an air core transformer become inefficient and an iron core transformer become necessary.* (3) *The receiver has suddenly developed the habit of generating oscillations without adjustments being changed. What is the likely cause.* (4) *Would a small condenser connected across the reaction coil improve matters.*

(1) The diagram is given in Fig. 3. We do not recommend the connection of Dewar type switches for the purpose of transferring the connections from the L.F. portion of the circuit to the high frequency circuit. The switches in the diagram show how to cut out L.F. valves. (2) Iron core transformers may be designed for use in radio circuits, but generally it may be said that iron should be kept out of a coil when the currents flowing in the coil have a frequency of about 50,000 cycles. (3) We cannot say exactly why your receiver should generate oscillations suddenly without adjustments being made. We suggest you examine the earth connection, and also connect a 2 mfd. condenser across the H.T. battery. Try a new grid leak. The addition of the small tuning condenser mentioned in (4) will probably enable you to obtain finer reaction control.

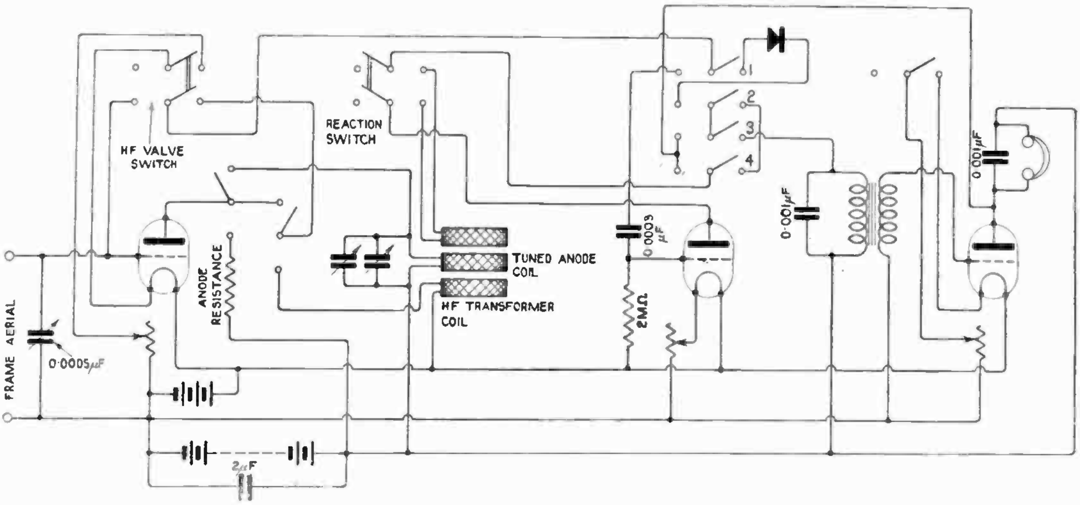
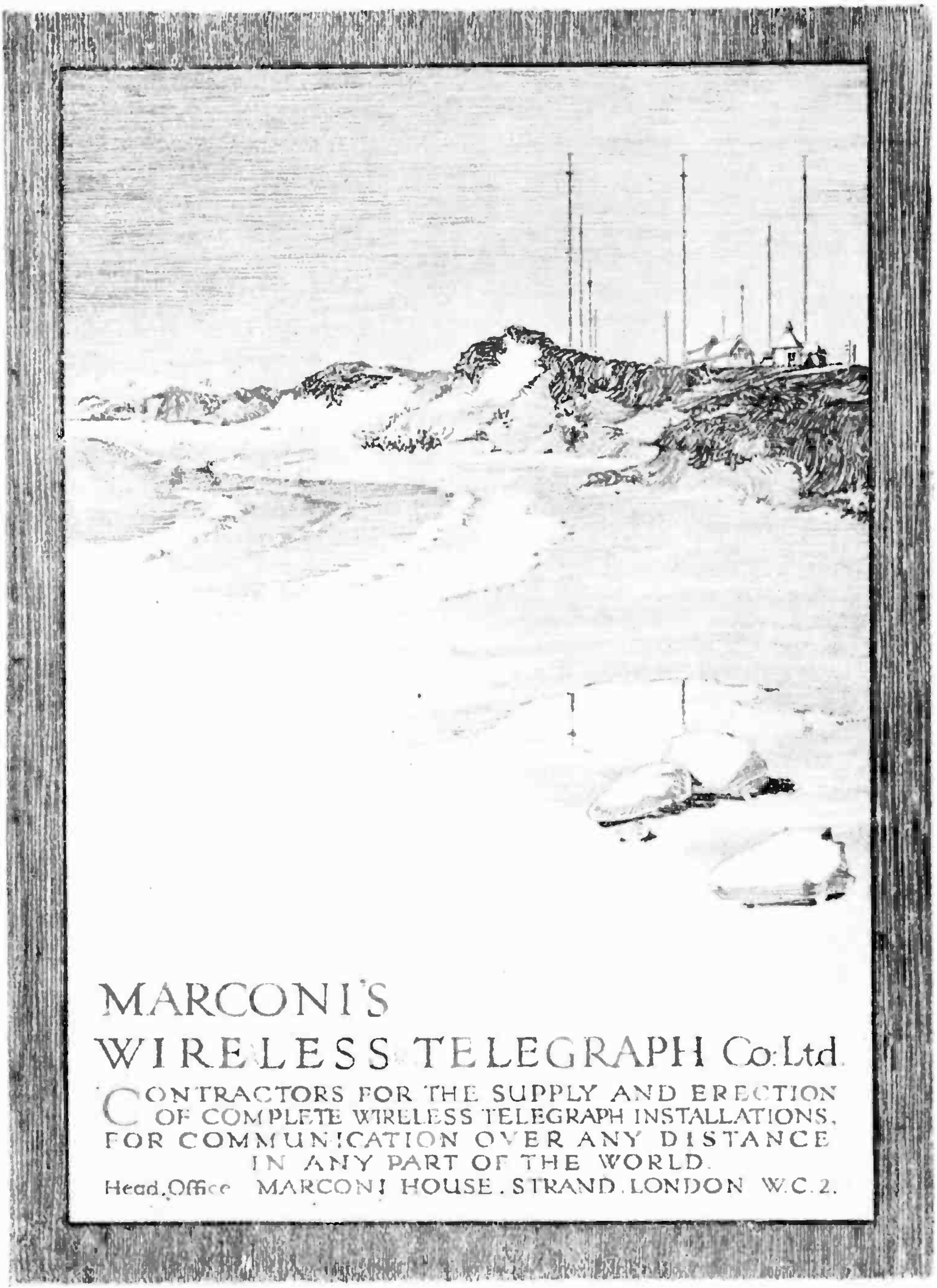


Fig. 2. A three-valve experimental receiver.

"C.B." (Hampstead) *asks* (1) *Which is the best type of indoor aerial.* (2) *What is the best total length for a ceiling type aerial, and should the frame aerial be in series or parallel.* (3) *What is the best arrangement for a frame aerial, with size and number of turns.* (4) *Is the length of the aerial wire material.*

(1) We suggest you use a frame aerial. (2) When a frame aerial is used no other aerial need be used in conjunction with it. (3) We would refer you to the article entitled "Frame Aerials in Radio Reception," which appeared in the issue of January 27th. (4) An earth wire is not needed when a frame aerial is used, but if an outdoor aerial is employed an earth wire is needed, and it should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"**J.D.S.G.**" **(Derbyshire)** *asks* (1) *Whether the Post Office would permit him to use a circuit of the type submitted.* (2) *How may permission to transmit be obtained.*

(1) The diagram submitted is correct, and we think the Post Office would give you permission to use it for the reception of broadcast transmissions. (2) We suggest you communicate with the Secretary of the Post Office, London.

give him permission to use a receiver wired according to the diagram. (2) *Is the circuit thoroughly practicable for the reception of C.W., spark and telephony signals.* (3) *Is it possible to add a high and low frequency amplifier to this receiver; if so, could the connections be given.* (4) *Could a fixed coupling between the closed aerial circuits be used, and the remainder of the A.T.I. and closed circuit inductance be apart from the coupling coils.*

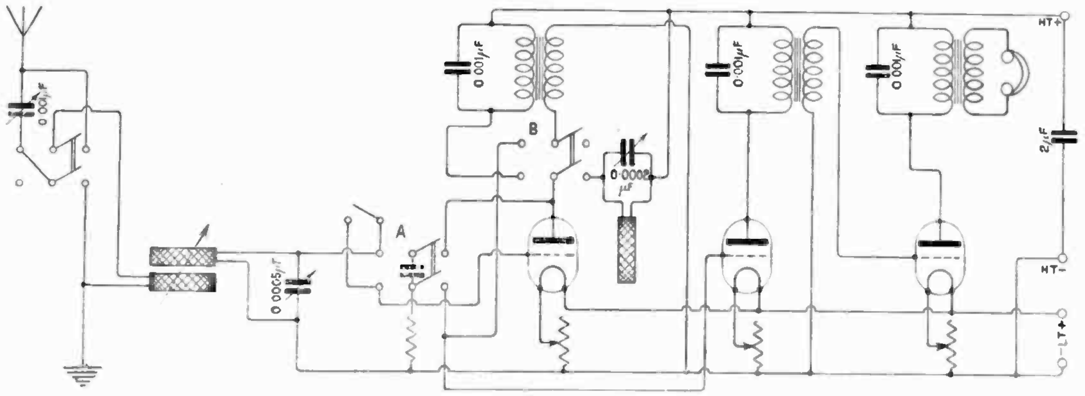

Fig. 3. *This is a three-valve receiver the first valve of which may be used as a H.F. amplifying valve or as a detector valve.*

"**NOSEY**" **(Cardiff)** *asks* (1) *Why does the use of resistance wire in a high frequency transformer slightly extend the tuning range.* (2) *Would the same effects be obtained in the case of the tuned anode method of high frequency amplification.* (3) *Why should the use of resistance wire have any effect at all, in view of the fact that the resistance of the valve is of the order of 20,000 ohms.* (4) *It is found that the signal strength is the same whether the anode coil is wound with No.* 40 *or No.* 24 *copper wire. Is this correct.*

(1) If the high frequency transformer is wound with resistance wire, tuning is flattened considerably, therefore the range is slightly increased. The strength of the signals would not be so great when the windings are wound with resistance wire. (2) The effectiveness of a tuned anode circuit depends very greatly upon the resistance of the coil and the condenser circuit. If the resistance is high, there could be no rejector effect. If the resistance is low, the tuned anode circuit will only allow signals of the wavelength to which it is tuned to be effective. (3) The resistance of the valve has nothing to do with the resistance of the tuned anode circuit, which is a separate oscillatory circuit tuned to the wavelength of the signal. (4) When receiving short wavelength signals we can quite understand that a very little difference in the volume of the signal received would be noticeable, even when the coil is wound with No. 40 copper wire instead of No. 24. You would probably notice a great increase in signal strength if the reaction coil were coupled with the tuned anode coil, so that the resistance in the circuit is almost neutralised.

"**W.B.**" **(Norfolk)** *submits a diagram of connections and asks* (1) *Whether the Post Office will*

(1) The diagram submitted is not quite correct. The grid condenser should not be variable. The coils and condensers shown in the anode circuit do not serve any useful purpose. We suggest you rewire the receiver according to the diagram Fig. 4, page 678, February 17th issue, which shows the connections of one high frequency, one detector and one L.F. valves. We think the Post Office will permit you to use a circuit of this description. (2) The circuit will be quite useful for the reception of signals desired. (3) The method for adding H.F. or L.F. connected valves is given in practically all issues of this journal. (4) The proposed arrangement is quite suitable. A portion of the aerial coil may be coupled with a portion of the closed circuit coil.

"**J.E.R.**" **(Evesham)** *asks* (1) *For a diagram showing how to connect a power amplifier suitable for a loud speaker.* (2) *May the* 120 *Brown microphone relay be used in conjunction with a "Magnavox" loud speaker.*

(1) A power valve amplifier is connected in exactly the same way as a low frequency magnifier, but a few cells should be connected in the grid circuit to make the grid a little more negative. The H.T. volts should be higher than normally used. Care should be taken when using a power amplifier that the loud speaker is not burnt out. It is not always necessary to use power valves just to operate a loud speaker for ordinary use. (2) The Brown relay may be used to operate the loud speaker, provided a transformer is connected with the loud speaker. We suggest you purchase a suitable transformer from the manufacturers of the amplifier.

"**H.J.H.**" **(Paddington)** *asks* (1) *Is the circuit submitted correct.* (2) *Could reaction effects be* *obtained by coupling the coils marked C and D in the diagram.* (3) *Does a person who applies for an experimental licence and who states that he intends to listen to the broadcast transmissions pay an additional fee.* (4) *Are the types of coils referred to suitable for use as tuned anode coils.*

(1) The diagram submitted is quite correct, and is a standard circuit. A number of similar circuits have appeared recently in these columns. (2) Reaction effects cannot be obtained in the manner suggested. It would be necessary to couple coil D and coil B, and then there is the danger that oscillating energy may be transferred to the aerial circuit. (3) The cost of an experimental licence is 10s., and one does not have to pay more if it is intended to listen to broadcast transmissions. (4) The type of coil suggested is satisfactory.

"KEMS-WAT" (Watford) *submits a plan of his three-valve panel and asks us to complete the connections.*

The diagram is given in Fig. 4.

may have a primary winding of the same dimensions as the intervalve transformer, but the telephone winding should be 1,000 turns of No. 34 S.S.C. wire.

"G.A.S." (Erith) *asks* (1) *Whether the diagram submitted is correct.* (2) *What would be the numbers of suitable honeycomb coils for use in the receiver.* (3) *Is there any disadvantage in mounting the whole of the variable condensers required in the receiver in one cabinet.*

(1) The diagram submitted is correct. The connections shown between −H.T. and +L.T. may stand, as there is not a great deal to choose between this connection and the alternative, namely −H.T. to −L.T. (2) For the A.T.I. we suggest you use a No. 75 coil, a No. 50 coil for the closed circuit, and a No. 35 coil for the reaction coil. It will be better, however, to purchase, in addition to the above coils, Nos. 100 and 150. The size of the reaction coil depends very greatly upon the winding of your receiver, and cannot always be accurately estimated. (3) Provided the connecting wires are kept reasonably short, no ill effects will result from mounting the condensers in one cabinet. If the connecting wires are long losses will occur.

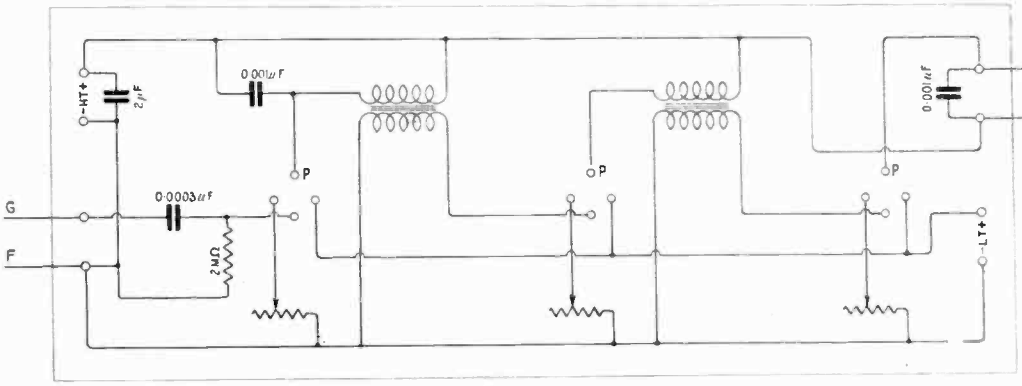

Fig. 4.

"C.R.L." (Windsor) *wishes to make basket coils and asks for particulars of the former and wire to be used.*

We suggest you use a former 2″ in diameter, containing 13 spokes. Six coils should be used, each coil having 90 turns of No. 28 D.C.C. The coils should be connected in series and a spacing washer fastened between each coil, so that the total self-capacity is not appreciably raised.

"S.F.P." (Birmingham) *wishes to construct a telephone and low frequency transformer and asks for particulars.*

The iron suggested is satisfactory, although it is better to use soft iron wire. We suggest you wind a bobbin to 1½″ long and 2¼″ in diameter. The figures are applied to the winding space. The bobbin should be wound for one-third of its space with No. 40 double silk covered wire for the primary, and the remainder of the winding space should be filled with No. 44 single silk covered wire for the secondary. The iron should be cut out so that it fits round the bobbin. The telephone transformer

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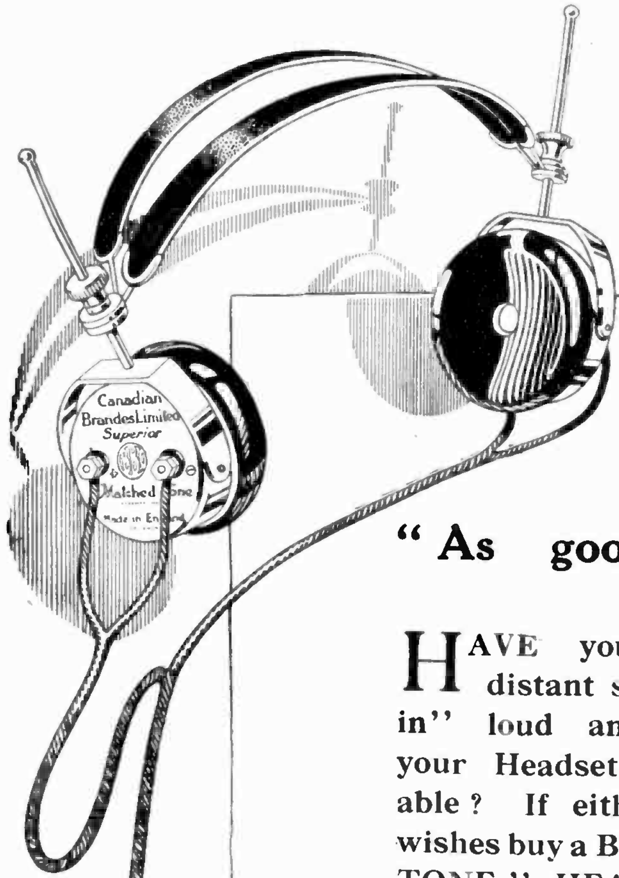
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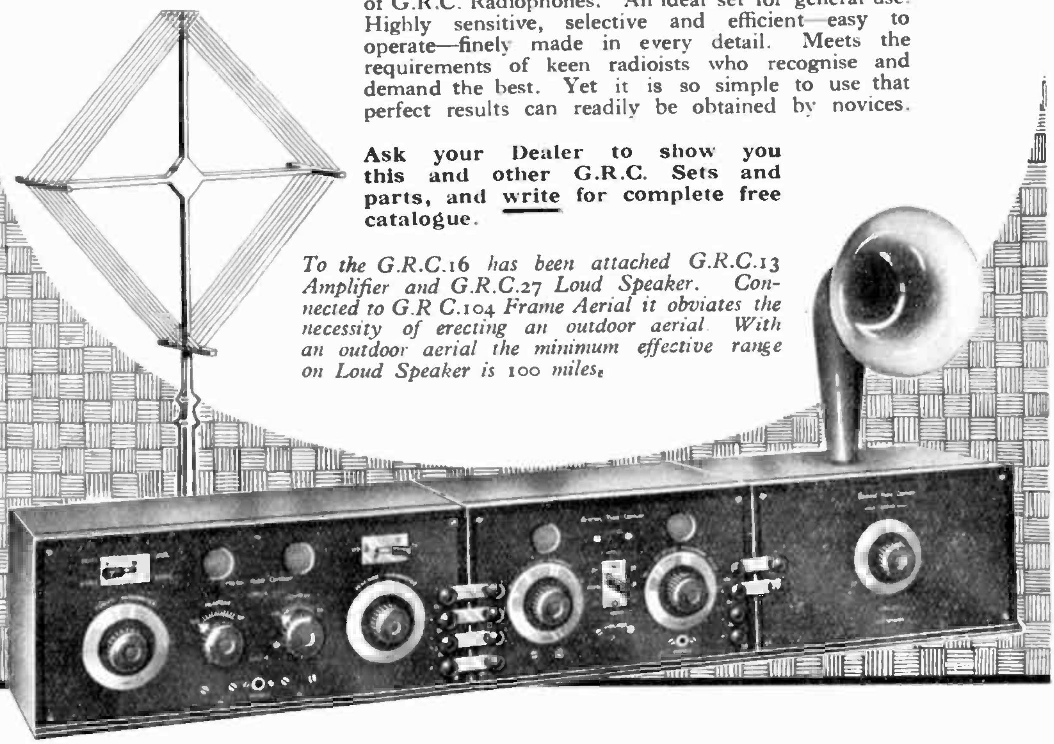

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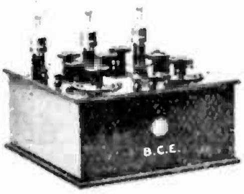

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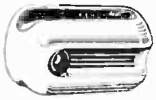

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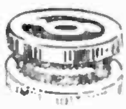

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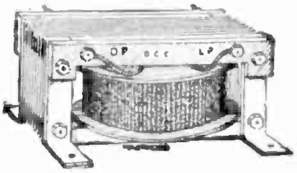

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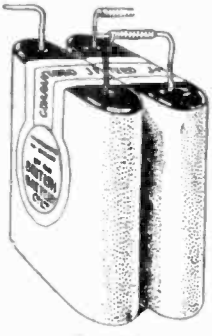

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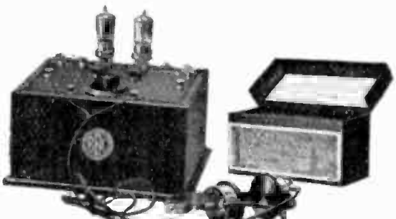

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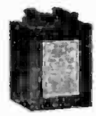

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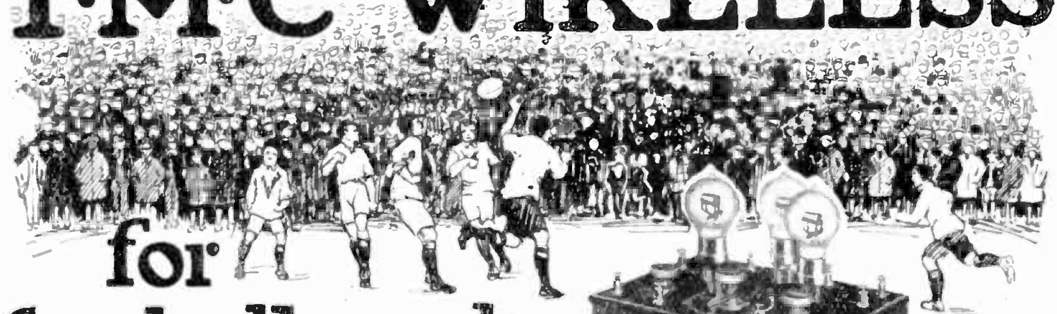

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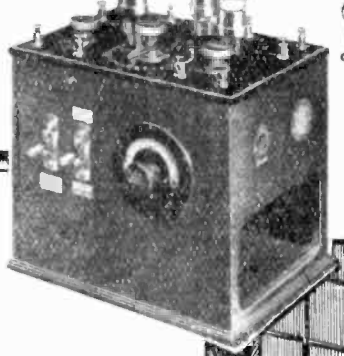

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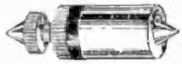

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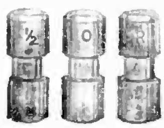

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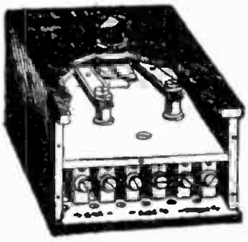

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Price: Set only, £11 10s.
Complete with accessories, from £18.
Royalties, £3.

H. E. Ashdown (Birmingham) Ltd.

Perry Barr —— Birmingham.

THE WIRELESS WORLD EXCHANGE AND MART

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FOR SALE.

Excellent Bargains.—Western Electric loud speaker, 120 ohms, 45s.; three-coil holder, extension arms and scale, cost 32s. 6d., sell 25s.; set seven plug-in coils, 200 to 20,000 metres, 63s.; 8,000 ohms Brown's "A" telephones, 43s.; teak detector panel, 35s.; three-valve resistance capacity amplifying detector panel, 70s. All carriage forward.—HISLOP, 8, Northumberland Terrace, Tynemouth.

Four-Valve Panel in handsome bevel oak case, valves, coils, phones. Paris, Hague. Trial, £20.—WARREN, 86, Great Cambridge Street, Hackney Road.

Manufacturer's Agent, in touch with leading makers of Valve and Crystal Sets. Write for quotation. All parts and sundries supplied. Trade enquiries specially invited.—A. H. MONCRIEFF, 26, Page Street, Westminster.

Splendid Three-Valve Amplifier, professionally made, £10 or offers. Brown relay, perfect, £4.—CULPAN, Lentonville, Castle Street, Cambridge.

Almost New Castagnoli Two-Valve Set, 1 H.F. and 1 detector, complete with aerial, H.F. and L.F. batteries, two sets 'phones and valves. £16.—CUSHING, Headmaster Diss.

Transformer, to give 1,000 or more volts, from 240 volt 50 cycle mains.—Box V.4, BERTRAM DAY'S ADVERTISING OFFICES, 9 and 10, Charing Cross, S.W.1.

Two Mark III* Tubers. As new, £10 each. To be seen in the City.—Apply, Box X. Y. Z., BERTRAM DAY'S ADVERTISING OFFICES, 9 and 10, Charing Cross, S.W.1.

Loud Speaker Horns. Guaranteed perfect acoustics. Enamelled black matt, complete with polished aluminium base for receiver. 4s. 6d. Post, etc., 1s. 3d.—MIDLAND RADIOPHONE CO., Hearsall Works, Coventry.

Quantity B.A. Screws and Nuts. As new. Must be cleared.—MAC, 32, Half Moon Lane, Herne Hill, S.E.

Three-Valve Set. All accessories perfect.—BROWN, 601 Romford Road, Forest Gate, E.7.

Townsend Wavemeters. Ex-Disposal, a limited number carefully calibrated. Price £4 15s. each, post free.—OMEGA LAMPWORKS, LTD., 83, Merton Road, London, S.W.19.

11 m.m. H.T. Wire for Lead-ins. Brand new Government surplus. Perfect condition. 100-yd. coils, 33s. 4d.—E. W. FARROW & SONS, Spalding.

Super Crystal Magnetite (loud). Quickly adjusted 9d., 1s., 1s. 6d. per box. Below :—

Variometers. 300-600 metres. Complete with knob bushes, scale pointer, 4s. 6d. Below :—

Grid Leaks. Permanent, with clips, 1s. All post free.—WIRELESS COMMERCIAL SERVICES, 6, Holborn Viaduct, London.

100 ft. Aerial; set slabs, 300-30,000; ·001 variable condenser; telephone condenser; three "V.24," one "Q," one "R" valves; filament resistance; pair Brown's phones; 6v. 40a. accumulator; grid condenser leak; L.R. ear-piece; lightning arrester; sundry terminals. £10 the lot.—KEMP, Builder, Alton, Hants.

Mark III* Short Wave Tuner, polished case, complete and perfect in every detail, £8.—GILES, 11, Crown Road, Morden.

B.A. Screws, Nuts and Washers, assorted gross, 2s., lists 2d. Trade supplied.—J. H. BENNETT, Station Road, Willesden Junction.

Experimental Receiver. Three valves, L.F. Coils for all wavelengths. Brown loud speaker, Sullivan 'phones. Many extra fittings (potentiometers, etc.). £45 or offer.—VICKERS, 75, Charles Street, Sheffield.

Radio Instruments. Anode coil 200 to 20,000 metres, 16s.; Senior gas engine 1 1/6 h.p., with 8 volt 3 amp. charging dynamo, perfect. £3 15s. approval. Wanted, honeycomb coils.—CRISP LUCY, Wollaston, Wellingboro'.

Burndept Ultra III, guaranteed perfect, £20. Also Burndept two-valve note magnifier with switch, £10.—MARLOW, High Street, Maplethorpe, Lincolnshire.

THE WIRELESS WORLD EXCHANGE AND MART

Electradix Radios

For all Wireless Wants.

AERIAL WIRE. Always use enamelled outdoors. Per 100' 7/25, **3/4**, 7/22, **4/4**. 1/22 permax and D.C.C. for indoors, 100' **1/-**.
INSULATORS. Small R.A.F. ebonite, **2/6** doz. Beat Hun China.
LIGHTNING ARRESTERS. Mounted on ebonite, **2/6**. Earth Clips, **6d.**
DOWN LEADS. Light Rubber Flex, **1/-** 12 yds. Medium, **2/6** and **3/6.**
AMMETERS. Milli. 0.15 or 0.50 Moving Coil. Hotwire 0.500, Small, **12/6.** Large, **17/6.** 0.2 amps. Marconi Pattern, **20/-.** Fil. Ammeters 0.3a. or 0.10a., 8s. Switchboard type, 10 amps. to 1,000 amps., **10/-** to **50/-.** Elliott Sub-standards, brand new, **45/-.** Combined 10 amps. and volts, on base, **25/-.**
AMPLIFIERS, 2-Valve, **40/-.** 3-Valve, Mk. III, new and guaranteed to make Loud Speaker shout, **£6 10s.**
BATTERIES. 6-volt Fuller Block, **30/-.** Peto and Radford Bull Pup, **42/-.**
BOXES. H.T. teak, 200 volt, **6/6.** Mahogany, 100 v., **7/-**, 60 v. **4/-.** All plugs.
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CLIMBING IRONS, 7/6 pair. R.A.F. Copper Earth Mats, **10/-.** Earth Spikes, **1/-.**
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CRYSTAL DETECTOR. We have designed an entirely new enclosed pattern of Perikon and Tickler for your panel with just the crystal holder you want. Very smart, **2/9.** Detector Parts, **1/9** card.
CONDENSERS. Fixed, **1/6.** Murdoch panel from **18/6.** 10,000 volts, **15/-.**
DYNAMOS. Ours are the cheapest. Charging 6/8 amps., **£3 10s.** 12 amps., **£8 10s.** H.T., 500 volts, Motor Generator, new, **£16.**
EBONITE. Sheet, Rod and Tube from **2/9** per lb.
FILAMENT FUSES. Holders, Navy, 1/- pair. Fuses, 1, 2 and 3 valve, **9d.**
H.T. UNITS for C.W. Transmitters, T.V.T., in case with condensers, plugs, etc., 10-1,000 volts, A.C., **30/-.**
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MASTS. 15ft., Steel and guys, **7/6.** 40ft. Hollow Spar, **£3 10s.**
MORSE RECORDERS. S.H., **35/-** and **£5.** Enclosed Keys, **2/6.** Vibrators, **5/-.**
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RECEIVERS. B.B.C. Crystal, **30/-.** Marconi Trench 1-valve, **£6 10s.** Mark II.B. 2-valve, **£7 10s.** M.H. 3-valve, **£25.**
TRANSFORMERS. P.O. Telephone, **7/6.** Marconi, **20/-.** Intervalve, **15/-** to **19/-.**
TELEPHONES. Solo L.R., **4/6.** Double Head, **12/-.** Sullivan, **12/6,** cords **1/3.** H.R. French, **20/-.** Sullivan, **32/-.** Sterling's 2,000, **48/-** to 8,000, **56/-**, brand new, with cords, guaranteed.
TERMINALS. 4BA Govt. with double nuts, lacquered, **2/6** and **3/-** doz.
TOOL ROLLS. Neat Leather, Govt., **2/6.** A boon, worth **7/6.**
TRANSMITTERS. 1-valve, **£5.** Power Buzzer Sets and Key, **20/-.** Micro, **5/-.**
VALVES. "B" trans., **15/-.** Marconi-Osram, **17/6.** Ex. Govt., **10/-.**
WAVEMETERS. £2 to **£7 10s.** Heterodyne or Detector.

We have three floors full of Radio Goods. Send us your wants or call and inspect our varied stock. Close to Aldgate Station, City. Met. Rly. First on left down Minories. Tel.: Aven. 4166.

LESLIE DIXON & CO.,
9, Colonial Avenue, Minories, E.1

FOR SALE continued

All Wireless and Electrical Goods stocked at 9, Colonial Avenue, Minories, near Aldgate Station. Handiest place for City buyers.—LESLIE DIXON & Co. Telephone No., Avenue 4166.

Experimenter's Parcel of 50 brass terminals, washers, nuts and screws, 1s. 1d. post free.—GARDNER, 1, Caxton Road, London, N.21.

Steam Pan, 19½ × 19½, 160s.; quantity 1" steam pipe 4½d. per ft., automatic wood turning lathe, £21. 40" polishing spindle by Canning, 150s.—DIXON, Butts Works, Worcester.

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Variable Condenser Parts.—Complete sets of parts for various capacities; panel mounting, ·0001 mfd 4s. 6d., ·0003 mfd. 6s., ·0005 mfd. 7s. 6d., ·00075 mfd. 8s., ·001 mfd. 9s. 3d., ·0016 mfd. 12s. 6d. Postage 6d. each. Half doz. lots. Post paid. Trade enquiries invited.—C. OLDFIELD, 1A, Choumert Road, London, S.E.15.

New Fuller Block Accumulators, 2 volt 20 amp. hour actual. Case of three, 28s. 6d.; of five, 42s. 6d.; buzzers, 5s. 6d.; copper wire D.S.C., 40 to 44 gauge, 16s. lb. Trade supplied.—KETT & Co., LTD., Electrical Department, 73, High Street, Southampton.

Sullivan Six-Valve Amplifier, transformer coupled, 4 H.F., detector, L.F. Recent design, perfect condition. Cost £35. What offers?—Box Z6, BERTRAM DAY'S ADVERTISING OFFICES, 9 and 10, Charing Cross, S.W.1.

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Polished Mahogany or Teak Cabinets. Quotations per return.—LANCASTERS, 87, Parade, Birmingham.

Firm of Telephone and Radio Instrument Manufacturers would be glad of quotations and particulars of materials used for making mouldings for the various parts. Manufacturers of raw material suitable for making mouldings kindly get into communication, giving particulars, to Box 1476, SELLS ADVERTISING OFFICES, Fleet Street, E.C.4.

Forward all Enquiries for radio parts in brass, copper and nickel, to CHAS. MORGAN & SON, 24, Farringdon Avenue, London.

The "Newtonia Wireless Factory" supply dealers with raw material and partly manufactured parts at the right prices. Any parts manufactured for the trade. Write for our list.—13/15, Whitcomb Street, Pall Mall, London, near Trafalgar Square.

Nameplates, engraving of all descriptions.—STILWELL & SONS, Little Park Street, Coventry.

Wireless Inventors.—Patents and Trade Marks Advice. Handbooks and Consultations free.—KING, Regd. Patent Agents, 146A, Queen Victoria Street, London. 'Phone, 682 Central.

Walsh, Holmes & Co., 148, Charing Cross Road, W.C.2., require quotations for reliable receiving sets and panels, also all brass parts, insulators, valves, 'phones, etc. Factors only to the music trade. Send lists and fullest particulars, or call.

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Technical Books.—Second hand and New Books on every conceivable subject. Catalogue free. State wants. Books sent on approval. Books bought.—FOYLE, 121, 125, Charing Cross Road, London.

FOR DISPOSAL.

Instrument Factory, freehold, about 5,000 sq. ft., on two concrete floors; crane, etc. Situated Elephant and Castle, London. L.C.C. building. Owners wish to sell. Would leave half outstanding at 5 per cent.—'Phone Hop 1322, or write "H." 233, Bellingham Road, Catford, S.E.6.

"TRIUMPH"

CRYSTAL RECEIVER

(Approved. P.M.G. 419)

Price 12/6

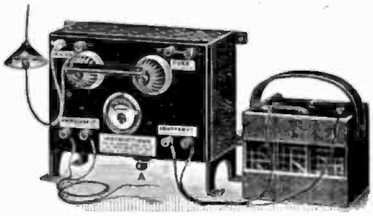
HAVING NEARLY COMPLETED ALL LONDON ORDERS WE ARE NOW READY TO ACCEPT ORDERS FROM DEALERS AND OTHERS WITHIN 20 MILES OF THE BROADCASTING STATIONS OF MANCHESTER, CARDIFF, NEWCASTLE, BIRMINGHAM, AND GLASGOW.

IMPORTANT.

THIS IS A PERFECT AND COMPLETE BROADCAST RECEIVER, APPROVED P.M.G. 419, AND NOT A BOX OF LOOSE PARTS.

"THE TRIUMPH"

Accumulator Charging Sets



IF YOU HAVE ELECTRIC CURRENT IN THE HOUSE, WHY BOTHER TO SEND YOUR ACCUMULATORS TO BE RECHARGED WHEN YOU CAN DO IT YOURSELF BETTER AND MORE ECONOMICALLY.

GARAGE PROPRIETORS AND OTHERS MAKING A BUSINESS OF CHARGING WILL FIND OUR EQUIPMENTS ABSOLUTELY THE BEST AND MOST FOOLPROOF SETS ON THE MARKET.

COMPLETE OUTFITS FROM 30/-

C.T. Ltd. 26, Church Street Soho, London, W.1

THE WIRELESS WORLD EXCHANGE AND MART

SITUATIONS WANTED.

Wireless Manager of Prominent Firm, young and energetic, desires position with progressive firm.—Write Box 1480, SELLS, Fleet Street, E.C.4.

Young Man (21) desires a situation in wireless trade as Salesman or Demonstrator. A first-class knowledge of assembling and installation work.—Write, E. N., 185, Telsham Road, Putney.

Strong Lad (16) seeks situation connected with wireless or electrical trades. Any capacity. Wages, 15s.—A. H., 38, Fulham Place, W.2.

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Managing Salesman for Wireless Department of a London electrical firm. Good opening for enterprising man.—Write full particulars, experience, etc., Box K.19, BERTRAM DAY'S ADVERTISING OFFICES, 9 and 10, Charing Cross, S.W.1.

MISCELLANEOUS.

The Proprietor of the Patents, Nos. 137073 and 138318 for "System for the Transmission of Electro-Radiant Energy" and "Method of, and Apparatus for, the Reception or Transmission of Electro-Radiant Energy," is desirous of entering into arrangements, by way of license and otherwise, on reasonable terms, for the purpose of exploiting the same and ensuring their full development and practical working in this country.—All communications should be addressed, in the first instance, to HASELTINE LAKE & Co., Chartered Patent Agents, 28, Southampton Buildings, Chancery Lane, London, W.C.2.

Telephone Receivers Rewound up to 1,000 ohms, 5s.; 2,000 ohms, 7s. 6d. Cash with order.—M. E. HAMPSHIRE, 139, Sydenham Road, S.E.26.

Accumulator Charging Resistances, complete with flexible cable and adaptors to charge from any convenient lampholder, 1 Amp., 22s. 6d.; 2 Amp., 25s.; 3 Amp., 27s. 6d.; 4 Amps. 30s.; 5 Amp., 32s. 6d.—WALTHAM MANUFACTURING Co., 2, Jackson Road, Holloway, London, N.

MARCONI'S LATEST

New Popular Marconiphone Brings ALL Broadcasting Stations within Range.

A New and improved Two-Valve Marconiphone has been perfected and is now on sale.

With it, no matter what part of the country you live in, you can listen-in with perfect results to *all* the British Broadcasting Stations from Glasgow to Cardiff.

PRICE REDUCED.

Owing to the enormous demand created for this instrument, it has been found possible to economise largely in overhead charges. The public is given the benefit of these economies, and the New Marconiphone V2 is on sale everywhere at

£16 : 3 : 6

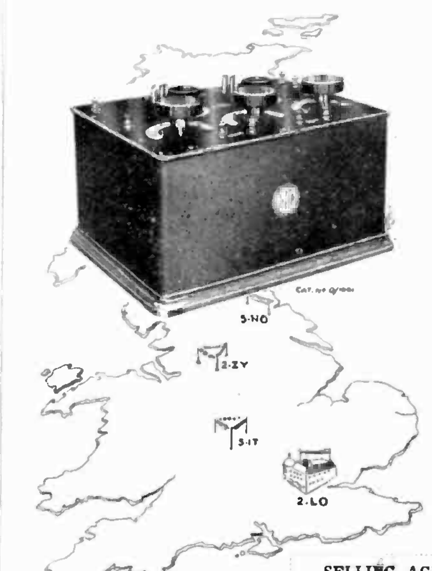
without accessories—or **£24** complete.

The Marconiphone

The Triumph of the Master Mind.

Ask your local dealer AT ONCE about the New Marconiphone V2.
All orders are being dealt with in strict rotation.

Marconi's Wireless Telegraph Company Limited
Marconiphone Department, Marconi House, Strand, London, W.C.2



Listen-in to all the British Broadcasting

This wonderfully selective 2-valve receiver has the *utmost reactance allowed* by the G.P.O. It has two carefully calibrated circuits which allow of the most minute tuning plus the utmost simplicity in manipulating.

Beautifully finished in lacquered or nickelled brass, mounted on matt-finished ebonite, all mounted in a polished walnut case.

Panel £13 14s. 0d. M.O. Valves 17/6 each. Pair 4000 ohm Ericsson 'Phones. 60 volt H.T. Battery. 4 volt 80 ampere hour Accumulator. 100 ft. Aerial 7/22 Enamelled Copper and Insulators.

Pr ce from Aerial to 'Phones, packing and delivery £20

Write to-day for full particulars.

THE BRITISH L. M. ERICSSON MFG. CO., LTD.,
International Buildings, 67/73, Kingsway W.C.2.

Ericsson

WIRELESS APPARATUS

We also make Crystal Sets—range 15/25 miles. With 'Phones £5 0s. 0d.

SELLING AGENTS.
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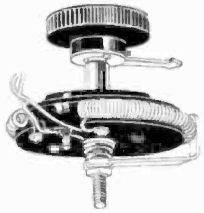
N.E. England: North British Engineering Equipment Co., Milburn House, Newcastle-on-Tyne



FILAMENT RESISTANCES

2/6 each.

Postage 4d. As illustrated.

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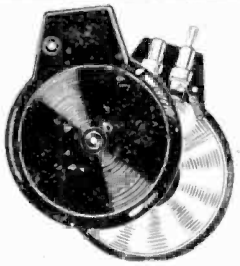
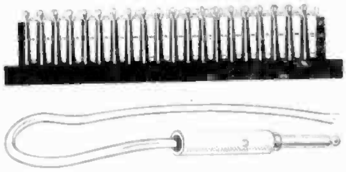


BASKET LOW CAP OR SLAB COIL HOLDER, 2/- each.

Postage 6d.



STRIP OFF TWENTY JACKS @ 2/6

Two-way Plug for above 1/-

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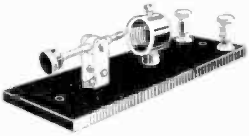

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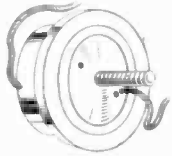

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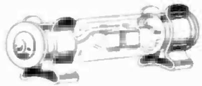


LIGHTNING CONDUCTORS,

2/6 each. Postage 3d.

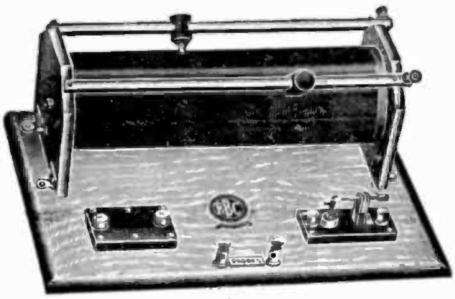
TELEGRAMS: "QUOTATION"

BERESFORD BROS.

ELECTRICAL ENGINEERS,

2 & 3, BULL STREET, BIRMINGHAM

TELEPHONE: 7590 CENTRAL



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APPROXIMATE RANGE, 30 MILES

Double Slider Tuner, handsomely mounted on polished base. Tested and guaranteed, complete with 100 ft. aerial wire, 2 insulators and lead-in terminal, 1 pair B.B.C. Headphones, and B.B.C. Royalty **£4**

RADCOM RHEOSTATS, COILS, TUNERS, VARIOMETERS, TRANSFORMERS - ACCUMULATORS - AERIALS, &c.

Radio COMPONENTS, LTD

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Telephone - - Museum 3485.

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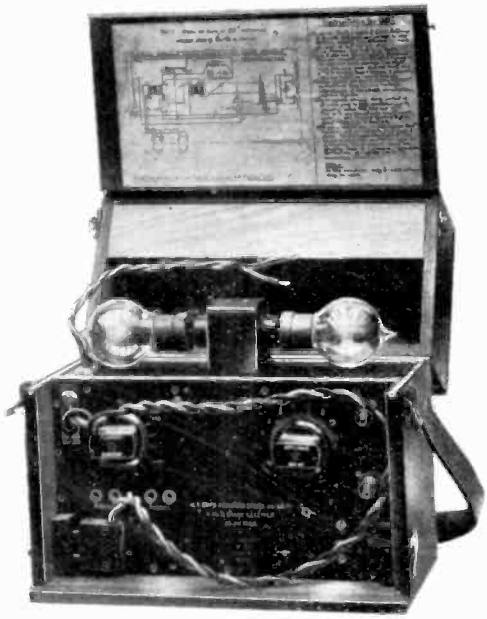
AT PRICES WITHIN THE REACH OF ALL



MARK III TUNER

Wavelength 100-700 metres.

This instrument is too well known to require detailed description. In its present form it forms a splendid instrument, as the whole of the broadcasting wavelengths are well within its range. With the existing crystals it will receive efficiently up to a distance of 30 miles from the broadcasting station, whilst the addition of a low frequency amplifier will magnify the signal strength considerably. The wavelength can be easily increased, if desired, with slight modification.

Complete with full instructions, and ready for immediate use.

PRICE, including one pair of SULLIVAN 8,000 ohm Telephones (complete with cords)

£8 : 0 : 0

B. MARK II RECEIVING SETS

This instrument was designed as a trench radio receiving set for use on short wavelengths of 65 to 80 metres. It can quite easily be converted for use on higher wavelengths, the method being thoroughly explained in various recent issues of the Radio press, and more particularly by Mr. Philip R. Coursey in the handbook " Disposal Board Radio Instruments and their Application to Experimental Uses." A copy of the latter is supplied free with every instrument.

The instrument contains intervalve transformer, valve to 'phone transformer, condenser and grid leak, filament resistance, change-over switch, and two valve holders.

PRICE ***£3 : 15 : 0***

Ditto, with variable air condenser ***£4 : 15 : 0***

AERIAL MASTS and EQUIPMENT

15′ Steel Masts in sections, each 2′ 8½″, complete with halyard, pulley and stays. Per mast complete

15/-

30′ ditto, with all necessary equipment

£2 : 10 : 0

We hold the largest stocks of Wireless Apparatus in the Country. Send for our lists to-day.

THE CITY ACCUMULATOR CO., 79, Mark Lane, London, E.C.3

'Phone—Avenue, 1316.

And at **33, RUE D'HAUTEVILLE, PARIS.**

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Bristol Wireless Co., 52, Cotham Hill, Bristol.

LANCASHIRE AND CHESHIRE—
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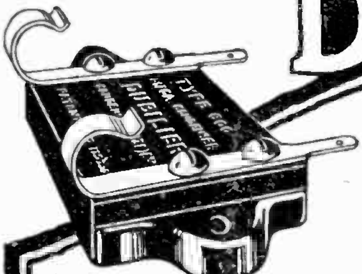
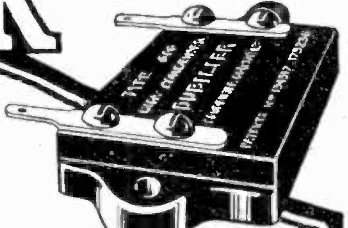
LEICESTERSHIRE—
Walter Rowe, Ltd., 96, Granby Street, Leicester.

SOUTH WALES—South Wales Wireless Installations Co., Ltd., 18, West Bute Street, Cardiff.

Local Customers will greatly assist the work of our Despatch Department by ordering direct from our nearest Agents.

DUBILIER





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QUALITY PRODUCTS AT POPULAR PRICES.

Because we concentrate on manufacturing condensers you get good deliveries.

Our policy makes sure that in Dubilier Condensers you get quality products at popular prices.

Dubilier Mica Condenser. Type 600.

For use in wireless receivers, with or without Dubilier grid leaks.

0·0001 mfd. and 0·0009 mfd. - **2/6** each
0·001 mfd. to 0·005 mfd. - **3/-** each
Condensers with grid leaks - **5/-** each

Tested to 1,000 volts.

Dubilier Mica Condenser. Type 600a.

For close mounting in wireless receivers, space occupies $2\frac{3}{8}'' \times \frac{5}{8}''$.

below 0·001 mfd. - - - - **2/6** each
from 0·001 mfd. to 0·005 mfd. - **3/-** each

Tested to 1,000 volts.

The Dubilier Condenser. Type 577,

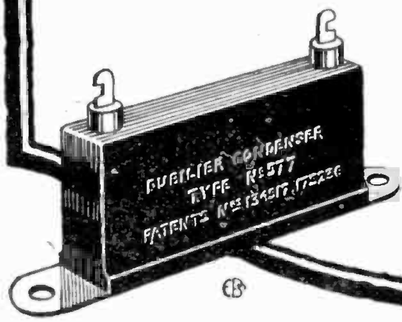
Is a small power condenser and is suitable for either transmitters or receivers. It has extraordinary small losses and the capacity remains constant under all conditions.

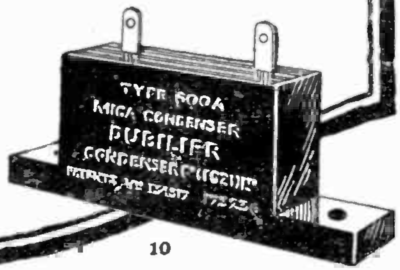
From 0·0001 mfd. to 0·01 mfd. **7/6** each. Tested to 2,000 volts.

Trade terms and descriptive leaflets of these and large power Dubilier Condensers will be sent on request.

THE DUBILIER CONDENSER CO. (1921) LTD.
DUCON WORKS, GOLDHAWK ROAD, LONDON, W. 12

Telephone: Hammersmith 1084. *Telegrams: "Hivoltcon, Phone, London."*





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