The WIRELESS WORLD

FORTNIGHTLY] NOVEMBER 12th, 1921. PRICE 6D. NET

THE WIRELESS WORLD

THE OFFICIAL ORGAN OF THE WIRELESS SOCIETY OF LONDON

VOL. IX. No. 43. NOVEMBER 12TH, 1921 FORTNIGHTLY

A SEPARATE HETERODYNE FOR SHORT WAVE WORK

AN INSTRUMENT WHICH CAN BE USED FOR THE TRANSATLANTIC TESTS

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

(*Continued from page* 464.)

DETAILS of the dimensions of other parts required for the construction of the instrument are given in Figs. 5 to 10. It will be noted from this that provision is made for using a V 24 type of valve, which is a very convenient one to use for an instrument of this type, since only a low value of H.T. voltage is necessary. When completed with one of these valves the instrument will usually oscillate with only 6 volts in the high tension battery. If preferred, a holder for a 4-pin valve of the standard French or "R" type may be fitted, instead of the spring clips for the V 24 valve, with but trifling alteration to the general layout of the apparatus. The low capacity of the V 24 valve, however, is advantageous for this short wave instrument.

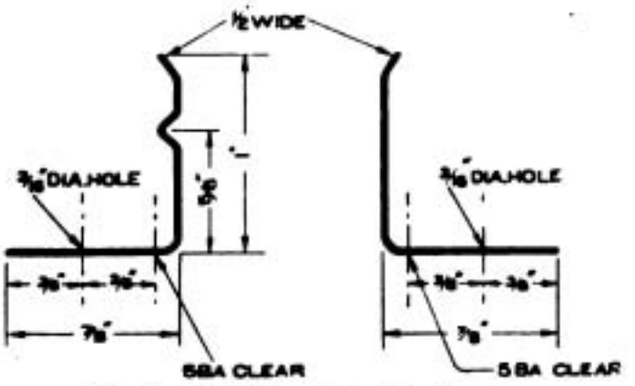


Fig. 5. Details of side clips for valve.

Fig. 5 gives the details of the side-clips for the V 24 valve. They are bent up from

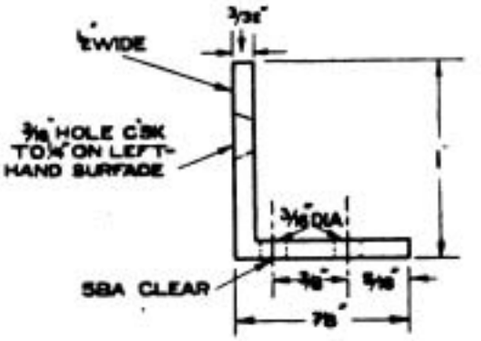


Fig. 6. Fixed end clip for valve.

thin springy phosphor-bronze strip, ½-inch wide, to the dimensions shown in that sketch. These are the clips marked A and G in Fig. 11.

The end clips for the valve are shown in Figs. 6 and 7, the former being of $\frac{3}{32}$ in. brass strip, ½ in. wide, and the latter, the flexible one, of thin springy phosphor-bronze strip. The thickness of this strip should not much exceed about $\frac{1}{64}$ in. These two clips are those mounted on the right and left-hand ends of the valve in Fig. 11 respectively. In Fig. 8 will be found details

of the two brass angle brackets used to support the former on which the coils (Fig. 3) are wound. This is made of $\frac{3}{32}$ in. brass strip, $\frac{1}{2}$ in. wide. Two are required to the dimensions given.

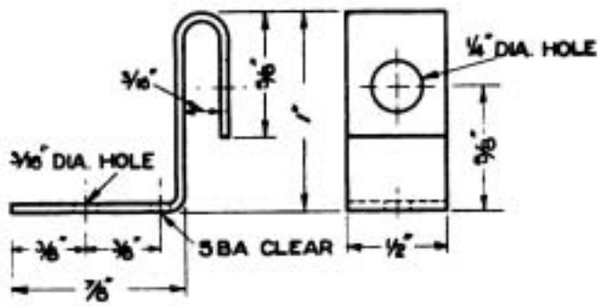


Fig. 7. Springy end clip for valve.

The pointer for the condenser scale (shown mounted on the right-hand side of the condenser, in Fig. 11) is shown in Fig. 9. This is made of thin brass strip about $\frac{1}{32}$ in. thick. Fig. 10 indicates the dimensions of the brass strip used to short-circuit the

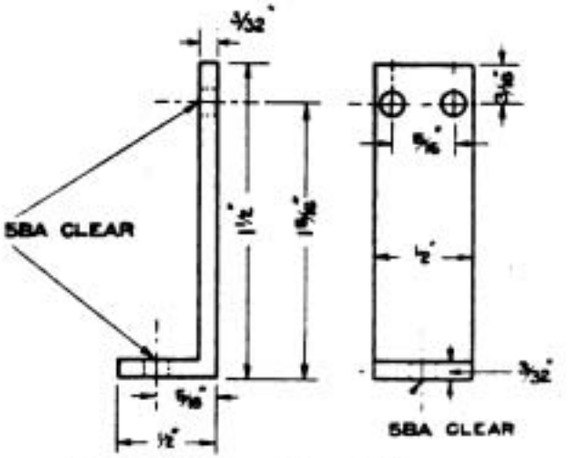


Fig. 8. Supports for coil former.

"phone" terminals when telephones are not required connected to the set. This, of course, is usually the case when the instrument is used purely as a separate heterodyne, but the terminals are very convenient in some cases since the instrument can also be used for many other purposes, such as a c.w. wavemeter, and for carrying out many simple high-frequency measurements.

In Fig. 11 will be found a diagram of the layout of the top of the instrument, with the lettering of the various terminals, and in Fig. 12 a diagram of the connections of the instrument between these terminals, the labelling of the terminals in this diagram corresponding with that in Fig. 11. In Fig. 11 it will be noticed that a miniature tumbler switch is shown, to provide a filament switch for the set. The position of the centre only of this switch is indicated in Fig. 4, as the exact position and size of the holes necessary for fixing this switch in position, and for allowing the connecting wires access to its terminals, will depend upon the particular pattern of switch used. The position of these holes should therefore be marked out after the purchase of this switch. Its

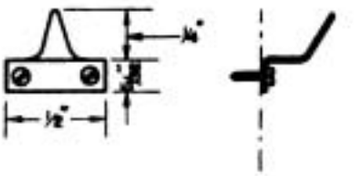


Fig. 9. Pointer for condenser scale.

outside diameter should not exceed about $1\frac{3}{4}$ ins.

The terminals used (2 B. A.) should be screwed into the ebonite, and provided with washers and nuts on the underside for the connections. The wiring is most conveniently carried out with bare No. 18 copper wire, covered with insulating sleeving where necessary.

The former on which the anode and grid coils are wound is supported from the underside of the ebonite top by means of the brass brackets, of which the dimensions are given in Fig. 8.

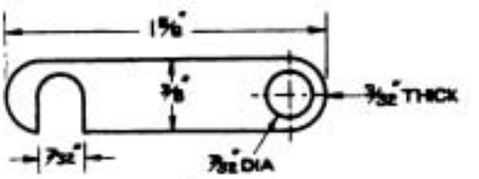


Fig. 10.

The variable condenser has a maximum capacity of approximately 0·00025 microfarad. One of the small ex-Service condensers of about this capacity may conveniently be employed by mounting its aluminium top

on the underside of the ebonite top of the instrument. The bush of the aluminium top through which the condenser spindle projects should be passed through the ebonite, a hole of suitable dimensions being drilled for this purpose. The position of the centre only of this hole is indicated on the drilling diagram of Fig. 4.

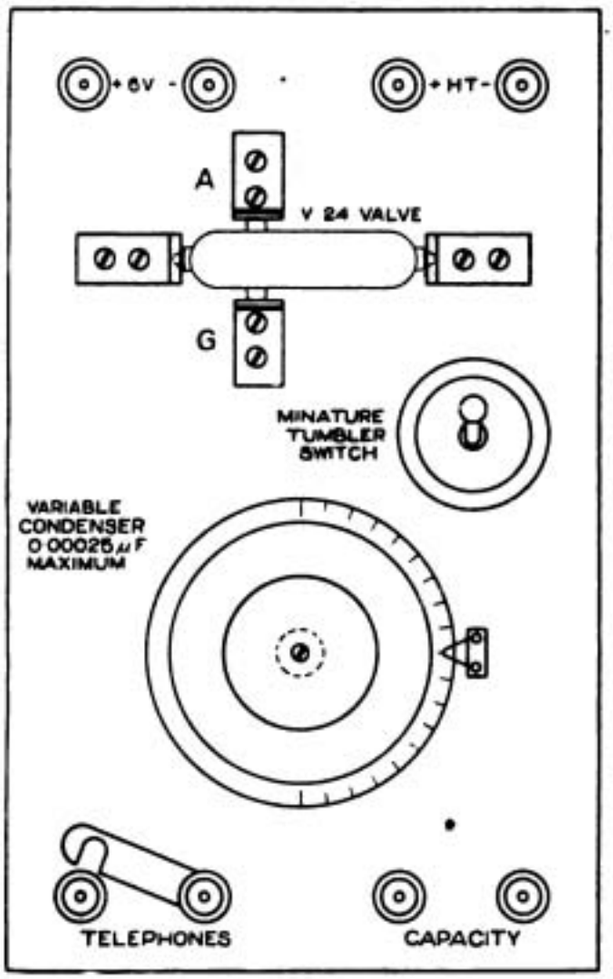


Fig. 11. *Layout of top of instrument.*

If it is desired to build up the condenser, 6 fixed plates and 5 moving plates of the sizes shown in Figs. 13 and 14 respectively may be used. These plates may be cut out of sheet metal $\frac{1}{32}$ in. thick, either brass or aluminium being used. The corners and edges should all be carefully rounded, and all the rough burrs removed.

Spacing washers $\frac{1}{16}$ in. thick should be used between the plates, those for the fixed plates being $\frac{1}{4}$ in. diameter, and for the moving

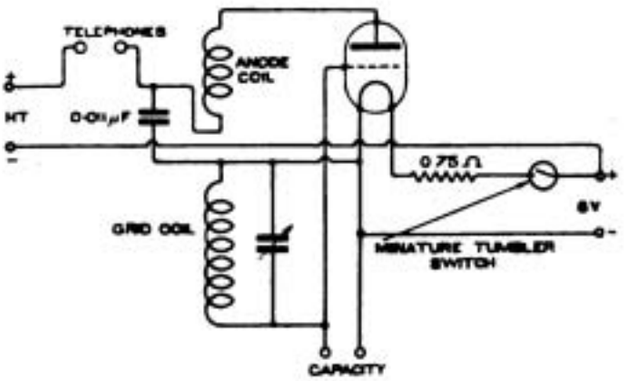


Fig. 12.

plates $\frac{3}{4}$ in. diameter. Eighteen of the former will be required, and four of the latter, allowing one set of 3 washers to be used for spacing the first fixed plate $\frac{1}{16}$ in. away from the under surface of the ebonite.

Three brass screws $\frac{1}{8}$ in. diameter by $1\frac{1}{4}$ in. long with countersunk heads, are necessary to hold the fixed plates in position. They should be screwed through the ebonite from the upper side, holes being drilled and tapped in the ebonite for this purpose in the correct positions to correspond with the holes in the fixed plates shown in Fig. 12. Six nuts will be required for these screws to clamp and lock the plates in position.

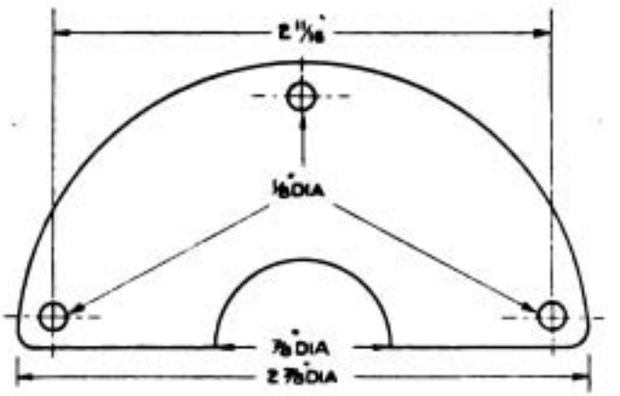


Fig. 13. *Fixed condenser plates.*

The dimensions of the knob and scale are shown in Fig. 15. They should be provided with a brass bush on the underside with a square hole to fit the square top of the spindle on which the moving plates are mounted.

This spindle is $\frac{1}{4}$ in. diameter by 2 ins. long, nuts being provided for clamping the moving plates on to it, and filed square to

fit the condenser knob at its upper end. The knob is fixed in position by a screw through it into the top end of the spindle. The lower end of the spindle carrying the movable plates is held in position by a suitable framework, Fig. 16. The $\frac{1}{8}$ in. hole marked in this diagram as for the bearing A is to take the lower end of the condenser spindle, which should be tuned down to $\frac{1}{8}$ in. diameter for this purpose. This frame is cut out of $\frac{3}{32}$ in. brass sheet, and is held in place by long 2 B. A. screws, passing through the $\frac{3}{16}$ in. holes at the extremities of its arms. These screw into the underside of

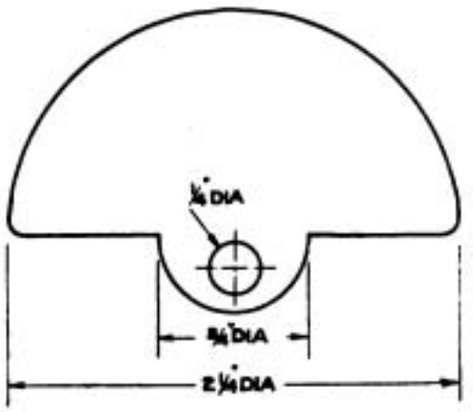


Fig. 14. Movable condenser plate.

the ebonite top of the instrument, the frame, Fig. 15, being secured rigidly to them by means of nuts. The positions of these screws, and those required to hold the fixed plates are not shown in the drilling diagram, Fig. 4, but should be marked out when the parts are ready for mounting. It is recommended, however, to use a ready-made variable condenser for this instrument, if possible, and merely to mount it in the position indicated in Fig. 4, as already described.

The fixed blocking condenser of 0·011 microfarad capacity shown in Fig. 12, may be built up of tinfoil with paraffined paper, or mica, for the dielectric. More conveniently a small Dubilier condenser of this capacity may be employed, and fixed in place on the underside of the ebonite top by two small screws.

The filament resistance of $\frac{3}{4}$ ohm, shown in the circuit diagram (Fig. 12), may be built up of a few inches of resistance wire wound on a strip of mica or other convenient non-inflammable insulating material, and mounted on the underside of the ebonite lid. Its

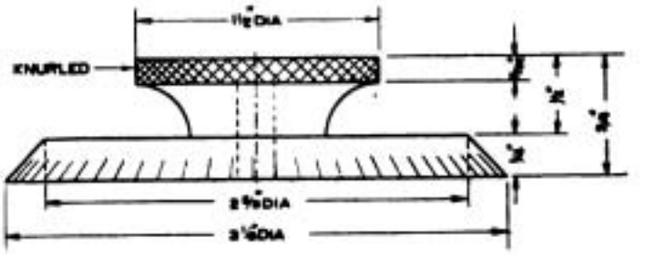


Fig. 15.

purpose is to enable a 6-volt accumulator to be used with the V24 valve, and to obtain about $4\frac{3}{4}$ volts on the filament terminals of the valve when in use.

An instrument constructed on these lines with a V24 valve should oscillate readily over the whole range of the condenser scale with 6 volts connected to the H.T. terminals.

The negative lead of the H.T. battery is joined to the positive of the filament battery so that the two combine together in the plate circuit of the valve, giving an effective voltage of 12 in that circuit. With this arrangement care must be taken to keep the

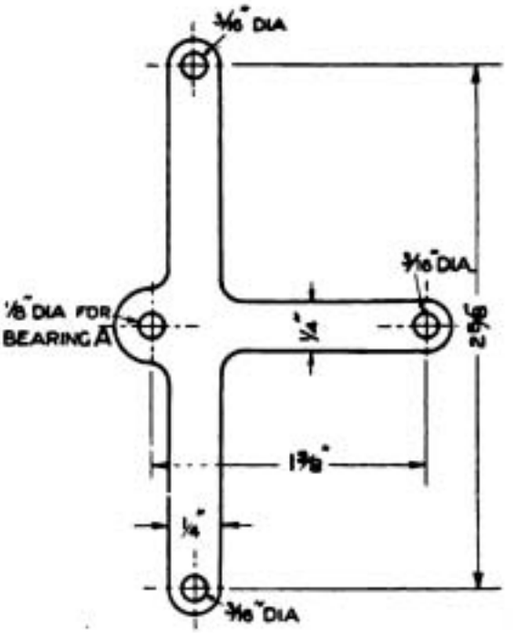


Fig. 16.

grid circuit joined to the negative end of the filament. This will be the case if the wiring diagram given in Fig. 12 is adhered to. With such an instrument a 200-metre wave will usually be found a little over half-way round the scale of the variable condenser, rendering the instrument convenient for use on the licensed 180 metres wavelength as well.

When in use as a normal heterodyne unit the telephone terminals are not required and should be short-circuited by the link provided. They are only fitted to the instrument to enable telephones to be joined in circuit as a help for calibration purposes, and for other measurements.

The two terminals marked "capacity," in Figs. 11 and 12, are connected directly across the ends of the variable condenser. A very small single plate or vernier condenser can be joined across these terminals when desired to aid in fine adjustments of the wavelength. Such an addition is particularly desirable when heterodyning these short wavelengths, as the tuning range for maintaining the beat note within the audible limits is very restricted at these high frequencies. Such an addition, however, will, of course, alter the calibration of the instrument should it be desired to use it as a wavemeter.

The readings of the instrument may be calibrated against a standard wavemeter, so as to obtain the approximate wavelength corresponding to any scale reading of the condenser. Such a calibration, however, will vary slightly with all changes in the filament and H.T. batteries, and will usually also vary somewhat when the valve is changed. It must be carried out, of course, without any additional fine adjustment or vernier condenser connected to the "capacity" terminals, as such an addition, although very convenient for use, would constitute a serious disturbing element.

An important point to note when joining up the leads inside the instrument is that the wire from the grid of the valve should be joined to the *fixed* plates of the variable condenser, the movable vanes being connected to the filament of the valve. The potential of the movable vanes will then be lower, and the presence of the hand when making adjustments will be less serious. This precaution will be found of particular value when calibrating the condenser.

When accurate work is necessary with an instrument of this kind it is very desirable to fit a long handle to the condenser so as to enable the hand to be kept further from the instrument. Any convenient form of such handle can readily be added to this instrument, and will aid considerably the ease of its operation.

PRIZES FOR TRANSATLANTIC TESTS

AS promised in our last issue, we give below particulars of the valuable prizes offered by various manufacturers of wireless apparatus, in connection with the Transatlantic Competition.

Prizes are offered as follows, by the companies indicated :—

Amateur Supplies Association.—A "Simplex" cabinet valve set.

E. M. Ashley, Ltd.—A prize to the value of £8 to the winner, the prize to be completely at the disposal of the judges.

G. Z. Auckland & Son.—Apparatus from their stock to the value of £10.

Burnham & Co.—Three prizes—(1) A Burndept III receiver ; (2) a Burndept II ; and (3) a Burndept I. Prize (1) to be awarded to the individual or club receiving the signals ; prizes

(2) and (3) to go as consolation or other prizes to be given at the discretion of the judges.

Butler & Co.—A selection of apparatus from their list to the value of £5.

Dubilier Condenser Company, Ltd.—Condensers to the value of £10 to go to the most successful competitor, the winner choosing his own prize.

A. W. Gamage, Ltd.—A prize to be offered subject to the employment in the tests of apparatus purchased from them.

Halliwell & Good, Ltd.—A prize of goods selected from their catalogue to the value of £30, conditional on the successful competitor employing at least one essential unit of apparatus supplied by them.

B. Hesketh.—Any standard apparatus chosen from their list, current at the date of the award, to the value of £5 5s. This prize to be available, at the discretion of the judges, for the best designed circuit.

H. P. R. Wireless, Ltd.—Prize to be offered, but particulars not yet supplied.

H. W. Sullivan.—A Sullivan standard laboratory heterodyne Wavemeter (sold at £35 nett). The following conditions are imposed :—(1) That not less than two components of the set used shall be of their manufacture; (2) that this prize be only awarded in the event of the signals actually being received.

It is felt that there must still be a large number of experimenters interested in the attempt to get these signals who have not yet registered their names with us. It is pointed out that the final details of the tests, together with any other special information on the subject, will be circulated by post only to those who have supplied their names and addresses in accordance with the regulations of the Competition set out in the last issue of *The Wireless World* (October 29th, pp. 482-483.)

Arrangements have been made for the transmission of special **calibration waves** on 200 metres at frequent intervals from after the appearance of this issue until the date of the commencement of the Transatlantic Tests. Particulars as to the dates and times of the transmission of these calibration waves will be circulated by post to those entering for the Competition.

DUTCH CONCERTS

BELOW we reprint a list of the total subscriptions received to date in response to the appeal for funds in support of the Dutch concerts :—

	£	s.	d.
The Wireless World	5	5	0
Sheffield and District Wireless Society	3	3	0
Mr. J. C. Walker	3	3	0
Wireless and Experimental Association	3	0	0
Mr. F. H. Berryman	2	2	0
Messrs. Burnham & Co.	2	2	0
J. R. C.	2	2	0
Mr. W. J. Crampton	2	2	0
Dr. Nesbitt Burns	1	1	0
Messrs. Arnold Mack & Co.	1	1	0
Mr. W. R Wade	1	1	0
Mr. W. S. Hubbard	1	1	0
"Billy Jones"	1	1	0
N. S. Rly., Electrical Dept. Wireless Soc.	1	1	0
Mr. N. K. Niness	1	1	0
Mr. B. E. Peal	1	1	0
Mr. W. C. Butler	1	0	0
Mr. H. E. Adshead	1	0	0
Captain R. B. Turbutt	1	0	0
Mr. J. A. A. Yeo	1	0	0
Mr. G. Smith Clarke	1	0	0
North Middlesex Wireless Club		10	6
Mr. S. R. Wright		10	6
Mr. P. R. Coursey		10	6
Mr. P. W. Harris		10	6
Mr. H. S. Pocock		10	6
Mr. J. R. Clay		10	6
Mr. H. J. Oram		10	6
Mr. E. Fowler Clark		10	0
Captain J. D. Adamson		10	0
Mr. H. Bevan Swift		10	0
Mr. C. L. Bell		10	0
Mr. J. P. Beeson		5	0
Mr. J. Wood		5	0
Mr. W. G. Boothroyd		5	0
Mr. E. J. Simmonds		5	0
Mr. D. M. Burn		5	0
Mr. H. S. Woolley		5	0
Mr. S. Evans		2	6
	£43	13	0

THE USE OF THE D.C. MAINS FOR "H.T." SUPPLY

By Robert Shute, *Student I.E.E.*

THE object of the following words is to demonstrate to the amateur, a suitable means of obtaining a H.T. supply for the 3-electrode valve in its many uses.

The 3-electrode valve, when used for transmission, requires a higher plate voltage than when it is used for reception. The various valves which are put on the market differ in their required plate voltages, and it is found that the higher the plate voltage used, the better the results obtained. A high voltage made up of dry cells is not altogether satisfactory, since they deteriorate whether in use or not. The paste containing the ammonium chloride tends to dry up, and increases the resistance of the cells. Also accumulators are too dear at present to be used as H.T.

A satisfactory method of obtaining the H.T. source for reception and transmission is the use of the D.C. mains, of which the voltage ranges from 100 to 250 volts. The voltage produced by a generator is not steady, that is, there are fluctuations produced in the armature (the same voltage not being produced in each coil), and also commutator ripples produced by "sparking" at the brushes. These noises would be heard in the telephones which would drown weak signals, and if high amplification were used, the noises would be objectionable.

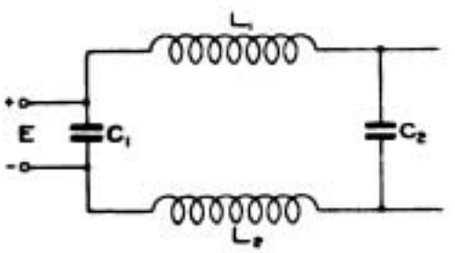


Fig 1.

A method of reducing these noises is shown in Fig. 1, where C_1 and E_2 are two condensers of about 2 mfds. each, and L_1 and L_2 are two chokes. Two induction coils of about ½ in. spark or even ignition coils would do (using their "secondaries") for the chokes L_1 and L_2. On some circuits where the noises are not great, one choke will be found to be sufficient. It would be advisable, however, to have a lamp connected in series with the coil L_1 at some point E, in case of an accidental short-circuit, the lamp used being one which would take little current in order to protect the fine winding of the choke.

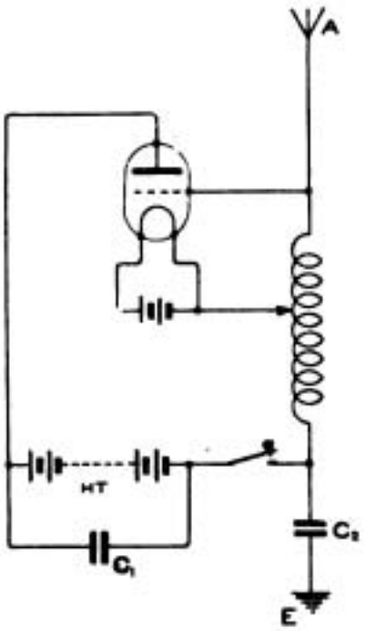


Fig 2.

In the case of using the mains for transmission, the chokes need not be used as the commutator, ripples, etc., do not affect transmission so much as reception, but they may be used in order to prevent high frequency oscillations disturbing the apparatus on other parts of the circuit. It is practically necessary to shunt the mains with a condenser of, say, 2 mfds., so that the H.F. current may pass by way of the condenser instead of employing the resistance of the cable to the generating station.

Now it happens in some districts that one wire is "earthed," the system usually being the 3-wire system. On one side of the road there will be a circuit from positive wire to earth, and on the other side, circuit from

"negative" to "earth." Those living on the side of the road in which the former applies to, may "earth" the negative wire as is necessary in receiving and transmitting circuits, but those living on the side of the road to which the latter applies, cannot "earth" the "negative" wire without short-circuiting the supply.

In Fig. 2, which shows a transmitting circuit, it will be noticed that the negative of the mains is connected to "earth" when the key is operated. A condenser placed in series, say at C_2, would not do for transmission, and some other arrangement must be adopted to insulate the negative wire from E.

A method of overcoming this, would be to use a balanced capacity which is suitable both for reception and transmission. For an instance, the balanced capacity method is used for transmission at Croydon aerodrome.

An insulated wire or a wire on insulators is placed underneath the aerial at about a few inches from the ground, to prevent leakage due to rain, etc. Fig. 3 shows a plan of the aerial and balancing wire. The wire is arranged as shown, and in the case of amateurs, it would be convenient to fix the wire to the fence around the garden, so as to be under the aerial. Now instead of connecting the negative wire to "earth,"

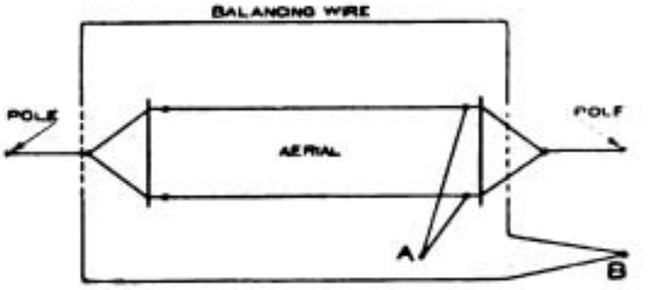


Fig. 3.

it is now connected to B, the balancing wire. It is advisable to have a lamp connected in series with the "negative" and balancing wire, in case the insulation of that wire should break down.

SOME METHODS OF RECORDING WIRELESS SIGNALS*

(*Continued from page* 480 *of the previous issue.*)

Mr. R. H. Klein.

I have been requested to say a few words with reference to a method of recording which I have used for some time. The apparatus was described in 1916 by Professors H. Abrahams and L. Bloch, who are, no doubt, in the front rank of wireless workers. Mr. Campbell Swinton, who has already used the apparatus at a previous lecture, was kind enough to show me the first diagrams. The apparatus is called by the inventors a very low frequency amplifier, and is described by them as follows.

When receiving signals by telephone in wireless telegraphy the amplifiers first amplify and detect the high frequency current. The detected current is still a variable current of audio frequency, corresponding either to the frequency of the spark transmission or to the heterodyne beat if continuous waves are received. Supposing that this audio frequency current which is generally listened to by the telephones is again rectified. This rectified current will then vary according to the rhythm of the dots and dashes of the Morse code of the transmitting station, according to the diagram given in Fig. 19.

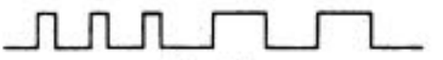


Fig. 19.

If transmission is made with a Morse

* Discussion before the Wireless Society of London, on Friday, September 30th, 1921.

key, these variations will not exceed an average of 10 per second. In other words, the final rectified current will not be a continuous current, but a kind of pulsating current comparable with an alternating current of very low frequency. It was therefore necessary to make an amplifier capable of amplifying alternating currents of very low frequency which could be placed after the ordinary amplifier and thereby enable one to obtain a still higher amplification. The chief property of this very low frequency amplifier is that it possesses a large time constant, which must reach several seconds if one wishes to amplify alternating currents having a frequency of the order of a second, as, for example, in the case of the Paris time signals, where dashes last over a second.

The amplifier is of the usual resistance capacity type. One obtains the necessary values of time constant by increasing sufficiently the value of the coupling capacities between the successive valves. These capacities vary between 0·1 to 2 microfarads. The grids are maintained, as usual, at the average potential of the negative pole of the filament battery through resistances of about 4 megohms, so that the capacity resistance coupling, which is connected to each of the grids, is charged or discharged with a time constant, which can be carried, if desired, up to several seconds. The apparatus will then amplify correctly any current, the variations of which are faster than this time constant.

Fig. 20 shows the diagram of a 5 stage amplifier having three valves in parallel with the last stage. The instrument itself is shown in Fig. 21. With this kind of amplifier it is necessary to use as high a voltage as possible—120-volt being the minimum which I have found to answer the requirements. The above-mentioned three valves are placed in parallel to enable one to obtain a fairly large output current, and this is especially useful when a Morse inker is to be worked directly from the amplifier. Where a syphon recorder is used, or even a more sensitive type of recorder, there is no need to have the last valves in parallel. The resistances can be either 60,000, 70,000 or 80,000 ohms. In the

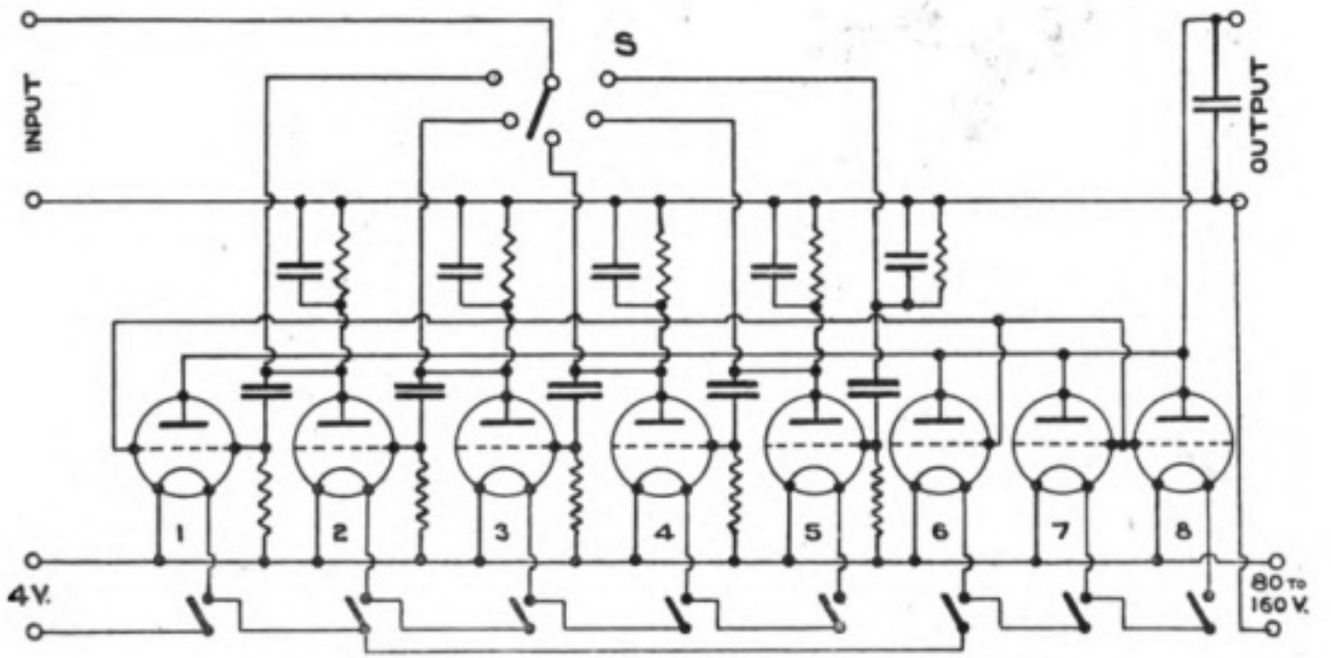


Fig. 20.

Circuit diagram of Amplifier.

case of the 5-stage amplifier it will be seen that, as it is desired to be able to place several valves in parallel with the last valve, it is necessary that the last amplification valve shall always be the same. In Fig. 20 the valve, No. 1, on the extreme left, is the last valve. If one wishes to use two amplification valves the current to be amplified will first enter No. 2 valve then No. 1 valve. If three valves are used, it is valve No. 3 which is the entrance valve. The current then goes to valve No. 2, and then to valve No. 1, etc. The switch S in the diagram enables one to use at will from 1 to 5 stages of amplification. The resistances are shunted by 0·25 microfarad condensers to stop the reaction of the very low frequency amplifier, to the amplifier which usually precedes it. One can plug a telephone in the low frequency side without reducing the current too much. On lighting up the valves, if a milliamperemeter is placed in series with the high tension current at the output side, one can see that the output current only reaches its maximum value after several seconds. Sometimes it will take from 4 to 5 seconds to enable the milliamperemeter to show the maximum amount of current, dependent on the degree of insulation of the condensers, valves, etc. The charge will then leak away after for a

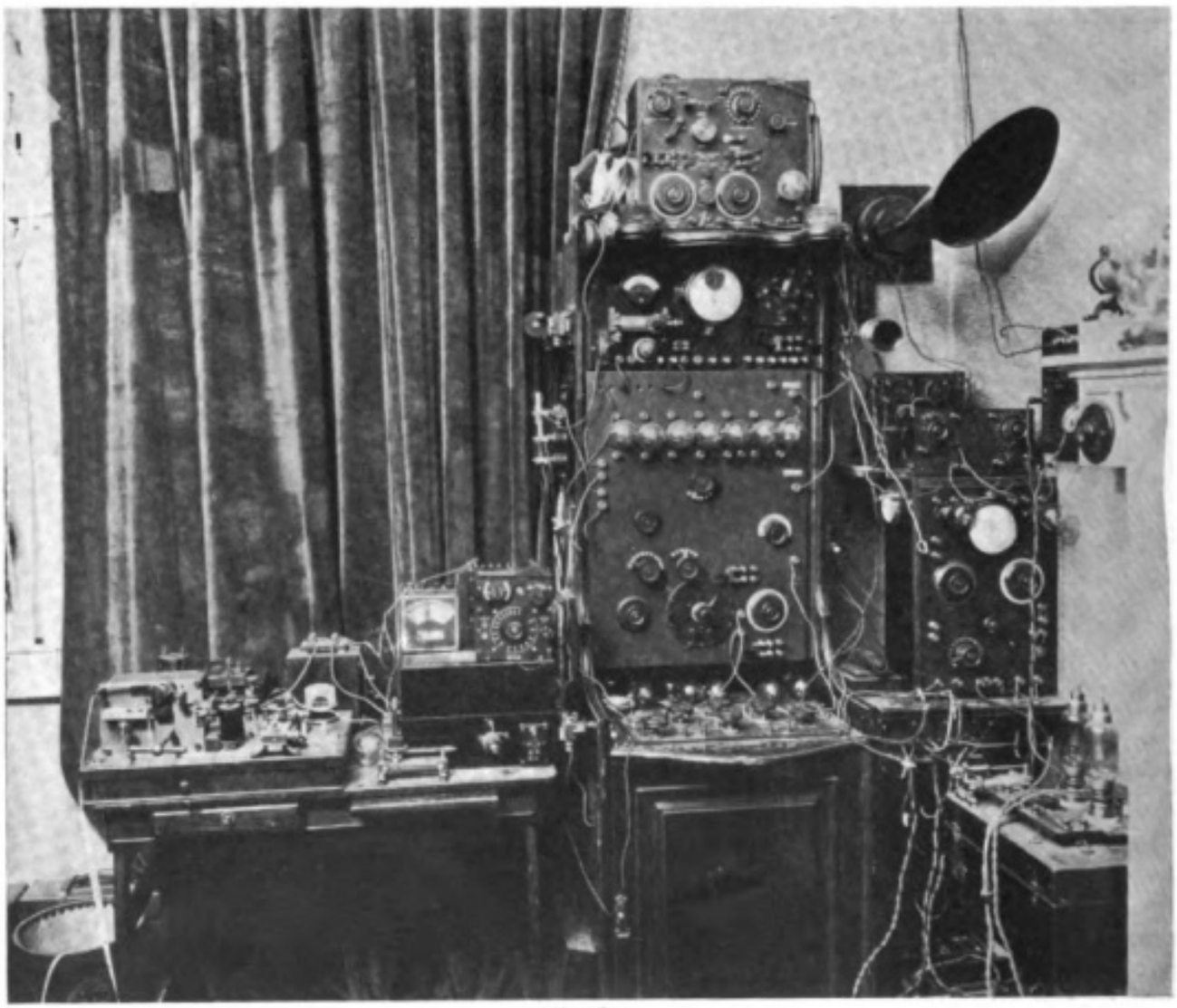


Fig. 21.

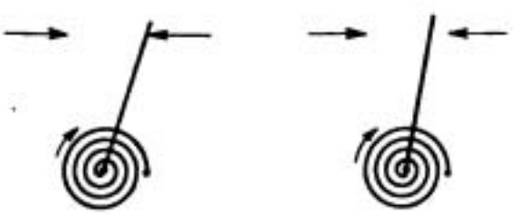
The Amplifier and Recording Apparatus.

longer or shorter time. The milliamperemeter will show the gradual leaking away of the charge. When the current is at its maximum any sudden change of potential at the input is followed at the output by sudden variation of the plate current, which then gradually returns to normal. If, therefore, the variations at the input side of the amplifier follow one another at a shorter period than the time constant, they will be correctly amplified. An increase of current at the input will result in either an increase or decrease of current at the output terminals, according to the number of amplification stages used. One can obtain an increase or decrease by reversing the connection between the ordinary low frequency amplifier and the very low frequency amplifier. If the variations of potential at the input are sufficiently large, the output current will oscillate between its maximum value (depending on the number of valves in parallel at the output and the H.T. voltage on the output plates), and zero which shows that the last grid has become sufficiently negative. The apparatus has then a threshold and a saturation current.

For ordinary wireless reception, a capacity of $\frac{1}{4}$ microfarad is sufficient for the inter-valve condensers. Where, however, it is necessary to hold the Morse inker down for a second, as in the case of recording time signals, it is better to use condensers of 2 microfarads capacity. The only disadvantage here is that the apparatus takes longer to get into working condition.

In order to obtain a satisfactory result signals require to be fairly strong, and I find that provided the milliamperemeter, which is placed in the plate circuit of the ordinary amplifier, shows variations of between 1 to 2 milliamperes on each signal, the recorder will work. In the ordinary way my milliamperemeter registers a steady current of 10 milliamperes and strong signals will show variations of between 3 and 4 milliamperes, weaker signals showing from 1 to 2. One advantage of the use of the very low frequency amplifier is that most atmospherics will not interfere.

For recording I use a Morse inker interposing a Weston moving coil relay between the very low frequency amplifier and the Morse inker. These instruments are all shown in Fig. 21, the Morse inker being on the left of the photograph. I can, of course, record direct from the very low frequency amplifier, but this method has some drawbacks. Originally I worked without a relay. With only two stages of amplification I obtain a steady current of about 5 milliamperes when no signals are coming in, and zero current when signals come in, with the result that the Morse inker will draw a black line for no signals and blanks for signals. I was, therefore, getting negative records showing the dots and dashes as short and long blanks. To get over this difficulty I could have reversed the magnet coils of the Morse inker as Mr. Campbell Swinton has just indicated, but I preferred to use a Weston moving coil relay. The use of this intermediate relay has another advantage, viz., the moving coil has a tongue oscillating between 2 contacts and held in position by a couple of hair springs, the tension of which can be increased or decreased in either direction (see diagram Fig. 22). I set the moving coil relay in the following manner.



(*a*) *Fig. 22* (*b*)

The tongue touches the right-hand contact and the full tension of the hair spring tends to make a very good contact, thereby closing the local circuit (Fig. 22a). On switching on the filament current and very low frequency amplifier, a steady current traverses the moving coil pulling it to the left, that is, away from the contact (Fig. 22b). The tension of the spring must not be too great, or it will stop this movement. I therefore

release the spring slightly until there is a microscopical gap between the tongue and the contact. The local circuit is now broken. When a signal comes in the steady current is brought to zero and the local circuit is again closed. I thereby ensure a very good contact as I do not depend on the amount of current supplied by the valve to do this. Of course, it is to be understood that for the very low frequency amplifier to act in this manner, signals must be strong, or the valve will not vary from zero or maximum according to whether a signal is or is not coming in. It is very important, in using a very low frequency amplifier to watch the filament temperature. There is a critical point which can be found by adjusting the resistance. In order to prevent pitting and burning of the contacts of the Weston moving coil relay, I use a fairly high resistance (300 ohms) in series with the local Morse inker circuit, and even after a year and a half working, the contacts are quite bright and show no sign of corrosion. Generally speaking, continuous wave signals record best even if comparatively weak in the telephones. Spark signals also record well, except ships, on account of the amount of traffic going on, which makes it impossible to get complete messages without being interfered with. I have recorded almost every station, except the American stations, *i.e.*, Warsaw, Stockholm, Prague, Vienna, Rome, Barcelona, etc. The great advantage I find in the use of this low frequency amplifier is the almost complete elimination of atmospherics. On the strips which I have taken I hardly ever find atmospherics, which is not quite the case with a syphon recorder. Specimens are shown in Fig. 23, one being from Poldhu and the other from Lyons.

The drawback with the Morse inker, however, is the inertia of its moving parts, but no doubt in the hands of a more clever mechanic than myself, this difficulty could be got over by lightening the parts and reducing friction to an absolute minimum.

I am surprised to find that so very few amateurs trouble to record and most of my friends who have seen my station imagine that the matter is an extremely difficult one. It is, as a matter of fact, quite a simple affair, and for those people who cannot read Morse at commercial speed it is quite a boon, if they desire to read the weather reports, etc. I may say that when the apparatus is working it requires no attention whatsoever, and will go on clicking merrily until the paper has given out.

Fig. 23. Specimens of Records of Lyons and Poldhu.

It is quite an easy matter to build a very low frequency amplifier, as I have described, following the circuit diagram given in Fig. 20. Mine was made in a very few hours and has worked satisfactorily ever since.

Fig. 24 shows a specimen of a tape record of Annapolis working to Berlin. This

record was taken by Professor Abrahams in Paris, using a very low frequency amplifier, and a moving recorder coil with a needle scratching on smoke-covered paper.

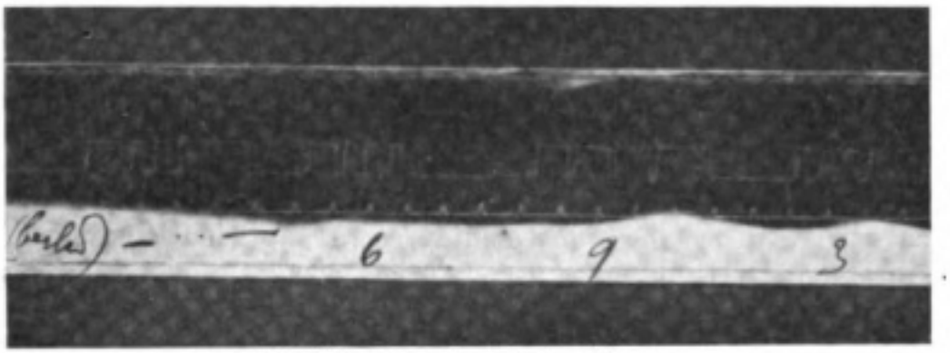


Fig. 24. Record on Smoky Paper.

Fig. 25 shows a specimen record taken on an oscillograph at high speed by the Société Française de T.S.F.

Mr. W. H. Shortt.

My experience has been chiefly with the recording of Paris time signals in connection with researches I have been doing with precision time keeping. Pre-war signals sent out at 11 p.m., one could very well wait up for, but summer time changed this to after midnight, which is rather late, and as the 10 o'clock signals in the morning are no use to me either, it was necessary to devise and construct some form of automatic recording apparatus. My first experiments were with apparatus of the Turner valve relay type, but I am afraid I was not altogether successful with these experiments, although I did find that good results could be obtained with a single valve when lighting the filament with alternating current. As those of you who have read Captain Turner's paper will know, his apparatus requires a high frequency amplifying valve followed by his valve relay followed by a Post Office or other quick acting relay. Personally, I find that I can record such powerful stations as Horsea and Carnarvon quite satisfactorily with one valve and a Post Office relay of the polarised type if the filament of that valve is lit by alternating current. I may possibly be able to give you details of the arrangement at some future date. I have not, however, followed up the experiments because I found that the Turner scheme favoured the reception of C.W. in preference to spark, and as the Paris time signals are spark there was great liability of getting your spark signals seriously interfered with by C.W. signals of a similar wavelength. First of all I tried a relay of the Weston type, but this instrument was very slow moving, and I found difficulty with the quenching of the oscillations which is

Fig. 25. Type of record obtainable with oscillograph at high speed.

required by the Turner scheme. A Post Office "B" type relay, rewound with No. 44 gauge, something like 20,000 turns, with a resistance of 7,000 ohms was then tried, and the result was more or less satisfactory. My present method involves single valve reception with grid leak and condenser, using the ordinary Post Office aerial. The plate current from this valve is passed into a two-stage low frequency amplifier, so that there are only three valves in all. The grid of the last valve is made strongly negative, so that the plate current is rectified, and as Mr. Carpenter has already stated in his description of his apparatus, its normal value is practically zero, and when the signals come in, it jumps to 0·5 milliampere

or more. The plate current is passed direct through the Post Office relay with the high resistance winding, and the relay is arranged to open the local circuit of a chronograph magnet on the armature of which is mounted a syphon pen which normally draws a straight line. The chronograph magnet therefore is de-energised by the signal and a record of the syphon recorder type is produced.

As regards the automatic part of recording, the valves are switched on by a relay operating from a clock at 11 p.m. G.M.T., and off again at 11.5 p.m. G.M.T., so that you pick up the 300 beats sent out by Paris. The clock also operates the relay from 11.49 to 11.54 when the exact times of the first and last beats sent out by Paris and repeated three times are picked up.

In order to avoid the use of a separate pen in recording the clock times and to avoid variations in lag, it is arranged for the clocks to send out wireless signals. These signals are received at the same time as the Paris signals and consequently operate the same pen, but there is no question of confusion.

During the Paris 300 beats the clock operating every half-minute records itself ten times, so that ten separate checks of its time are generally available and usually agree to one or two one-hundredths of a second. As regards the syphon recorders or undulators, the ink used is dosed with glycerine with the object of making it non-drying and preventing it from clogging the pen. In my case the syphon pen remains on the paper throughout the 24 hours working for two 5 minute periods only, and I have no trouble whatever, the pen being always ready for action. Glazed paper, of course, is necessary. As a confirmation of what Mr. Carpenter said about the reliability of this type of apparatus I can say that when I went away for my holidays I left the apparatus to act on its own, and I got six days records satisfactorily. The reason it stopped after that was because the paper had a trace of gum on one side of it and ceased to pull out.

Mr. W. Bowyer.

Our chief concern at the Royal Observatory, Greenwich, is the recording of time signals, and we have had experience with two recorders, one a very low-frequency recorder, as described by Mr. Campbell Swinton. With this method we found that the signals required very sensitive amplification to be received at all, and although C.W. stations could be taken, we never succeeded in recording an arc station satisfactorily. The other recorder that we had some experience with was an adaptation of the principle of the Turner relay; but the difficulty we found was the necessity for altering of adjustment for different signals. One can use the relay quite readily for spark signals, but rather a different sort of adjustment is required when C.W. or signals of different strength are coming in.

Our object in recording time signals at the Observatory is to do away with the personal equation of the observer.

Mr. H. E. H. Burbury (*communicated*).

Owing to short notice it is impossible to get together an entirely satisfactory description of the methods of recording used by Mr. H. T. Burbury. It is hoped that the following short description will be of interest to members and novel to some of them. It is regretted that no illustrations or diagrams are obtainable in so short a time; but samples of records obtained are shown in Fig. 27. One is Poldhu and the other is the message sent by the Eiffel Tower at the time the Creed automatic system was being demonstrated by Mr. Campbell-Swinton to a meeting of this Society.

It was considered that the main difficulty in any recording system lay in the relay: with any relay of the mechanical movement type there are three main troubles, two of which are intimately connected. The first, time lag, is inherent in any mechanical system suitable for recording, and becomes the more apparent with very fast signals.

The second and third troubles may be taken together, and are concerned with the relay and its contacts. However carefully

these may be made, and even if made of platinum or gold, owing to the exceedingly light pressure on them, the contact at "make" is a doubtful quantity; and also except with very careful design, including high resistance shunts and also capacity shunts, there is bound to be a certain amount of sparking, which, however minute it may appear, will be reproduced in the high-frequency wireless amplifier, and therefore will interfere in the accurate recording of signals.

It appeared, therefore, that the best relay would be a valve; the gain is twofold, no time lag and amplification of any input. The system used is due in the original instance to M. Marius Latour, who has designed an amplifier for use with very low frequency, of the order of the "key" speed of ordinary Morse transmission. This amplifier has the circuit of the ordinary resistance-capacity amplifier, but the coupling capacities are larger to work on the lower frequency. This works efficiently as a relay.

The currents supplied by the relay should pass to the recorder without any moving contact, and, in consequence, the coil of the actual recorder is included in the anode circuit of the relaying valves. The recorder itself consists of a coil, suspended in a magnetic field, on which coil is mounted a pen. The coil is wound to 4,000 ohms on the form of a Weston relay, and is suspended at each end by a steel wire of fine gauge, these two wires being used to supply the current to the coil. One of these wires is fixed at its end remote from the coil, and the end of the other also remote from the coil is fixed to a spindle, fixed longitudinally but which can be rotated by a worm adjustment, thus giving the "spring effect" necessary to overcome the steady anode current. Having got the coil into a state of equilibrium, it is obvious that any impulse given to the grid of the relay valves by a wireless signal will result in a change in the anode current of the relay valves, and so a change in the position of the pen

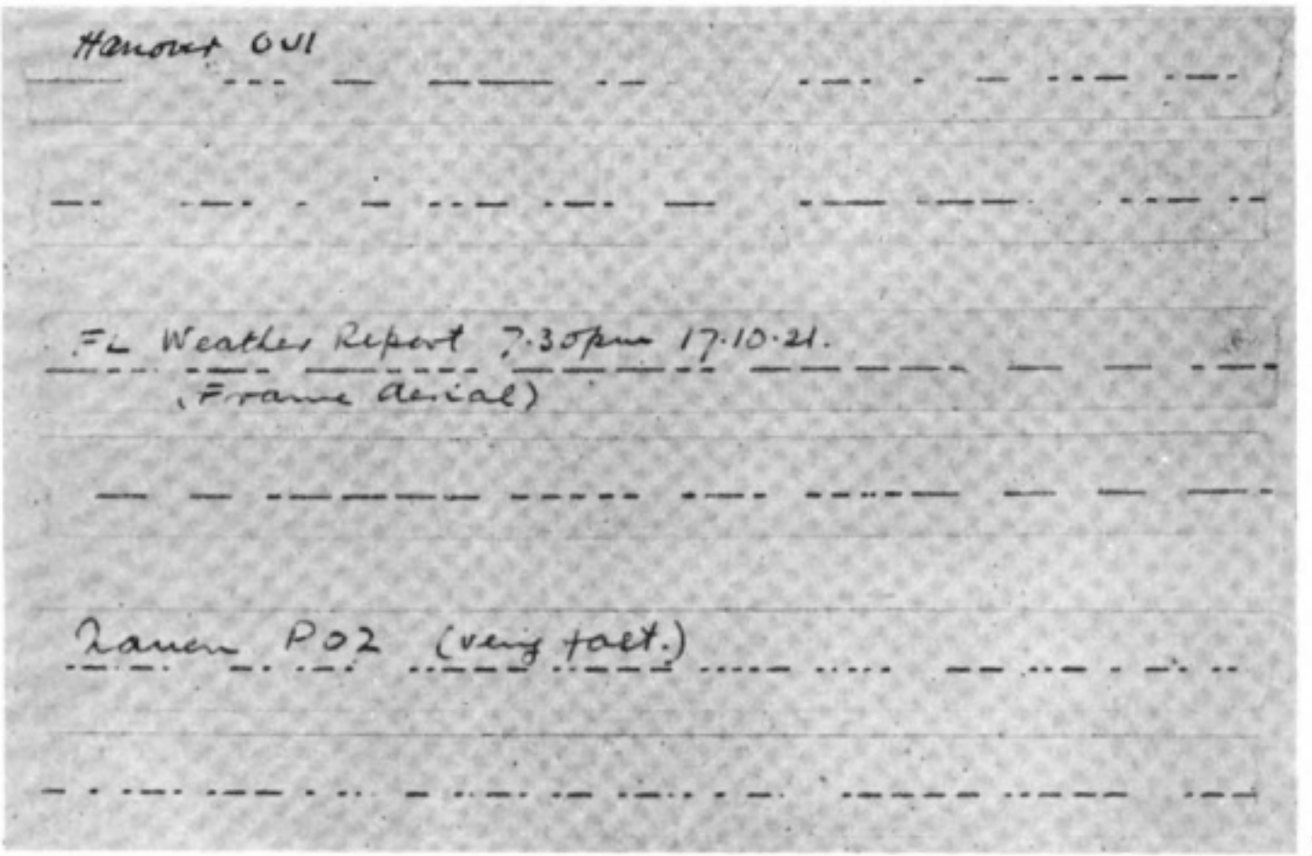


Fig. 27. Specimen Records.

The relay valves are ordinary "R" type receiving valves worked two in parallel; the coupling capacities are of the order 0·05 mfd. with 5 megohm leaks and 100,000 ohm. anode resistances. The best anode voltage appeared to be about 120. The field of the recorder is made by an electric magnet, for two reasons. The first, it is variable, and the second and the more important is that the movement of the pen may be reversed. Supposing a station is to be recorded that is using a compensating wave, as many high-power arc stations still use, there is a possibility that there may be jamming on its "marking" wave, but none on the spacing. If the set is tuned to the spacing wave and the magnetic field in the recorder be reversed, the pen will record the signals as "marking" signals, though the wireless receiver *per se* is receiving the "spacing" signals.

Owing to varying anode voltages, transformers are used between the amplifier and relay; but these are preferably of the 1/1 type. From the records passing round it will be seen that a very clear record is produced. The system will not record the very fast automatic transmission in use, but will record as fast as any hand transmission, or automatic of equivalent speed. Fifty words per minute should not be beyond its capacity. The sensitivity is purely dependant on the strength of the signals as received by ear. As received by high-frequency amplifier only, *R*4 should be easily recorded. The moving pen is a silver capillary tube, dipping in an inkwell on the opposite side of its point of connection to the coil to that on which the pen action is required.

The finer points cannot be demonstrated or explained without taking up much time and interfering with others who are also anxious to explain their particular methods. But it will give pleasure to give further details or to answer questions that may be put in writing through the Hon. Secretary of the Society.

Mr. J. H. Reeves.

I cut the Gordian knot by the simple process of buying a second-hand spring-driven dictaphone. (I have been told that one of the old type cylindrical phonographs can be picked up more cheaply).

Taking off the horn of a Brown loud speaker, a simple sleeve enables this to be fitted to the machine. Signals good enough to reproduce are obtained if the amplification is large enough, so that in the ordinary usage signals would be heard over a moderate-sized room; but to reproduce loudly, larger amplification is necessary.

To reproduce I tried several methods—

(*a*) the ordinary flexible tube of the dictaphone;

(*b*) the Brown unit, *in situ* for recording, with low resistance head telephones in series with it;

(*c*) a microphone on the dictaphone in series with head telephones, or the Brown in its normal condition;

(*d*) the microphone in series with a "valve to telephones" transformer, the high resistance circuit of the latter attached to the input side of a two-valve note amplifier.

Of these (*b*) was best for single reception, and (*d*) easily filled a large room when records of Press transmissions were taken.

From the amateurs' standpoint this system offers many advantages. Beyond its simplicity I give three :—

(1) There are none of those yards and yards of paper. Run "slow," a cylinder holds some 2,000 to 3,000 words; it can be cut clean easily, between twenty and thirty times, and a new cylinder costs very little.

(2) It offers by far the pleasantest method of getting over the drudgery of learning Morse. Run at its highest speed, the British or French Press is taken down for, say, ten minutes. Then one has the choice of reproducing "slow," or running at same speed as received. A foot-operated lever can stop the machine after every few words, or one can turn it back to cover the missed portion. The normal method of ear reception is followed in contrast to eye.

(3) The ability to reproduce speech and music is a great—perhaps the greatest—

incentive to tune up the reception circuit, with its H.F. and L.F. amplifiers, to work at minimum distortion.

Music is comparatively easy to reproduce. Only occasionally have I been able to get speech good enough to amplify, but I have reproduced, through the two-note amplifier, a number of consecutive words, audible and understandable over a large room.

Mr. A. F. Bartle.

I should like to describe to you the apparatus mentioned by Mr. Bowyer. It is so simple that any amateur can build it, and also it has the advantage of cheapness of construction. The apparatus employed is shown in Fig. 28, and is very much like the Turney relay. There is no quenching device—the other difference being the 9-volts positive applied to the grid of the valve. Mr. Turner says in his paper that a valve started in oscillation by a signal will not stop oscillating again. In this apparatus, however, a signal will cause oscillation, and oscillation will cease when the signal ceases. The increase or

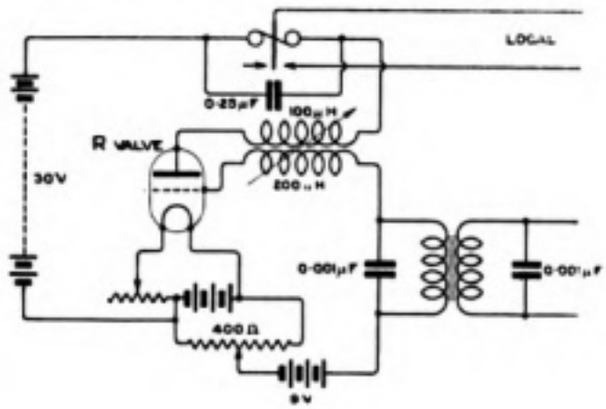


Fig. 28.

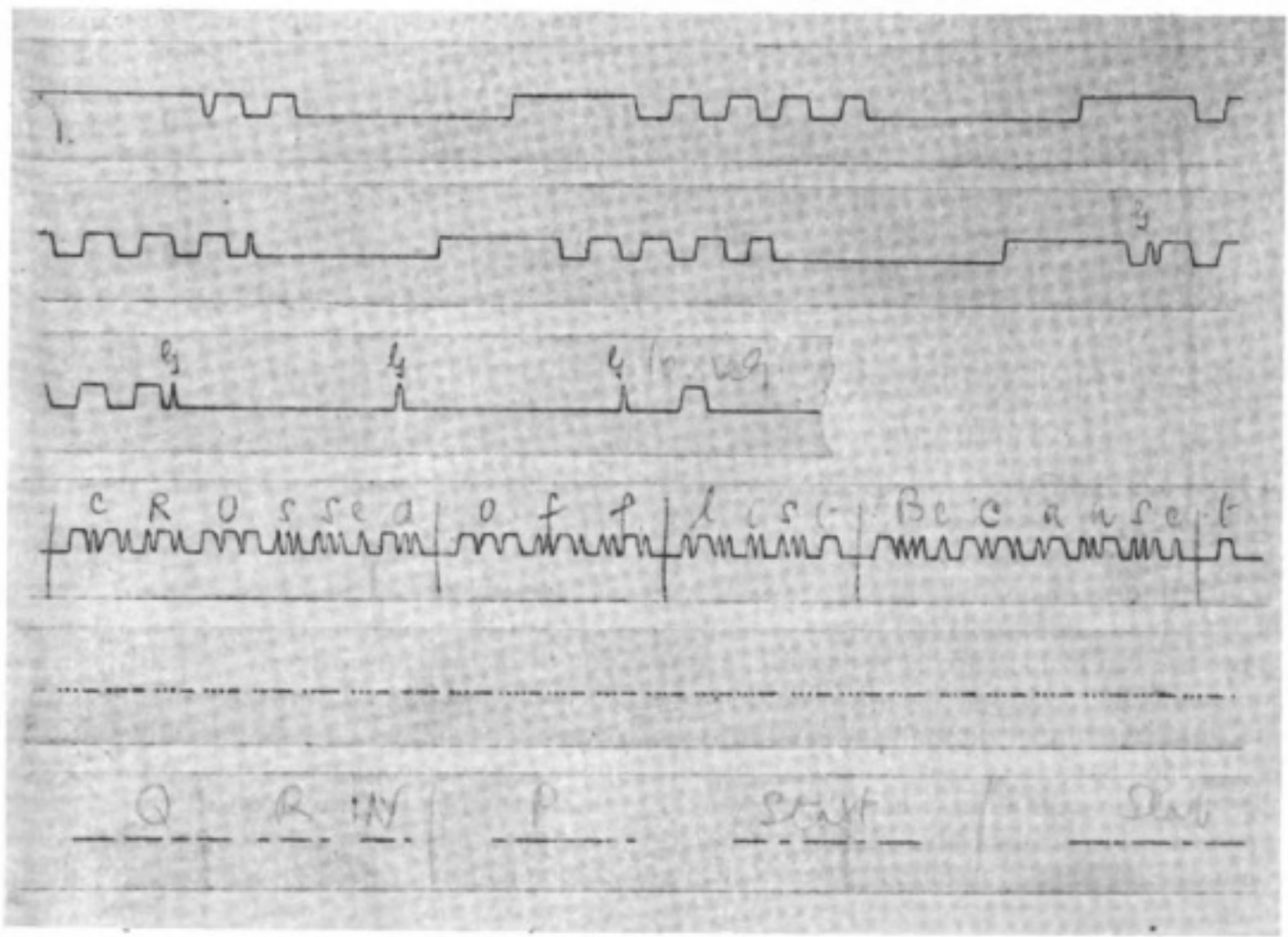


Fig. 29.
Specimen Records.

decrease in plate current may, with a moderately soft valve, be as much as 3 or 4 milliamperes. The valve is an "R" type, with high tension of 50-60 volts, the plate current operating either a Siemens 10,000 ohms relay or an ordinary P.O. relay B type. The values of most of the components of the circuit are shown in Fig. 28. A condenser of about ·25 microfarad should be placed across the coils of the relay. The method of adjusting the apparatus is as follows :— Tighten the coupling of the inductance and reactance ; place potentiometer in mid-point ; adjust filament resistance until valve oscillates, this will be heard in the telephones which may be placed across the input transformer primary ; finally, adjust potentiometer until signal is recorded. The advantage of this set is its peculiar sensitivity to the pitch of a note. It will invariably choose the lower of two notes heard in the telephones —thus rendering arc signals simple to record.

Specimens of tape records are shown in Fig. 29. The first three lines are a Paris time signal taken on my apparatus at the Observatory. The tape shows extra beats marked "G" ; these are the seconds of the Greenwich standard clock and, being sideral time, do not, of course, necessarily correspond with the Paris seconds.

The fourth line is a sample of Bordeaux. The fifth line is interesting as being automatic signals received from Chelmsford on a well-adjusted Morse inker with pen adjustment. The speed was about 80 words per minute. The last line is from Annapolis.

Mr. H. S. Pocock.

Mr. Campbell Swinton has already referred to recording conducted by himself which is, in the main, similar to that I wished to mention this evening. Mr. Campbell Swinton has referred to a method of receiving which he conducted with a crystal set before the introduction of valves, using a Brown relay with a syphon recorder. I was present at some experiments which were conducted by the late Mr. Tingey in about 1910, when he employed for the same purpose two Brown relays and a Siemen's relay, and was able to get Paris without any difficulty at all, and also, I believe, Norddeich. His object in the experiments was chiefly to synchronise clocks from the signals. The beats of his clock were registered on the same tape as that on which the signals were recorded.

HIGH FREQUENCY TRANSFORMER AMPLIFIER—III

(*Continued from page* 482 *of the previous issue.*)

AS stated in the previous instalment we intend to describe, first of all, how the approximate natural wavelength of individual transformers, and finally, now the natural wavelength and amplification of a complete amplifier can be measured. First, to measure the individual transformer wavelength, connect one winding of the transformer across the grid and the negative end of the filament of a valve and leave the other winding open. In the anode circuit of the valve connect the telephones and anode battery. Place a wavemeter, energised by a buzzer, near the transformer, and pick up the wavemeter signals.

Adjust the wavelength of the buzzer signals for a maximum sound in the telephones. Weaken the coupling between the transformer and wavemeter, and retune until there is no doubt about the tuning point. The wavelength indicated by the buzzer set is then approximately the natural wavelength of the transformer. When the transformer is mounted on the amplifier panel the wavelength may be slightly different owing to the capacity of the leads. If the transformer is for use on short waves with a reaction coil, the natural wavelength in a complete set will be considerably higher owing to the effect of the reaction. It is obvious that in making the above test it is essential that the leads to the transformer winding should be kept as short as possible to

minimise the capacity effect. The method is illustrated in Fig. 4. When the amplifier is completed the natural wavelength and the voltage amplification factor can be accurately measured in the following manner. For this test it is necessary to so arrange the connections (in a simple manner) that the signals to be detected may be put directly on to the grid of the rectifying valve, or on to the grid of the first H.F. mag. valve, and passed through all stages of amplification before being rectified.

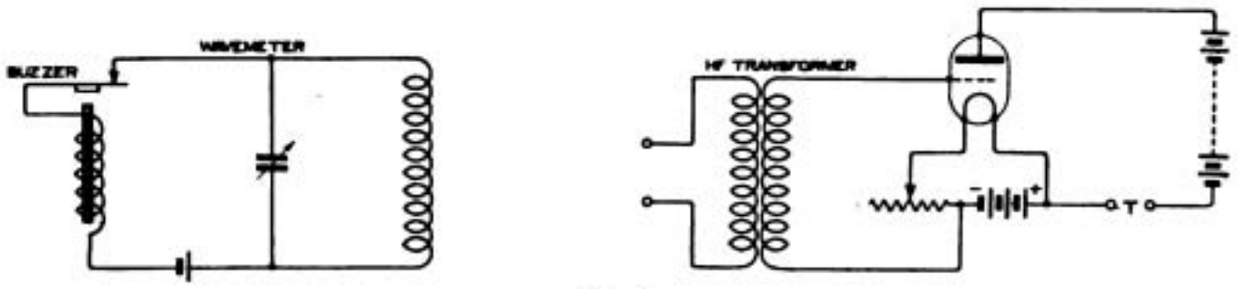


Fig. 4.

Arrange the circuit as shown in Fig. 5, placing it in such a position that the wavemeter may be moved in a straight line away from the amplifier tuning inductance. The approximate natural wavelength will be known from the transformer test or can be roughly determined by noting at which wavelength signals on the amplifier appear the strongest. Having done this, proceed in the following manner.

Set the wavemeter buzzing at a wavelength below the apparent natural value and accurately tune up the receiver, having the change over switch on the "Rectifier only" side. Move the buzzer set away from the tuning inductance until signals are only just audible. Note the distance d_1 in feet between the tuning inductance and the wavemeter inductance, and call that distance unity. Then change over the switch to full magnification, and, of course, signals should become strong again.

Move the buzzer set farther away from the tuning inductance until signals are again only just audible. Note the distance d_2 in feet between the two inductances, and express it in terms of unity. For example, if on "Rectifier only" the frames are 2 ft. apart 2 = unity, and on "Full Mag." they are 4 ft. apart, reduced to terms of unity this becomes 2. The voltage amplification is given by "cubing" the figure 2, *i.e.*, $2^3 = 8$. This gives a measure of the actual voltage amplification.

Change the wavelength by, say, 50 metres, and carry out the test again. Signals should be the same strength with "Rectifier only," but should be checked to make sure. This time the distance d_2 may be 5 ft., reduced to terms of unity it equals 2·5, which gives a voltage magnification of $2{\cdot}5^3 = 15{\cdot}6$.

This process should be repeated until a range of wavelengths on both sides of the natural wavelength has been covered. It is then possible to plot a curve of the wavelength

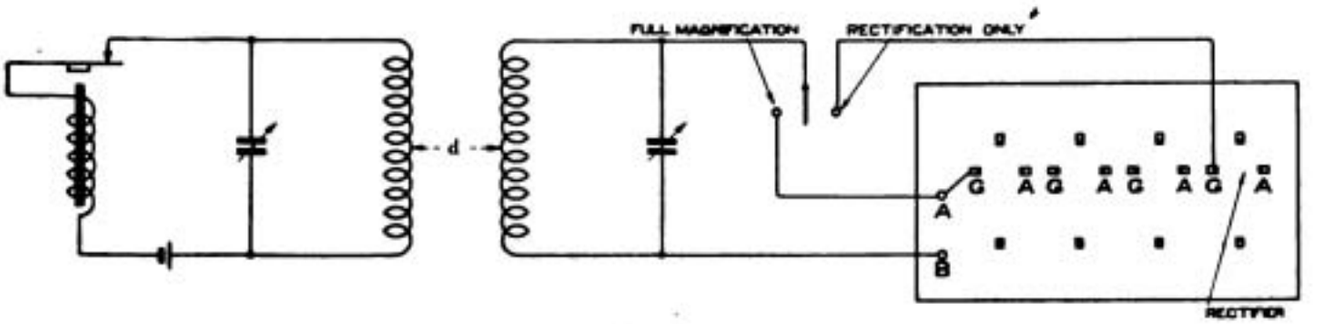


Fig. 5.

and voltage magnification so obtained. The curve will take the form of those shown in Figs. 2 and 3 in the October 15th issue.

The reason for "cubing" the distance d can be mathematically shown, but it is sufficient to say that the voltage induced from one coil into another varies as the cube of the distance between them, *i.e.*, if the distance is reduced by one-half the voltage induced from one coil to the other is increased by $2^3 = 8$, or if the distance between the coils is doubled only one-eighth of the voltage is induced from one coil into the other.

To indicate the true voltage amplification at each wavelength it is necessary to have the same voltage put on to the first grid at each wavelength. To do this the coupling should be maintained constant, but cannot be kept so owing to the necessity of getting just audible signals each time. Therefore the "cubing" of the distance d corrects for this.

These voltage amplification curves mean that at a given wavelength a signal voltage of 0·1 volt will give x times 0·1 volts voltage change on the detector grid, x being the voltage amplification value at that wavelength.

Constructional details will be fully dealt with in the next instalment.

(To be continued.)

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 in the exact form in which they are to appear and as concise 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 of unusual or special interest read before Societies.**

The Wireless Society of London.

The 40th General Meeting of the Society was held on Wednesday, October 26th, at 6 p.m., at the Institution of Electrical Engineers, the President, Major J. Erskine Murray in the chair. After the minutes of the previous meeting had been read by the Secretary and confirmed by the meeting, the **President** said:—

There are two Societies which have been affiliated, the Wandsworth Wireless Society and the Luton Wireless Society.

I am glad to be able to announce that we are at present in negotiation with an institution in this neighbourhood for the use of rooms as club-rooms. The rooms are very suitable indeed, as an aerial is already erected there. We hope that these negotiations will be successful, and that we shall be able to announce the result at the next meeting. (*Applause.*)

The question has been raised with regard to the interference caused by amateur stations to commercial stations, and particularly to the stations which control the area between Croydon and various other parts of the world. There is no doubt that a certain amount of interference has taken place, and, in a letter which has been received by the Secretary, there are one or two points which I should like to read to you:—

> "I can safely say that there is not an undue amount of interference considering the number of licences now granted. Most amateurs seem to stray off their wavelengths, but I am sure that this is true not only of amateurs, but I believe of others. As regards power, I should say that excessive power is used in a few cases."

We will have to be very careful about that. It is not easy to measure your power, and not very easy to "get there" on the power which you have, but at the same time, if we do not keep strictly to the power which is allowed there will be trouble. Another point is a suggestion that more attention should be paid to listening-in before and after transmission to find out whether any serious work is going on with which you are likely to interfere. That is a very strict rule with regard to all ordinary and commercial wireless procedure, and if we are to have the benefit of these licences, we must keep to the rule. That is to say, you cannot go blazing away for half an hour at a time without listening-in to see whether you are jamming somebody else who has more right than we have. I am told that in connection with aircraft work it is very often a very serious matter to be jammed for even a few minutes. It may be a matter of life and death if a man wishes to know where he can land, or if you wish to warn him of fog or give any other notice of that kind. You may want to take his bearing, and his bearing may be no use to him in a few minutes. I might remind you that it is very easy nowadays, with direction finding stations, to locate the offenders, and although the authorities do not want to be hard on anybody, there are cases of people transmitting for unnecessarily long periods without changing over to listen-in to find out if they are interfering, and there is very little doubt that these offenders will be located. I do not necessarily suggest that members of this Society are doing what they ought not to do, but there may be others, perhaps not members of this Society, and over whom we have no control, who occasionally do so.

There is one item of business. The ballot

figures for the hour of meeting show 123 votes for 6 p.m., and for 8 p.m., 98, so we presume that the Society would like to carry on at 6 p.m. This ballot was made by the members of the Society on cards through the post.

I will call upon Mr. Maurice Child to give his paper on "Selectivity in Wireless Transmission and Reception." (*For full report see next issue of The Wireless World.*)

At the close of the discussion the **President** said:—

I suggest that we show our thanks in the usual way to Mr. Maurice Child for a very interesting lecture and demonstration, and to Mr. Blake also for his contribution. (*Applause.*)

The following candidates who were put up for ballot have been duly elected as Members: Arthur Hardy, Leslie Dixon, William A. Johnson, Reginald J. Hibbert. The meeting adjourned at 7.45. p.m.

The West London Wireless and Experimental Association.

(*Affiliated with the Wireless Society of London.*)

Hon. Secretary, Horace W. Cotton, 19, Bushey Road, Harlington, Middlesex.

The Association is now holding its weekly meetings, and the Committee are pleased to see that the members are attending in force. At the meeting held on September 29th, our late Hon. Secretary, Mr. S. J. Tyrrell, tendered his resignation as he is going to the North in connection with his business. He will be greatly missed by one and all, and it is with much regret that we have to lose him. Mr. F. E. Studt, who for some long time has given much valuable assistance to the Association and its members, was, amid great applause, made an honorary member as a mark of appreciation of his untiring labours.

At the meeting held on October 6th, buzzer practice was taken advantage of by a great number present and many of the younger members are now becoming very proficient readers. Mr. R. Cole read a very interesting paper—"Spark Transmitters"—which he illustrated by diagrams drawn on the blackboard.

The meeting held on October 13th proved another great success; "listening in" on the Club's set revealed two or three concerts in progress, the music being exceptionally good.

Mr. W. F. Clarke read a paper—"Modern Warfare Signal Practice"—to which he added his personal experiences (assisted by some rough sketch maps he had prepared).

The Committee have now arranged special terms for juniors, and it is hoped to commence a series of instructional lectures for young members who show great enthusiasm, and are anxious to possess their own sets for the winter evenings.

Further, the Committee hope to make the Winter Session an interesting and fascinating one, already a series of prizes have been offered for the best paper read and the best piece of apparatus made by any of the members.

The Secretary will have much pleasure in answering any enquiries as to membership, fees, etc.

North Middlesex Wireless Club.

(*Affiliated with the Wireless Society of London.*)

Hon. Secretary, Mr. E. M. Savage, "Nithsdale," Eversley Park Road, N.21.

The 76th meeting of the North Middlesex Wireless Club was held at the Club's headquarters on October 19th, 1921. The chair was taken by the Secretary in the absence of the President, and after reading the minutes, he called on Mr. C. Midworth to read his paper on "Silent Wave Generators for Wireless Telephony."

Commencing by pointing out the disadvantages of using an ordinary generator for producing waves suitable for telephony, Mr. Midworth explained some of the ways in which the difficulties had been overcome. The chief difficulty, said Mr. Midworth, was the peak of the wave produced in the armature winding, causing what was known as a ripple in the generator current. Another trouble was due to sparking at the commutator; this could be largely overcome by careful adjustment of the brushes. The lecturer produced several armatures in various stages of completion, and showed how the winding was arranged, and explained how, by forming the slots at an angle to the pole pieces of the magnets the ripple was eliminated. Mr. Midworth had also a complete machine, together with a number of parts ready for assembly, which he passed round for inspection.

Turning to the practical side of the subject, he demonstrated by means of a small temporary aerial the effects produced by an ordinary generator, and then connected the silent wave generator so that the two could be compared. The transmitter used in these experiments was kindly loaned by Messrs. Burnham & Co., and the generators were by Messrs. Evershed & Vignoles, Ltd. Mr. Midworth acknowledged his indebtedness to both these firms for their kindness in lending the apparatus which went so far to make the lecture a success.

A vote of thanks was moved by the President, who had arrived later in the evening, and was heartily carried.

Manchester Wireless Society.

(*Affiliated with the Wireless Society of London.*)

September 15th.—A lecture was delivered before the Society by Mr. Oswald J. Carpenter, A.M.I.R.E., of the Marconi Scientific Instrument Co., Ltd. During a very interesting description of various modern valve circuits the lecturer touched upon the theory of the four-electrode valve, which has been patented by the Marconi Company, and very ably explained each separate function of this apparatus. Mr. Carpenter also described a few three-electrode valve circuits, especially with regard to the reception of telephony. He explained that it was inadvisable to have more than one stage of low frequency amplification when receiving telephony, as the most efficient receiver of speech was the one which was the most silent in action, and therefore the "iron noises" set up by the L.F. transformers were to be avoided. The ideal receiver was one employing one or more H.F. stages, and there were several methods used to obtain this class of amplification. The lecturer gave his views on the various types of transformers with their relative efficiency values, finally describing

in detail the principles employed in the Marconi type M.18A Tuner and Amplifying Detector. The excellent combination of this set was fully appreciated by those present, and the number of questions asked justified the interest taken in the lecture, and Mr. Carpenter tackled each question with zest. At the close of the discussion which followed, the Chairman, Mr. J. McKernan, proposed a hearty vote of thanks to Mr. Carpenter, and to the Marconi Scientific Instrument Co., for their kindness in providing such an interesting evening for the members, after which the members showed their appreciation in the usual manner.

Thursday, October 6th.—The first meeting of the Winter Session took place at the headquarters of the Society, The Albion Hotel, Piccadilly, Manchester, and in the absence of the President, Mr. J. Hollingworth, who is at present at the National Physical Laboratory, Teddington, Mr. Parkinson, Vice-President, read the opening address. He gave the membership to date as 110, and remarked that there was still a steady increase which he confidently expected would double the membership by the end of the session. Great assistance had been rendered by the transfer of the whole of the members of the Y.M.C.A. Wireless Society, numbering about twenty-five. It was hoped that further amalgamation would take place in the district so as to include the whole of the amateur enthusiasts in the one Society. Dealing with the syllabus, Mr. Parkinson pointed out the series of interesting lectures which had been prepared with a view to giving the members every facility for increasing their knowledge of wireless and kindred subjects. Others would probably be arranged and circulated in due course. A short discussion followed the address during which suggestions were made as to the best method of members co-operating in private experiments, and also how to enliven the amateur movement by co-operation with other societies. The Chairman, Mr. McKernan, contributed to the discussion in a very able and interesting description of how members could overcome their various difficulties by bringing them up for discussion at the meetings. The meeting was closed at 9.45 p.m.

Saturday, October 15th.—Commencing at 8 p.m., a very interesting talk on Wireless was conducted by Mr. W. W. Burnham and Commander Phillips, both of whom had made a special journey to Manchester in order to give the members of the Society the benefit of their wide experiences in the Science of Wireless as applied commercially. The discussion was augmented by the occasional reception of messages through the medium of a special five-valve demonstration set embodying all the latest principles of the Burndept Receiving equipments. The best reception of the evening was that of the Bar Lightship, Liverpool, whose speech was perfectly clear to all in the room, though parts were distorted owing to the inefficiency of the Society's aerial, a point which Commander Phillips severely criticised, and which was freely admitted by those responsible for the equipment of this part of the Society's apparatus. Questions were invited and the response was such as to keep our visitors busy until the Chairman, Mr. McKernan, was reluctantly compelled to mention the lateness of the hour, whereupon he expressed satisfaction at the way in which the members had followed the discourse, which proved that the principals had put their views before the meeting in a very expert manner. He proposed a hearty vote of thanks be passed to Mr. W. W. Burnham and Commander Phillips for their courtesy. This was seconded by the Vice-Chairman. Mr. J. C. A. Reid, who requested the members to show their appreciation in the usual manner, the latter responding liberally. Mr. W. W. Burnham and Commander Phillips thanked the members one and all for their kind reception, and expressed a hope that they would be able to visit the Manchester Wireless Society at some future date. The meeting was then declared closed.

Thursday, October 20th.—A smoking concert was held by the members at the headquarters of the Society, the programme being supplied entirely by the Society. A wireless telephone demonstration was given at various intervals during the evening, and both music and speech were received perfectly. The success of the concert was entirely due to Mr. and Mrs. Jones, Mr. and Mrs. Cottier and a few members of the Committee who arranged the wireless part of the programme.

The next meeting will be held at the Albion Hotel on Thursday, November 17th, on which date Mr. H. Powell Rees will give a lecture and demonstration of wireless.

Hon. Secretary, Mr. J. W. P. Evans, 7, Clitheroe Road, Longsight, Manchester.

Edinburgh and District Radio Society.

(Affiliated with the Wireless Society of London.)

The monthly general meeting of the above Society was held on October 5th, when the following proposal was made by the Hon. Secretary:—"That a committee should be formed to take in hand the design and arrange for the construction of an efficient receiver for use at the Society headquarters; that members should assist the Committee in whatever way they were best able to carry out this scheme." The Committee was duly appointed, and then left to make their own arrangements.

Copies of the winter programme were issued and a request made to those members who had not yet come forward to do so now, and assist in filling in the gaps.

Particular emphasis was laid on the Exhibition proposed for December 17th, the advantages of which are self-evident. The assistance of all members would be required in order to make this occasion the success which was desired.

Sundry other items of minor importance were then discussed, and the business meeting was closed.

On Wednesday, October 12th, Mr. Crichton delivered his address, and introduced "Force" in its particular connection with wireless telegraphy; giving a very full and interesting description of the various forces which are available, although as yet unused, in the natural physical condition of the earth. He also dealt on the possibility of rays or wave emanations from the human body; including the "eye ray" discovered by Dr. Russ of London, and a peculiar case in his own experience when photographic negatives had been "fogged"

by being brought into close proximity with a human body. The "fogged" portion of the negative showing that light rays had penetrated to it through the container or plate-holder.

The Hon. Secretary then proposed a hearty vote of thanks to Mr. Crichton, and the meeting was adjourned.

On Wednesday, October 19th, a meeting of the above Society was held, the Vice-President in the chair.

On this occasion Mr. J. G. W. Thompson favoured us with a lecture on "Inductances." He covered his subject in a very full and comprehensive manner, dealing firstly with the problem which usually besets the beginner who finds difficulty in chosing the type of coil likely to be most useful.

At the present time a great feature with most people is to have a receiver which is compact, easily operated and efficient.

In order to gain this end he gave a minute description of the various methods which have been employed in the construction of tuning inductances, showing wherein lay their advantages and failings.

He explained fully the meaning of "self-capacity" and its detrimental effect on voltage operated devices such as a valve or crystal.

Among others he described and compared the "Honeycomb," "Duolateral" and "Lattice" coils, illustrating by diagrams how the self capacity is kept comparatively low, and concluded his address by giving a few experiences of unexpected results which beset the experimenter without having any obvious reason for their behaviour.

After discussion on a few minor points the Vice-President proposed a hearty vote of thanks (which was duly accorded), and read a letter from the Halifax Wireless Club asking our co-operation in a proposal to be made, to follow the lead given by America in broadcasting news by wireless telephone from the various air stations. It was unanimously agreed to give all possible assistance towards furthering this suggestion, although doubts were entertained as to the manner in which the proposal would be accepted by the "powers that be."

The meeting was then adjourned and members had the opportunity of examining a beautiful piece of work, in the form of a long and short wave set made by Mr. D. G. Watson, and hearing signals from it on the Society's aerial.

Wireless and Experimental Association.

At the meeting of the Association in the Central Hall, Peckham, on Wednesday, October 12th, 1921, Mr. Kloots gave a most interesting and practical lecture on the design of alternating current transformers. Now that A.C. transformed voltages play such an important part in wireless practice the lecture was perfectly timed. With the aid of vector diagrams the matter was made so clear that the least technically instructed were able to follow the reasoning almost without effort. Weagent's Group Frequency Tuner was also described and discussed.

A meeting was held at the Central Hall, Peckham, on October 19th. Mr. Nicholson, for the benefit more particularly of the junior members, described, with the aid of diagrams, the flow of negative electrons across the spaces inside a thermionic valve. An analogy was drawn between these conditions and those governing the emission of hungry scholars from a L.C.C. school at dinner time. The youngsters streamed from the doorway and across the playground, diverging till they encountered the grid erected at the opening to the street, which grid governed the rate at which they could approach their dinners waiting upon the plate at home. Their negative or hungry state was soon rendered positive, and the plate no longer had any attraction for them, and in due course they completed their circuit back to the school door again.

It was resolved to assist the scheme put forward by the Halifax Wireless Club to try to get a telephonic "broadcast" of news from the Air Ministry stations.

Hon. Secretary, Mr. Geo. Sutton, A.M.I.E.E., 18, Melford Road, S.E.22.

Birmingham Experimental Wireless Club.
(Affiliated with the Wireless Society of London.)

Hon. Secretary, Mr. Frank S. Adams, 110, Ivor Road, Sparkhill, Birmingham.

An ordinary meeting was held at Digbeth Institute on Friday, September 30th, the President (Mr. A. L. Lancaster) in the chair.

Mr. R. G. Turner (Assistant Hon. Secretary) read the minutes of the last meeting, which were confirmed.

Mr. Lancaster read a letter from the Principal of the Birmingham Municipal Technical School, confirming his offer of accommodation for the Club Exhibition at the Technical School.

He then proposed a general discussion, which was opened by Mr. A. T. Headley. Mr Headley brought forward a three-valve audio-frequency amplifier, with which he was experiencing some trouble. His experiences with this instrument provoked a very interesting and informative discussion.

Mr. Towers mentioned some experiences with the new "R.M.R." valves, a discussion on which was followed by some opinions on the relative advantages of different types of aerials.

Mr. C. Morris described some methods of erecting aerial masts, illustrating his remarks with blackboard sketches.

Owing to the value of these general discussions, and their popularity with members, it has been decided that alternate meetings shall, in future, be devoted to discussions of this kind.

At a meeting of the Club, held on Friday, October 14th, at Digbeth Institute, several members exhibited and described various instruments which they were using. Mr. Towers showed an interesting portable two-valve receiver of his own design and construction. Mr. Harvey Marston exhibited and described a resistance-amplifier of ingenious construction. Mr. F. S. Adams showed a valve-panel designed for short-wave reception, and Mr. A. T. Headley demonstrated his L.F. amplifier, with which he was now obtaining good results. Mr. A. Woodcock showed a neat set with which five different combinations of valves could be obtained.

The advance prospectus of the Exhibition in

January next is now ready, and the Hon. Secretary will be pleased to receive applications for space.

The Gloucester Wireless and Scientific Society.

(Affiliated with the Wireless Society of London.)

Hon. Secretary, Mr. J. J. Pittman, 1, Jersey Road, Gloucester.

A meeting of the above Society was held on October 13th at the headquarters. The President brought a four-valve amplifier along, and with it some good signals were received from all the usual European stations, and also some local telephony was heard. A programme has been arranged fortnightly on the second and fourth Thursdays of each month, and those interested in wireless will be welcomed at the Rich's School Science Laboratory at 7 p.m. on any of these dates.

Blackpool and Fylde Wireless Society.

(Affiliated with the Wireless Society of London.)

The above Society intend to hold a series of social evenings, etc, during the coming winter months, with the proceeds from which they propose to purchase a new complete up-to-date wireless instrument set for the benefit of their seventy odd members.

The first of the series, taking the form of a whist drive, was held on September 29th last, and was a complete success. This was especially gratifying, inasmuch as this event was quite in the nature of a hitherto untried experiment.

The Society's President, Colonel P. Warren, C.M.G., C.B.E., Postmaster of Blackpool, honoured the assembly by presenting the prizes which had been given free gratis by enthusiastic supporters (in the district) of the fascinating study of wireless telegraphy and telephony.

As an interlude and a variation, a short wireless demonstration with the Society's own instruments was given during the evening.

The apparatus consisted of a portable field set as used in the recent Blackpool Tower experiment, containing a four-valve amplifier coupled to a loud speaker which made the signals audible all over the room. Excellent results were obtained, particularly in view of the temporary nature of the short single wire aerial outside

By invitation of the officers of the Society, a number of people remained behind personally to inspect the apparatus, and enjoy for the first time the novelty of listening in through wireless telephones.

It was a most enjoyable event, and those who were responsible have much to congratulate themselves upon

The second event of the series will take place on November 3rd next, and will also be a whist drive, the third being after the Society's annual general meeting, which is to be held at their headquarters, The Café Waldorf, Church Street, Blackpool, on November 24th next.

Hon. Secretary, C. Sheffield Doeg, The Poplars, 6, Seventh Avenue, South Shore, Blackpool, to whom all communications should be sent.

The Willesden Wireless Society.

(Affiliated with the Wireless Society of London.)

We are pleased to announce that, following upon negotiations with the Wireless Society of London, our affiliation with that Society is now an established fact.

On September 12th, a paper was read by the Hon. Secretary on behalf of Mr. C. S. Dunham, entitled "Oscillatory Circuits." This lecture was the first of our series of instructive lectures, and made a strong appeal to the members present. Although the series is primarily intended to instruct our "beginners," we find the more experienced of our members are also taking advantage of them to rub up their own knowledge, judging by the hot discussions evoked!

This lecture was continued on the following Tuesday by Mr. Dunham, as Mr. Wyatt, who was to have lectured, was unable to be present. A vote of thanks for the two lectures was passed.

Following upon a suggestion made by one of the Committee, a debate was held on September 26th, entitled "H.F. *versus* L.F. Amplification."

Mr. Dunham concluded the evening with a demonstration of a Marconi resistance capacity coupled amplifier connected to L.F. note magnifier, using a B valve.

On October 4th and 11th, our Chairman, Mr. W. E. Corsham, lectured on "The Theory of the Thermionic Valve." He treated the subject in a very elementary manner for the benefit of those present who are just commencing to study the valve. As before stated, however, the experienced members were well on the track, and the lecturer had a lively time when the period for discussion commenced. In spite of the fact that one gentleman wanted to know the precise cause of howling, the meeting passed off peacefully enough.

All particulars can be obtained by post from the Hon. Secretary, Mr. F. A. Tuck, 87, Mayo Road, Willesden, N.W.10.

Sheffield and District Wireless Society.

(Affiliated with the Wireless Society of London.)

The second annual general meeting was held at the club-room, St. George's Square, on Friday evening, October 14th, some sixty members being present.

This was the opening meeting of the new session, and after a report of the past year's work by the Secretary, who also outlined the syllabus for the present year, the Hon. Treasurer submitted the balance sheet, showing that the finances of the Society are in a healthy condition, the sum of £47 13s. 10d. being carried forward to the present financial year, which commenced on October 1st, 1921.

Fourteen lectures will be given during the new session, in addition to twelve elementary classes, a "Wireless" Dance, an Exhibition and Sale of Apparatus and practical demonstrations with the Society's apparatus. The first lecture on "Comparative Amplication" was given on Friday, October 21st, by Mr. C. Handford.

The following officers were elected:—President, Mr. E. H. Crapper, M.Eng., M.I.E.E.; Past President, Mr. H. E. Yerbury, M.Inst. C.E.,

M.I.E.E.; *Hon. Secretary, Mr. Leonard H. Crowther, A.M.I.E.E.; *Hon. Treasurer, Mr. C. H. Hainsworth, A.M.I.E.E.; Chairman of Educational Committee, Mr. J. Patrick, A.M.I.E.E.; *Chairman of Technical Committee, Mr. W. Burnet; *Hon. Auditors, Messrs. W. A. Grinston and R. G. Ward; Hon. Registrar, Mr. F. W. Stapley; Hon. Librarian, Mr. L. E. B. Sandford-Thompson.

The question of sending a donation towards the expenses of the Dutch telephony transmissions was discussed, and it was decided to forward a cheque for £3 3s. from the Society's funds.

The meeting terminated with a vote of thanks to Prof. Ripper and the Sheffield University authorities for the use of the club-room.

Glevum (Gloucester) Radio and Scientific Society.

(Affiliated with the Wireless Society of London.)

The First Annual Meeting of the Gloucester Radio and Scientific Society was held at the new headquarters, "The Ram" (Y.M.C.A.), Gloucester, when the officers for the coming season were elected. An enjoyable evening was spent, and arrangements made for the erection of a suitable aerial. The matter of apparatus and permanent receiving set was freely discussed, and the Secretary (Mr. J. Mayall) informed the meeting that he had great pleasure in stating that the "last word" in an exhibition wireless set had been kindly promised to him for the Society by Messrs. Burnham, of London. This was received with enthusiasm, and the Secretary congratulated on his efforts in this direction. A most interesting programme is being compiled for the coming season with the help of the Gloucestershire Engineering Society.

The Radio Scientific Society.

(Affiliated with the Wireless Society of London.)

The Annual General Meeting of this Society was held on Wednesday, October 19th, 1921.

The Secretary's report, reviewing the work of the past session, included a stirring appeal to the members to show greater enthusiasm in the life of the Society, and to endeavour to overcome the all too frequent reluctance to give papers before the Society. It is earnestly hoped this appeal will produce the desired effect.

The Treasurer's report shows a small balance in hand on the year's working.

The following officers were elected for the session 1921-22:—Chairman, Mr. G. Boullen; Secretary, Mr. H D. Whitehouse; Treasurer, Mr. J. R. Halliwell, M.I.E.E.; Business Committee, Messrs. Bennett, Edwards, Grocott, Holmes, Lomas, and Megson, with the Chairman, Secretary and Treasurer as members *ex officio*; Press Secretary, Mr. L. H. Lomas, B.Sc., F.R.S.: Technical Committee, Messrs. Grocott, Halliwell and Megson.

The Society's meeting place is at the City School of Wireless, 61, High Street, Manchester.

Further particulars as to membership, lectures, etc., may be had from the Secretary, Mr. H. D. Whitehouse, 61, High Street, Manchester.

*Re-elected.

Plymouth Wireless Society and Three Towns Wireless Club.

A general meeting of the members of the Plymouth Wireless Society and the Three Towns Wireless Club was held on Wednesday, October 19th, at Plymouth Technical College to consider the question of the amalgamation of the wireless interests of the town and the formation of one joint wireless club. Mr. Nicholson, representing the Plymouth Wireless Society, M. Monk, Chairman of the local section of the Junior Institute of Engineers, and Mr. Lock, Hon. Secretary of the Three Towns Wireless Club, gave their views on the subject, and as a result it was unanimously decided to form a new society incorporating the members of the two former clubs. An election of officers for the new society, then took place, with the following result:—President, W. S. Templeton, Esq., M.A., B.Sc.; Chairman, Mr. Mitchell; Vice-Chairman, Mr. S. G. Monk, B.Sc., M.J.I.E.; Hon. Secretary, Mr. G. H. Lock, A.M.J.I.E.; Treasurer, Mr. C. E. Harris; Librarian, Mr. Carter; Local Representative, Mr. Currah; Committee, Messrs. Skinner, Lewarn, Voss, Bodle, Graves.

At the committee meeting which followed, the question of the title of the new society was discussed, and it was decided that the aim and scope of the Club were best described by the title Plymouth Wireless and Scientific Society.

Particulars of membership and other necessary information will be furnished on application to the Hon. Secretary, Mr. G. H. Lock, 9, Ryder Road, Stoke, Devonport.

Hounslow and District Wireless Society.

Hon. Secretary, Mr. A. J. Rolfe, 20, Standard Road, Hounslow.

On Thursday, September 15th, Mr. F. O. Read paid a visit to this Club and gave a lecture on various windings for long and short wave tuners; he also returned the Club set, which he was good enough to overhaul and add one or two things. On Thursday, October 6th, we again had the pleasure of a visit from Mr. Read; this time he brought one of Messrs. Burnham's Ultra III's with three-valve amplifier and loud speaker. After the usual Club business, the Chairman called on Mr. Reid for his demonstration. He fully explained to the members present the working of the Ultra III, and afterwards tried this set on the Club aerial, and very good signals were received, including some telephony from Brentford. Next week we hope to have a demonstration with a B.T.H. Portable; Messrs. Burnham have promised to loan one. The usual question now arises, if there are any gentlemen interested in the wireless game, please trot along any Thursday evening, to the Mission Hall, Pears Road, Hounslow, or communicate with Mr. A. J. Rolfe, Hon. Secretary, 20, Standard Road, Hounslow.

Cambridge and District Wireless Society.

A meeting of the above Society was held on Wednesday, October 12th, at 7.30 p.m., in the lecture room of the Photographic Society, Ram Yard. Mr. Farren in the chair called upon Mr. Butterfield to read his paper on "Coil Winding." Mr. Butterfield dealt in detail with the various methods of

winding coils from the old-fashioned single layer tubular coils to the modern slab inductances, basket coils, etc. At the close of the lecture a hearty vote of thanks was passed to the lecturer, and the meeting declared informal. Mr. Culpan demonstrated a three-valve set with excellent results.

The next meeting of the Society is to be held on Wednesday, October 26th, in the lecture room of the Photographic Society at 7.30 p.m. Mr. Diver will read a paper on his experiences as electrician in charge of a waggon wireless set in East Africa during the war.

Kensington Wireless Society.

Headquarters, 2, Penywern Road, Earl's Court.

At the last meeting the resignation of the Hon. Secretary was accepted. The Hon. Treasurer, Mr. J. H. Reeves, M.B.E., consented to act as Secretary (*pro tem.*). All enquiries should be addressed as above.

Recent lectures have been :—"External Heterodyne Reception" (with demonstration), by Mr. Maurice Child; "The Marconi Four-Electrode Valve," by the President, Capt. H. de A. Donisthorpe; "The Society's Wavemeter," by Mr. Maurice Child; "Switch Gear for L.F. Amplifiers," by Mr. J. H. Reeves.

A competition was arranged for single valve reception at an unknown wavelength between 600 and 1,000 metres, the only items provided being batteries, H.T. and L.T. and a condenser. The transmission was by means of a buzzing wavemeter placed in another room. Only two competitors took part, and the reception by both was remarkably good. It was resolved to hold a similar competition later on in the season.

The N. S. Railway Electrical Department Wireless Society.

The Society held their first annual meeting on Tuesday, October 5th, in the works messroom, which has been put at the disposal of the Club for meeting purposes by our President, Mr. A. F. Rock, Telegraph Superintendent and Engineer. The Club are looking forward to a very interesting and enjoyable winter, and hope to soon have an up-to-date receiving and transmitting station.

During the past summer the Club have been experimenting with several pieces of apparatus, including one of Gordon Castagnoli's Hague sets.

This is a beautifully constructed set, and although at present we have not received the concert on the set, several of our members have received telephony on the same.

The Club are also indebted to Mr. A. H. Wilson, of the Stoke-on-Trent Society, for the gift of a single valve panel and inductance.

Mr. A. F. Rock, M.I.E.E., was again elected President, and Mr. F. T. Scragg, A.M.I.E.E., to the Vice-Presidency.

The balance sheet showed a substantial amount in hand, and the prospects for the coming winter look bright.

Mr. P. E. Banks, 87, Spencer Road, Shelton, Stoke-on-Trent, was again elected Secretary and Treasurer.

Aldershot and District Wireless Society.

A general meeting of the Aldershot and District Wireless Society was held on Monday, October 10th, at their headquarters, Queen's Avenue, Aldershot.

The occasion was the opening night of the autumn and winter session, and was well attended.

A demonstration of wireless telephony, which had been arranged by Lieut. Tate, R.A.F., was given during the evening. Listening to the spoken messages and gramophone music, one realised how very successfully the Royal Air Force had developed this branch of wireless for their particular needs.

After a vote of thanks had been passed to Lieut. Tate, the syllabus of the classes, for which students had been enrolled earlier in the evening, was read out and explained.

The classes are held on Mondays and Fridays, and are divided into three parts. The first hour, from 7 to 8 o'clock, is devoted to Morse Code practice, the second hour to a lecture and then practical work follows.

The lecturers are Mr. R. A. Watson-Watt, Capt. D. A. Butler and Mr. J. F. Herd, who each deals with a particular section of wireless, on alternate evenings, the lectures forming progressive steps of a very comprehensive course. A special feature will be a "tutorial class," which is to be held on alternate Friday evenings. No lecture will be given on these evenings, but questions on previous work will be invited and answered at length.

Students can still be enrolled, and anyone desirous of joining should attend before 8 o'clock on any Monday or Friday evening.

Oldham Lyceum Wireless Society.

A new wireless club has been formed during the last week or so under the name of the "Oldham Lyceum Wireless Society," with headquarters at the Oldham Lyceum. The membership at present is only twenty-six, but we are receiving good support and hope to enrol more when the Society has been brought to the notice of the Oldham public. Even at this early stage an interesting programme is being prepared for the next year, and the Society has every hope of a successful career.

The Cricklewood and Brondesbury Radio Club.

This Club has now been formed, and meets at 202, West End Lane, West Hampstead, N.W.2, every Monday evening at 8 o'clock p.m. Intending members should apply there at the stated time, or write to Secretary (*pro tem.*), C. N. Green, 213, Fordwych Road, Cricklewood, N.W.2, who will be pleased to forward particulars.

NOTE.—A number of Club Reports are unavoidably held over.

THE WIRELESS SOCIETY OF LONDON.

The next meeting of the Wireless Society of London will be held on Wednesday, November 23rd, at the Institution of Electrical Engineers, Victoria Embankment, at 6 p.m. A paper describing a new type of receiving apparatus will be read by Mr. Leslie Miller. Tea will be served at 5.30 p.m.

GENERAL CONSIDERATIONS FOR BEGINNERS

SOME HELPFUL ADVICE

THE wireless amateur who has taken up the study of his hobby, either by attending classes or by reading some of the excellent books published on the theory of the subject, finds himself in a different situation when he commences to apply his theoretical knowledge to the actual construction and working of a station. Design of apparatus and the lay-out of a station, in wireless work, is the critical factor which will decide whether the apparatus shall operate with maximum efficiency or result in complete failure. For example, in a receiving circuit, an incorrect ratio of aerial circuit coupling coils will render valueless all the amateur's endeavours to obtain the highest aerial he possibly can.

Developments in wireless telegraphy, particularly in connection with the three-electrode valve, are daily opening up new fields of work. The valve is peculiarly suited to the amateur's requirements. It may be used both for receiving and transmitting, and the man who possesses a good valve receiving circuit, even though he only has a very small aerial, will find himself far ahead of his friends using crystal receivers, though they may be favoured by being able to erect high and costly aerials. The cost of valves is not high. Every amateur is strongly recommended to take up the study of valve theory; the subject is a rapidly expanding one, and as yet the field has been only partly explored. There is ample opportunity for the amateur to give valuable contributions to our knowledge of the three-electrode valve. The circuit arrangements and methods of application are legion. One has only to consult a file of patent specifications to realise this, and every wireless man has the opportunity of increasing the store of information.

In regard to transmitting apparatus. The spark system still retains adherents, but continuous wave transmission has many advantages from the amateur's point of view.

There is one other point to which we would refer before going on to other considerations—namely, that of the experimenter's licence. Every experimenter must obtain a licence before he commences work in wireless telegraphy. It is very necessary that the State should control the operations of wireless stations in order that public and commercial communications may proceed without interference. We urge upon every person who takes up wireless telegraphy either as a hobby or for serious experimental work, to take the greatest care to carry out their experimental work so that the limitations set out in the licence granted to them are in no wise exceeded. The genuine amateur wireless telegraphist will, of course, do his best to observe the regulations in spirit and in letter, but it is very easy to make mistakes. Unless one is careful in checking the wave length being used for transmitting, one may be unknowingly interfering with some other station engaged in important public work. It is the duty of the amateur, in return for facilities offered by the State, to take the greatest care in his work. Carelessness in this respect can only result in restrictions being placed upon amateur wireless. Another important point is secrecy; it is essential that private messages overheard should not be divulged. Comment on this is unnecessary.

Proceeding to practical considerations, the following general and broad principles are given as a guide to the constructor when considering the erection of a station.

Amateur wireless telegraphists can, in the main, be divided into two classes : (*a*) the man with a natural inclination towards electrical engineering, whose hobby is his station ; and (*b*) the man who wishes to experiment in wireless telegraphy from a purely scientific and academical standpoint. Probably the first class still embraces much the greater part of the body of wireless amateurs, though the number of recruits to class (*b*) is ever on the increase.

One of the first things to be considered is the site for the proposed station. Probably the ideal transmitting or receiving aerial would be one erected upon a perfectly conducting

surface. This ideal condition is, of course, not realisable in practice. The nearest approach to be made to it is that of an aerial on a steel ship at sea. In this case the "earth" is formed by a connection made to the hull of the ship; and since the hull is in contact with the surrounding sea water, which is a comparatively good conductor, we do arrive at a condition similar to the ideal. The site of the average station will provide natural advantages which will vary considerably, and the following advice may be helpful.

In a country site the main points to be observed are;—

(1) Choose preferably high ground, and if near to the coast it will be better to choose land which slopes away towards the sea.

(2) The space around the station should be as open as possible; trees, etc., do not matter as long as not too numerous and not too close to the station.

(3) The ground should be such that it does not become very dry and scorched during the summer. Extensive earth systems are needed on land of this kind. It has been suggested that a station should be erected over water-bearing strata which lead to the sea. Refinements of this kind in site choosing are generally impracticable.

The three points given above can only be observed in certain cases; a large number of wireless amateurs live in towns and are compelled to make the best of circumstances which exist.

In a town site the main points are:—

(1) Try to get the aerial as high as possible. By "height" in this case is meant the distance of the aerial above the surrounding buildings and neighbouring conductors. An aerial supported ten feet above the leaded roofs of a building 50 feet in height cannot be taken as having a height of 60 feet. The presence of conductors under or near to the aerial effects a considerable reduction of effective height.

(2) Avoid running the aerial close to and parallel with telephone and telegraph wires. This is particularly important in the case of a transmitting aerial. Currents will be induced in the neighbouring wires when transmitting, and if the aerial is within a foot or two of them damage may be done. In the case of a receiving aerial, neighbouring telegraph wires often cause troublesome induction noises in the telephone receivers, which may be loud enough to jam out even strong signals.

(3) It is bad practice to bring the aerial down-lead close to rain-water pipes, etc. Eddy currents are induced in masses of metal close to the down leads. These currents result in losses and reduce the radiation from the aerial.

(4) *Never* under any circumstances use a connection to the gas pipes as an earth. If it is not practicable to sink a special earth plate for the station, connection should be made to the *water* pipe as near as possible to the point where it emerges from the ground.

It will be understood that the above remarks, both for town and country stations, apply with much greater force to a station from which it is intended to transmit. Quite good receiving work can be carried out under conditions which appear to be most adverse, and the amateur should not be discouraged because he is not able to arrange his station as well as might be wished. Make the best of the facilities which offer themselves.

The construction of the aerial itself will be governed by whether it is intended to do receiving work only or not. For receiving only, a single wire of not too small a gauge is all that is necessary. The increase in strength of signals which is obtained by the use of multiple wire aerials is so insignificant as to render unjustifiable the extra outlay on the

aerial. A single wire aerial of No. 14 or No. 18 bare hard drawn copper wire is very suitable, the chief disadvantage being the low tensile strength of copper. This latter limitation makes it impossible to avoid a large sag in a long horizontal part of the aerial owing to the stretching and ultimate breaking of the wire as it is tightened up. The aerial is also easily carried away during a gale or blizzard. For this reason it is generally customary to use a bronze alloy (such as silicon-bronze or phosphor-bronze) of high tensile strength for aerial construction. These wires are best stranded, and a very suitable size is 7/19 (*i.e.*, seven strands of No. 19 S.W.G. bronze wires laid together). The amateur is recommended to avail himself of this wire unless he is already in possession of other material.

It is not always possible to arrange a transmitting aerial so that there are no joints in the wire, but this can be done in the case of a single wire receiving aerial. By adhering to the rule "no joints," a host of troubles are avoided. The aerial wire outside the wireless room should be one continuous length, and it should be led straight indoors, through a suitable leading-in insulator, right down to the bench or table where work is done. By this principle of avoiding joints anywhere one can at once say with certainty that there is no bad contact in the aerial itself in case of failure of signals, and the tracing of faults is thereby simplified. Joints may have quite a considerable resistance unless carefully made; they also weaken the wire at and near the junction, particularly if the wire is overheated when soldering. All joints should be soldered up solid. The resistance of an unsoldered joint gradually increases with weathering and consequent oxidation of the surface of the conductor occurs.

It is sometimes stated that enamelled wire should be used for aerial work, the reason given being that uncovered wire oxidises on the surface; this oxidation increasing the skin resistance of the conductor. Since the high frequency current in the aerial is at its greatest density on the surface of the wire, it is alleged that this oxidation increases the effective resistance of the aerial as a whole. If any such effect does occur, it is probably small, but it opens up a field for investigation.

Whilst on the subject of joints we would once again warn the amateur that the greatest care should be exercised in the soldering of phosphor- or silicon-bronze conductors. They should *not* be sweated, that is, soldered by coating with flux and then holding in the flame of a blowlamp whilst applying a stick of solder. This method is almost certain to lead to overheating with a consequent reduction in tensile strength of the wire at the point heated. The solder should be carefully applied by means of a copper soldering bit, with the minimum heat necessary. Of course, sufficient heat must be applied to cause the solder to flow properly and permeate right to the centre of the joint. It is not necessary to use resin as flux when soldering outside joints. The continual exposure of a joint to rain soon washes away all traces of any corrosive flux which may have been used. Any flux having zinc chloride as a base is quite suitable.

The earth connection is one of the factors in the usual amateur station which leaves much to be desired. For receiving work, the quality of the station earth is probably not important as for transmitting. Therefore it is sufficient, in the case of a town station, to take a lead down to the water pipes. The connection to the pipe should be soldered, and it should be borne in mind that the remarks we have made regarding the necessity of ensuring good electrical joints in the aerial apply with equal force to the earth lead and its connection to the grounding system. In the case of a country receiving station, it will generally be sufficient if a metal plate, about three feet by two feet in size, be buried so that its top edge (*i.e.*, one of the longer sides) is one foot below the surface of the ground. The earth lead, preferably of copper wire, should be soldered along the top edge of the plate, and to guard against the wire becoming

detached by corrosion it is as well to insert two or three copper rivets along the edge, taking a turn around the head of each rivet before they are hammered up. It is best to bury the earth plate as near as possible to the receiving room, in order that the length of the earth lead may be kept short. If the lead *must* be long, say over ten feet, it is advisable to insulate it. This may be done either by supporting the bare conductor on small reel insulators fixed to the wall of the building, or by using insulated wire for the lead itself. The same remarks regarding the necessity for a short earth lead apply, of course, in the case of a connection to the water pipe.

In a transmitting station every effort should be made to secure the best earth possible. By "best earth" is meant an earth connection with the lowest resistance possible. The resistance of an earth connection when used for purposes of wireless telegraphy is not necessarily the same as the ohmic resistance when measured by a method employing direct current. In this latter case the resistance measured is that of the earth plates, etc., to the surrounding soil (this quantity is generally known simply as the "ohmic resistance" of the earth connection), and is determined by the contact resistance between the earth plate or plates and the soil. When, however, high frequency currents are used for the measurement of the resistance quite a different value will be found (this value is generally known as the "high frequency resistance" of the earth). In the high frequency resistance of an earth capacity effects play an important part; this fact is well illustrated in the use of "earth nets" for portable stations. An earth net consists of a length of copper netting laid on the surface of the ground underneath the aerial. Quite a practical earth can be secured in this manner.

In a transmitting station it is our object to reduce the resistance of the earth to as low a value as possible. A high earth resistance means that most of the power which is delivered by the transmitter to the aerial is lost. The earth which the amateur will employ is chiefly dependent upon the depth of his pocket. The best arrangement is to lay down a circle of plates, about fifteen feet in diameter, either right round the transmitting room, or close to it. A lead should be attached to each plate and brought to the centre of the circle. All the leads are then soldered together and the earth lead proper joined to them and led into the transmitting room. The leads from each individual plate is buried in a narrow trench about six inches below the surface of the ground. Each individual plate should be about three feet by two feet, and should be buried in the manner indicated for a receiving station. The plates should be close together, edge to edge in fact. The earth may be still further improved by running four or five wires in separate trenches about six inches deep and three feet apart out underneath the aerial and a little beyond its end. It will be understood that in the foregoing description we have indicated the best arrangement for the amateur who has the necessary means and facilities at his disposal.

A great many readers will content themselves with something a little less complete and consequently not quite so efficient. Quite a workable earth for a transmitting station can be made by burying two plates of the before mentioned size (three feet by two feet) face to face and about six or eight feet apart, the lead from each plate being brought to the midway line between the plates and there jointed to the station earth lead. In any case we recommend the amateur to run out at least one wire under the aerial to supplement the plates. Whatever arrangement of plates is decided upon it is necessary to arrange the connections to the plates so that the common earth lead is symmetrical with regard to them. By this we mean that the wires connecting each plate to the station earth lead should all be of the same length. If this rule is not adhered to, the current will not be evenly distributed over all the plates. Also it is obviously necessary that the earth lead should be of at least the same cross section as the wires forming the aerial. It is not consistent to use, say two 7/19 wires in the aerial and then employ a single strand of No. 20 for the earth lead.

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) Questions should be numbered and written on one side of the paper only, and should not exceed four in number. (2) Queries should be clear and concise. (3) Before sending in their questions readers are advised to search recent numbers to see whether the same queries have not been dealt with before. **(4) The Editor cannot undertake to reply to queries by post.** *(5) All queries must be accompanied by the full name and address of the sender, which is for reference, not for publication. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume."* **(6) Readers desirous of knowing the conditions of service, etc., for wireless operators will save time by writing direct to the various firms employing operators.**

BEGINNER (Bolton).—(1) *If a certain valve circuit will be satisfactory.* (2) *If a low plate voltage valve can be used.* (3) *The name of a low voltage valve.*

(1) The circuit suggested is O.K.

(2) Not without loss of efficiency on transmission.

(3) The Marconi V 24 is about as low as any, and under certain circumstances can be used with as little as 4 volts H.T.; but for transmitting at least 30 should be used Results will even then be distinctly poorer than with a higher voltage valve, such as the R, at 60 volts.

J.F.B. (Middlesbrough) *asks* (1) *for a criticism of a circuit.* (2) *If it is possible to receive the Dutch concerts on the set, crystal only.* (3) *If it is possible to receive C.W. on a crystal.*

(1) O.K., if you do not short circuit the part of the A.T.I. not in use at any time.

(2) No, not sensitive enough.

(3) Only by putting an interruptor of tikker type in place of the crystal. Fair results can be obtained in this way with a good deal of trouble. We think it would pay you better to use a valve circuit.

"PUZZLED" (Birmingham) *points out a discrepancy between Fig. 1 and Table 1, of pages 262 and 263, of July 23rd issue, and asks* (1) *the reason.* (2) *Dimensions for a honeycomb coil of 1,000 mhys.* (3) *Formula for capacity of an air condenser* (4) *Ditto for a glass dielectric.*

(1) The values in Table 1 are by mistake ten times too big.

(2) Approximately 6 cms. diameter, 2·5 cms. long and with 120 turns of wire on it.

(3) and (4)

$$C \text{ mfds.} = \frac{KAn}{900000 \times 4\pi d}$$

where K is specific inductive capacity, *i.e.*, about 1 for air and 6 for glass. A is area in sq. cms. of each slab of dielectric and n is the number of slabs of dielectric, and d is the thickness in cms. of each slab of dielectric.

F.N. (Leeds) *asks* (1) *Whether a certain 3-valve circuit sketched is O.K.* (2) *If it will receive the Dutch concerts.* (3) *If slate is suitable for a valve panel.* (4) *What a loading coil is.*

(1) Yes, provided the upper filament resistance is not joined across the filament battery, as your sketch appears to show it.

(2) Yes, if the parts are properly proportioned.

(3) Possibly, but not very good, owing to the poor insulating qualities when damp and the ease with which damp is picked up.

(4) A coil added to a circuit, generally the aerial circuit, to increase the wavelength to which it will tune.

"NOVEWIRE" (Catford) *asks* (1) *For the capacity of a condenser.* (2) *A suggestion for an aerial for a portable set.* (3) *If a loud speaker of his own design should be put in series or in parallel with his telephones, or where else in the circuit it should go.* (4) *A design for a crystal slip which will not lose its sensitive point when carried about.*

(1) We cannot say, as you do not give the distance between the plates.

(2) No portable aerial will give as good results as the high wire you describe, but you might try about 50 turns of wire on a 4′ frame.

(3) This depends on the design. As you do not describe this, we cannot suggest the best way of connecting up.

(4) Any good spring clip should do. Your suggestion, with powdered crystal and fixed electrodes is of very little use.

R.H.T. (Stockholm) *asks* (1) *For information about a frame aerial set.* (2) *For formula for calculating inductance.* (3) and (4) *If twisted flexible leads are harmful in a receiver, and if their effect has to be allowed for.*

(1) A single valve set will be almost useless on a frame aerial, and in any case the frame should not be less than about 3′ in diameter. Put about 50 turns of wire, and add a loading coil of about 5,000 mhys. Both condensers 0·001 mfds. Reaction coil, 3,500 mhys.

(2) $$L \text{ mhys} = \frac{1}{1000} \cdot \pi^2 d^2 n^2 l K,$$

where n is the number of turns per cm., d is the diameter in cms., l is length in cms, and K is a constant depending on d l, the value of which can be obtained from the article on page 262 of July 23rd.

(2) and (3) Twisted flex in an H.F. circuit weakens signals, owing to the capacity between the leads. This cannot be allowed for, and should be avoided.

J.M.G. (Nottingham). (1) The set is ambitious, and theoretically correct; but will probably keep you busy indefinitely in trying to stop it howling. We should strongly advise you in such a complicated amplifier to avoid tuned either H.F. or L.F. circuits.

(2) It might be used to apply a potential to the first 2 H.F. valves.

(3) Generally speaking, almost immaterial. We have not space to discuss the exceptional cases.

(4) Take a flexible lead from the bottom of the primary of the telephone transformer and arrange to clip it to the plate terminal of the valve required, insulating it from the part of the holder which normally touches the plate.

HON. SEC. (Dartford).—(1) Instrument will do for the type of Fig. 2, page 792, of February 19th, but not much else.

(2) and (3) About 3 oz. of No. 44 for H.R., covered by 8 oz. of No. 32 for the L.R. Core 3" long by ½" diameter iron wires.

(4) No.

E.H.L.S. (Princetown).—(1) We regret we have no particulars of the inductance of coils of the make you mention, and can therefore not give the wavelength.

(2) It is almost impossible to suggest the maximum distance received for reasons as above. Moreover, such a distance depends entirely on the power of the transmitter, which is not specified.

(3) The circuit is only useful with soft valves, *e.g.*, of the Audion type.

F.J.P. (Manchester) *asks* (1) *From whom is he to obtain particulars regarding amateur receiving licence.* (2) *Are H.R. telephones more suitable for a silicon crystal detector than L.R. telephones with transformer.* (3) *Is* 2000 *ohms. enough for telephones with crystal detector.*

(1) The Secretary, G.P.O., London.

(2) Immaterial.

(3) Fairly good, but 4,000 to 8,000 ohms would be more efficient.

W.H. (Bolton) *asks* (1) *For an explanation of the "hank" winding of the receiver, on page* 312 *of the issue for July* 24*th*, 1920. (2) *If the wire should be single or double-covered.* (3) *Data for a mica condenser of* 0·0015 *mfds.*

(1) "Hank" winding simply means that the wires should be bundled together into a ring—a somewhat poor method of construction.

(2) Preferably D.C.C.

(3) Three slabs of mica, 4/1000" thick, overlap of plates 9 sq. cms. for each slab.

(4) Make formers of about the same sectional area and long enough to take the same number of turns of wire plus 20 per cent.

L.C.G. (Brixton Hill) *asks for winding particulars for honeycomb coils for a number of wavelength ranges.*

These windings cannot be calculated at all accurately, and we have not enough experimental results to give the values required, especially as you do not say what size condenser is to be used. Wind a coil of about 5 layers and see what range this gives, and then fix the windings of the remaining coils accordingly.

R.N.E. (Moseley) *describes set, illustrated on page* 399 *of September* 17*th issue, and asks* (1) *If suitable for Hague Concerts and transatlantic work.* (2) *Alterations necessary to use a certain type of oscillator instead of the reaction coil.* (3) *Values of anode and grid leak resistance.* (4) *If various parts of the set are of correct value.*

(1) O.K. for the Hague, but wavelength too low for transatlantic stations.

(2) We have no information concerning this piece of apparatus, and cannot therefore advise.

(3) Anode resistance 20,000 to 50,000 ohms. Grid leak, 2 megohms.

(4) The capacity of condenser H is rather low, otherwise O.K.

"GLENSHEE" (Herne Hill) *has a crystal set, and asks* (1) *For criticism.* (2) *If block condenser across the telephones is necessary.* (3) *If a coupling between the A.T.I. and secondary is necessary.*

(1) Circuit is incorrectly arranged. For correct diagram, see page 189, June 11th, Fig. 6. This shows a telephone transformer, which may be omitted if you have H.R. telephones.

(2) A 0·001 condenser will be a great improvement.

(3) Your circuit is an auto-coupled one and does not require a separate coupling.

"FAWLEY" (Southampton) *asks* (1) *For criticism of a set, and* (2) *Where to insert H.F. bye-pass condensers.*

(1) Type normal; results should be good. Unnecessary to short circuit grid condenser to receive C.W. Use a condenser in series or in parallel with A.T.I. for C.W., as the sliding A.T.I. will not give fine enough tuning.

(2) Connect a 0·001 condenser across the anode winding of the first transformer.

"SPARCONI" (London) *asks* (1) *Why valves do not oscillate on all wavelengths.* (2) *Resistance of R valve filament.* (3) *What SMMT rating on accumulators means.*

(1) Whether a valve oscillates or not depends on the circuit it is attached to. If the proportions of the circuit are unsuitable at any wavelength, *e.g.*, if the amount of reactance provided is too small, the valve will not oscillate at that wavelength. 0·5 ohms when cold, but much more and varying with the temperature when hot.

(3) Society of Motor Manufacturers and Traders' rating, used for car ignition accumulators. This rating is about twice the continuous discharge rating.

W.H.S. (Golder's Green) *asks* (1) *Why he is unable to receive signals on a set as described.*

A 20' aerial, 8' high, is quite useless for a crysta set. If you make it three times as high and three times as long you will have some chance of getting results. Windings are fairly O.K. for 2,000 ms. Capacity of the condenser is only 0·00005 mfds., owing to the large spacing of the plates. If the crystal is good and the aerial is improved as suggested, quite good results should be obtained.

R.C.M.R. (Eastbourne) *asks* (1) *Names of certain stations.* (2) *Capacity of a condenser.* (3) *Size of former for an increase of wavelength for his set.* (4) *If resistance amplifiers and V* 24 *valves are suitable for all wavelengths.*

(1) EGJ Coruna (land) Spanish, ENM Trincuolo (ship) English. GEG Lympne (land) English. PED Riznam, Dutch ship. EGK Tetuan, Spanish (land.) The remaining signs you have probably misread.

(2) 0·0002 mfds.

(3) As you do not give size of present former, we cannot say. For 5,000 ms. on a P.M.G. aerial a former 18" by 6", wound with No. 26 would be correct, if used alone.

(4) V 24 suitable for all wavelengths. Resistance amplifiers suitable for all wavelengths greater than about 1,000 ms.

R.L.R. (Palmer's Green) *asks for a diagram for a three-valve set, with* 1 *R and* 2 *L.F. valves, with*

a switching arrangement for changing over the telephones.

The circuit given to **J.P. (Boscombe)**, September 17th issue, should be quite suitable. This shows a reaction coil in the first plate circuit, which can be omitted if desired. We do not advise joining up the telephone windings for switching, as this is liable to lead to bad howling.

"EBOR" (York) *has a 50-watt set, and wishes to* (1) *Add a valve.* (2) *Increase wavelength to* 10,000 *ms.' And also asks* (3) *Which to use—Brown,* 8,000 *ohms, or Sullivan,* 120 *ohm telephones.* (4) *What is small "lamp" with Telefunken valves.*

(1) and (2) Do not attempt to turn this set into something so very different from what it was intended to be. This could not easily be done, and is not worth while. Dismantle it and use the parts.

(3) Almost immaterial, provided a suitable transformer is used with the L.R. telephones.

(4) An iron in hydrogen resistance, which has the property of keeping the filament current almost constant for a considerable variation of the filament volts.

"EXILE" (Tiverton) *asks* (1) *If he can receive the Hague Concerts on a* 2*-valve set.* (2) *For a diagram of a suitable set.* (3) *If* 4,000 *ohm telephones are suitable.* (4) *Best forms for A.T.I. and reaction.*

(1) Doubtful, unless the set is particularly efficient. You may get aircraft telephony on 900 ms.

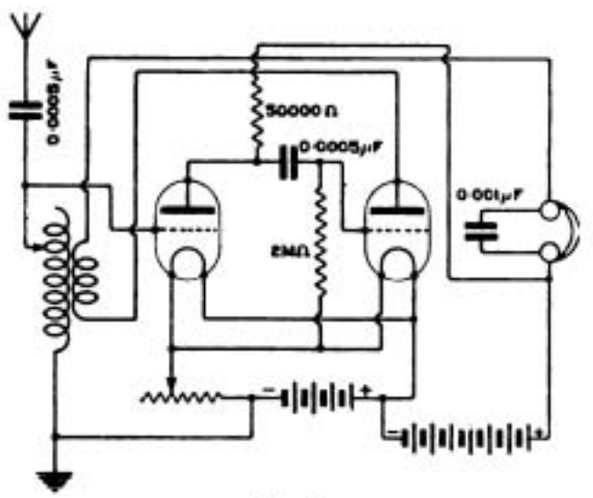


Fig. 1.

(2) See Fig. 1.

(3) Possible, but in a set of this type L.R. telephones with a transformer are better.

(4) Single layer solenoids will certainly be best for both coils. The reaction coupling for telephony is very critical.

"RADIO" (Colchester) *asks* (1) *How to add a H.F. valve to a crystal set.* (2) *For a low anode voltage valve.*

(3) *For an inductance for* 4,000 *ms. with a* 0·002 *mfds. condenser.* (4) *What use can be made of a series of block condensers ranging from* 0·001 *to* 0·01 *mfds.*

(1) A good arrangement is shown in Fig. 2.

(2) V 24 type.

(3) Cut out the fixed condenser, which would be very inefficient. Make former 6" by 12", wound with No. 26; about 250 yds. will be required.

(4) It can only be used as a block condenser across the telephones.

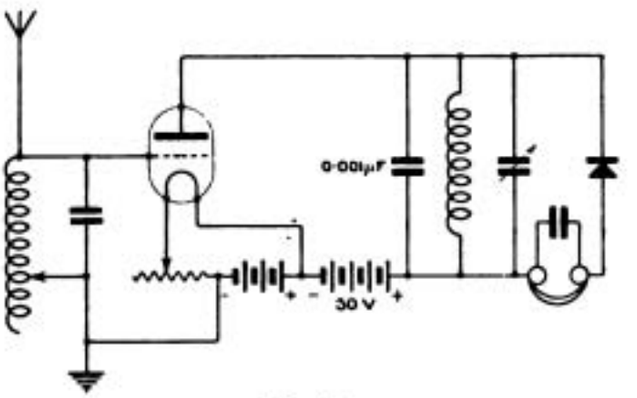


Fig. 2.

E.A. (Whickham) *asks* (1) *If set, which is crystal with* 1 *note mag., is suitable for C.W., spark, and telephony.* (2) *Wavelength range.* (3) *If loose coupled inductance will do for the aerial circuit.* (4) *For dimensions of a suitable inductance.*

(1) Only suitable for spark, and less efficient telephony. If you have a valve, we should recommend you to try one of the simple reaction circuits frequently given in these columns.

(3) and (4) Yes. Make former 5" by 8", wound with No. 26, and use it with a parallel condenser of 0·0005 mfds.

R.V.S. (Manchester) *asks* (1) *For criticism of a frame aerial set, the aerial being* 40 *turns on a* 4' *frame.* (2) *Value of certain condensers.* (3) *Value for loading inductance.* (4) *If telephone transformer described on February 5th,* 1921, *will do.*

(1) Good arrangement, but unless the best point for the H.F. transformer comes about 1,100 ms., it is doubtful if you will receive the Hague. See articles on H.F. transformers now appearing.

(2) Variable 0·0015, and block 0·0014 and 0·0028 mfds. only.

(3) This should be approximately 8,000 mhys.

(4) We have not tried this type of transformer experimentally, but think it should be O.K.

W.R.J. (Nunhead).—(1) and (4) Range probably about 400-8,500 ms., with the 0·0005 mfds. condenser.

(2) 0·0005 mfds. the better of the two.

(3) No, but probably some improvement.

B.S.P. (Wandsworth) *asks various questions about a receiver, and* (4) *For a reference to a book explaining inductance, capacity, wavelengths, etc., calculations.*

(1) and (2) Minimum very uncertain, maximum about 8,000 ms. The set is of good type, and suitable for 10,000 ms., which can be reached by increasing either the capacity or the inductance.

(3) An additional valve will certainly improve results.

(4) Nottage's "Calculation of Inductance and Capacity," Wireless Press, price 3s. 6d., postage 6d. should meet your requirements well.

"HOLLAND" (Amsterdam).—(1) Quite correct, but set will probably work somewhat better with lower plate resistances, say 50,000 ohms, or a higher plate voltage.

(2) It is only necessary to put a throw-over switch to interchange the sets of coils, no other alterations are required.

(3) Two millimetres is sufficiently close to the original value to be satisfactory.

(4) A.T.1. stands for Aerial Tuning Inductance. N.P.L. stands for National Physical Laboratory.

G.D.W. (Harlesdon) *describes a resistance amplifier with capacity reaction which oscillates irregularly, and asks the reason.*

The connections and dimensions are O.K., except for the absence of a condenser across the H.R. telephones and telephone transformer primary. Capacity reaction is often uncertain in action, but we can see no other explanation in this case. The reaction condenser should be smaller than 0·00002 at minimum.

E.J.E. (Sanderstead) *asks* (1) *For a diagram of a two-valve receiver, one being a note magnifier, to comply with certain conditions.* (2) *If he should get New Brunswick, Glace Bay, etc.*

(1) See diagram, Fig. 3.

(2) Possible, but somewhat unlikely.

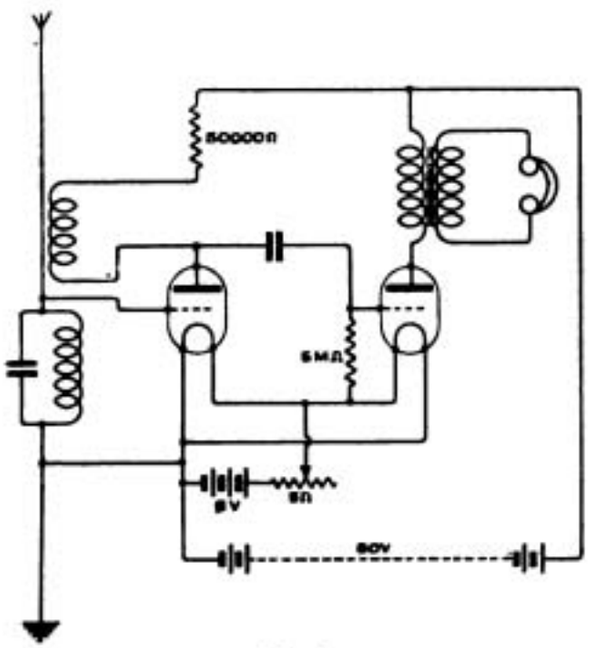


Fig. 3.

H.C.J. (Kildare) *asks* (1) *if certain components could be built up into a fairly good receiver.* (2) *If there is any difficulty in getting a receiving licence in Ireland.* (3) *Which of various combinations of valves is most efficient to use on a three-valve amplifier.*

(1) Yes.

(2) We believe so.

(3) The best arrangement for general purposes is 1 H.F., 1 detecting, and 1 L.F. 2 H.F. and 1 detecting is also very good.

E.H.W. (Weymouth) *asks for a circuit to add an additional valve to his set, the set to work on either one or two valves, which we give in Fig. 4.*

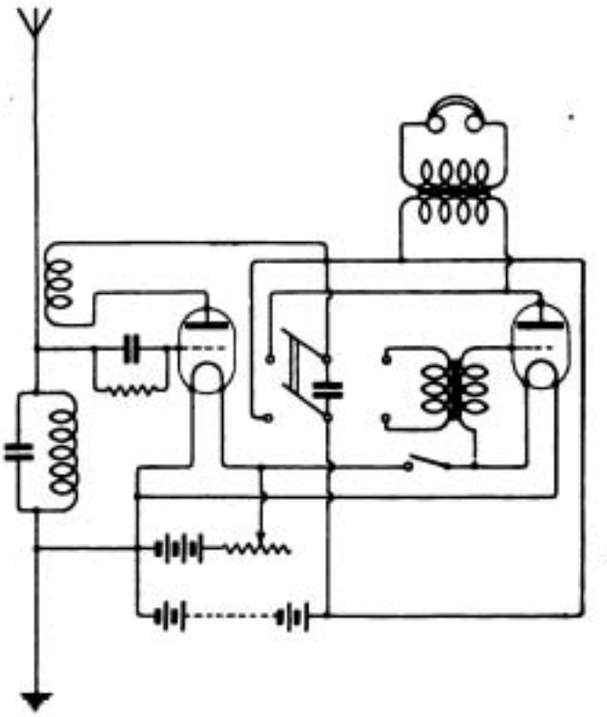


Fig. 4.

"SKYRO" (Highbury) *asks* (1) *If there are any restrictions or objections to putting an aerial across a road.* (2) *The best gauge of wire for an aerial, and whether plain or enamelled.* (3) *If No. 11 gauge zinc would be suitable for condenser plates.*

(1) It would be necessary to obtain permission from the borough or county surveyor responsible for the road.

(2) (*a*) For a small aerial, about No. 14 or the equivalent in stranded wire. (*b*) Immaterial.

(3) Material O.K., but thickness considerably more than necessary for a receiving condenser. Use about No. 16.

A.T.D. (Tomatin).—(1) The circuit is not quite correct. The variable condenser should be connected across the inductance instead of in series with the crystal.

(2) You will probably only receive ships on 600 ms. wavelength, and will require a valve set to get signals from some of the high power stations.

(3) The length of an aerial is limited to 100 ft. single wire. Make it as high as you can. Try 20 or 30 ft.

(4) No, the effect will be just the opposite.

J.H.J. (Nantyglo).—(1) Yes, this wire may be used.

(2) It does not matter whether the coils are wound clockwise or anti-clockwise, so long as all the sections of one former are wound in the same direction

(3) No, it is correct.

(4) Yes.

"NUMSKULL" (Sheffield).—(1) The reaction coupling is too tight; for telephony it should be so adjusted that the set is almost, but not quite, on the point of oscillating. Either use a smaller reaction coil or separate the slabs to weaken the coupling.

(2), (3) and (4) No particulars of winding are given us to estimate your present wavelength range or suitability of the coils. In making a long wavelength range set it is advisable to have two separate sets of A.T.I. and reaction coils, one up to 2,000 ms., and the other from 2,000 to 25,000 ms. A useful circuit is shown on page 168 of the June 11th issue.

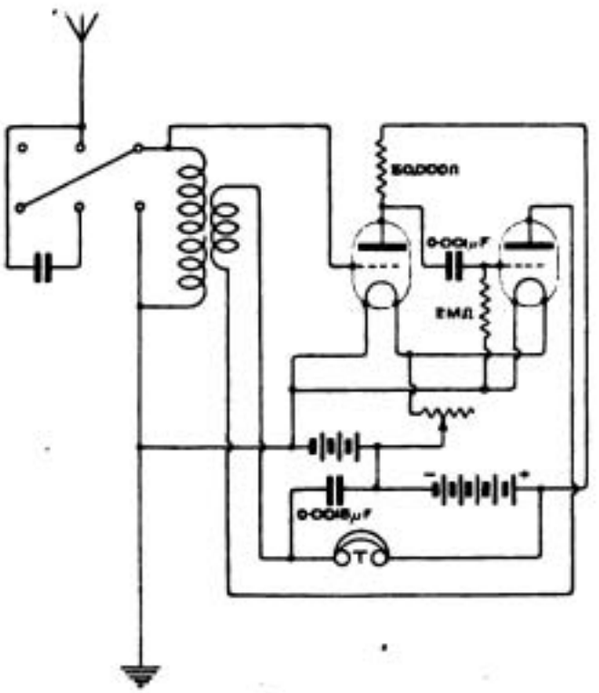


Fig 5.

J.F.E. (Tooting).—Connect the circuit as in Fig. 5.

SPARKS (Berwick-on-Tweed).—(1) See Fig. 6.

(2) Anode resistance 30,000 ohms. grid condenser 0·0002 mfds., grid leak 2 megohms, anode battery 50 volts.

(3) Possibly a 1/1 ratio iron cored transformer, coupling the rectifier to the Mark IV first valve would improve the working of the set.

(4) Yes. It can be made useful for longer wavelengths still.

H.C.B.B. (Bromley).—(1) The sample is of No. 32 gauge.

(2) It is too fine for A.T.I.'s, except for long wave reaction sets, but it is quite suitable for secondary or reaction coils.

R.D.L. (Wandsworth).—We recommend you to adopt the set described on page 168 of the June 11th issue, with windings as given in reply to **C.A.S. (Reigate)**, as this will answer your purpose much better than your suggested changes to an earlier design.

BRIGHTONIAN (Hove).—(1) 0·001 mfds., approximately.

(2) Connect the aerial condenser between the aerial and the A.T.I., and connect the negative of the 6-volt battery to the earth side of the A.T.I.

(3) You will be more sure of telephony if you can increase the height of the aerial. For telephony it is necessary to adjust the reaction coil almost to the point of oscillation.

(4) One can generally tell when a set is oscillating by the slight hissing sound of atmospherics, or by the heterodyne note of any C.W. picked up by the aerial.

G.C.H. (H.M.S. Spencer).—(1) You can use the H.R. telephones with a 1/1 ratio transformer.

(2) All usual receiving valves are made to work with 4 or 5 volts only across the filament. If your battery is 6-8 volts you should have a series resistance of about 3-5 ohms.

(3) Yes, but possibly you may have to cut out the inductance in the grid circuit.

(4) The alterations necessary for C.W. reception are hardly worth carrying out owing to the short wavelength of the sets. We should advise dismantling them, and using the parts for a good long wavelength receiver.

T.H. (Marske-by-Sea).—(1) Enclosed wire is too fine for aerial circuits, except perhaps on very long wavelengths. It can be used for reaction coils.

(2) The set should oscillate without a condenser across the reaction coil. Probably your reaction coil is too small. Couple the coils very closely, and try reversing the connections of the reaction coil. Try all the available coils in this way, and thus pick out the best combinations.

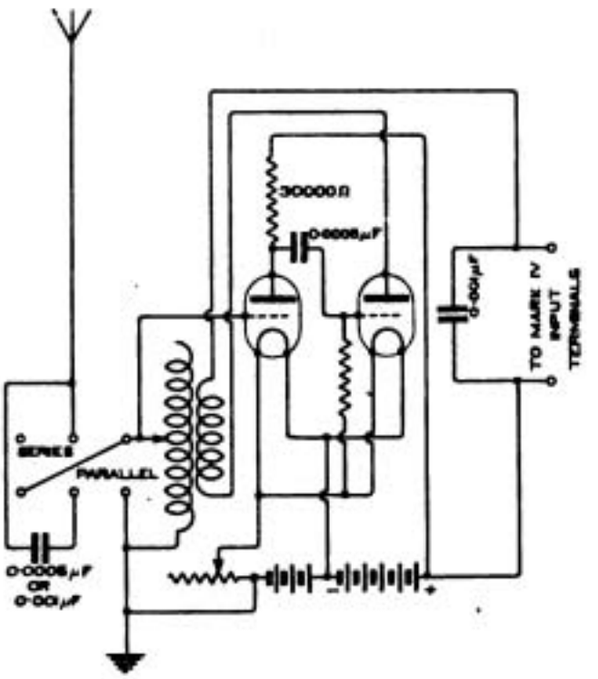


Fig. 6.

(3) Place finger on aerial terminal, which will give a click if the set is oscillating.

(4) Set probably has no faults. Disconnect the blocking condenser, and also short the grid condenser and see if this makes any difference. Is the H.T. connected so that the anode is positive ?

ELECTRO-MAGNETIC (Edinburgh).—(1) It is very inefficient to have such a large capacity secondary condenser—0·003 mfds. to a crystal receiver. This capacity should be as small as possible—about 0·0005 mfds. Why make a crystal receiver for 10,000 ms. ? The longest spark station is 5,000 ms., and there are not more than six spark stations between 2,000 and 3,000 ms. for you to receive

(2) The inductances are each approximately 20,000 mhys If the total active area is correct (*i.e.*, area of overlap of two plates multiply by the number of spaces between the plates), then the calculation of 0·001 mfd. is O.K. The S.I.C. of glycerine is not a stable quantity, and we should consider the capacity to be less than 0·001 mfds. We do not recommend glycerine as a dielectric.

(3) The wavelength will be nearer 15,000 ms. With all the inductance located in one coil the coupling between the primary and secondary will be tight, giving flat tuning, but as signals in your case will be weak, you cannot afford weaker coupling.

ELECTRON (Brixton).—A Mark III short wave tuner cannot be converted into a self-heterodyning C.W. receiver without considerable structural alterations, which are not worth carrying out owing to the smallness of the formers, which limit the range of wavelength. To convert the set it is necessary to rearrange the connections so that it becomes a single circuit receiver with the secondary inductance as a reaction coil. This will not be satisfactory for a long wave range because loading inductance must be included in the aerial, which will weaken the reaction coupling, as the reaction coil will only be coupling into a small portion of the A.T.I. The best thing to do is to dismantle the set and use the parts wherever suitable.

H.V.C. (Manchester).—(1) To receive PCGG in your district it probably will be necessary to use at least two valves. We suggest that you try the two-valve circuit shown in Fig. 4, page 368, of the September 3rd issue, omitting the grid condenser and leak to the first valve. Use the existing tuning circuit with the addition of the reaction coil in the anode circuit of No. 2 valve. This should be 4" diameter, sliding in and out of the secondary former. Wind it with 4" of No. 26. Make the anode resistance 50,000 ohms, condenser 0·005 mfds., condenser leak 2 megohms. Your present tuning circuit is very suitable for wavelengths up to about 2,000 ms.

(4) A telephone transformer will be necessary. For details see reply to **H.J.M. (Rochester)** on page 366 of the September 3rd issue.

C.S. (Exeter).—We do not know that it would be more advantageous, but if you use a valve without a crystal detector it is necessary to use a grid condenser and leak to obtain good rectification.

(2) Use a valve with the existing set and connect up as in Fig. 7. Re-wind the primary on a slightly smaller tube so that it will slide in and out of the secondary for reaction. Change over primary connection when using the valve set to get the best results.

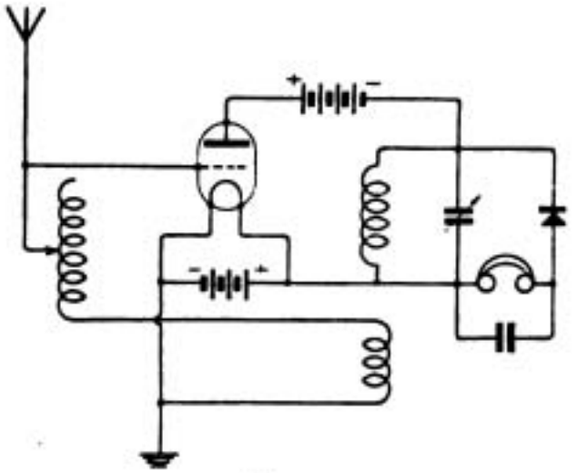


Fig. 7.

(3) An R valve usually requires about 50 volts on the anode.

C.A.S. (Reigate).—(1) The circuit is O.K., except that a 0·0001 condenser should be connected across the anode winding of the first iron cored transformer, as a low impedance path for high frequency.

(2) A may be any value from 0·0003 to 0·001 mfs. It should be small for short wave sets, but for long waves over 3,000 ms, it may be anything up to about 0·003. The bigger the condenser the smaller the inductance required. B = 0·0001 mfds. for short waves, 0·0005 for long waves. C — Approximately 2 megohms.

(3) For wavelengths up to 3,000 ms. (assuming the aerial condenser 0·0005 mfds.) the A.T.I. should be 4" diameter, wound with 10" of No. 22. Reaction 3" diameter with 4" of No. 30. For wavelengths up to 20,000 (assuming the aerial condenser 0·0005 mfds.), the A.T.I. should be 8" diameter, wound with 14" of No. 30. The reaction 7" diameter wound with 10" of No. 30.

(4) Have about seven tappings to each coil of the A.T.I.

SHARE MARKET REPORT.

Prices as we go to press, November 3rd, are :—

Marconi Ordinary	£1	12	6
,, Preference	£1	12	6
,, Inter. Marine		17	6
,, Canadian		4	6
Radio Corporation of America :—			
Ordinary		10	3
Preference		9	3

The WIRELESS WORLD

FORTNIGHTLY] NOVEMBER 26th, 1921. PRICE 6D. NET

THE WIRELESS WORLD

THE OFFICIAL ORGAN OF THE WIRELESS SOCIETY OF LONDON

VOL. IX. No. 44. NOVEMBER 26TH, 1921 FORTNIGHTLY

A FINE ADJUSTMENT *of* REACTION *for* TELEPHONY

By G. P. KENDALL, B.Sc.

EVERY amateur who receives much telephony knows that the secret of success with any circuit which includes reaction coupling lies in the ability to adjust the set to a point just short of that at which self-oscillation commences.

Many amateurs cause most annoying interference to other stations simply through failing to keep off the point of oscillation, thereby distorting the speech received and radiating energy from their aerials. To keep off this point easily, two conditions must be fulfilled: firstly, the circuit must be freed from "overlap" by a suitable combination of filament current and plate voltage, and, secondly, some means must be provided for obtaining a very fine adjustment of reaction. On most amateur receivers this adjustment takes the form of a small variable condenser placed across the reaction coil in the plate circuit. This arrangement, although serving the purpose fairly well, has certain defects which it is the object of the device here described to remove. The drawbacks of the condenser method are mainly the difficulty of getting rid of capacity effects from the operator's hand, and the fact that each alteration of the plate circuit tuning may necessitate a re-adjustment of that of the grid circuit.

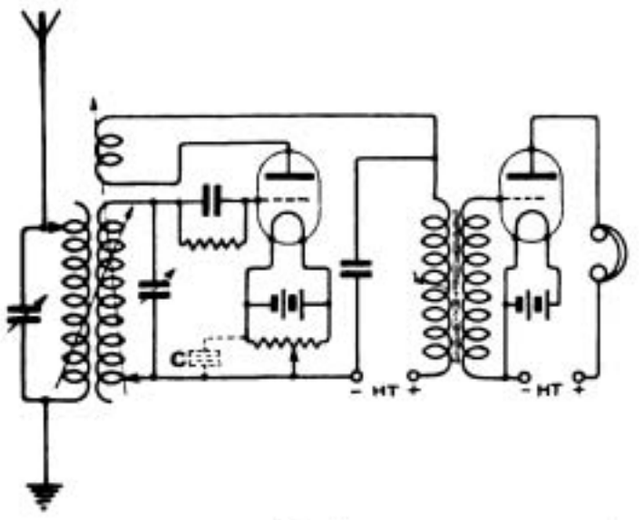


Fig. 1.

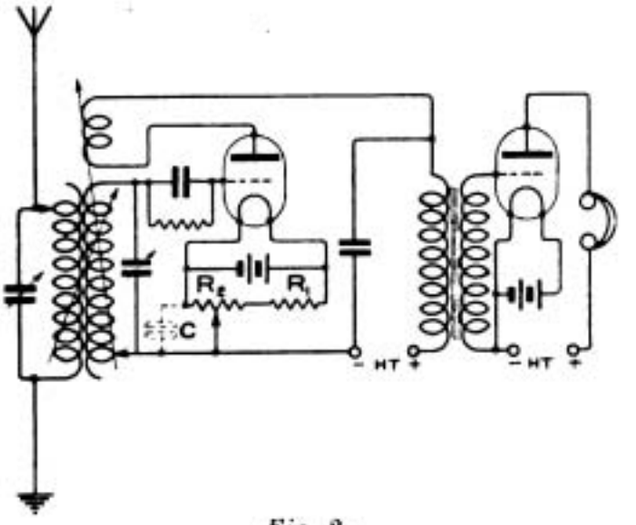


Fig. 2.

I have obtained considerably better results by the use of a form of potentiometer control of the valve from which reaction is taken. Fig. 1 shows a useful type of circuit with potentiometer control, while Fig. 2 indicates the modification which my experience has shown to give an extremely fine and easily managed adjustment of reaction. R_1 is a fixed resistance of 100 to 400 ohms, while

R_2 is a resistance of about 50 ohms, with a sliding contact, and wound with fairly thick wire (say 26 S.W.G.). Since the fall of potential across R_2 is small very fine adjustments of grid potential, and hence of reaction, can be obtained with neither of the disadvantages of the condenser method.

A very convenient resistance for use as R_2 can be easily made by re-winding with finer wire one of the rotary filament regulators which are now a standard line with most wireless firms. Leads should be taken from both ends of the resistance, and from the sliding contact.

A small fixed condenser, C, shown dotted, is desirable, but not essential.

HIGH TENSION BATTERIES

By L. W. CODD.

OF the various components of a valve receiving set, that which needs most care and attention is, perhaps, the high tension battery. Suggestions have been made for the use of the town mains for supplying current to the valve anodes, but this method requires care in the provision of suitable condensers for the elimination of commutator ripple, and is, besides, not available in a large number of cases. In such circumstances a H.T. battery composed of small pocket flash-lamp batteries is most often used, or possibly a number of small accumulators if expense is not a consideration. Such batteries, whether of dry cells or accumulators, are generally a source of trouble, and the dry cells have the disadvantage of deteriorating even when not in use.

Realising this, the writer had for some time been looking for a convenient substitute, and was considering the possibility of using one of the various types of wet cell when he happened upon the short note in your pages a few months ago, describing the construction of a high tension battery of wet cells of the Leclanché type. This seemed, in a large measure, to meet the requirements, but a number of modifications found convenient in practice were added, and a brief account of these may be of interest to others.

Instead of earthenware jars, small glass "specimen tubes" are used; these have the advantage of cheapness and lightness, against which must be set their comparative fragility, but this is not serious in the form of construction adopted. The tubes are 1 in. in diameter and 3 ins. high, and half a gross of them were obtained for 10s. 6d. from a dealer in chemical glassware.

The writer of the note referred to above

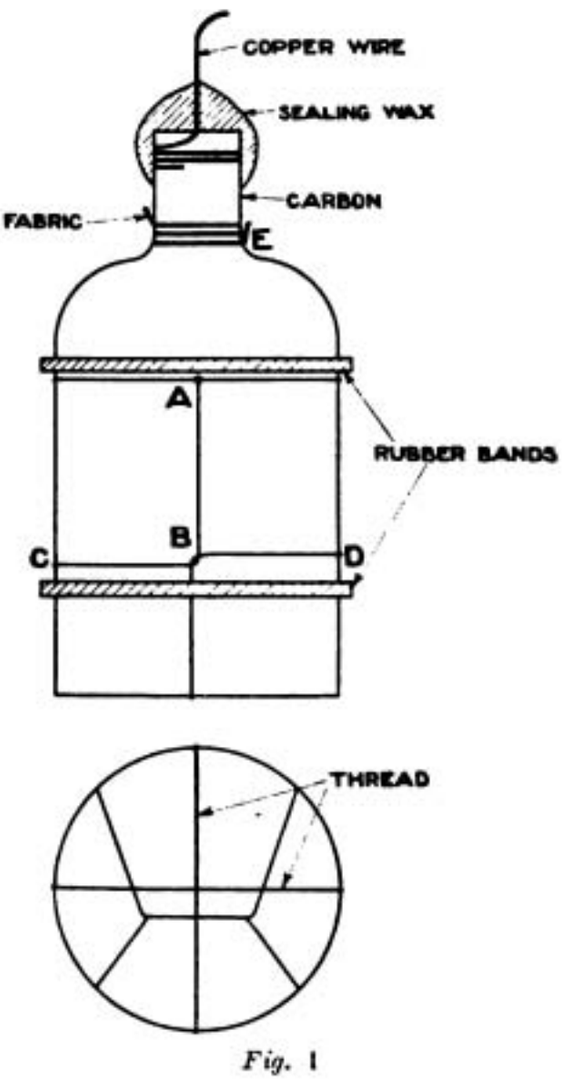


Fig. 1

used as positive elements the "sacs" employed in the manufacture of dry cells; these consist of a carbon rod surrounded by a compressed graphite-manganese dioxide mixture, and were obtained from the makers. In the present

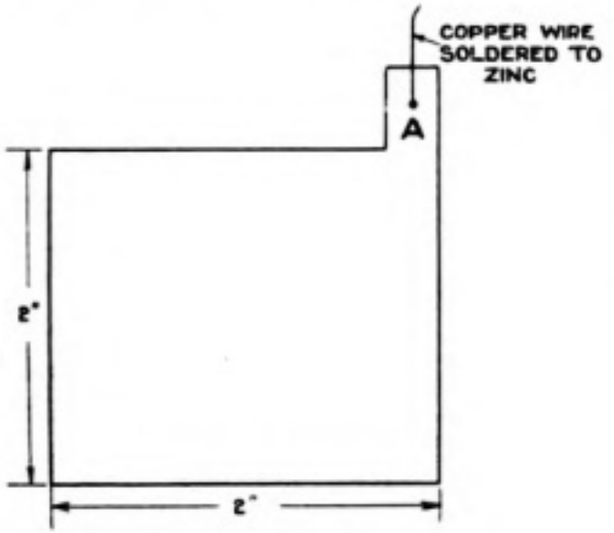


Fig. 2.

case, however, the more economical plan was adopted of dissecting old dry cells of the small 4-volt type, containing three cells. The positive elements are in no way injured when the cell runs down, and answer just as perfectly as the new ones for the construction of the wet type of battery. It is found that the sac is considerably encrusted with a hard deposit formed during working, and it is therefore better, instead of trying to scrape it off, to remove completely the cotton or paper covering which surrounds the carbon and its graphite block. The latter will remain intact if handled carefully, and may then be re-wrapped in a small square of thin calico, secured by means of thin thread. The quickest method of tying on the thread will be gathered from Fig. 1. The cylindrical block is first rolled lengthwise in a piece of the calico of such a size as to allow about $\frac{1}{4}$ in. overlap, and about $\frac{1}{2}$ in. projection at the lower end. A slip-knot of thread is first passed round the cylinder at A, pulled tight, and the thread passed down AB. It is again looped round as at BCD, and then passes over the bottom end of the block, and up the other side under the loops already made. It is then twisted once or twice round the carbon rod where it projects at the top E, catching up enough of the calico to hold it fast as shown. Another vertical loop is then passed down to the bottom and up the other side, so placed as to be midway between the two previous vertical loops; the thread is, of course, passed under the horizontal turns, and is finally tied off round the top over the carbon rod. The projecting material at the bottom is tucked in as shown in Fig. 1, and held in position by the threads which pass over the end. The whole process is completed in a very short time, and a large number of "sacs" may be finished very speedily.

It is well to remove the metal caps usually found in the top of the carbon rod. These are liable to come loose subsequently and cause trouble, and should be replaced by a

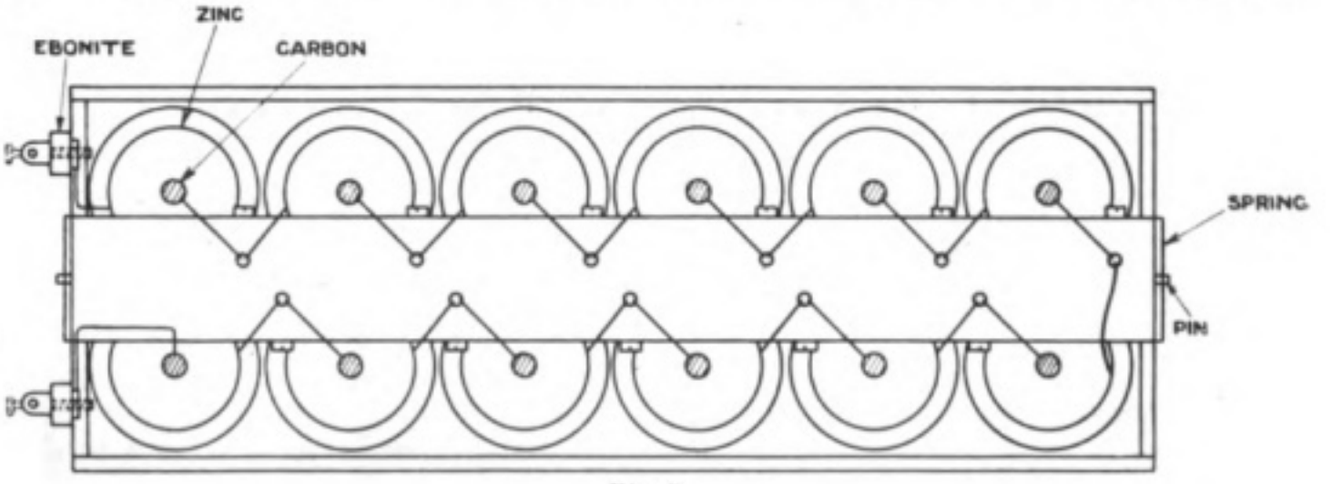


Fig. 3.

short length of fairly stout copper wire, wound once or twice round the top of the rod and twisted tightly. The top of the carbon is then covered with sealing wax as at E. The projecting wire should be varnished or enamelled for a short distance above the wax, as it is found that the liquid from the cell rapidly eats through the wire if allowed to come in contact with it. Finally, two rubber rings are placed round each "sac" to separate it from the zinc plate which is to surround it.

The zincs are made from thin sheet zinc of the shape and dimensions shown in Fig. 2, bent into cylindrical form so as to spring over the positive elements and grip them firmly. A connecting wire is soldered to each zinc plate as shown at A, and varnished at the joint, and for a small distance above it to prevent corrosion. It will be found that the combined positive and negative parts just fit snugly into the glass containers, and covers are therefore not needed to hold the parts in place.

It is the usual practice to make up high tension batteries to a fixed voltage, providing tappings for lower voltages if necessary.

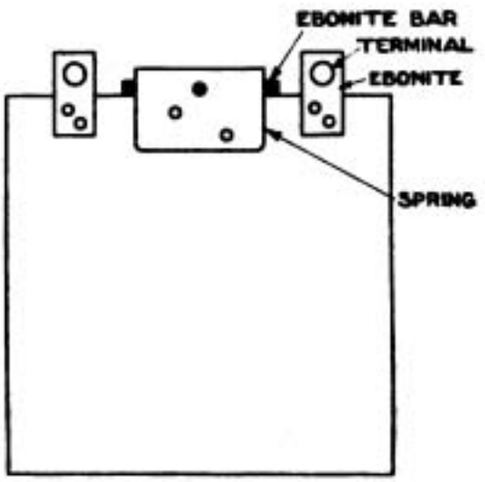


Fig. 4.

This has the disadvantage that some of the cells get hardly any use at all, while others are in use all the time. It therefore seemed more satisfactory to make up the battery in small blocks of a dozen cells, giving about 16 to 18 volts, and this was the plan finally adopted; a suitable number of blocks may quickly be connected to give any required voltage.

As regards connections between the separate cells, small terminals are usually not very satisfactory, owing to the almost inevitable corrosion due to "creeping" of the liquid from the cell. Soldered joints, on the other hand, are troublesome when it is a question of removing and replacing a faulty cell. By adopting the plan described below it is possible to remove a single cell with a minimum of trouble without disturbing the rest.

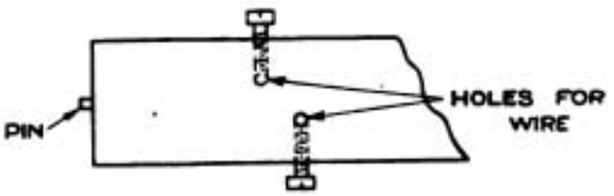


Fig. 5.

The cells are placed in small wooden boxes made to hold 12 cells; these boxes are quickly put together from the wood, which is supplied ready planed for fretwork, a suitable thickness being $\frac{1}{4}$ in. If a fretsaw is handy, the corners may be dovetailed, and the whole glued together. It is possible to put together quite a number of boxes in a short space of time.

A short bar of ebonite is then cut from sheet $\frac{1}{4}$ in. thick. It should be about $\frac{1}{2}$ in. wide, and of the same length as the (outside) length of the box. In each end a short pin is screwed, and eleven holes are then bored right through (Figs. 3, 4 and 5). A further series of holes is then made through the thickness of the bar to intersect the previous ones at right angles, each hole in this second series being tapped to take a small screw.

The connecting wires from the cells can thus be brought in pairs into the untapped holes and secured by means of the screws, the ebonite bar being held in position on the top of the box by means of two pieces of springy brass screwed to the sides of the box, having holes to engage with the two pins in the bar. In this way the bar may be quickly removed, if necessary, to remove the cells from the box. Terminals may be fitted at

the end of the box as shown, and insulated on strips of ebonite screwed to the wood.

The cells are finally charged with sal-ammoniac solution, and require little attention beyond occasional addition of water to make up for evaporation. This should be attended to carefully; if the level of liquid gets low a hard deposit is often formed on the exposed parts of the plates, which is difficult to remove.

A number of units constructed as described have given great satisfaction in use, and where portability is not essential have proved far more economical and lasting than the dry cells normally employed. After some months of use the zincs still are quite sound, and, indeed show little signs of wearing way. At the present rate they should last for several years, while, of course, the carbon elements and other parts of the cells are practically everlasting.

TWO PRACTICAL SETS

By T. W. Higgs.

THESE sets, shown in Figs. 1 and 2, each consist of one H.F. amplifier, a rectifier, and a L.F. amplifier; one is portable, the other not, but the design is the same. The H.F. amplifier is of the impedance type,

Fig. 1. The Portable Set.

two chokes with sliding iron cores covering the whole range of wavelengths, 200 to 25,000 metres. The short wave tuners (200 to 3,000 metres) are baskets of 22 DCC; the long wave sides (2,500 to 25,000 metres) are pancakes of 26 enamelled wire. The L.F. amplifier in each set can be switched in (including filament lighting) at will, and is seldom used except for magnification of such telephony stations as PCGG, 2AZ, 2FQ, etc.

The aerial is a 50-ft. double wire, average height 40 ft., and is badly screened by trees.

Either set, using H.F. and rectifier only, can be relied upon to bring in NSS, WII, and WGG nicely readable, while NBA (Panama) time signal is audible at 10 a.m. On the short wave tuner Croydon, Lympne and Pulham are easily received, the Hague concert being heard though rather feebly; the note magnifier, however, remedies this, and the strength is then quite fair. Only one reaction coil is used for all wavelengths.

For impressing friends, by using all three valves, MSK, HB, Croydon, etc., can be heard with telephones on the table, as can also Annapolis up till eleven a.m.

The photographs show the portable set with three valves fitted, the other set having been at that time without its note magnifier.

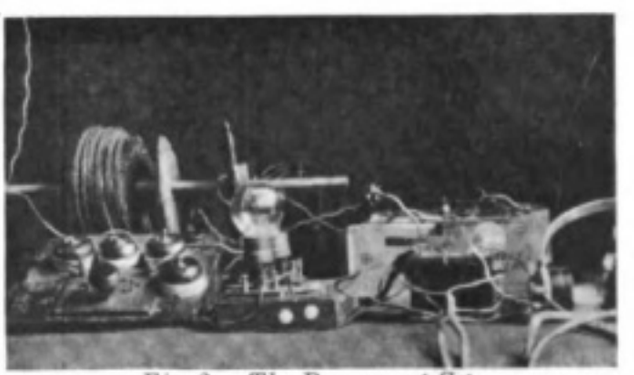


Fig. 2. The Permanent Set.

The chokes are seen "end on" in the portable set, but are concealed in the valve panel of the permanent set.

THE DUTCH CONCERTS

Extracts from Correspondence.

BELOW we publish further comments on the subject of the Concerts contained in various letters received :—

"At the annual general meeting of the Sheffield and District Wireless Society on October 14th, it was unanimously decided to forward a cheque to the Dutch Concerts Fund, and I have pleasure in enclosing same herewith.

In discussing this matter, it was generally agreed that the telephony transmissions were a source of great interest and instruction to those members possessing receiving apparatus, and regret was expressed that no similar enterprise had yet been initiated in this country.

This Society desires to join with Halifax, Stockport and any other Society by giving its wholehearted support to the proposals for a weekly British Concert as recently put forward by the Leicestershire Radio Society."

* * *

"I have pleasure in enclosing herewith a donation to the senders of the Dutch Concert.

Personally I find that it provides 50 per cent. of the interest of amateur wireless. I was listening on last Sunday week to the appeal for funds to be sent to you; also to the letter which was read from Mr. Wade. (I might here mention that, when names and addresses are given out, I should appreciate if they were read a little slower, as would, I believe, other amateurs.)

In the course of the appeal I understood that it was necessary to raise about £300, and I hope that this sum will be forthcoming. It would be a sad day for the amateur if it was discontinued, as many are enjoying it and many more are striving to get it. It is the problem of getting the concert that provides the interest and amusement."

* * *

"I and many friends who have listened-in have much enjoyed these transmissions, and I take this opportunity to tangibly express my appreciation of the enterprise and efficiency displayed by our Dutch friends."

* * *

"I am delighted to see that a subscription list has now been opened to enable the Dutch Concerts to be carried on, and have pleasure in enclosing a small donation, and would suggest that every amateur sends at least 2s. 6d. towards the upkeep of these splendid concerts, especially now that the Nederlandsche Radio-Industrie intend to increase their power.

We here in Cheshire think it very selfish of the amateurs in the South of England saying that the power is quite enough, as it is only under the best atmospheric conditions that the elusive Dutch Concert can be heard on a one-valve circuit with an additional note amplifier.

So live and let live."

* * *

"In response to the appeal for funds to enable the Dutch Concerts to be continued, I have pleasure in enclosing a small subscription.

Personally, in this part of the country (Bingley), we do not experience a great measure of success in their reception. We do get them, of course, but they come in very faintly.

After reading some of the various extracts from letters you have received on the subject from various amateurs, I can see that many uphold the same views on the subject of these transmissions, that I hold myself.

I think a very much greater response would be found if we could get an English station to transmit telephony on ample power, the station to be centrally situated. It is a crying shame that we should have to depend on a foreign country to provide concerts for their benefit, and if any sound proposal comes forward to establish an English station, I will support such a scheme to the limit of my ability.

Meanwhile, we must not let those who have shown sufficient initiative to commence these concerts suffer, and consequently it is the duty of amateurs generally to support this appeal. At least, that is how the matter strikes me."

* * *

"I have perused with interest in your edition of the 1st inst. the extracts from some of the letters you have received on this matter, and I cannot help from commenting on the selfish spirit displayed in the communication from the gentleman in the South of England, who is of the opinion that no further increase in power is necessary. It is evident that our friend thinks only of himself, and when writing to you has not taken into consideration at all the large number of amateurs situated hundreds of miles on the far side of London from Holland who have the greatest difficulty in hearing these concerts on two or three valves, and to whom the increased power would be very welcome indeed.

As no English firm has been enterprising enough to organise concerts similar in character to the Dutch Concerts, I feel that the final remarks contained in our friend's letter are not only gratuitous, but illogical, as although he is prepared to listen-in and enjoy a foreign concert, he objects to sending a subscription to 'a foreign firm' because they propose to increase the power! In a matter such as this, surely it would have been nicer to have taken the broader view and to have thought what would benefit the majority instead of looking at it entirely from a personal and selfish standpoint."

The organisers of the Dutch Concerts have indicated that in order to continue the concerts and to be able to increase the power of the transmissions an additional expenditure of about £300 will be required.

We understand that the amount already subscribed is not nearly enough to meet this additional expenditure, and it is hoped that further subscriptions may be received from *all* those who are enjoying the concerts.

SOME METHODS OF RECORDING WIRELESS SIGNALS*

(*Continued from page* 510 *of the previous issue.*)

Mr. A. W. Sharman (*communicated.*)

The subject matter of this evening's discussion opens up a field of great theoretical and practical interest. Those of us who have followed the development of wireless from the plain aerial coherer days right up to the complicated present-day methods will, I think, have been conscious of some element of fascination which was absent during the strenuous days of intensive aural reception. In spite of the wonderful extension of range and increased speed which aural methods of reception rendered possible, the absence of the call-bell and the cheerful clicking of the Morse inker robbed the station of some of its interest. The advantage of obtaining a permanent record of messages received is self-evident, and well repays anyone for the extra trouble required for the construction and installation of the additional apparatus.

The usual form of Morse inker is not very suitable for use as a wireless recorder. The armature, print wheel and lever which forms the moving element, is quite unduly heavy, and the large electro-magnet fitted takes a perceptible time to excite with a reasonable voltage and to demagnetise on the cessation of the current. Moreover, a very short "dot" impulse sometimes fails to do more than cause the armature to commence its excursion without actually bringing the print wheel into contact with the paper, so that dots tend to miss. If, on the other hand, the spring control is set very light, the armature tends to hold down after the dot impulse, and this, of course, is more noticeable when the magnetic winding is shunted with a non-inductive resistance.

The shunt must be used, or the self-induction kick from the magnetic winding tends to weld the relay contacts together and also reacts upon the detector, making the whole set unmanageable. Naturally these defects do not appear when the instrument is used under conditions for which it was designed. In land-line working the operating current can be large, so that there is a big factor of safety and the adjustments are coarse and easily obtained. I therefore only use the clockwork portion of the Morse inker as a paper drawoff, and do the actual printing with a separate electro-magnetic movement built on the same design as the old-fashioned Varley relay. The armature of the Varley relay movement carries a small glass or silver syphon tube, one end of which dips into an inkwell and the other rests continuously upon the moving paper slip. When the armature moves (it requires only a fraction of a milliampere) the syphon is moved laterally across the paper and the signals are recorded in a form similar to those obtained from a syphon cable recorder, except that the dots and dashes are represented by excursions of the line in the same direction but of different duration.

Apart from the fact that the full excursion of the syphon is obtainable at a much higher speed and with far less applied power than is possible with the Morse inker movement, there is the very great advantage, that even an incomplete excursion is recorded and readable from the slip.

The armature of the Varley movement, in addition to the syphon, also carries a pair of relay contacts, so that when I use the well-known "Turner trigger circuit" I use these contacts for quenching, and am thus able to dispense with the usual relay, the Varley movement serving both as recorder and quenching relay. Under these conditions the excursions of the syphon are *always* complete, because once the syphon begins to move under the control of the augmented plate current, that current is maintained and cannot cease until the syphon excursion *is* complete and the quenching contacts touch.

With the low-frequency form of a circuit,

*Discussion before the Wireless Society of London, on Friday, September 30th, 1921.

and using one valve as autodyne receiver and one valve as note magnifier and one valve in the trigger set, I find I can record with this device all the usual large stations, North Foreland and several of the ships without

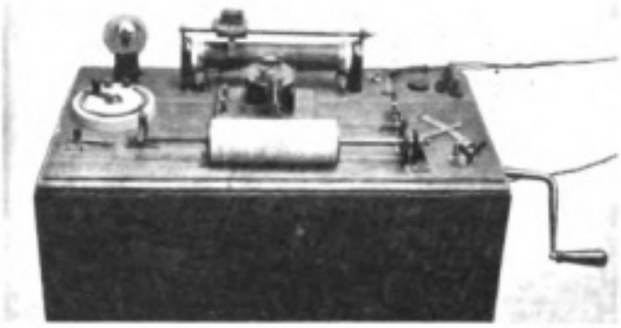


Fig 30.
Mr. Lander's Recorder.

using any outside aerial. All I use is a four-member umbrella aerial, fixed under the slates of the roof of my house.

If one does not mind using an outside aerial and some form of note magnifier, so that really strong wireless signals are available, there are at least two methods of printing which are simple and give good results. Everyone knows that a crystal detector will act as a rectifier for a high-frequency oscillating current, but a crystal will also rectify an alternating current of relatively low frequency, such as that available from the secondary winding of a telephone transformer when the primary is excited by the current from an amplifier or from a Brown telephone relay. If a good crystal rectifier is inserted in place of the telephone in such a circuit, we shall have in place of an alternating current a series of brief impulses all in the same direction.

If we now insert the line winding of a really sensitive relay, such as a 10,000 ohm Siemen's or Marconi relay, the impedance of the winding is so tremendous that these desirable little current impulses are stopped altogether. If, however, we shunt the winding of the relay with a well-insulated condenser, such as a Mansbridge of from $\frac{1}{3}$ to $\frac{1}{2}$ microfarad capacity, these little impulses are jerked into this capacious condenser without difficulty and, being unable to leak backwards through the rectifier, they are compelled to oblige by trickling through the winding of the relay, thereby causing the field change necessary to trip the relay and record the signal.

My best results have been obtained with the rectifier formed of a copper wire point resting upon a piece of molybdanite; but carborundum or zincite hellurium are all good combinations to use. The main point is that the resistance of the crystal combination to currents in a positive direction should not be too great.

The second method I referred to consists in the application of Professor Lodge's

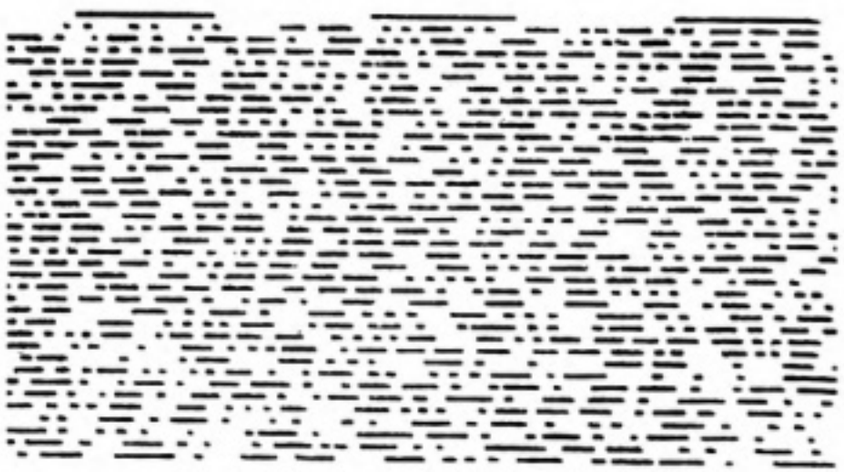


Fig. 31.
A Specimen Record (Lander).

"Dancing Contact" to printing. If you fix an ordinary high resistance telephone receiver so that the diaphragm is horizontal, and fix a small light carbon contact in the centre of the diaphragm and arrange a small pivotted lever carrying at its end a second carbon contact, so that the two rest together in light contact, a signal impulse from the amplifier passed through the winding

of the telephone will cause the diaphragm to move slightly and the light contacts to chatter, thereby increasing the contact resistance and reducing the current flowing through them.

I utilise this effect by joining up a cell or potentiometer in series with the relay winding and "dancing contacts," so that the steady current through them holds the tongue of the relay in contact with the spacing stop.

When the signal impulse arrives the contacts vibrate, their resistance is increased, and the relay tongue flies over to the marking contact, thus recording the signal.

The system works well in my house when all is quiet, but the microphonic contact is unpleasantly sensitive to domestic vibration and passing traffic, and the system works best at night.

Mr. A. Lander (*communicated*).

My recorder, shown in Fig. 30, is intended for use in any wireless receiving circuit, continuous wave or spark, which is giving ordinarily good signals; this instrument simply replacing the telephones.

The principle of the apparatus, which is a modification of the Turner relay principle, is this. The potential of the grid of the recorder valve is initially adjusted to the subgenerative stage, so that the incoming signals will produce local oscillations, the rush of current then actuates a relay, and *breaks* the local circuit, causing the magnet to release the pen and so mark the rotating chart as long as the oscillation persists.

One adjustment only is necessary, that of the potentiometer for controlling the poten-

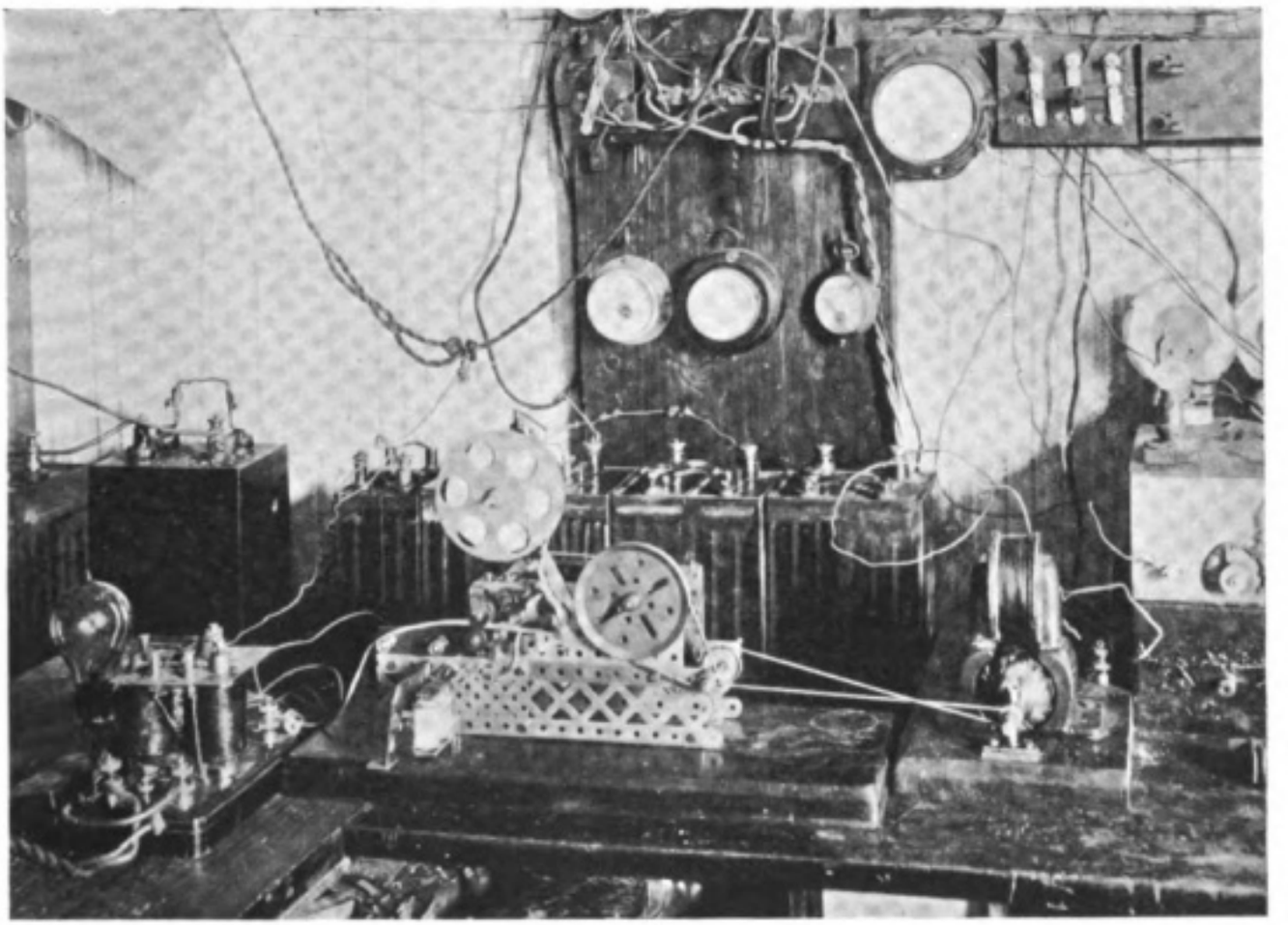


Fig. 32.

The Recorder (*Henderson.*)

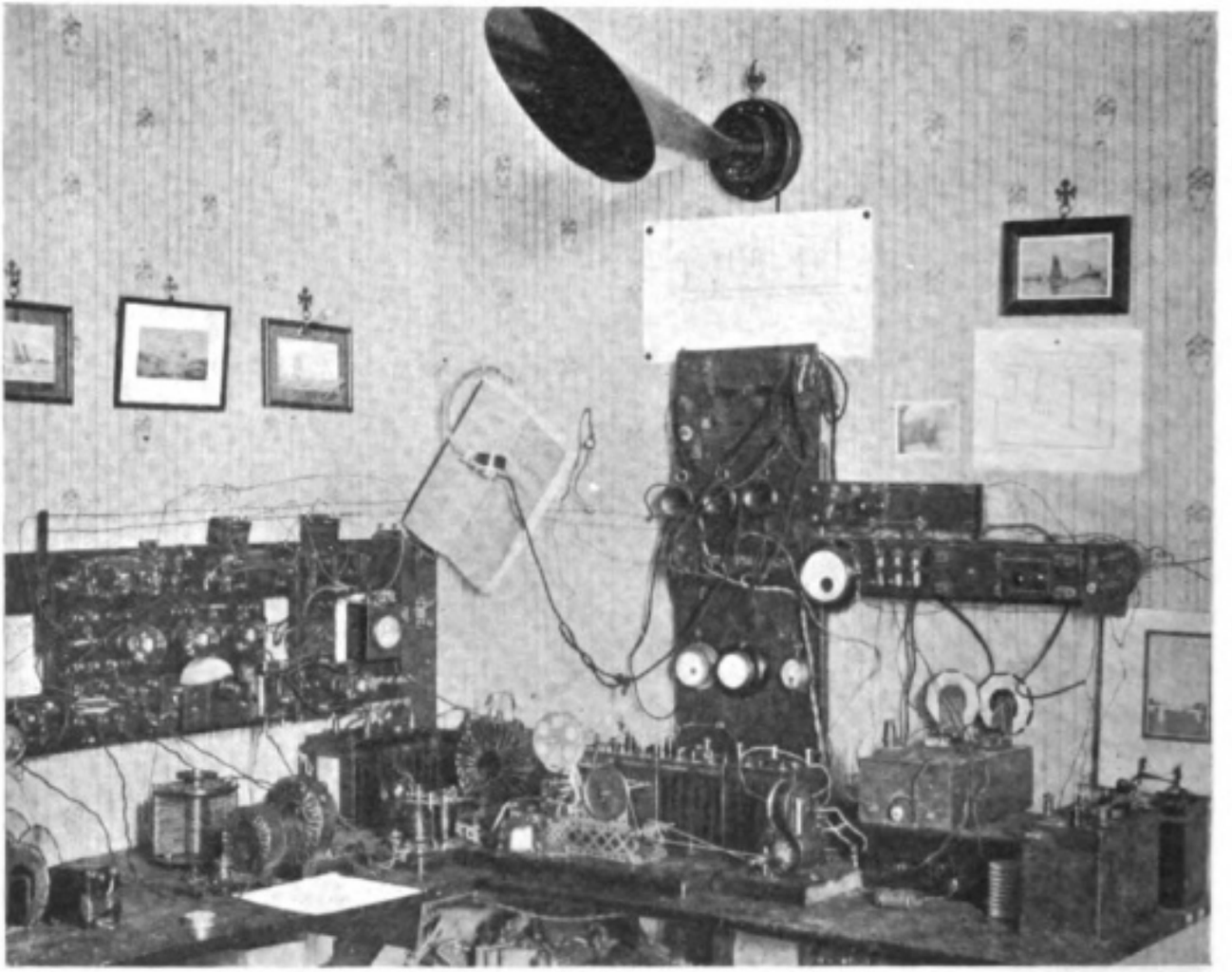


Fig. 33.

The Complete Apparatus (Henderson.)

tial of the grid, and, when once that adjustment is made, it is not easily upset.

The essential features of the instrument are—

(1) The exactness with which the reactance coils, shunts, condensers, etc., have been adjusted to the necessary ratio for extreme sensitiveness and accuracy of response.

(2) The marking of the pen at the *break* of the magnet circuit, instead of at the *make*, as in other instruments.

The recorder mechanism consists of a

Fig. 34.

Tape Record (Henderson.)

gramophone or other motor, which rotates the cylinder at whatever speed is required, at the same time causing the record to move longitudinally in a spiral under the pen. This arrangement permits of the recording of an extremely long series of messages on a piece of paper no larger than a half-sheet of note-paper, the pen taking about half-an-hour to fill the chart.

The recorder is perfectly automatic, and records continuously until the paper is filled, without requiring the least attention.

messages which are far too fast to be read in the ordinary way.

Fig. 31 shows a specimen of a portion of a record made at an amateur's station, at which the usual small aerial was used. The record shows the end of the Paris time signal of June 4th, 1920, and a section of the French Meteorological Report. It is remarkably clear and distinct, showing even the individual peculiarities of the sender.

Mr. J. A. Henderson (*communicated*).

The following particulars of my home-made

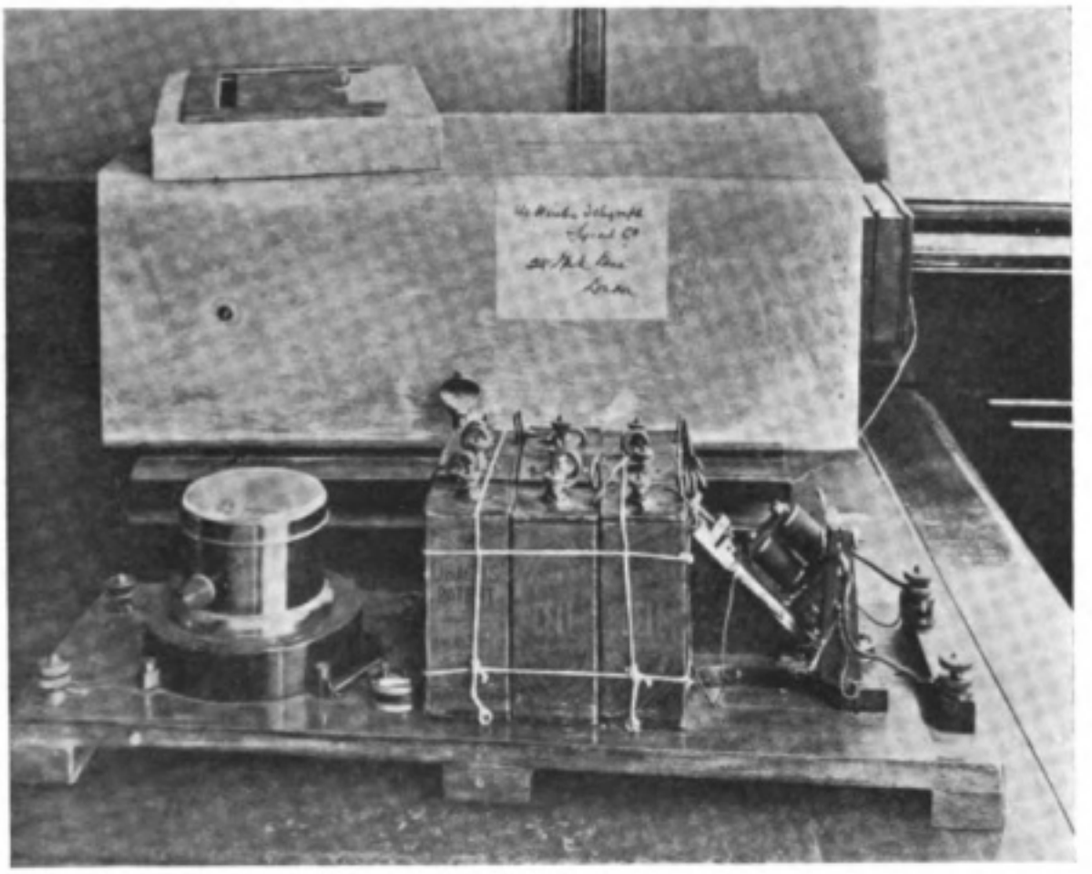


Fig. 35.

Marconi Coherer and Tapper.

This instrument is eminently suited for commercial or for amateur stations. Any operator receiving clear signals on his ordinary set can instantly switch over to the recorder without any adjustment or alteration in tuning, and obtain a permanent record of those signals in ink on paper. There is no speed limit, the instrument will record

Morse recording apparatus may be of interest. In Fig. 32 the polarised relay is shown on the left of the photograph. The magnets are wound with 44-gauge wire, 10,000 turns on each leg, and are shunted by a non-inductive resistance. The Morse inker, in centre, is made from "Meccano" parts, and driven by a motor, on right. The speed of the

tape can be regulated by a rheostat on the motor, or by changing the driving belt to a larger or smaller pulley. The ink-wheel revolves at same speed as the tape roller, and in same direction, and the tape is moved against the ink-wheel by a smaller roller on the end of telephone transformer, and is shunted by a 2 microfarad condenser. In addition to the Morse inker I have a flashlamp and P.O. sounder (not shown in photograph), any of which can be instantly switched in, and work on signals at the same time as the telephones.

Fig. 36.

An historic Marconigram.

the armature extension. Signals from FFU have been successfully recorded, and it can be easily worked by all the high-power stations. The relay is used in series with a Perikon detector, and the low resistance side of the I have several times recorded the complete press from FL and BYC without a single error.

A general view of my station is shown in Fig. 33. Fig. 34 shows a sample of tape record taken on the apparatus.

Marconi's Wireless Telegraph Company, Ltd. (*communicated*).

A contribution of one or two pictures of apparatus used by this Company in the recording of wireless signals may be of interest.

The coherer used by Senator Marconi in 1895 is now purely of historical interest. Everyone will recall the results obtained with his first experiments, and how these were at times consistently successful, whilst at others gave variable results. In the employment of the coherer for printing purposes most careful nursing was required in order to record an intelligible message at say twelve words per minute.

Fig. 35 shows a very early type of the coherer mounted on its tapper, which is shown on the right of the figure. The dry cells and the relay for the local circuit are shown, and in the rear is seen the screening box.

Fig. 36 is interesting as being a tape message printed through the medium of a coherer. The message was sent by Queen Victoria to the Mayor of Boulogne upon the occasion of the meeting of the British Association at Dover, communication taking place between stations erected at Dover and Wimereux.

Fig. 37 shows recording apparatus at Witham station in which the signals are impressed at high speed upon the wax cylinders of a gramophone. The cylinders are then transferred to a machine carrying a sound box and ear telephones, and the message is received at any convenient speed by the operator, the only difference being in the reduced pitch of the original note, due to the slower motion of the rotating cylinder.

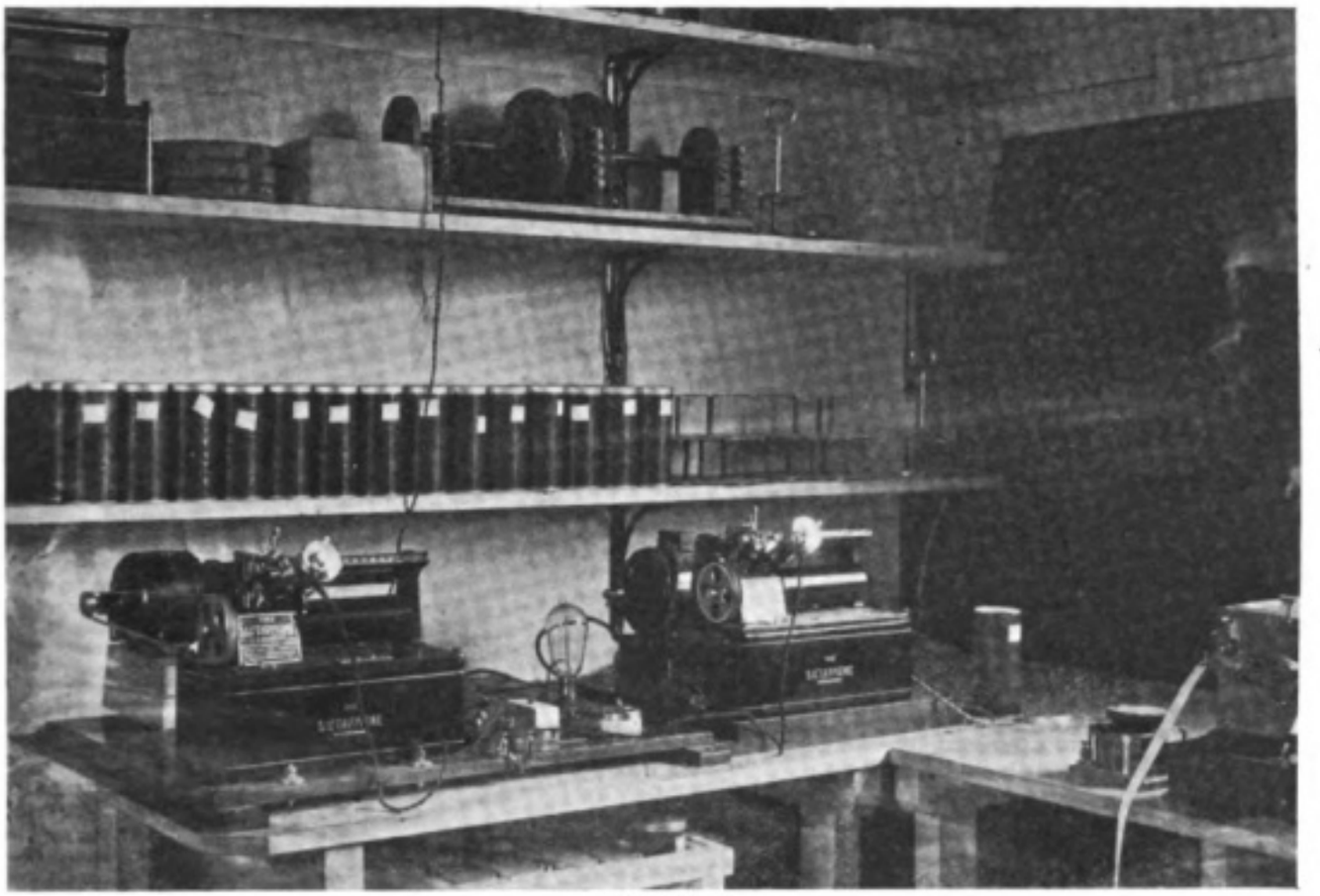


Fig. 37.
Dictaphone Recording Apparatus at Witham.

Fig. 38 is a picture of a special Marconi recording receiver used on board the S.Y. *Elettra*.

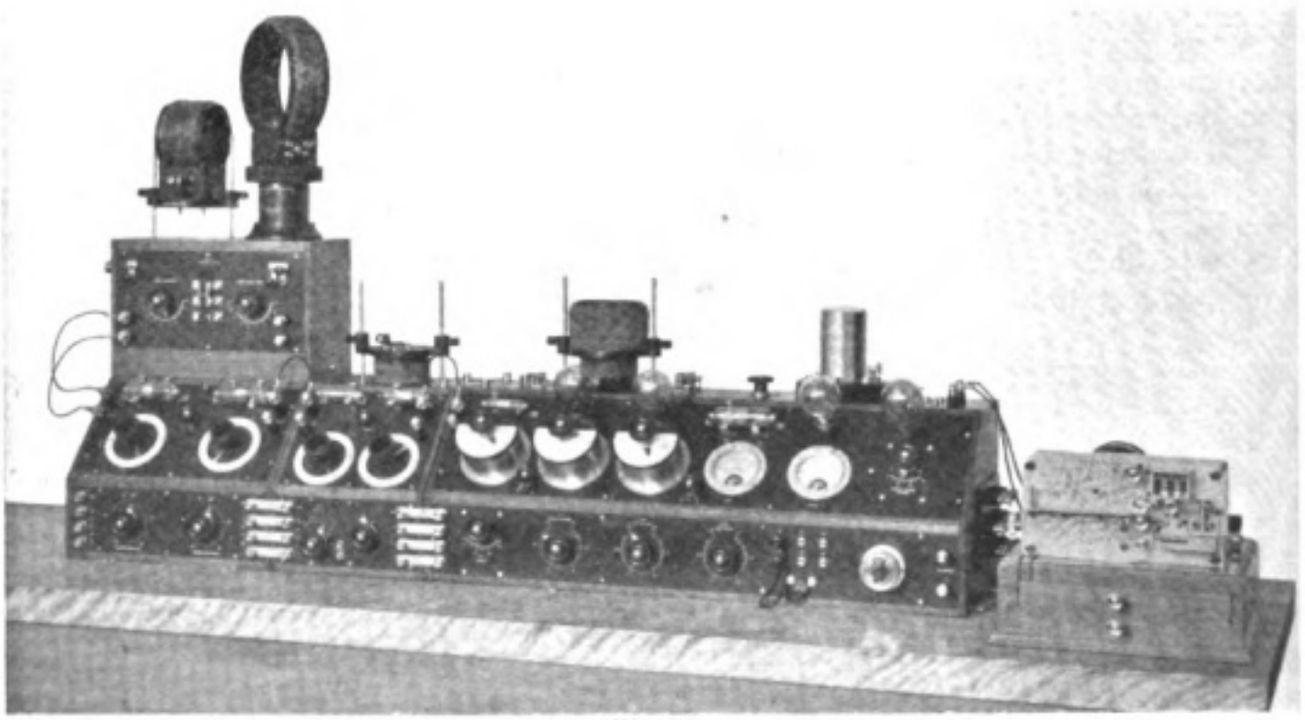


Fig. 38.
Apparatus on the S.Y. Elettra.

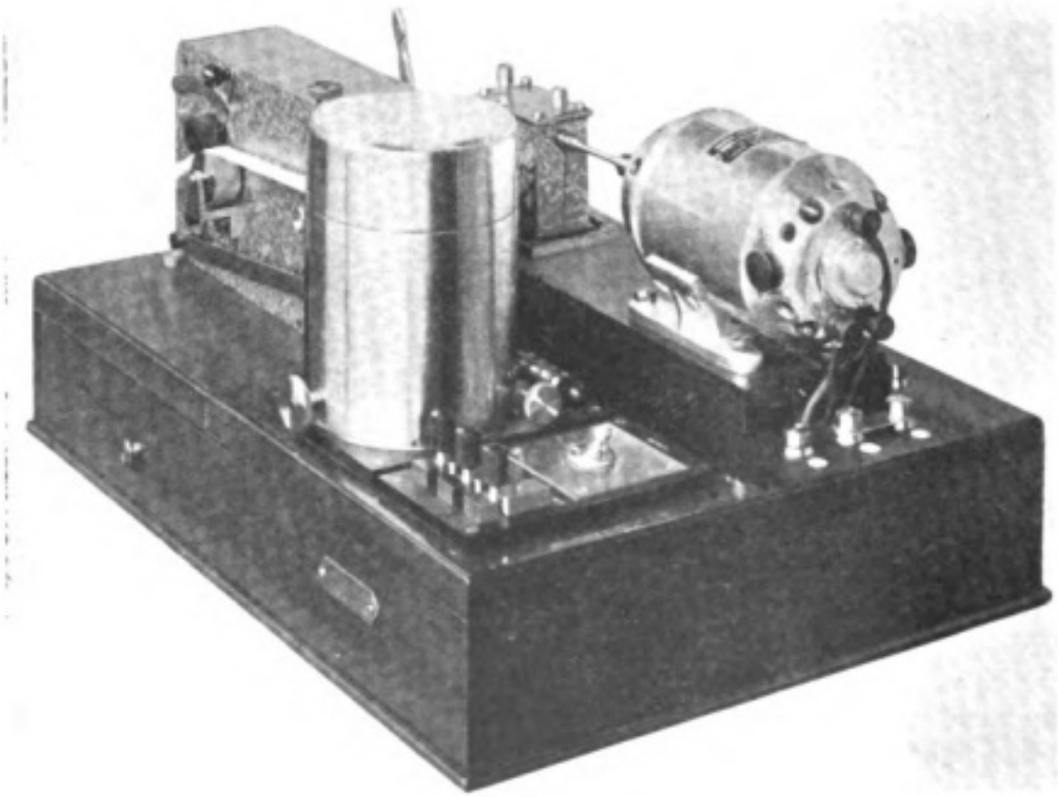


***Fig.* 39.**
Marconi Undulator.

Fig. 39 is the Marconi undulator of recent construction. This machine is working at a speed of 150 words per minute daily, and is extremely consistent. The syphon pen is contained in the cylindrical box, and is attached to the relay tongue.

Apparatus installed in Marconi House, and used for recording traffic in connection with the League of Nations' Conference at Geneva is shown in Fig. 40. In the foreground is a high speed direct printer. The latter is an invention of Mr. Creed, and shows the latest type operated by electric drive. Earlier types were operated by compressed air.

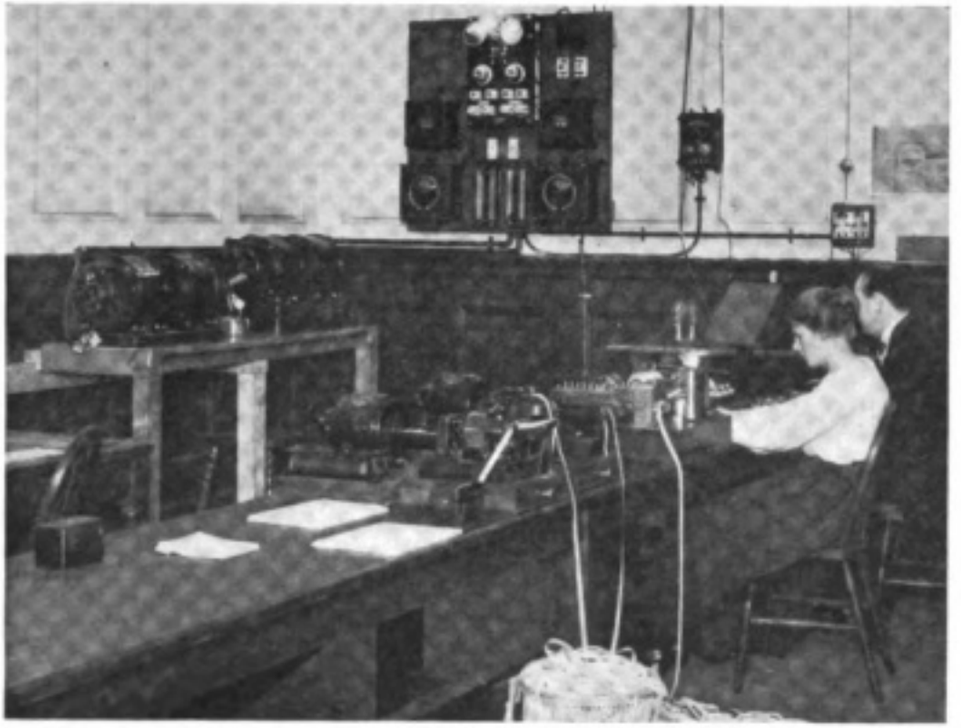


Fig. 40.
The Creed Printing and Recording Apparatus.

Mr. W. H. Shortt (*communicated*).

Figs. 41 and 42 are supplied in illustration

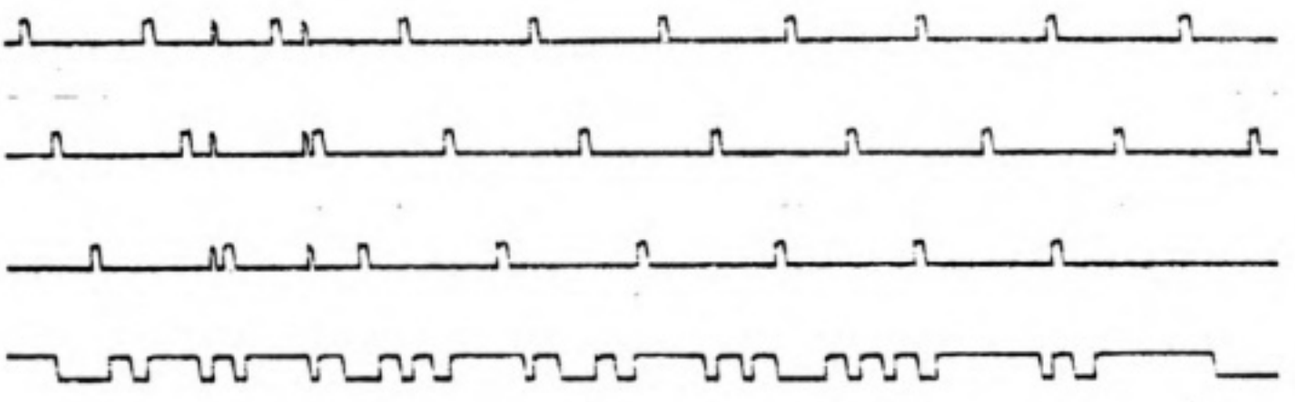


Fig. 41.
Specimen Record (Shortt.)

of the remarks made at the meeting of the Society.*

Fig. 41 shows a specimen of tape with the Paris "beats," followed by the times of the first and last "beats." Fig. 42 gives a diagram of the recording circuit employed.

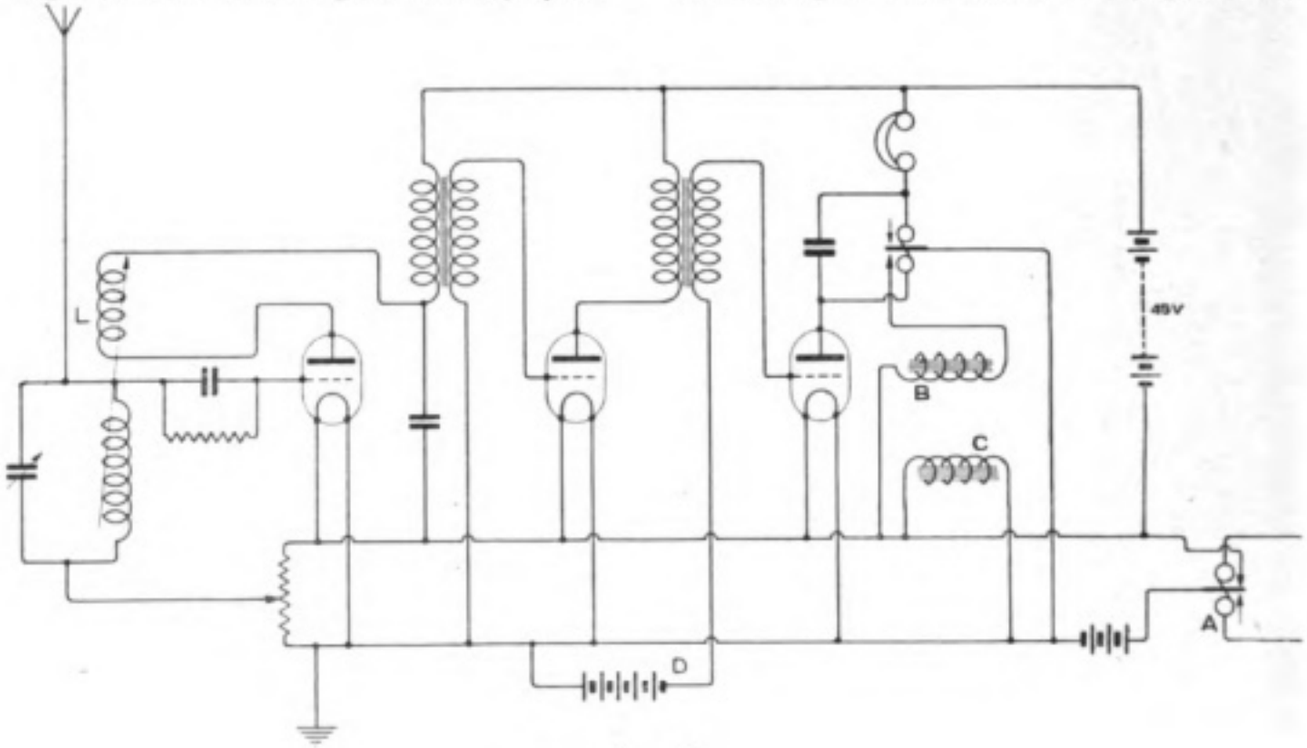


Fig. 42.
Circuit Diagram (Shortt.)

Mr. A. A. Campbell Swinton (*communicated*).

Referring to the reproductions of Wireless records published on page 471 of the October 29th issue of *The Wireless World*, I fear I have not made it plain that the excellent photographic mirror galvanometer record of the signals from the Eiffel Tower, reproduced in Fig. 5, was not obtained by myself, but was taken, I think in the year 1913, by Mr. Harold T. Ellis, of Wrea Head, Scalby, near Scarborough. Indeed, it was this gentleman who first put me on to recording wireless in this manner.

Capt. H. de A. Donisthorpe, on behalf of R.M. Radio Co., Ltd. (*communicated*).

Mr. V. Ramage draws our attention to the circuit shown on page 474 of the October 29th issue of *The Wireless World*, which is an elaboration of a patent of which he is co-patentee.

*See **Mr. W. H. Shortt**, *The Wireless World*, Nov. 12th, 1921, pp. 505-506.

THE TRANSATLANTIC TESTS

BEFORE the next issue of this magazine appears the Transatlantic Amateur Wireless Tests, arranged by the American Radio Relay League, will have commenced. The latest information received from the American League indicates that the preliminary trials on their side have already taken place (between November 1st and 6th). These preliminary trials were made with the object of determining the transmitting stations which are eligible to compete in the Transatlantic transmission. The conditions laid down for entry in the main tests were that the transmitting stations must be capable of sending over a range

of at least 1,000 miles overland. Seventy-nine transmitting stations in various parts of the United States and Canada entered for these preliminary trials, but the results obtained are not yet available here.

Those stations which succeed in these trials will be entered for the main tests which will take place between December 8th and 17th. We expect to receive, in due course, from the Traffic Manager of the American Radio Relay League the full particulars as to those stations which will participate in the final trials. Information as to the number of stations taking part, their times of transmission, etc., will be sent by post to those who have registered their names as desirous of listening in for the signals.

It may be of interest to note here that of the above-mentioned 79 stations taking part in the preliminary trials not more than half are using C.W. transmission, and not more than half are stated to be using a wavelength of exactly 200 metres. A few are shown as using a wavelength as high as 375 metres, while two are down to 190 metres.

The schedule of transmission for the main tests will begin at midnight, G.M.T., on each night, and will continue for approximately six hours on each occasion.

The first part of each night's transmission will be a " free-for-all " period, during which all transmitters in a certain district will be sending—the idea being to imitate as nearly as possible normal conditions on amateur wavelengths in America, *i.e.*, a large number of stations sending, and the most powerful ones signalling louder over the general flock of stations. The second part of each night will be allocated to the various stations who succeed in the preliminary trials, so that each station has a chance of transmitting in turn.

Mr. P. F. Godley, who is being sent over here by the American amateurs, will bring with him his own receiving equipment of a sufficiently flexible nature to cover the above-mentioned range of wavelengths, but obviously those American stations who are nearest to 200 metres on which wavelength most of us will be listening will have a better chance of getting through. Mr. Godley is determined to pick up the signals if it is at all possible to do so, so that for the honour of British amateurs and experimental wireless we appeal to all radio enthusiasts in this connection either to make every effort to pick up the signals—using a non-radiating receiver with a separate heterodyne so as to avoid interfering with other listeners—or to keep quiet during the test periods, and to avoid either transmitting or receiving. Indiscriminate use of either transmitting or receiving apparatus by those not taking part may upset those who are listening in, hence we take this last opportunity of mentioning the matter so as to increase our chances as much as possible.

If you wish to take part, send in your name and location of station (if you have not already done so), to Mr. Philip R. Coursey, c/o The Wireless Press, Ltd., 12-13, Henrietta Street, London, W.C.2, as soon as possible, so that the details of the transmission schedules, and 200 metre calibrations and test waves may be posted to you.

The list of prize offers that have already been received was published in our last issue.

We have since received an additional offer of prizes from The Peto-Scott Company. Three prizes of value £5, £3 and £2 are are offered in apparatus from their catalogue. To be eligible for this prize a part of the apparatus used must have been purchased from this firm.

The conditions attached to the award of these prizes to those receiving the signals were also set out in that issue.

Details of the offer of The Marconi Scientific Instrument Co., Ltd., are as follows :—A first, second and third prize of a selection of apparatus to the value of £25, £15 and £5 respectively, and, in addition, six consolation prizes of Marconi " V24 " valves.

DIRECTORY OF EXPERIMENTAL STATIONS

CORRECTIONS AND ADDITIONS

Call Letters.	Power in Watts.	Wave-lengths in Metres.	Hours of Working.	System.	Name and Address.
2 FP	10	180 1,000	—	Spark, Telephony, C.W. and T.T.	F. Foulger, 118, Pepy's Road, S.E.14.
2 IQ	—	—	—	—	W. A. Ward, 26, Marlborough Road, Sheffield.
2 KW	—	150, 180 1,000	7.30–9.30 p.m.	C.W. and Telephony.	W. R. Burne, Springfield, Thorold Grove, Sale, Cheshire.
2 LP	—	—	Thursdays and Saturdays, 3–4 p.m. and 8–9 p.m. Other days, 8–9 p.m. and 10–11 p.m.	—	A. W. Knight, 26, Stanbury Road, S.E.
2 LY	10	1,000	12.30–1.30, 10.30–11.30 p.m.	Telephony	H. H. Thompson, 59, Redlands Road, Penarth, Glam.
2 MZ	—	—	9.30–10.30 p.m. Except Mon., Tues. and Thurs.	—	J. Mayall, "Burfield," St. Paul's Road, Gloucester.
2 OF	10	180 1,000	8–10 p.m.	Spark, C.W. and Telephony.	H. C Trent, Secondary School, Lowestoft.
2 ON	10	180 1,000	7–9 p.m. Monday–Saturday 11–12 a.m. and 7–8 p.m. Sunday.	Spark, C.W. and Telephony.	Major H. C. Parker, 55, Stern-Hall Street, Walthamstow, E.17.

A GERMAN RECEIVER.

The photograph shown in Fig. 1 was sent us by Mr. H. E. Adshead, the contributor of the article "A Slab Inductance Tuner," which appeared in our October 15th issue. Fig. 1 shows a German shortwave spark receiver used during the war, possibly in a submarine. Fig. 2 is a simplified wiring diagram of the instrument. The secondary of this tuner is calibrated from 120 to 3,000 metres. All tappings are to make and break contacts instead of studs.

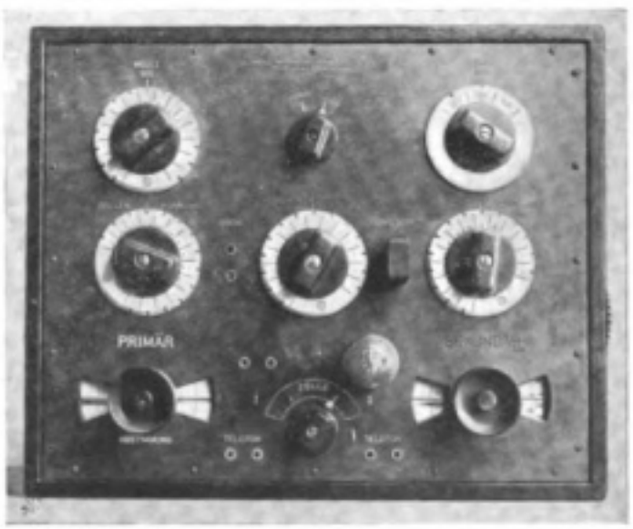


Fig. 1.

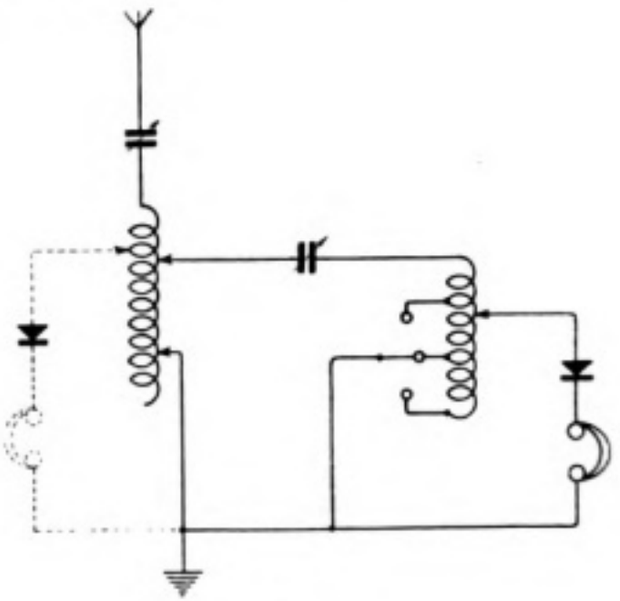


Fig. 2.

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 in the exact form in which they are to appear and as concise 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 of unusual or special interest read before Societies.

Manchester Wireless Society.

(Affiliated with the Wireless Society of London.)

Thursday, November 3rd.—Mr. H. Powell Rees, of H.P.R. Wireless Ltd., demonstrated before the Society with a full set of H.P.R. units, and during the course of the evening explained the principles employed in the construction of these instruments. As may have been noticed, none of the units employ a rotary condenser, and after serious consideration it must be admitted that the sliding type certainly possesses advantages over the rotary. It is simpler to construct, more adaptable to the receiver and particularly useful when tuning for telephony, inasmuch, in the rotary type, when adjusting, the hand is placed over the condenser, thereby bringing in a great deal of capacity effect, unless a special tuning handle is used. In the sliding type when adjusting, the hand only affects the ends of the condenser, and the capacity effect is thereby reduced to a minimum. Another special feature of the H.P.R. units is the system of calibrating wavelengths, by means of the calibration cards supplied with the instruments. By this method one can immediately adjust the receiver to any desired wave, the pilot wave being 2,500 metres (F.L.). The instruments are absolutely foolproof and highly finished, and Mr. Rees is to be complimented on the display. The outstanding feature of the evening was the Loud Speaker used with the amplifying set. This was the first occasion on which the instrument had been used in public, and Mr. Rees has certainly got one step nearer to the ideal instrument. Telephony was not received during the evening, so one cannot vouch for its merits in this respect, but any member present who was familiar with the sound of the principal stations had no difficulty in distinguishing the notes of many stations received. Other loud speakers invariably muffle the note, and otherwise distort the pitch so that unless an audience of wireless enthusiasts are told the name of the station being received it is practically impossible for them to distinguish one from another. It is to be hoped that Mr. Powell Rees will perfect the instrument in question and enable those interested to enjoy its advantages. Another point discussed by the lecturer was the distortion of speech caused by the use of L.F. amplification, most of this being due to the magnetic action of the iron cored transformer, since certain frequencies, of which the human voice has many, cannot be passed as quickly as others, thereby causing the impulses to become "mixed," and destroying the pure speech note.

After explaining a few simple "gadgets" of use to the amateur, and answering several questions from the members, Mr. Rees concluded his discourse with a demonstration of receiving high-power stations through the medium of a three-valve receiver, the signals, relayed through the loud speaker, being heard in various parts of the building.

During the reception of signals mentioned above, one transmission was received on 16,465 metres approximate, and rather puzzled Mr. Rees as to its identity. This has since been confirmed by him as being a trial transmission from the new high-power station at Rocky Point, Long Island, U.S.A. in anticipation of the formal opening by President Harding on November 5th. It is interesting to know that this was actually received on the Society's aerial, using the H.P.R. Universal Amplifying Receiver, 150 to 30,000 metres.

The Chairman, Mr. McKernan, in proposing a hearty vote of thanks to Mr. Rees, remarked that he believed the reception that evening had been the best ever heard on a three-valve receiver by the Society, and that Mr. Rees was to be congratulated on such a fine demonstration. This was seconded by the Vice-Chairman, Mr. Reid, after which the members showed their appreciation very heartily.

The date of the next meeting is November 17th, this being the Annual General Meeting.

Hon. Secretary, Mr. Y. W. P. Evans, 7, Clitheroe Road, Longsight, Manchester.

North Middlesex Wireless Club.

(Affiliated with the Wireless Society of London.)

The 77th meeting of the Club was held at Shaftesbury Hall, Bowes Park, on Wednesday, November 2nd. The chair was taken by the Hon. Secretary, and after reading the minutes he called on Mr. Haynes to read a paper on "The Recording of Wireless Signals."

Mr. Haynes began by describing the methods used in the early days of Wireless, and said that a coherer of the Lodge-Muirhead type was successfully used, with a polarised relay in circuit. He then described the Wheatstone Bridge method of connecting a valve in the circuit. He said that he had found that relays of the Siemens type gave the best results. By connecting two valves in the Wheatstone circuit it was possible to use both halves of the wave oscillation, and thus greatly increase the efficiency of the working. Mr. Haynes also drew and described the Siemens relay. Replying to a question, the lecturer emphasised the much greater sensitiveness of the Wheatstone circuit over the note magnifier type.

Having mentioned the R.M.R. valves in the course of his talk, Mr. Haynes drew curves showing the special features of this type of valve, and explained why it was particularly suitable for the purpose of inclusion in a circuit such as he had described. He also gave a description of some of the difficulties met with in the construction of valves, showing how a number of points little thought about by the majority of users had a great deal to do with the results given by a valve in use. He described some of the methods used in R.M.R. valves which contributed to the results obtained with these valves.

A vote of thanks was moved by the Chairman and heartily carried.

Hon. Secretary, Mr. E. M. Savage, "Nithsdale," Eversley Park Road, Winchmore Hill, N.21.

Sussex Wireless Research Society.

(Affiliated with the Wireless Society of London.)

Hon. Secretary, Mr. Edward Hughes, B.Sc., A.M.I.E.E., The Technical College, Brighton.

The second meeting of this Society was held at Cottesmore School, Upper Drive, Hove, when the President, Capt. Hoghton, F.P.S.L., M.Inst.P., gave a lecture on "Valves—a General Survey." The lecturer reviewed the electron theory with special reference to the work of O. W. Richardson on the thermionic emission of hot bodies. The use of tungsten filaments alloyed with thorium was referred to, and the construction of soft and hard valves dealt with. Valve characteristics and their significance were explained, especially in regard to the effects of varying the distances between and the construction of the plate, grid and filament. The action of the grid leak and condenser was explained in detail. At the end of the lecture, a number of questions were asked by various members and replied to by Capt. Hoghton.

The programme of meetings for the next two months will be as follows:—

November 2nd.—Lecture and Oscillograph Demonstration on "Harmonics," by Mr. E. Hughes, B.Sc., A.M.I.E.E., at the Technical College.

November 16th.—Lecture on "The Valve as a Generator of Oscillations," by Capt. Hoghton, at Cottesmore School.

November 30th.—Demonstration of Wireless Apparatus, etc., by Mr. W. Bennett, B.Sc., A.R.C.Sc., at Brighton College.

December 14th.—Lecture on "Transmitter Circuits," by Capt. Hoghton, at Cottesmore School.

A meeting of the Society was held at the Technical College, Brighton, on the 2nd inst., under the chairmanship of Capt. Hoghton, M.Inst.P., F.P.S.L., when a lecture on "Harmonics" was given by the Hon. Secretary.

The occurrence of harmonics in acoustics was first explained and illustrated by an organ pipe blown at different pressures, when the fundamental and harmonics up to the fifth were clearly distinguishable. The question of harmonics in alternating e.m.f's. and currents was then dealt with, and the effect of inductance in reducing and of capacity in accentuating the harmonics was demonstrated by inserting a shunted "loud speaker" in different types of circuits fed from an alternator having decided eleventh and thirteenth harmonics in its e.m.f. wave.

Finally, the wave forms of the currents in inductive and capacity circuits were illustrated on an oscillograph of the tracing-desk pattern. This instrument was also employed to show the manner in which the plate current of a valve varies with the alternating voltage applied to the grid, and how the faithfulness of the reproduction of the wave shape depends upon various adjustments of the valve potentials.

The Society's membership roll was increased by the election of three new members; and the Secretary will be pleased to give particulars of membership to any person interested in wireless matters.

Newcastle and District Amateur Wireless Association.

(Affiliated with the Wireless Society of London.)

Members please note that the weekly Club meeting night has been transferred to Monday evenings as from Monday, November 7th. This change was made in order that members might receive the Dutch concert in their own homes.

The Society's Exhibition is fixed for December 2nd and December 3rd. A transmission of telephony from a local source will probably take place on those dates. The Committee depend on members to make the exhibition a success by exhibiting as much of their apparatus as possible. Both old and new types are required. Loans of apparatus from prominent firms would be welcomed.

Hon. Secretary, Mr. Colin Bain, 51, Grainger Street, Newcastle-on-Tyne.

Bradford Wireless Society.

(Affiliated with the Wireless Society of London.)

All communications to be addressed to Hon. Secretary, Mr. J. Bever, 85, Emm Lane, Bradford.

At a general meeting of the above Society the following officers were elected:—PRESIDENT, Mr. C. Wood; VICE-PRESIDENTS, Mr. R. Ramshaw, Mr. A. Bever, Mr. A. Liardet; COMMITTEE, Mr. A. Barber, Mr. W. Andrews, Mr. Daniels, Mr. Eskdale; ORGANISING SECRETARY, Mr. N. Whitely; HON. TREASURER, Mr. N. Hammond; HON. SECRETARY, Mr. J. Bever.

A very successful programme has been drawn up for the session, and we hope to see any members of other Clubs who are in the town.

The Stockport Wireless Society.

(Affiliated with the Wireless Society of London.)

On October 5th, Mr. H. Bentley delivered a most interesting lecture on "Induction," which he explained in a very lucid manner.

On October 12th, Mr. F. Banyard gave a lecture on "Motors and Dynamos." The lecturer demonstrated the theory of the motor very clearly, and he then gave particulars of the characteristics of the rotary converter, the motor generator, and several other types of machines used in wireless telegraphy.

On October 19th, the Vice-President of the Society, Mr. A. Roberts, gave an interesting lecture on "Accumulators," in which he explained the chemical process which takes place during charging. He also gave particulars of the care, charging, laying up and use of accumulators. These lectures are part of an elementary and progressive course of lectures working from "Simple Cells" to "Three-Electrode Valve Transmission," and they have been found of great benefit to the members as they are designed to give a thoroughly sound grounding in the theory of wireless.

During the month the P.M.G. has granted permission for the use of an aerial 150 feet long, and it has been erected and found most efficient.

All communications to Mr. R. H. Jackson, 54, Princes Street, Stockport.

WIRELESS CLUB REPORTS

Woolwich Radio Society.

(*Affiliated with the Wireless Society of London.*)

Hon. Secretary, Mr. H. J. South, 42, Greenvale Road, Eltham, S.E.9.

The monthly meeting of the above Society was held at Woolwich Polytechnic at 8 p.m. on Friday, October 28th. There was a good attendance, including several lady visitors.

Mr. W. T. James, Vice-President, took the chair, and introduced the lecturer, Mr. A. F. Bartle, who is Secretary of the Greenwich Radio Society.

Mr. Bartle had brought with him some interesting apparatus, including a new Burndept Ultra III receiver, which we were fortunate to see, as this was the second time it had been exhibited: also a three-valve universal amplifier of his own design, and a complete set of Burndept coils. Before beginning his lecture he tuned up his set to receive a concert from Mr. Burnham, of Blackheath, who was sending it for our benefit. Immediately Mr. Burnham came on with a call, and then delighted us with three or four gramophone records, including "The Flight of Ages" and the song from "Il Trovatore." These were heard on Mr. Beeson's loud speaker with an enormous volume of sound.

In his lecture Mr. Bartle dealt chiefly with his three-valve universal amplifier. By an exceedingly simple and ingenious arrangement of switches he showed us how to make an amplifier in which the first valve acts as a H.F. amplifier, the second as a rectifier, and the third as a note magnifier. Each valve could be cut out at will by a simple turn of a switch. In dealing with H.F. amplification he illustrated circuits for reactance, resistance, and transformer amplification. He emphasised the advantages of a separate heterodyne circuit, especially when endeavouring to get the American tests this winter, which several Club members have resolved to try to get. Finally he demonstrated the new Ultra III receiver that Mr. Burnham had kindly lent for the evening.

At 9.10, Mr. Burnham came on again and gave us another delighted quarter of an hour with some fine gramophone music which was thoroughly enjoyed.

After the demonstration, Mr. Bartle was asked several questions by members, which he kindly answered.

Mr. W. T. Janes had to bring the delightful evening to a close at 9.30 by proposing a hearty vote of thanks to Mr. Bartle and Mr. Ward, who assisted him, in giving us this fine demonstration, also to Mr. Burnhan for providing the music.

We have been promised a lecture demonstration by Colonel Cousins, R.E., C.M.G., of the S.E.E.—our President—on Friday, November 25th, at 8 p.m., and members are looking forward to it.

Weekly meetings of the Woolwich Radio Society take place at the Old Mill, Plumstead Common, on Thursdays, where there is always plenty doing.

Smethwick Experimental Wireless Club.

At a meeting on Tuesday, October 18th, the Vice-President, Mr. A. Adams, F.I.C., F.C.S., in the chair.

Mr. C. Grew (Chairman) gave a very interesting discourse on the subject of the Manufacture of Amateur Apparatus, which the lecturer illustrated with apparatus of his own manufacture. A very hearty vote of thanks was accorded to Mr. C. Grew.

On Tuesday, October 25th, Mr. A. Adams, F.I.C., F.C.S., in the chair. After the usual buzzer practice, Mr. McKale gave a very interesting paper on "Magnetism." A hearty vote of thanks was accorded to Mr. McKale.

It has been found more convenient to hold weekly meetings of the above Club on Friday evenings, 7 to 9.30.

A very successful meeting was held on Friday, November 4th, when, after the usual routine, the Chairman called upon Mr. L. Sanders to give his paper on "Properties of Matter."

The lecturer must be congratulated upon his lecture which was admirably illustrated by apparatus, leading up to that very interesting subject, X Rays. This proved a very interesting evening. A cordial vote of thanks, moved by the Secretary and carried with acclamation, brought a most successful meeting to a close.

Several new members have been enrolled.

The Bournemouth and District Radio Club.

Hon. Secretary, Mr. T. H. Dyke, 2, Iris Road, Winton.

The above Club held a general meeting on October 28th. The chair was taken by our President, Capt. Hobbs, at 7.30. Our Club-room, which was under process of reconstruction, being completed, we had plenty of items to go into among which was drafting rules; and having had our P.M.G.'s permit through, the matter of getting our apparatus in working order had also to be gone into, all of which was fixed up. Capt. Hobbs asked for volunteers to erect the mast, etc. The Hon. Secretary, together with Mr. Lee and Mr. Anderson, agreed to attend to this.

The Committee have in hand the forming of a good Winter Programme, on which we should have much pleasure in adding the name of any gentleman who would care to give a lecture or exhibition to the Bournemouth Club.

Cambridge and District Wireless Society.

A meeting of the above Society was held on Wednesday, October 26th, at 7.30 p.m., in the lecture room of the Photographic Society, Ram Yard, Mr. Farren being in the chair. The Chairman informed the Society of the season's programme. The question of subscribing to the Dutch Concerts was next raised, and it was agreed that the treasurer should receive any contributions. Owing to the illness of Mr. Diver, the Chairman described the constructional details of a valve he had constructed for special use with the circuit described in *The Wireless World* of April 17th, 1920. The Chairman then called upon the Secretary to read a paper on "Reaction." This the Secretary complied with, dealing with the theory and practice of reaction. Afterwards the subject was declared open to discussion, and then the meeting was declared informal. Some sets present were demonstrated, and commented upon.

Next meeting, November 9th, 1921, at 7.30 p.m., in the lecture room of the Photographic Society, Ram Yard. Mr. Hanby will read a paper on "Interference."

South East Essex Wireless Club.

Hon. Secretary, Mr. F. A. Mayer, "Stilemans," Wickford.

On August 27th the members paid a visit to the works of the Marconi Wireless Telegraph Company at Chelmsford. The party was conducted through the whole of the works, a very interesting afternoon being spent. One of the chief features which interested the members was the screening arrangement now being introduced into receiving sets and amplifiers. Several high and medium power valve transmitting sets were under test. The building containing the set used for the Paris service, which was working at the time, was also visited.

Altogether, much valuable information was gained, and a hearty vote of thanks was passed to the Company for their kindness in arranging the visit.

Loughborough College Wireless Society.

A General Meeting was held on October 25th, at Loughborough College, at 7 p.m.

H. V. Field (Whit Sch.), A.R.C.Sc., who occupied the chair, called on the Secretary to read the report of the past year's work.

The Chairman then announced that the officers of the Society retired.

The election of officers for the season 1921-1922 then took place, the following being elected:—PRESIDENT, H. Schofield, M.B.E., B.Sc. (Hons.), A.R.C.Sc., A.M.Inst.C.E.; VICE-PRESIDENTS, J. F. Driver, M.I.E.E., A.M.I.M.E.; H. V. Field (Whit Sch.), A.R.C.Sc., Lt.-Col. F. G. Hill, M.C., A.M.Inst.C.E.; HON. SECRETARY, F. T. Pamment; COMMITTEE, W. Turner (Chairman), S. M. Douthwaite, A. Hutchen, A. S. Jones, C. S. I. Martin, F. E. Wheeler.

The College have received permission from the Postmaster-General to instal a Receiver and Transmitters (spark, C.W. and telephony) in the College to work on a wavelength of 1,000 metres for communication purposes, and 180 metres for experimental purposes. The call sign of this station is 2PI, working 7 p.m. to 9 p.m.

Also for a portable receiver and transmitter (spark, C.W. and telephony) to work within a radius of 10 miles of the College, with 1,000 metres wavelength for communication and 180 metres for experimental work. The call sign of this station is 2PJ.

Permission has also been given for intercommunication with five other wireless societies; at present arrangements have only been made with three societies, viz., Leicester Radio Society, Nottingham Wireless Society and Derby Wireless Society.

At present only the College receiver is installed.

Arrangements are now being made for research work of an important nature, this being one of the principal objects of the Society.

The Lowestoft and District Wireless Society.

The Lowestoft and District Wireless Society, Bridge Road, (G.E. Rly. Station), Oulton Broad. Hon. Secretary, Mr. L. W. Burcham, "Gouzeacourt," Chestnut Avenue, Oulton Broad.

On September 20th a lantern lecture was given by Mr. Chipperfield at the Victoria Hall, on Valves and Wireless Gear, which was thoroughly appreciated by a large audience of members and friends. A regretable loss to the Society is the retirement of Mr. P. Savage (late 2MD), who has been obliged to leave the district owing to business reasons. As a member of the Committee he has done much to make the Society a success since its inception last March. At a General Meeting on October 4th, Mr. O. G. Scarle was elected to fill the vacancy on the Committee.

At a meeting of the Committee on October 11th, a programme for the winter was drawn up as follows:—1st Tuesday in the month, lectures; 2nd Tuesday in the month, experimental night; 3rd Tuesday in the month, discussion night; 4th Tuesday in the month to be an informal night. The usual buzzer practice will be given from 7.30 to 8 p.m. The forthcoming Transatlantic Tests were then discussed, and the Secretary was instructed to enter the name of the Society as competitors. Four new members and one associate were then elected. On October 24th two members brought Mark III tuners, one in its original condition, and one converted for use with three valves. Various experiments were carried out with these sets, the results being very good. At the close of the meeting a letter from the Halifax Wireless Society asking for support from Wireless Societies in making application for a daily news service by telephony similar to a scheme at present successfully in operation in America. The President then proposed that the Secretary should write for further particulars of the scheme, and state that the scheme has the wholehearted support of this Society. This motion was seconded by Mr. Hudson, and passed unanimously.

Ilford and District Radio Society.

A very interesting evening was spent on Wednesday, October 12th, when Mr. Nickless, M.I.E.E., gave a lecture and demonstration on his new set, the "Ultra 50."

The Chair was taken by Mr. Welch, and after the minutes of the previous meeting were read and confirmed, Mr. Nickless commenced his lecture. The set he was demonstrating consisted of five valves which could be used in various combination. By means of various switches the circuit could be used for either "tuned anode" or "grid leak" with or without H.F. magnification, and either one or any number of valves up to five could be used.

The set was purely a detector and amplifier unit on its own, and could be applied to any form of loose coupler. The results obtained were not as good as might have been owing to a very bad aerial, but music transmitted from 2JX, the Secretary's station, were received on the loud speaker. Everybody was very interested, and a hearty vote of thanks being accorded to Mr. Nickless, the meeting closed.

On October 26th, the usual ordinary meeting of the Society was held at headquarters, and owing to the absence of the Vice-President, the chair was taken by Mr. J. Thompson.

The usual fortnightly lectures were not given, but the meeting occupied itself with discussing a few business matters. It was decided to arrange for half-hour confidential talks between members

when convenient, at the ordinary meetings. The Secretary then gave a description of the Society's set in detail, and described the method of assembling which was very acceptable to some of the members. At the next meeting, Mr Carpenter, of the Marconi Scientific Instrument Co., is lecturing and demonstrating on the four-electrode valve.

Will intending members either write or call at the Secretary's house, 12, Seymour Gardens, Ilford.

Edinburgh and District Radio Society.

(Affiliated with The Wireless Society of London.)

Exhibition of Wireless Apparatus.

An Exhibition of Wireless and Electrical Apparatus will be held by the above Society on Saturday, December 17th, 1921, at Gillespie's School Hall, from 3 to 10 p.m. The Hall has kindly been loaned for the occasion by the Board of Education.

Admission will be free of charge, although any visitor who finds interest in the show will have the opportunity of showing appreciation in contributing to the incidental expenses of the Exhibition and to the "Research Fund" of the Society.

Many interesting exhibits are promised, including Distant Control Apparatus and Tesla Tube Experiments.

Further particulars can always be obtained on application to the Hon. Secretary, Mr. W. Winkler, at 9, Ettrick Road, Edinburgh.

Hounslow and District Wireless Society.

The above Society is moving into new headquarters on Friday, December 2nd, and we want to make a grand opening night of this by asking members to invite their friends. We shal also be glad if members of any other Society near us would pay us a visit on this night; their assistance would be greatly appreciated. From December 2nd our meeting night will be altered from Thursday to Friday, and the address of our new headquarters will be The Alexandra Schools, Alexandra Road, Hounslow, one minute's walk from trams, and two minutes' walk from Histon Hounslow Station, District Railway. Meetings will commence at 7.30 p.m. All interested in or near the district are cordially invited.

Hon. Secretary, Mr. A. J. Rolfe, 20, Standard Road, Hounslow.

Kidderminster.

Mr. George Bell, of 33, St. George's Terrace, Kidderminster, is anxious to get in touch with any amateurs in or around Kidderminster who would care to communicate with him.

WIRELESS TELEPHONY FROM EIFFEL TOWER.

From the commencement of November, the Wireless station of the Eiffel Tower, Paris, is transmitting telephony daily, from 3 to 5 p.m., G.M.T., with the exception of Saturdays and Sundays. The wavelength is 2,600 metres, and the power about 400 watts in the aerial. (The wavelength, it will be noted, is the same as that used for the Paris Time Signals.)

These transmissions are the prelude to a regular news service, which will include financial news.

We are indebted to Dr. Pierre Corret, editor of "T.S.F. Moderne," for the above details.

DUTCH CONCERTS.

We learn that the Thursday transmissions of the Dutch Concerts from the Hague are to cease, although the Sunday afternoon transmissions are to remain as before.

This curtailment is due to action by the Dutch Authorities.

CORRESPONDENCE

To the Editor of *The Wireless World*.

Sir, I should be interested to know if any readers of *The Wireless World* have noticed the following peculiar effect when receiving the lower harmonics (*i.e.*, harmonics having a longer W/L than the fundamental) of a C.W. transmission.

If the grid leak of a single valve receiver is of the correct value as to give loudest C.W. signals *just after* the point at which oscillation commences, then by still further tightening the reaction coupling ordinary C.W. signals will decrease in strength, as is well known. A lower harmonic signal, however will *increase* in strength, and may ultimately be almost as strong as the fundamental wavelength signal.

If, on the other hand, we receive an upper harmonic signal (*i.e.*, a harmonic having a shorter W/L than the fundamental) by tightening reaction coupling, the signal decreases in strength, just as does a fundamental wavelength signal.

I find that this effect is very useful when receiving long waves as it enables one to distinguish between a fundamental wavelength signal and a lower harmonic signal. The effect is very marked in Stonehaven (GSW) transmissions. (I wonder if the Post Office knows how much this station radiates harmonics!)

Spark signals produce this same effect, but in a much lesser degree than C.W.

"EXPERIMENTER."

To the Editor of *The Wireless World*.

Sir,—I am just writing you a line to let you know that I successfully received the Dutch concert last night on a frame aerial, using a Marconi 551D 7-valve amplifier. The frame was one of four-foot side wound with nine turns of 22 gauge enamelled copper wire. The signal was quite clear and readable, and could have been made very good with a note magnifier. I only mention this as I have not heard of this concert having been received on a frame before.

C. J. PRATT.

Putney, *September 23rd*, 1921.

To the Editor of *The Wireless World*.

Sir,—Having noticed a letter in your last issue *re* Attic Aerials from "Improvisor," I think I get as good results as our friend. My apparatus is a three-valve set which is home made, the maker is

a local man (Mr. H. Hiley). I get the Dutch concert on two valves. I also heard Mr. W. Le Quex on September 1st, 1921, talking to Mr. Burnham, which I think is very good. My aerial was a twin 14 ft. long in the attic which has no skylight or windows in. Now I use an outside wire 100 ft. long. I wish to thank the following for music sent out:—2AW, 2KD, and 2IQ.

ANDREW JAS. THOMSON.

A photograph of Mr. Thomson's apparatus is reproduced on this page.

To the Editor of *The Wireless World*.

Sir,—In reference to Mr. Skeets' letter in current issue, I am inclined to agree with him that it does not matter whether the grid or the anode circuit is tuned; but I do not agree when he says that there is no noticeable difference when both are tuned; I have an experimental amplifier rigged so that either grid or anode, or both, can be tuned; if both are tuned, there is a distinct gain in strength, though hardly enough to make the extra complication worth while. But I think that as the results are about the same whether grids or anodes are tuned, it is better to tune the anodes, for the reason that if the grid circuits are the tuned circuits, the last valve is thrown slightly out of tune with the others (if all condensers are moved with one handle, which is the obvious way to do it) owing to the capacity in the grid leak. This is certainly not directly across the tuning condenser, but it certainly does make a difference.

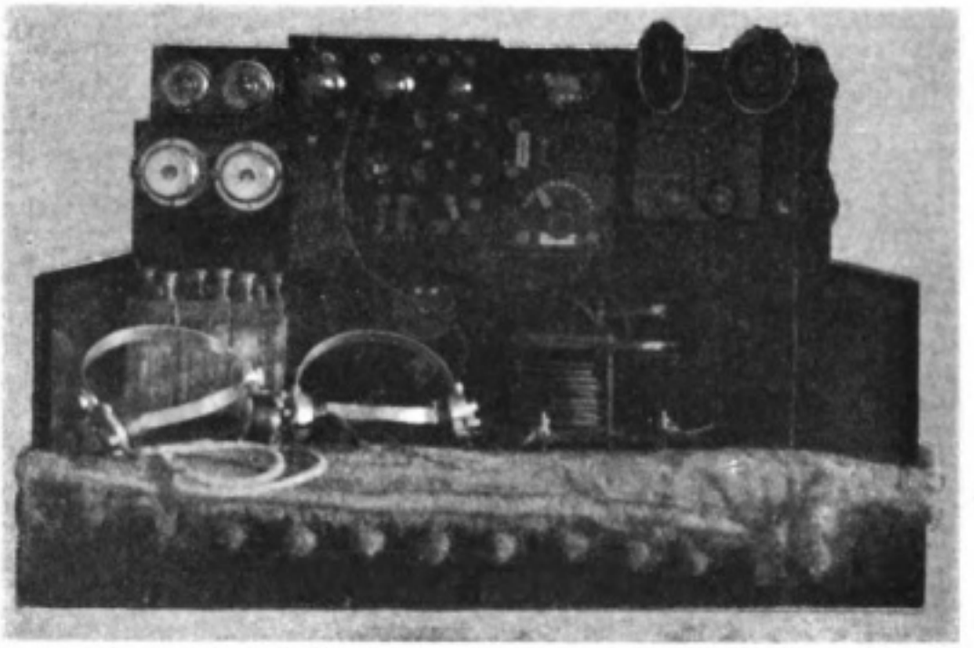
In reference to the article on tuned transformer amplifiers, no tuning condensers are used, apparently; therefore, of course, the peak is very narrow; but when a small variable condenser is put across either the anode or grid circuit, the peak can be moved up to the value of the capacity. So, by using sets of transformers for different wavelengths, it is possible, with from five to, say, eight sets, according to the maximum value of the tuning condenser used, to cover wavelengths from say 500 to 20,000 metres. As a matter of fact, I have sets which reach from 250 to 25,000 metres. The full maximum peak can be obtained through the whole range, and, as is well known, the strength is out of all proportion to what can be got out of an amplifier with either capacity coupling, or coupling by aperiodic transformers.

H. H. T. BURBURY.

Crigglestone, Wakefield, *October 14th*, 1921.

To the Editor of *The Wireless World*.

Sir,—Many of your readers who indulge in American Radio journals may have been puzzled over some of the slang terms used.



Mr. A. J. Thomson's set.

In writing to a friend of mine who is a prominent wireless man over there I asked him to explain the terms "bug" and "ham," and he reports as follows:—

A "bug" is one who has become so extremely interested in a subject that it amounts to an obsession; hence the term "wireless bug."

The word "ham" means somebody who is inefficient at what he attempts, but my friend goes on to say that this has come to apply more or less to the entire field of wireless amateurs without any disparaging allusion.

The Americans have evidently devised short names which express a lot without wasting too much breath.

Perhaps some of your readers could invent somewhat sweeter sounding—but still short—names which we could use with equal effect in this country.

W. W. BURNHAM.

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) Questions should be numbered and written on one side of the paper only, and should not exceed four in number. (2) Queries should be clear and concise. (3) Before sending in their questions readers are advised to search recent numbers to see whether the same queries have not been dealt with before. **(4) The Editor cannot undertake to reply to queries by post.** *(5) All queries must be accompanied by the full name and address of the sender, which is for reference, not for publication. Queries will be answered under the initials and town of the correspondent, or, if so desired, under a "nom de plume."* **(6) Readers desirous of knowing the conditions of service, etc., for wireless operators will save time by writing direct to the various firms employing operators.**

P.P.B. (Nottingham). (1) We have never actually made a test, but prefer the longer single wire.

(2) Not one that can be relied on for continuous working.

(3) It is an extremely simple circuit, and will not be very efficient. The wavelength change with the hinged coils will be comparatively small, and therefore must be carefully designed for the wavelength upon which it is desired to receive. Make a tubular inductance several inches in diameter with a sliding control, and you will get better results.

H.B. (Torquay).—(1), (2) and (3) An efficient receiver for 300 to 30,000 ms. cannot be made with one A.T.I. See the reply to **C.A.S. (Reigate)**, who refers to page 168 of the June 11th issue, and make a set similar to this, using the windings given in answer to the above query.

(4) If possible increase the height above the roof and also make the angle between the aerial and the telephone wires greater than 45°. You will, probably, pick up the telephony by direct induction.

A.R.T. (Brixton).—(1) Connect up the apparatus as shown on page 185, Fig. 3, of the June 11th issue, omitting the potentiometer and battery, and connect the primary or high resistance windings of the telephone transformer in place of the telephones. The 2 mfs. condenser is of no use in the circuit.

(2) The maximum wavelength will be about 2,200 ms.

(3) No.

(4) About 15,000 mhys.

CITROEN (Berkley). (1) Connect a 0·001 mfd. blocking condenser across the anode winding of your first transformer. Also place C_2 in the grid side of the circuit, and give it a 2 megohm let. Use a variable resistance in series with the filament.

(2) C_1 0·0005 mfds. C_2, 0·0001 mfds. C_3 is not necessary.

(3) See the reply to **C.A.S. (Reigate).**

(4) In England there is the *Wireless Year Book*, published by our publishers at 21s.

E.D. (Caversham).—(1) A blocking condenser in capacity does not require accuracy, but condensers for tuning to certain wavelengths do, therefore work to page 879. The blocking condenser capacity may well be more than 0·0015 mfds., therefore a greater number of foils was given.

(2) It was afterwards decided to use them only singly.

(3) Nearly 30,000 mhys. is necessary with 0·0045 mfds. to tune 20,000 ms., the maximum wavelength of the set. If you use the blocking condenser both in parallel, only 22,000 mhys. will be required.

"AMATEUR" (Stoneyhurst) *asks* (1) *If a home-made valve of type as sketched (Fig. 1) will be efficient.* (2) *The anode voltage required.* (3) *Resistance telephones required.* (4) *If it could be used with a single valve frame aerial set.*

(1) Fairly good results have been obtained, especially in America, with valves of this type, but they are not very efficient. We believe, moreover,

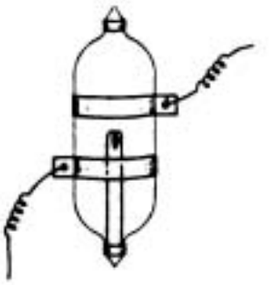


Fig. 1.

that it would be desirable to use bulbs pumped much harder than the ordinary lamp bulbs. Experiment with bulbs of this type should be interesting and worth while, but we should not care to guarantee good results.

(2) Probably about 200.

(3) As high as possible.

(4) Results would be almost nil with such a set, even with a good professionally-made valve of normal design.

A.S.C. (Clapton) *asks* (1) *In what issue the construction of a potentiometer was described, and* (2) *If the issue is still in print.*

(1) See page 692, issue for December 25th, 1920.

(2) Yes.

G.H. (Portsmouth) *asks various questions about a crystal set he proposes to construct.*

(1) Either pancake or honeycomb coils could be used. If honeycomb, both A.T.I. and closed circuit coils should have about 1,200 turns, with a mean diameter of 3", and winding length of 1½".

(2) Yes.

(3) Couple the reactance to the closed circuit, and make it about 250 turns as above.

(4) Circuit would be all right if the reactance connections were altered as stated above.

(5) 0·001 mfds. for both the aerial and the closed circuits.

J.L. (Stalybridge) *asks for criticism of a suggested receiver, and* (2) *The size for certain parts.* (3) *If a telephone transformer is required*

with H.R. telephones. (4) *Minimum size of aerial required.*

(1) O.K., except that reaction coil should be inserted in the plate of the first valve, and lower end of coil A should be connected to earth.

(2) E not more than 0·0003 mfds. A, 5,000 mhys. B, see current constructional articles. C, 4,000/10,000 ohms iron cored transformer. D, 5,000/100 ohms iron cored transformer, if low resistance telephones are used.

(3) No.

(4) Some results might be obtained with a large frame, but they would not be good. Preferably use a single wire not less than 50 ft. long.

T.A. (Athlone) *asks the following questions about a crystal set:*—(1) *For criticism.* (2) *If two silicon crystals can be used together on it.* (3) *Suitable resistance for the telephones.* (4) *Dimensions for suitable aerial.*

(1) O.K., except that the aerial should be connected to the slider and the crystal to the top of the A.T.I.

(3) Any reasonably high resistance telephones will do.

(2) Use only one at a time.

(4) Use as large and as high an aerial as you are allowed, say a single wire 100′ long and 50′ high.

T.A.S. (Bristol) *asks* (1) *for criticism of a suggested circuit, and* (2) *For instructions for wiring it up for use with a single H.T. battery.*

(1) The circuit would work, but not well, owing to the large capacity between your second valve and earth. Moreover, it would be very uneconomical in batteries.

(2) This type of circuit could not be wired up for a common H.T. battery. You will find many suitable types in these columns.

C.M. (London) *asks various questions about a crystal receiver.*

(1) No; put the crystal in series with the telephones across the variable condenser. Then put the fixed condenser across the telephones.

(2) Blocking condenser 10 sheets of mica, with 1 square inch of overlap to each pair of plates.

(3) 6,000 ohms telephones will be O.K.

(4) Quite impossible to give the wavelength range, as the particulars you give are inadequate.

J.F.G. (Cambridge) *asks* (1) *for the maximum wavelength with an A.T.I. 4″ × 3″ × 20″, wound with No. 24.* (2) *If a 0·002 mfd. condenser across the telephones will affect the wavelength.* (3) *How a buzzer should be used for testing.*

(1) About 3,500 ms.

(2) No.

(3) Connect the buzzer across a part of the A.T.I. Quite a few turns will be all that will be required.

A.S. (Colne) *asks* (1) *For a circuit to add a crystal to his valve set.* (2) *If a grid leak would improve his signals.* (3) *A question about the theory of action of a grid condenser.* (4) *What station is* YG.

(1) The circuit of Fig. 3, page 61, April 16th issue, will show you how to add the crystal.

(2) It should certainly do so, but may not if the insulation of your condenser is poor.

(3) Your ideas are not correct. Bangay's "Oscillation Valve" has a good explanation of this matter.

(4) Tours.

W.E.R.B. (Guildford) *asks* (1) *If a G.P.O. licence is necessary for receiving only.* (2) *If so, how obtained and the cost.* (3) *If telephony can be received with a crystal and ordinary circuits.* (4) *If instruction has been given in back numbers on the construction of a set suitable for the purpose.*

(1) Yes.

(2) Apply to the Secretary of the G.P.O. The fee is 10s.

(3) Yes, but the results will not be as good as with a valve set using reaction.

(4) Yes. A very good type is the frame aerial set described in Nos. 16 to 21 of the last Vol.

J.L. (Rothsay) *asks* (1) *Why his crystal set will not give signals.* (2) *What instruments will be necessary to add a valve.* (3) *A diagram of connections.*

(1) We cannot say at all, as you do not give us any information as to how your circuit is arranged.

(2) Valve holder, filament resistance, potentiometer, low and high resistance batteries, and additional coil and condenser.

(3) The simplest circuit of much use is given in the diagram (Figure 2).

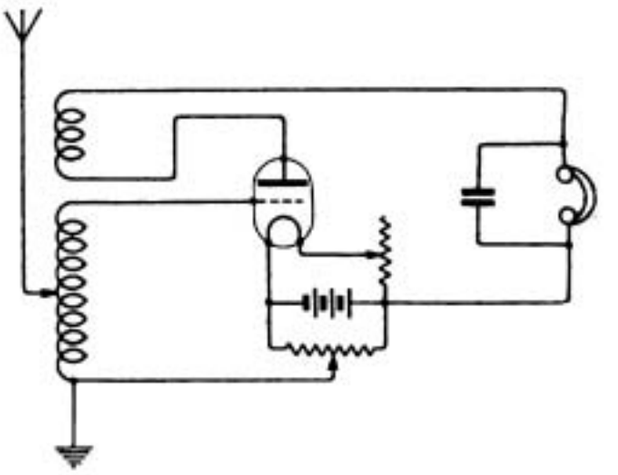


Fig. 2.

ELECTRON (Leeds) *asks why different specimens of a certain transmitting set installed on different vessels, but all with similar aerials and similarly tuned, give different values of aerial current.*

There are many possible reasons for this, but the most important and likely is a change of effective aerial circuit resistance. The resistance of this circuit may be considerably affected by such things as the ohmic resistance of aerial and earth, the shape of the earth lead, and aerial lead in, and the nature and positions of objects, either metal or of poor dielectric, anywhere in the neighbourhood of the circuit. All these factors are liable to vary in different ships.

S.M.D. (Felixstowe) *asks* (1) *for criticism of a set.* (2) *Why his H.F. transformers will not amplify.* (3) *Why a loading coil inserted in a particular way will not increase the wavelength.* (4) *The use of a potentiometer as introduced in this sketch.*

(1) and (4) The set is O.K., except that a potentiometer is useless when used with grid condenser. It would be of some use if inserted in the grid circuit of the first valve.

(2) Difficult to say without examination. Assuming that the windings are reasonably right for the wavelengths tried, the result is probably due to defective insulation in one or other of the windings, or between the two windings.

L.P. (Bristol) *asks various questions about a valve and crystal set.*

This set was described at considerable length in the constructional articles of the issue for April 17th, 1920, and following numbers. You will find nearly all your queries answered in these articles. A potentiometer should be used as in your sketch. The type suggested for condenser K is possible. The thickness and material of the metal plates may be what you please. The correct capacity (0·0015 mfds.) would be obtained if dielectric were ebonite tube 4" long, 2" diameter. Thickness of wall ½ millimetre.

C.L.R. (London) *has a S.W. tuner, and asks (1) The range of reception. (2) The resistance of the telephones without transformer. (3) For a diagram of connections for a short wave receiving set.*

(1) This set was designed for use on a small aerial on wavelengths of 1,000 to 7,000 ms.

(2) From 1,000 ohms per headpiece and upwards.

(3) A full diagram was given on page 221 of the June 25th issue, and suggestions for increasing the wavelength range in the March 5th and 19th issues.

F.C.R. (Hanley) *asks for (1) particulars of a simple receiving set. (2) What type of aerial should he use, as the house is on a steep slope. (3) The regulations governing a license. (4) For a method of protection against lightning.*

(1) See the article on page 344 of the September 3rd issue, which should meet your requirements.

(2) Yours is rather a difficult situation. We suggest that you try one of two methods, viz., an aerial up the slope, or one parallel to the top of the slope, and see which gives the best results. In any case you will get a certain amount of screening.

(3) These are very simple, no examination being necessary. Write to the P.M.G. for particulars.

(4) Earthing the aerial is quite sufficient.

CAPSTAN (Bleangarw) *has a crystal set, and wishes to know the best set to receive C.W. stations and PCGG. He has 105 volts at his disposal (D.C.).*

To receive PCGG in Wales it will probably be necessary to use three valves two H.F. magnifier and one rectifier—with a specially suitable short wave tuning circuit. Many longwave C.W. stations may be received with a single valve reaction circuit. If R valves are used the 105 volts D.C. may be used for the anode battery, but if it is from a town house it will probably be necessary to use a silencing arrangement of condensers and chokes.

W.M. (Glasgow) *refers to a set described on page 104 of the May 14th issue, and asks (1) and (2) If it is suitable for the Hague telephony. (3) For a book describing amateur stations. (4) For a valve book free from mathematics.*

(1) and (2) This is a good set, but signals from the Hague will not be very strong.

(3) There is an American book, "Practical Amateur Wireless Stations," which the Wireless Press could probably obtain for you.

(4) "The Oscillation Valve," by R. D. Bangay, is just the book, and is published by the Wireless Press.

E.H.J. (London) *asks (1) Why his set will not oscillate below 2,000 ms. unless the reaction coil is reversed. (2) A circuit to add another valve. (3) Should he use H.F. or L.F. (4) Suggestions.*

(1) The explanation is similar to that of the H.F. transformers at present being published in our columns.

(2) and (3) As a wide range of wavelength is desired, it will be simpler to use L.F For circuit see diagram Fig 3.

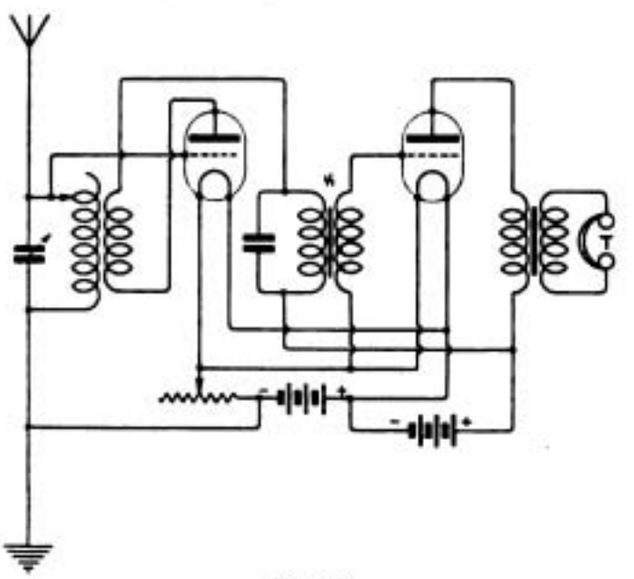


Fig. 3.

LE BON TEMPS VIENDRA (Retford) *asks (1) The approximate cost of equipping an "aerial" station for sending and receiving 100 miles. (2) The distance an amateur is allowed to send. (3) Whether a "spark" would transmit 100 miles. (4) Where a copy of the wireless regulations can be bought, and if they are the same in South Africa as in England.*

(1) Difficult to say: depending on how much of the gear you make yourself. If you buy the gear, probably at least £100, possibly considerably more.

(2) The distance is not specified. The maximum power to be used is stated; this varies with circumstances.

(3) Yes, with sufficient power: about ½ k.w. would be required.

(4) "The Wireless Year Book" gives regulations for all countries. The Secretary, G.P.O. London, will give regulations for amateurs in this country S. African regulations are different from those in force here.

SPARKS (Hetton-In-Hole) *gives diagram of*

a one-valve set, and asks (1) *For a diagram of connections to add another valve.* (2) *The wavelength of the set.* (3) *How to add a reactance coil.*

(1) and (3) see Fig. 4 for the reactance coil, rewind the secondary of the loose coupler with No. 30 wire.

(2) The maximum wavelength with the condenser in series is 1,400 ms. and 4,500 ms. when parallel.

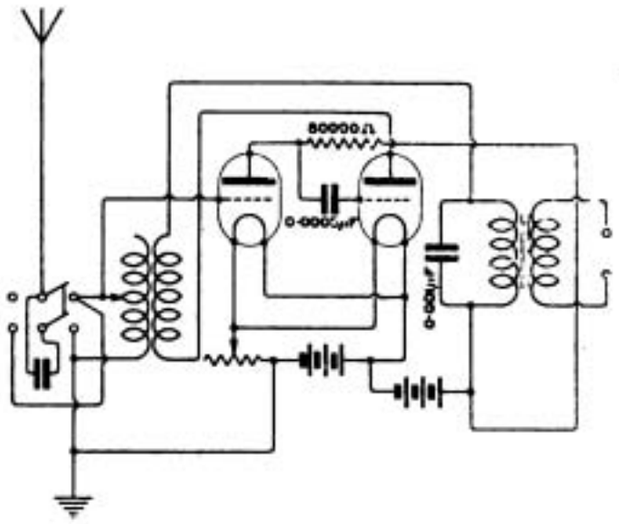


Fig 4.

N.A.V.M. (Harborne) *asks four questions about a telephonic problem.*

(1) What you call an inductance coil is a transformer. It might be useful if the resistance of P winding is the same as that of the microphone, and that of S winding the same as that of the telephones.

(2) Yes, certainly, if your microphone will handle enough current to operate it.

(3) Quite.

(4) We do not know of a simpler way than (3) in conjunction with a loud speaker, unless your microphone will operate the loud speaker without amplification.

C.R.R. (Dunfermline) *asks two questions about an aerial system, and* (3) *The maximum wavelength without additional A.T.I. of the Mark III receivers.*

(1) The aerial will be fairly satisfactory. A small pole erected at the house end to increase the height would be an advantage, but is not essential.

(2) The screening effect will not be serious.

(3) Short wave, 700 ms.; long wave, 5,000 ms.

N.E.R. (Oswestry) *has an L.F. amplifier, and asks* (1) *What sort of tuner to use with it for C.W., etc.* (2) *If and how a loose coupler can be used as A.T.I. and reaction coil.* (3) *Windings for 5,000 ms.* (4) *Ratio for telephone transformer for use with 120 ohms as shown.*

(1) The circuit of Fig. 3, page 432, of the October 1st issue is suitable, but by rebuilding the amplifier you could, with a little ingenuity, arrange to use the same batteries for both tuner and amplifier. You will find many such circuits in these columns.

(2) Yes; see Fig. referred to above.

(3) primary, 10", 6" of No. 24; secondary, 6" × 4" of No. 26 0·001 mfds. across the primary.

(4) Primary, 4,000 ohms of No. 44; secondary, 100 ohms, of No. 32 (ratio about 6:1.)

D.G.F. (Brixton Hill) *describes a crystal set, and asks for a suitable simple valve circuit.*

The circuit described on page 368 of September 9th issue, Fig. 9, will be very suitable for your purpose. Use the 0.0003 mfds. condenser in place of the 0·0005 mfds. shown in the diagram.

J.W.C. (Battersea) *asks re a simple crystal circuit.* (1) *If the proper place for a variable condenser is across the A.T.I.* (2) *If the circuit will work without this condenser.* (3) *If it will receive telephony.* (4) *What crystal is best to use.*

(1) Yes.

(2) Yes, but less efficiently, and only for shorter wavelengths.

(3) Yes, but not as efficiently as a properly used valve.

(4) Carborundum is good for all-round purposes. After getting some experience with this, you can try more fancy combinations if you wish.

F.S. (Stoke-on-Trent) *asks* (1) *and* (2) *for a circuit to receive the Hague and other telephony.* (3) *Wavelength of two honeycomb coils described.*

(1) and (2) We suggest you try a 2 or 3-valve circuit, as shown on page 399, September 17th issue. It is essential that the tuning circuit should be specially suitable for short wavelengths, and the reaction coil properly proportioned and adjusted.

(3) The inductance of these coils cannot easily be calculated. The large coil will be about 10,000 mhys., and the small one about 3,000 mhys.

L.D. (Etroyes) We are afraid that your questions are so comprehensive that it is quite useless for us to attempt to answer them in the space at our disposal here. If you read any good treatise on the art you will probably find about a quarter of the work devoted to a consideration of your first question. The answer to your second question is unknown so far.

A CORRECTION.

E.H.W. (Weymouth).—We are obliged to readers for drawing our attention to an error in the diagram given in the Nov. 12th issue, Fig. 4, p. 526. The lead from the bottom left-hand contact of the two-way switch should bridge over, instead of connect with, the lead to the reactance coil.

SHARE MARKET REPORT.

Prices as we go to press, November 18th, are :—

Marconi Ordinary	£1	12	6
,, Preference	£1	12	6
,, Inter. Marine		18	0
,, Canadian		5	0
Radio Corporation of America :—			
Ordinary		10	3
Preference		9	9