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THE DESIGN OF TUNING COILS—II.

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

IN the issue of *The Wireless World* for June 25th, an article was published describing "A Simple Method of Designing Tuning Coils" in which a modification of Nagaoka's formula was given for simplifying the problems of designing coils to have given inductance values, as distinct from the cases in which the dimensions of the coil are given and it is merely desired to calculate its inductance. The factors there tabulated were calculated for the "inch" unit—*i.e.*, all dimensions should be in INCHES and the inductance values in microhenries for using the formulæ and tables correctly.

As, however, some workers may prefer the CENTIMETRE as the unit of measurement, it may be of use to reprint this table giving appropriate figures for this case. Such a table of factors is set out below, the formulæ for use in connection with it remaining the same as in the earlier article, viz.:—

$L = D^3n^2k_1'$, { for use when the diameter is a known dimension

and $L = l^3n^2k_2'$ { for use when the length is a known dimension

where we have written k_1' and k_2' to represent the revised factors for centimetre units of measurement, corresponding with the factors k_1 and k_2 for inch units as used in the earlier article.

In these formulæ,

L = inductance of coil in microhenries,
D = mean diameter of coil in cms.
l = axial length of coil in cms.
n = number of turns per centimetre length of the coil.

The method of using the formulæ and table remains the same as has already been described. The values of k_1' and k_2' given in this table have also been plotted out on logarithmic scales in Fig. 1, so as to enable their values to be read off for intermediate values of l/D.

In order to render the use of this table and diagram quite clear the following numerical examples may be noted which are given for each of the four possible cases that are likely to arise, corresponding with the four cases already discussed in conjunction with the first table.

NUMERICAL EXAMPLES.

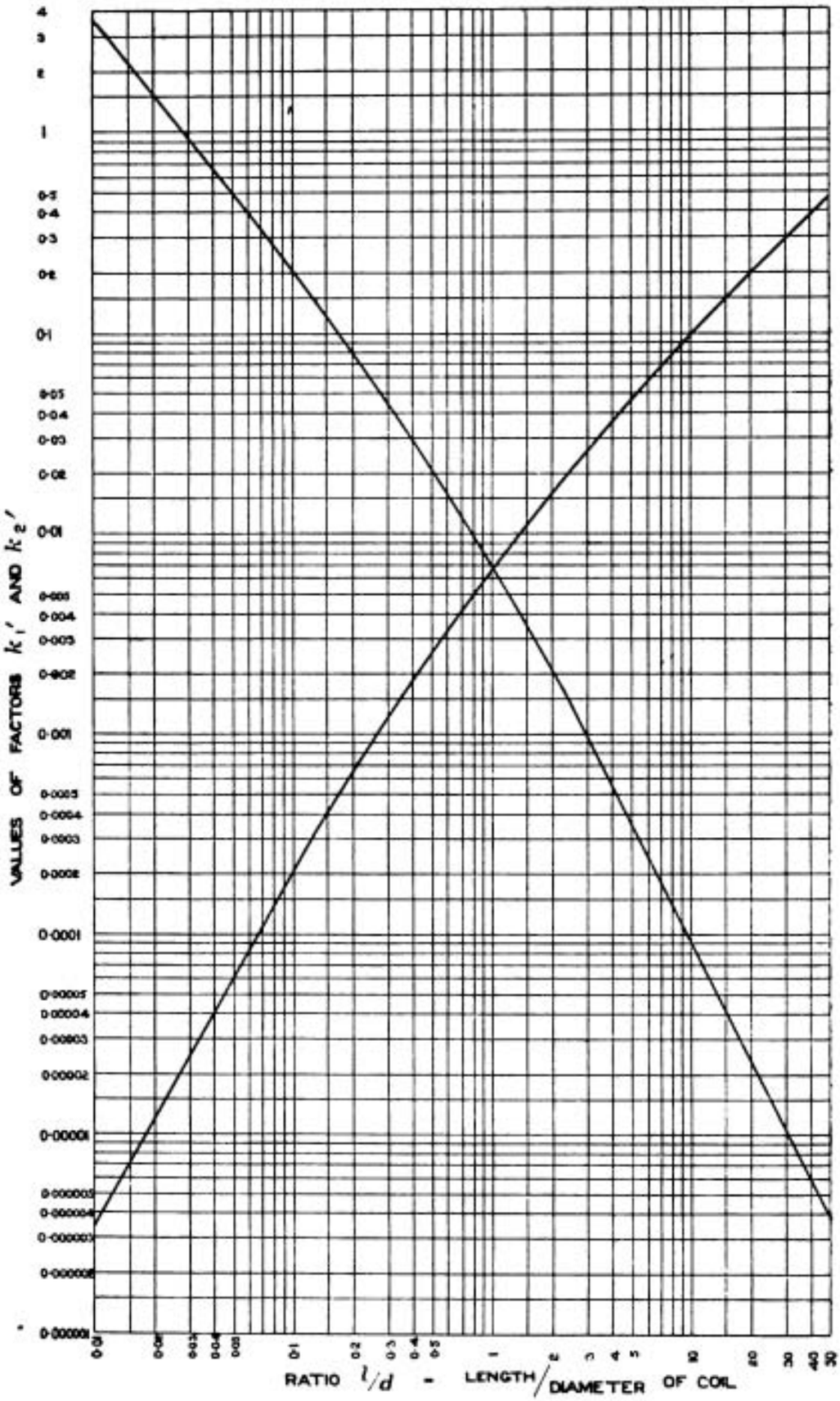
Example (1)

Given: Coil diameter = 24·5 cms; number of turns per centimetre length of coil = 12. Inductance required = 6,300 microhenries, *to find the necessary length of coil.*

We have,

$$k_1' = \frac{L}{D^3n^2} = \frac{6300}{24{\cdot}5^3 \times 144} = 0{\cdot}002975.$$

Hence referring to the curve, or looking up in the table opposite 29·75, (= 0·002975 × 10,000), we find that l/D = 0·55. But D = 24·5,



Hence l must be $= 0{\cdot}55 \times 24{\cdot}5$
$= \underline{13{\cdot}5 \text{ cms.}}$ (approx).

Example (2)

Given: Coil length = 13·5 cms., number of turns per centimetre length of coil = 12, and inductance required = 3,865 microhenries, *to find the required diameter of the coil.*

We have,

$$k_2' = \frac{L}{l^3 n^2} = \frac{3865}{13{\cdot}5^3 \times 12^2}$$
$$= 0{\cdot}01091.$$

Hence, by reference to the curve, or looking up 109·1 ($= 0{\cdot}01091 \times 10^4$) in the table, we find that $l/D = 0.75$.

Therefore $D = 13{\cdot}5/0{\cdot}75 = \underline{18 \text{ cms.}}$

TABLE OF FACTORS FOR USE WHEN ALL DIMENSIONS ARE IN CENTIMETRES.

Ratio l/D.	$k_1' \times 10^4$.	$k_2' \times 10^4$.	Ratio l/D.	$k_1' \times 10^4$.	$k_2' \times 10^4$.
0·01	0·03450	34500	1·00	67·95	67·95
0·015	0·07190	21304	1·50	114·0	33·77
0·02	0·1206	15080	2·00	161·5	20·19
0·03	0·2485	9183	2·50	209·6	13·42
0·04	0·4130	6451	3·00	257·9	9·554
0·05	0·6050	4840	3·50	307·8	7·178
0·06	0·8373	3876	4·00	355·9	5·547
0·07	1·092	3185	4·50	405·5	4·349
0·08	1·373	2681	5·00	454·0	3·623
0·09	1·641	2305	5·50	502·7	3·028
0·10	2·006	2006	6·00	552·0	2·555
0·15	3·908	1213	6·50	601·7	2·192
0·20	6·313	789·3	7·00	650·7	1·892
0·25	9·016	577·2	7·50	700·3	1·656
0·30	11·99	443·4	8·00	749·4	1·463
0·35	15·27	356·0	8·50	798·6	1·300
0·40	18·63	291·0	9·00	847·2	1·162
0·45	22·25	244·2	9·50	897·3	1·047
0·50	25·93	207·4	10·0	946·4	0·9464
0·55	29·75	178·7	15·0	1440	0·4265
0·60	33·52	155·2	20·0	1933	0·2416
0·65	37·72	137·4	25·0	2426	0·1553
0·70	41·94	122·3	30·0	2919	0·1081
0·75	46·05	109·1	35·0	3414	0·07960
0·80	50·39	98·17	40·0	3908	0·06105
0·85	54·62	88·94	45·0	4401	0·04831
0·90	58·75	80·79	50·0	4895	0·03914
0·95	63·48	74·04			

All values of k_1' and k_2' in this Table must be divided by ten thousand to obtain inductance in microhenries. This division has been carried out in the plotting of the curves in Fig. 1.

Example (3)

Given : Coil diameter = 10 cms., coil length = 10 cms., required value of inductance = 2,000 microhenries, *to find the necessary number of turns per centimetre length of the coil.*

We have $l/D = 1$, hence from table

$$k_1' = 67{\cdot}95/10{,}000 = 0{\cdot}006795.$$

$$\therefore n = \sqrt{L/D^3k_1'} = 17{\cdot}16 \text{ turns per centimetre.}$$

Example (4)

Given : Coil diameter = 10 cms.; coil length = 100 cms.; number of turns per centimetre = 20, *to find the inductance.*

We have $l/D = 100/10 = 10$; hence $k_1' = 946{\cdot}4/10{,}000 = 0{\cdot}09464$.

Therefore inductance of coil is given by—

$$L = D^3n^2k_1'$$
$$= 10^3 \times 20^2 \times 0{\cdot}09464$$
$$= 37856 \text{ microhenries.}$$

As in the earlier article on this subject, it may again be emphasised that this method of calculation is only applicable to coils in which the radial depth (or winding thickness) of the coil is negligible compared with the coil diameter; or in the case of basket or pancake coil, only to those coils in which the thickness is negligible compared with the depth and diameter of the coil.

Correction.—In the earlier article on this subject published in the issue of *The Wireless World* for June 25th, 1921, it should be noted that in the second example on page 194, the value of the inductance should be 3742 microhenries in both cases where its value is mentioned, and not 3260 as there printed; and in the table on page 193, the figure on the sixth line up from the foot of the right hand column should be 0·3945. Part of this figure is missing in some copies of the magazine.

THE DIAGNOSIS AND CURE OF AN OBSCURE CASE OF CONDENSER TROUBLE

By 2 A N.

THE diagnosis and treatment of diseased radio-telegraphic components has always been a hobby of mine, from the rudimentary coherers of early days to the highly organised multi-valve complications of to-day.

This bent of mine found ample and, let us hope, useful scope during the period of the "Great Conflict" in running a testing laboratory for one of the Government Departments. Here I investigated the histological peculiarities of the raw materials or tissues from which my future patients, the wireless instruments, were built up.

Daily experience with my patients soon gave me a very intimate acquaintance with every screw, nut, and connection in their pretty little insides, and, of course, the power of quick diagnosis of such common ailments as ruptured inter-valve secondaries, simple disconnections, the last yielding readily to a process of cautery skilfully applied with a hot soldering iron. The really interesting and obscure "cases" involving prolonged experiment and delicate surgery must, I suppose, still be regarded as State secrets, even in these days of relative peace; but they take perhaps a not unworthy place among the unrecorded battles fought and won.

The object of this article is, however, something much more tangible and useful than mere generalisations, for I have just left the bedside of one of the most interesting of the numerous patients which are brought to my laboratory by amateur friends. This particular "case" considered in this article was a Mark III Trench Receiver, the aerial tuning condenser of which, although to all

appearance in perfect health, was suffering from persistent and evidently painful internal trouble. The symptom complained of was a grating, scratching, and horrible microphonic noise on all scale settings, sensitive to the slightest pressure on the turning knob.

Experiment confirmed the owner's statements, and as a case of chronic dust contact between the plates seemed to be indicated, an exploratory operation was advised and undertaken forthwith—suitable antiseptic precautions with tobacco being adopted, as is usual on such occasions.

The patient, stripped of all superfluous clothing in the form of wire tentacles, was caused to assume a convenient if unusual inverted position on the bench, and the skilful application of a small screw-driver to the carefully hidden case screw enabled the cover to be removed and the plates to be inspected. They were found to be perfectly set and no trace of contact could be seen, but germs in the form of metallic filings and dust will make their unwanted appearance on the plates at times so to make certain, a patent pipe cleaner (nothing better for the job exists) was passed between the adjacent surfaces. The machine was reassembled and tested. Result : *as bad as ever !*

After a short interval, devoted to language, the patient was again opened up, and this time the insulating bushes of the rotary spindle were removed, cleansed with a sterilised handkerchief, and replaced. At the same time the spiral connector joining the terminal to the moving plates was examined for continuity and found to be O.K. To make sure, a few H.T. cells, connected in series with a telephone head set, were applied to the condenser, while the knob was moved to all positions. Not the slightest indication of a short or of intermittent contact could be discovered. Thinking that the trouble had been cured, the patient was again reassembled and tested. Again the horrible noise developed just as badly as before, and I began to sit up and take notice, for the case was becoming interestingly obscure.

I then had a lucid interval, and suddenly thought of a possible cause of the trouble ; and as it is likely to occur in any machine having a condenser of this type, its explanation and method of cure may be helpful to owners of similar sets.

The top of the brass spindle which carries the moving plates is squared, and engages with a small brass boss screwed to the under side of the ebonite scale. It is purely physical and is not intended to make electrical contact with anything. Now it so happened that the aerial end of the aerial tuning inductance was connected to the moving plates, and if, under these conditions *and with the circuit oscillating*, and with the knob and ebonite scale removed, you bring any tiny capacity such as an inch of No. 20 gauge copper wire suspended by a silk thread, into intermittent contact with the top of the brass spindle, you get at once the horrible grating noise in the telephones, exactly the same as those causing all the trouble. The smallest capacity will produce the sounds, even a small domestic pin. It acts, of course, by producing tiny surges into and out of the fragment of wire or pin acting as a capacity.

Now that miserable little brass boss on the under side of the ebonite scale was acting exactly like the fragment of wire or the pin in our experiment, by making intermittent contact with the main spindle.

The remedy was simple and obvious. The two wires joining the A.T.I. to the condenser were reversed so that the spindle was at earth potential and the boss was caused to make good and permanent connection with the spindle. The result of the treatment was a complete cure. With the machine reassembled you can wriggle the spindle to your heart's content, and there is not the slightest scratch or splutter.

DUTCH CONCERTS.

Those who are interested in the Dutch Concerts may be referred to the letter on this subject under Correspondence, p. 356.

DESIGN OF A PANEL TUNER—WAVELENGTH RANGE 600 TO 3,500 METRES*

By Leonard H. Crowther, A.M.I.E.E.

IN choosing the title for this paper, the author had in mind the designing of a tuner where all the component parts are mounted on a panel of insulating material, and thus completely and effectively insulated from earth and each other. There are many arguments in favour of keeping the various units separate, the chief being, perhaps, the facility for rearranging connections in order to try the many circuits possible in reception, particularly when using thermionic valves. Once a reliable circuit is found, however, it is desirable that the whole of the apparatus be mounted on a panel, and preferably enclosed by a suitable containing box. If this be done, the many adjustments necessary for correct tuning can be effected quickly and with the minimum effort on the part of the operator.

These remarks apply equally to the transmitting set, whether for spark or C.W. It is advisable here to state that it does not necessarily follow that, if certain results are obtained with the various instruments

* Paper read before the Sheffield and District Wireless Society, on January 7th, 1921.

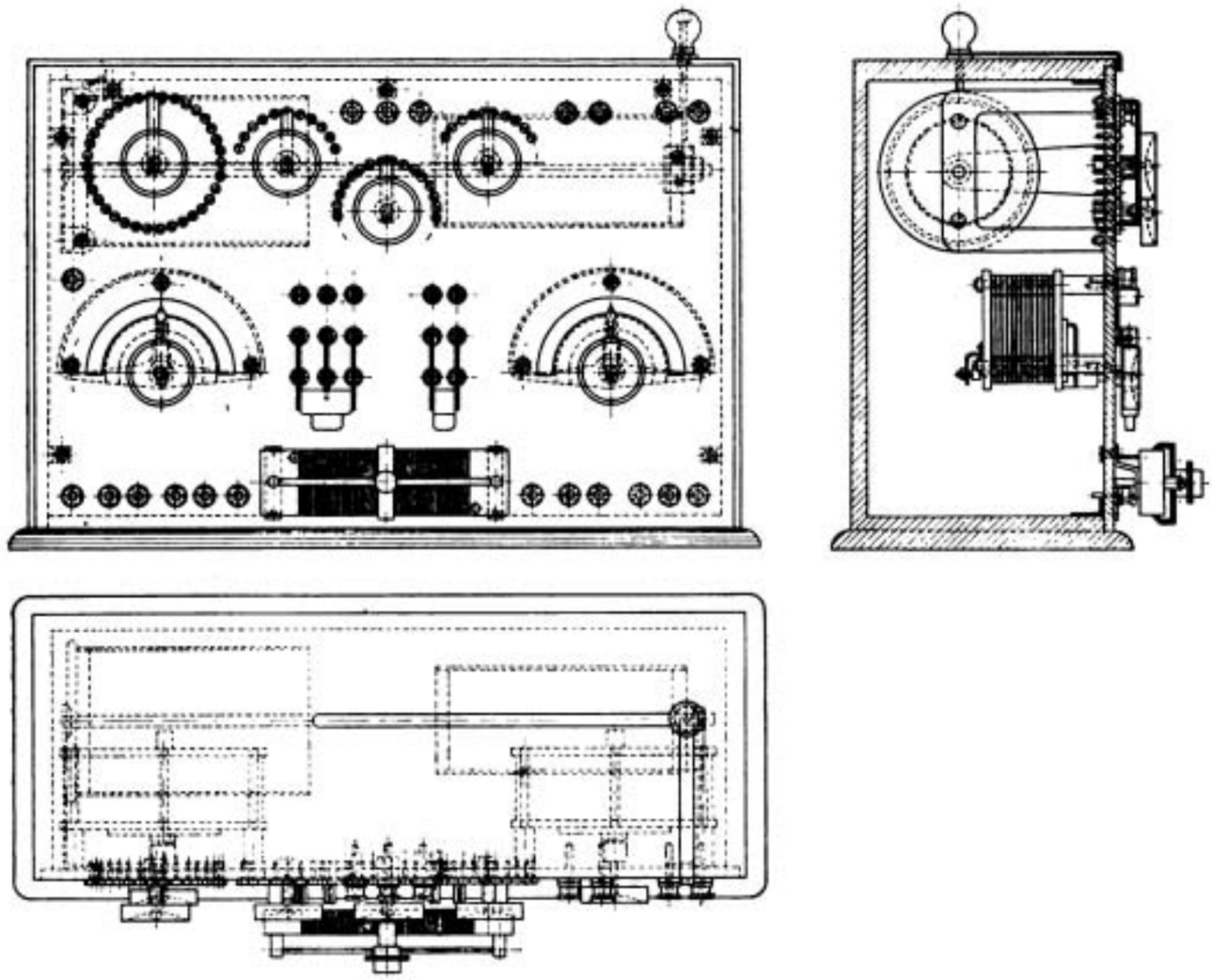


Fig. 1.
General Arrangement of Panel Receiving Tuner.

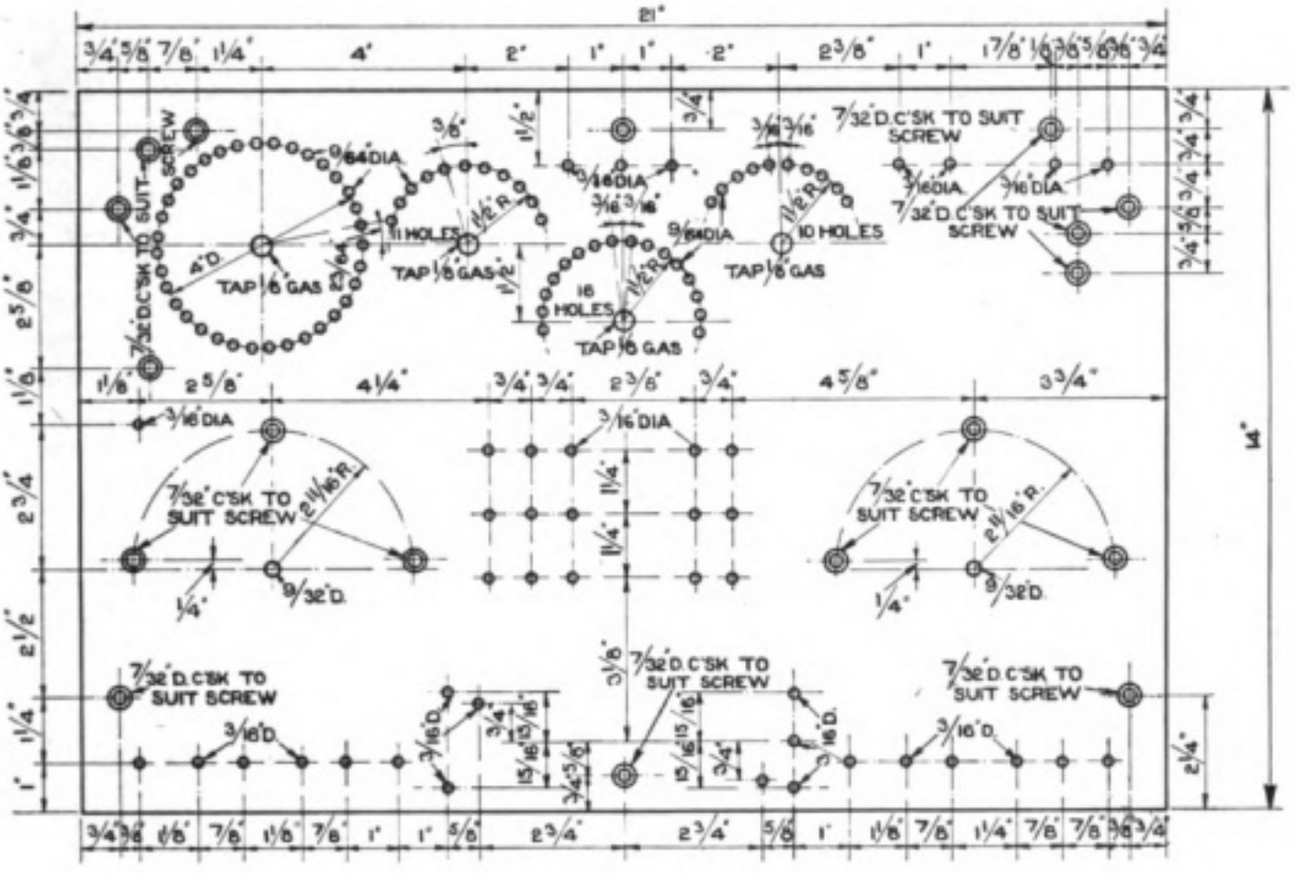


Fig. 2.
Drilling Diagram.

scattered about the work bench, the same will hold good when the instruments are mounted together on a common panel. The reverse is often the case, particularly with the valve detector portion of one's set, owing to capacity and inductive effects caused by the closer proximity of the connecting leads and instruments.

However, in the tuner about to be described, no such preliminaries were possible, as the design was got out during the year 1917, when wireless experiments, as far as amateurs were concerned, were absolutely banned. At that time, also, the author's knowledge of thermionic valves was very limited, and derived mainly from articles appearing in technical journals.

The author originally set out to design a set comprising a loose coupled tuner, complete with a single audion and tellurium-zincite detector, arrangements being made for change-over switches to enable either detector to be used, a potentiometer being also included which would serve the double purpose of supplying the slight potential necessary for the crystal, and also for adjusting the potential of the grid for rectification when using the valve. It was not until early in 1919 that, in view of information obtained in various ways, it was decided to eliminate the detector portion from the set and confine it purely to the function of a tuner. This decision the author has never regretted, and would strongly advise amateurs to bear it in mind when considering the design of their receiving stations. Unfortunately, before making this alteration, the panel had been drilled to the original design, and contains, therefore, many more terminals than are now necessary, and some holes which require plugging up.

Figs. 1, 2 and 3 show the tuner as originally designed, and also represent generally the finished article, if one eliminates the potentio-

meter and valve. It will be noticed that the tuning coils are of the single layer type, this being considered the most efficient type at the time, such things as basket and honeycomb coils being then unknown to the author. Bearing this in mind it will quite readily be seen that the wavelength range of such a set is limited mainly by the space at one's disposal, and, incidentally, by the length of one's purse. Other factors which will be dealt with later have to be taken into account, and after carefully weighing up the pros and cons, the range stated, viz., 600 to 3,500 metres, was finally decided upon, and subsequent results have fully justified that decision.

In the design of this tuner the author does not claim any originality in the layout of the various units, but there are certain features which are novel and may appeal to others.

Having decided upon the maximum wavelength, the first thing to do is to calculate

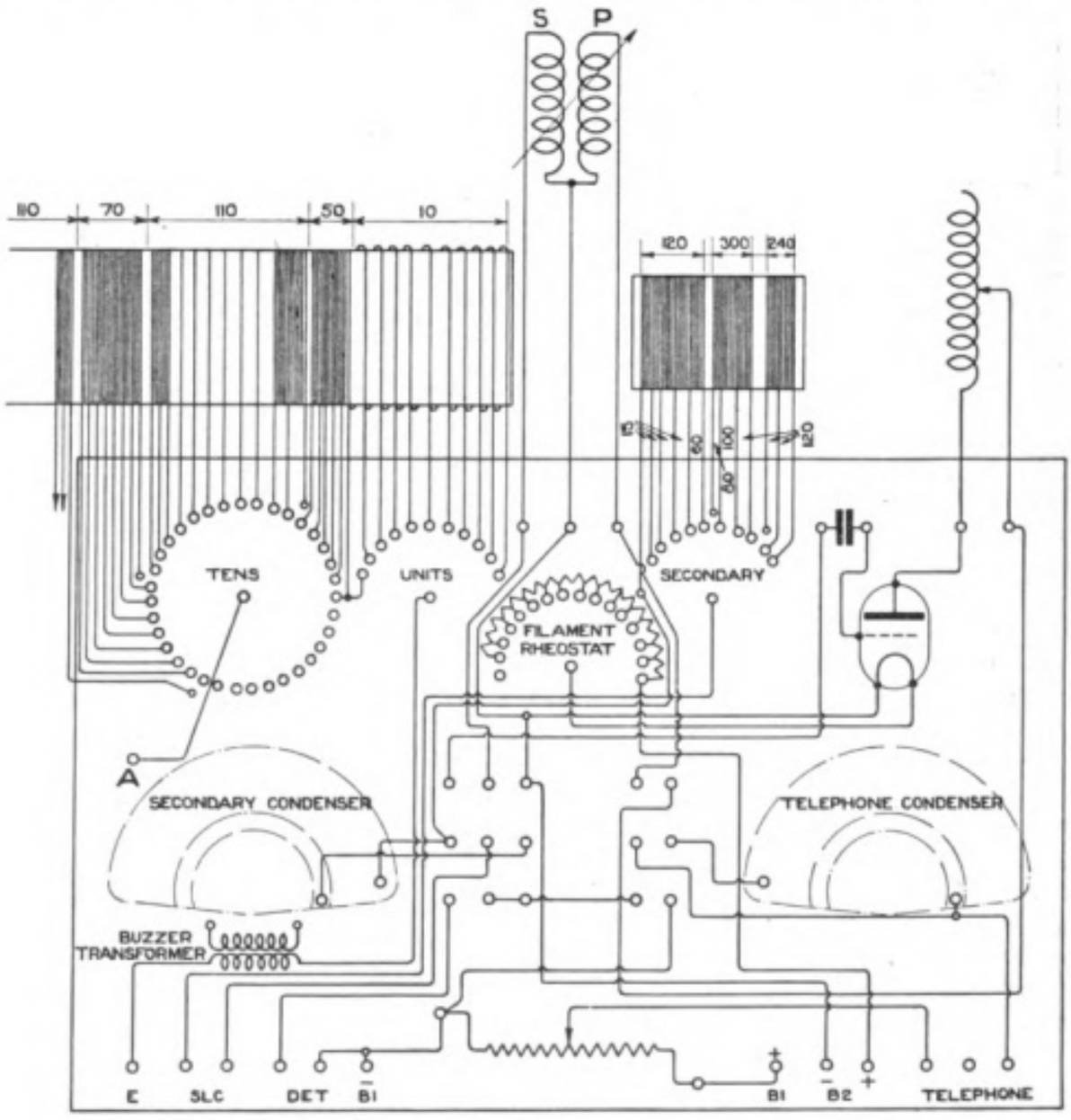


Fig. 3.
Diagram of Connections.

the total amount of inductance necessary for both secondary and primary coils. This is obtained from the formula, $\lambda = 1885 \sqrt{L \times C}$ where λ is in metres. L in microhenries, and C in microfarads.

Transposing this we get $L = \left(\frac{\lambda}{1885}\right)^2 \div C$.

Taking the case of the secondary coil first, and knowing the maximum wavelength (3,500 metres), we assume a maximum capacity across the secondary coil of 0·0002 mfd., insert these values in the formula and find that $L = 17{,}200$ microhenries. The next step is to determine the number of turns, size of wire and diameter of former to give us this value of inductance. It has been found by experiment that No. 36 S.W.G. S.S.C. wire is very suitable for the secondaries or closed circuits of tuners, and although smaller wire may be used it is not so easy to handle, and with crystal detectors is not so efficient. Having decided upon the size and insulation of the wire, the number of turns per cm. should be calculated, or, better still, determined by winding about 2 cms. of the wire on a lead pencil and counting the turns, dividing this number by 2 for the turns per cm. The wire actually used gave 42 turns per cm. The diameter of the former is usually determined by the space available, but should not be less than 3½ ins. if excessive length is to be avoided, the length, of course, being determined by the number of turns. It is advisable to try various diameters until a suitable length of coil is found. In this case the author decided upon 3½ ins. or 8·9 cms., after calculating the length and consequently the number of turns required, by the following formula, which was first put forward by Prof. Nagaoka.

$$L = \pi^2 \times D^2 \times n^2 \times l \times K.$$

(in centimetres)

where D = mean diameter of coil in cms.
n = number of turns per cm. length.
l = axial length of coil.
K = a correction factor which is a function of the dimension ratio l/D of the coil.

The correction factor K is obtained from a series of curves, the values of which have been calculated from the original formulæ. These curves were first published by Mr. Philip R. Coursey in *The Electrician* of September 10th, 1915, and have been found extremely useful and accurate for practically any shape of coil. Fig. 4 shows the curves in question.

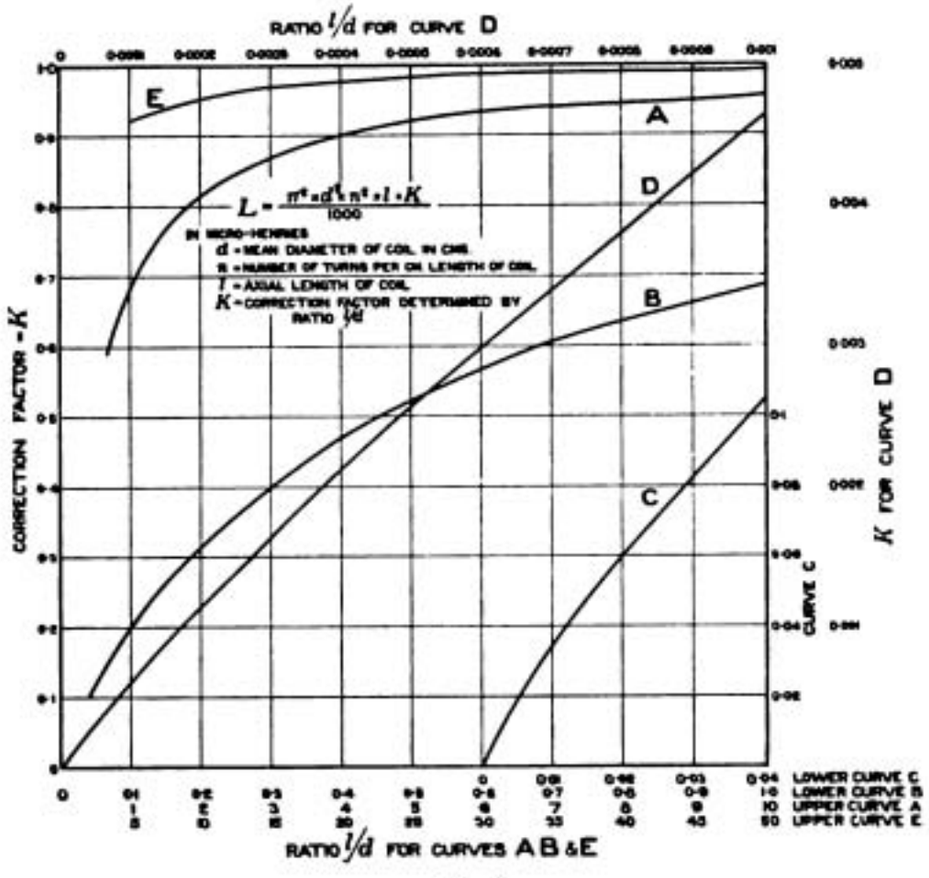


Fig. 4.
Inductance Calculations.

The formula may also be written $L = \frac{Z^2}{l} K$, this form often being the most convenient for calculation. Z = the total length of wire on the coil.

As we desire to know the approximate length of the coil we can transpose the formula, ignoring K for the moment, and we then get —

$$l = \frac{L}{\pi^2 \times D^2 \times n^2}$$
$$= \frac{17{,}200{,}000}{\pi^2 \times 8{\cdot}9^2 \times 40^2}$$
$$= 13{\cdot}75 \text{ cms or say } 5\tfrac{1}{2}\text{" approximately.}$$

This being a suitable length we can proceed to the more accurate calculations. In calculations of this kind the author finds that the following method of tabulation is very helpful, particularly when wishing to determine the position and number of tapping points.

No. of Turns.	l cms.	l/D	K	L = 1,375 lK.* Micro-henries.	Wave-length assuming C = 0·0002 mfd. Metres.
50	1·19	0·134	0·24	400	500
100	2·38	0·267	0·37	1,210	930
200	4·76	0·535	0·54	3,530	1,580
400	9·52	1·07	0·70	9,170	2,550
660	15·71	1·76	0·79	17,200	3,490

[NOTE.—For the accurate calculations,
$L = \pi^2 \times D^2 \times n^2 \times lK$
$= \pi^2 \times 8.9^2 \times 42^2 \times lK$
$= 1375\, lK$ ED.]

The winding will therefore take up 15·7 cms., or, say, 6¼ ins., and the former will have to be long enough to accommodate 660 turns, plus the necessary insulated ends on which the former is supported. The number and position of the various tappings

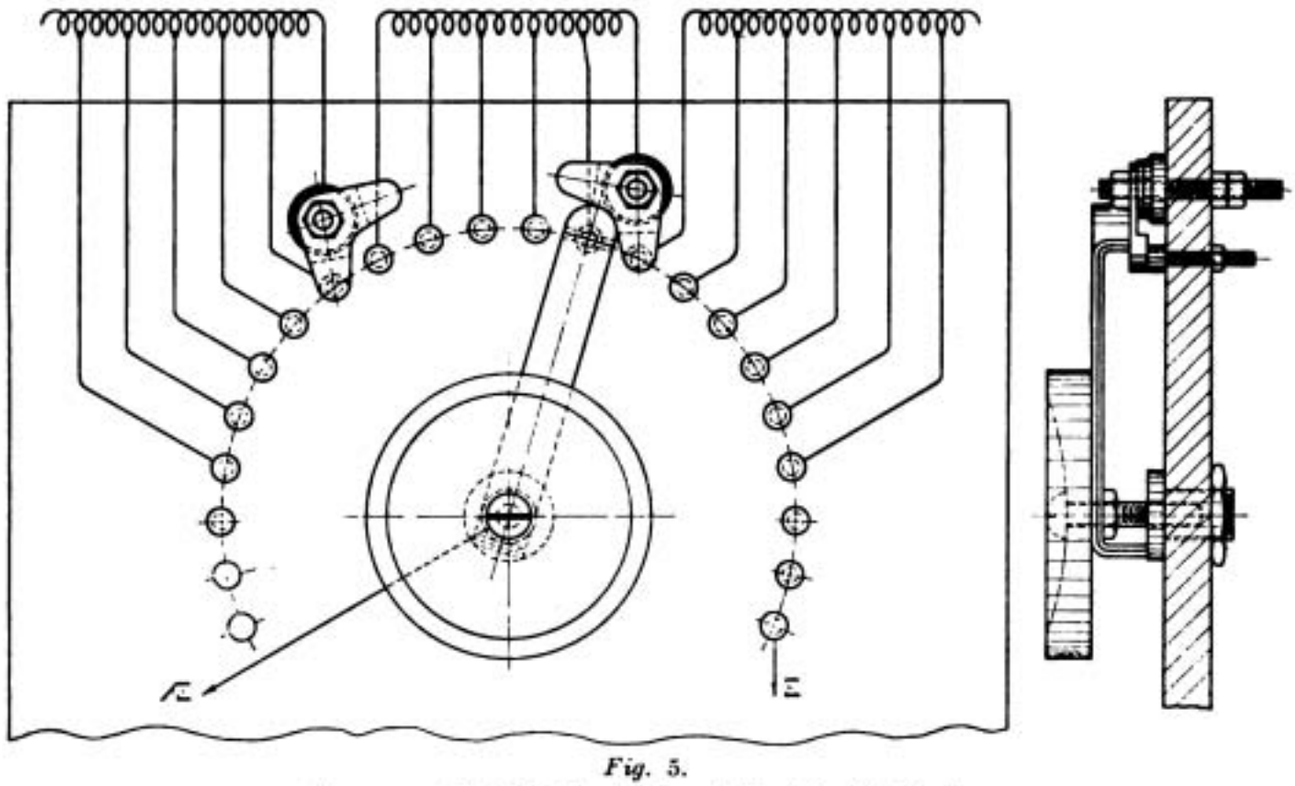


Fig. 5.
Arrangement of Switch showing "Dead End" Devices.

is next decided upon, and it is not usually found necessary to have more than five or six if a variable condenser is used in parallel. However, the author decided upon ten, placed as follows: 15th, 30th, 45th, 60th, 120th, 200th, 300th, 420th, 540th, 660th turns which, according to calculations should give on each stud wavelengths of 200, 350, 470, 600, 1,000, 1,500, 2,000, 2,500, 3,000 and 3,500 respectively.

Wishing to eliminate as far as possible the effect of unused turns of wire, being in circuit when using only a small portion of the winding, it was decided to introduce a switching device to accomplish this, and the one adopted is believed to be as simple and effective as any of the numerous devices used for this purpose, and, moreover, has the advantage that a good rubbing contact is made when closing the circuit, thus ensuring good conductivity. Fig. 5 shows the arrangement and operation of these switches, which were fitted between studs 5 and 6, and 8 and 9.

Before leaving the secondary coil tapping, attention should be drawn to the importance of arranging the switch so that the turns in use are nearest the primary coil, and thus more closely coupled for the lower wavelengths. This also applies to the primary coil.

In calculating the inductance necessary for the primary, the capacity of the aerial has to be taken into account. The inductance of the aerial is so small as to be neglected. The capacity is very readily obtained by the use of Prof. Howe's curves, which gave, in the case of the author's pre-war aerial, a capacity of 0·00035 mfd. The same methods are used as for the secondary and the diameter being fixed by allowing a suitable clearance for the secondary, say ½ in. all round, making, in this case, a diameter of 4½ ins., the length and number of turns is determined after settling the size of wire. It is not advisable to use a smaller wire than, say, No. 30 S.W.G., and if space is available a thicker or stranded wire should certainly be used, particularly in the case of wavelengths below 600. In this tuner, No. 28 S.W.G. S.S.C. wire was decided upon, and the total number of turns required was found to be 350. After plotting the various values of inductance and wavelength, as in the case of the secondary, three dead-end switches were fitted to divide the coil into four sections, giving maximum W.L. ranges of 600, 2,000, 2,500 and 3,500 metres, allowing for an aerial capacity of 0·0004 mfd. Each section was also spaced 1 cm. from its neighbour to reduce capacity effect.

The tuning switches were so arranged that any number of turns could be inserted from 1 to 350 in increments of one turn. This was accomplished by using the well-known method of "units" and "tens," one switch being connected to the first ten single turns and the studs of the second switch being connected to groups of ten turns. It is at once evident that by manipulating the two switches any number of turns from one upwards may be included in the circuit.

Dealing next with the coupling between the primary and secondary, we find that this at once limits the size of the panel and containing box. For the shorter wavelengths the distance apart need not be so great, but for wavelengths from 2,000 metres upwards the coils should be capable of being moved a minimum distance of 2 ins. apart if fine tuning is desired. In the panel described there is a maximum allowance of 4 ins. There are many methods for changing the coupling, but the one adopted, viz., sliding the secondary along the common axis of the two coils, is, in the author's opinion, the most efficient and quite simple in operation. Methods of operation such as a coarse pitched screw, rack and pinion, or wire passing over pulleys, are refinements, and, moreover, bring up the cost of the finished tuner.

The formers for the primary and secondary coils consist of papier maché tubes, soaked in paraffin wax, ebonite being considered too expensive and not absolutely essential, seeing that the completed coils would be mounted upon a well insulated panel with consequent high insulation resistance to earth. The insulation of the wire being silk and practically

embedded in paraffin wax also reduces the leakage between turns to a negligible quantity.

The former for the primary was screwed to a wooden flanged disc, which in turn is screwed to a brass bracket bolted to the panel. Through the centre of this former, and screwed into the brass supporting bracket, runs a ⅜ in. brass tube on which the secondary former slides, the tube being secured at its outer end by an L-shaped bracket bolted to the panel. Discs of "bakelite," ⅜ in. thick, are secured by brass machine screws into each end of the secondary former, and a ⅜ in. clearance hole is drilled for the brass tube.

The tappings of the secondary coil are brought out inside the former to a row of studs screwed into one of the end discs, and soldered to these, connections from these studs being made by rubber-covered flexible wire, laced out in a single row to again avoid capacity and leakage, more particularly between those tappings leading from each end of the coil between which, of course, the P.D. is greatest. (This can be seen quite well in the photograph of the interior of the panel shown in Fig. 10).

All tappings are secured to the back of the switches by means of nuts, but soldering would perhaps make a better job. The next items to be considered are the condensers. They should be of the variable type, preferably with air as dielectric, one being connected in the aerial or primary circuit and the other in the closed or secondary circuit. The one in parallel with the secondary circuit should not exceed, say, 0·0005 mfd. in order to get the maximum potential across the valve or crystal detector, and the primary condenser should be variable up to, say, 0·001 mfd. It is advisable to arrange for the latter condenser to be connected either in series or parallel with the primary, and a switch performing this function has recently been added.

Consideration of space determined the size of the condenser plates, which were fixed at 6 ins. diameter, and using the well-known formula —

$$C = \frac{AK}{4\pi \times d \times 900{,}000}$$

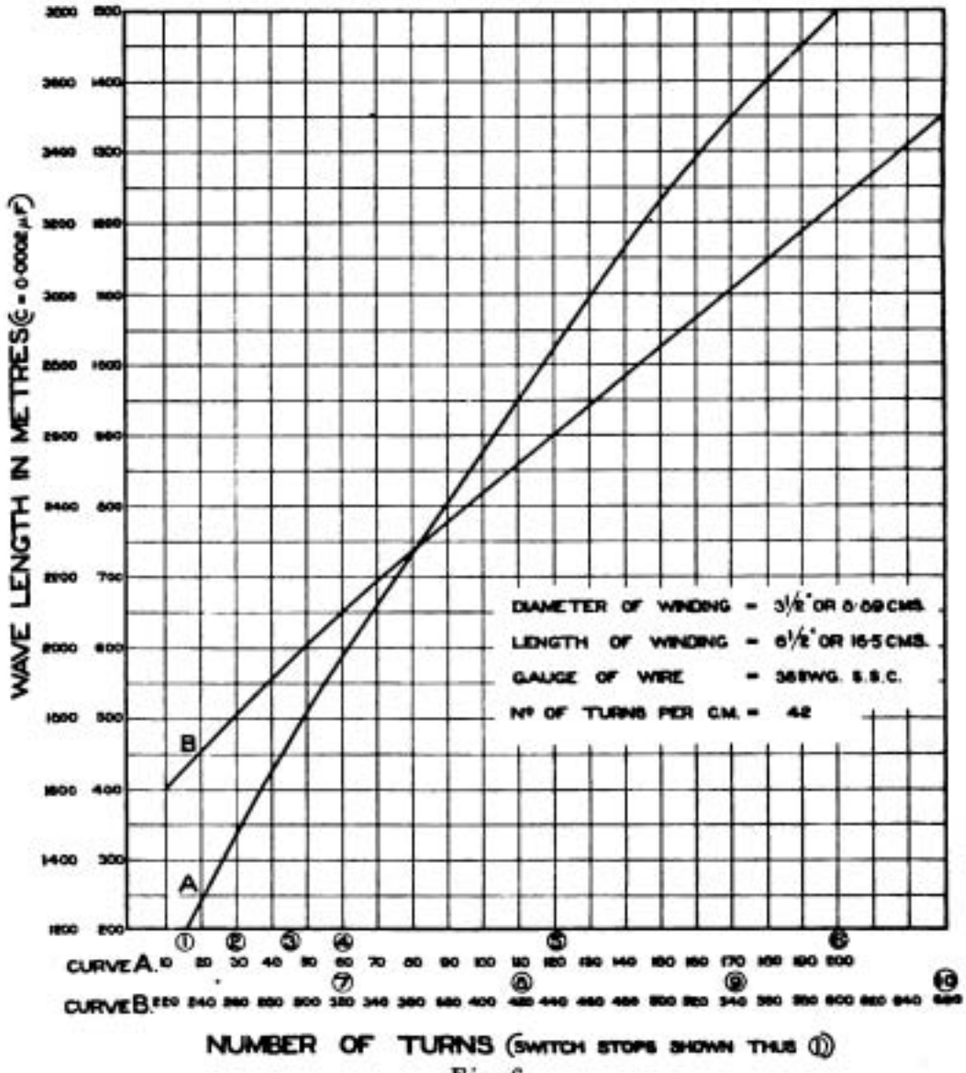


Fig. 6.
Curves for Secondary Coil.

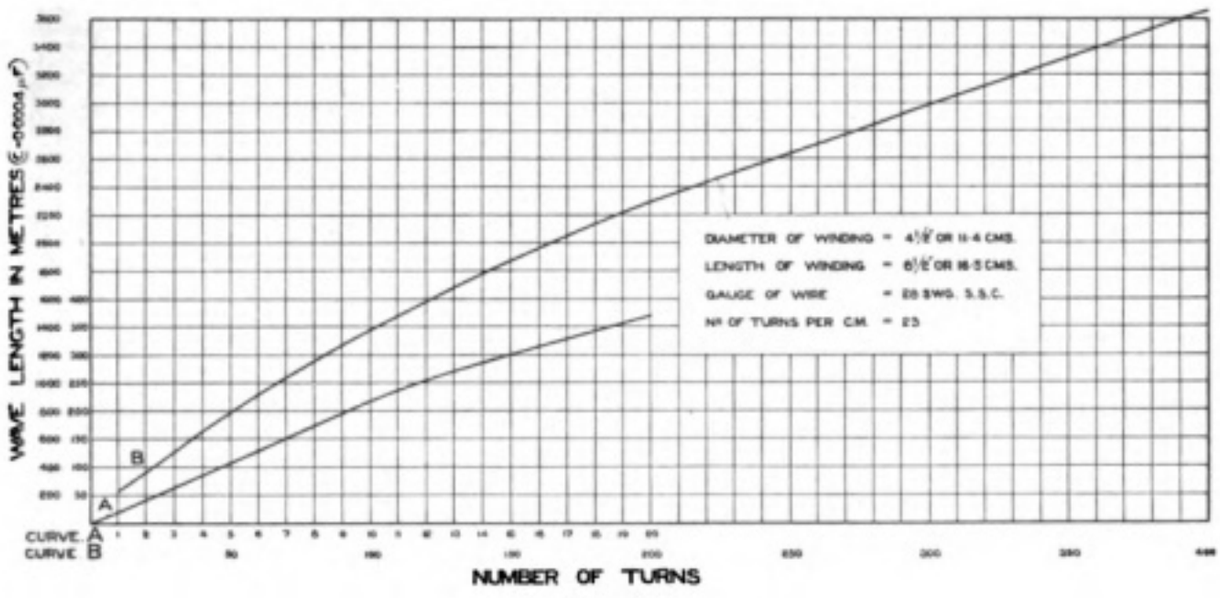


Fig. 7.

Curves for Primary Coil.

where C = capacity in microfarads.
A = total area in sq. cms. of the working sides of plates connected to one terminal.
d = distance between + and − plates in cms.
K = Specific inductive capacity.

It was found that spacing them ½ cm. apart, and with a single plate area of 49 square cms. would necessitate 10 movable and 11 fixed plates, to give a capacity of 0·0003 mfd., and this was adopted, with the intention of adding more plates later if necessary. The method of estimating the area of the shaped plate may be of interest to amateurs. The shape of plate was designed to give a minimum capacity between the ends of the plates when in zero position ; that is, all out, though later a switch was fixed to open-circuit the condenser in this position.

The correct shape of plate was cut out of a sheet of presspahn of uniform thickness, and was carefully weighed on a chemical balance. A known area of the same presspahn was then cut out and weighed, and by simple rule of three the area of the shaped plate was obtained.

The condensers at present in the panel taken from an old Mark III tuner were fitted quite recently, the reasons for the change being two-fold, economy of space with greater capacity, and the advantage of a graduated scale.

It was found, incidentally, that the calibration of both coils was altered, due to the end capacity of the plates and the lack of an open-circuiting switch.

It will be interesting to show at this point the calculated wavelength calibration curves of both secondary and primary (Figs. 6 and 7). These have been checked on signals received from well known stations, and with the tuner as originally designed it was found that the curves were near enough for all practical purposes. With the present condensers, however, the curves require lifting. For instance, FL's dots at 9.10 p.m. G.M.T. on 2,600 metres are now received on the stud corresponding to 170 turns, whereas it originally required 250 turns. MPD was heard at his best with 280 turns, now with 190.

It was originally intended to fix reaction or regenerative coils external to the panel, but the author decided later to enclose them in the cabinet. Room not being available on the panel itself, they were mounted on a separate "bakelite" panel, and screwed to the bottom of the containing case.

Finding, as most amateurs will have found by now, that it was not advisable to use one

coil only for reaction from 600 metres upwards, it was decided to use two, with a change-over switch enabling either to be used. The short wave coil was wound with 32 S.W.G. S.S.C. wire in basket form, having an inside diameter of 1½ ins. and outside diameter 3¾ ins., weight of wire 1 oz. and resistance 11·8 ohms. This will easily cover the range of the tuner, although not very efficient on the lower wavelengths. The long wave coil has the same dimensions, but is wound with 40 S.S.C., having a resistance of 280 ohms., and reacts up to 14,000 metres. The primary of the reaction coils, or, if you like, that part of the tuner primary or secondary to which the reaction coil is coupled, is wound with 28 S.W.G. S.S.C. wire, and has about 70 turns. This coil is hinged midway between the two reaction coils, and can be turned through 90 degs. to couple with either coil by means of the handle seen at the bottom of the panel. This is quite clearly shown in Fig. 10, and in practice works very well, notwithstanding the fact that only one end of either reaction coil is opened when not in use, a S.P. change-over switch on the front of the panel being used for this purpose.

Figs. 8 show the connections in simplified form for the whole of the panel, Fig. 8*a* showing connections for "stand-by" position, and Fig. 8*b* for the "tune" position. The

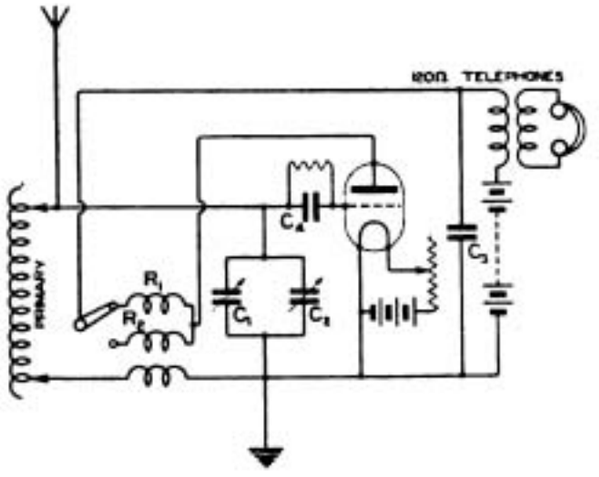


Fig. 8a.
"Stand By."

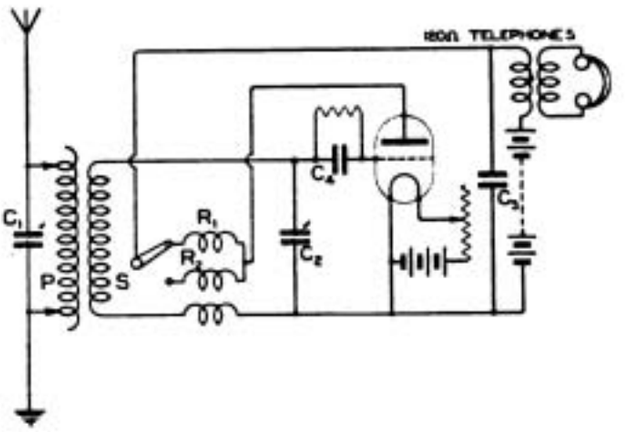


Fig. 8b.
"Tune."

switches for effecting these changes are purposely omitted for the sake of clearness, but are shown in Fig. 9, which gives the actual wiring diagram.

The function of these, which consist of triple pole, double pole and single pole change-over switches, is to couple the detector circuit to either primary or secondary, also to put the primary of the reaction coil either in series with the earth end of the tuner or in series with the low potential end of the secondary, these changes being necessary when in "stand-by" or "tune" positions respectively. The S.P. switch already described is used for inserting either short or long wave reaction coil, independently of the position of the other switches. It will be noticed in connection with this diagram of connections that when the switches are in the top or "stand-by" position, both variable condensers are in parallel with aerial and earth, and thus give an additional capacity up to 0·002 mfd., which is useful when using a loading coil for long wavelengths; the smaller condenser also gives finer turning for short wave C.W. signals.

Those terminals which are in use are clearly marked, A being the aerial terminal, A.T.I. for the loading coil, if required, E. for earth wire, G for grid and R for connection to the plate circuit for reaction purposes. The chain links shown dotted, enable one to disconnect entirely the primary of the reaction

coil and insert, if required, any experimental coil, say for very short waves, which cannot be obtained with the existing coil. The reaction coil terminals R, in that case, are not used.

The multi-contact switch marked secondary loading coil, was originally intended as a filament rheostat, and has not yet been coupled up to an inductance. It is intended, however, to use for this purpose a series of either basket or honeycomb coils.

In concluding, the author has endeavoured to treat the subject as simply and briefly as possible, and trusts the data given may prove helpful to the beginner who desires to construct his own set from first principles rather than rely upon the usual slipshod trial and error methods.

The tuner described has been in constant use for several months, and is quite efficient in operation over the wavelengths stated.

If desired, the secondary coil may be used as a reaction coil with the C.O. switches in the "stand-by" position, and in practice this has been found to give excellent results on

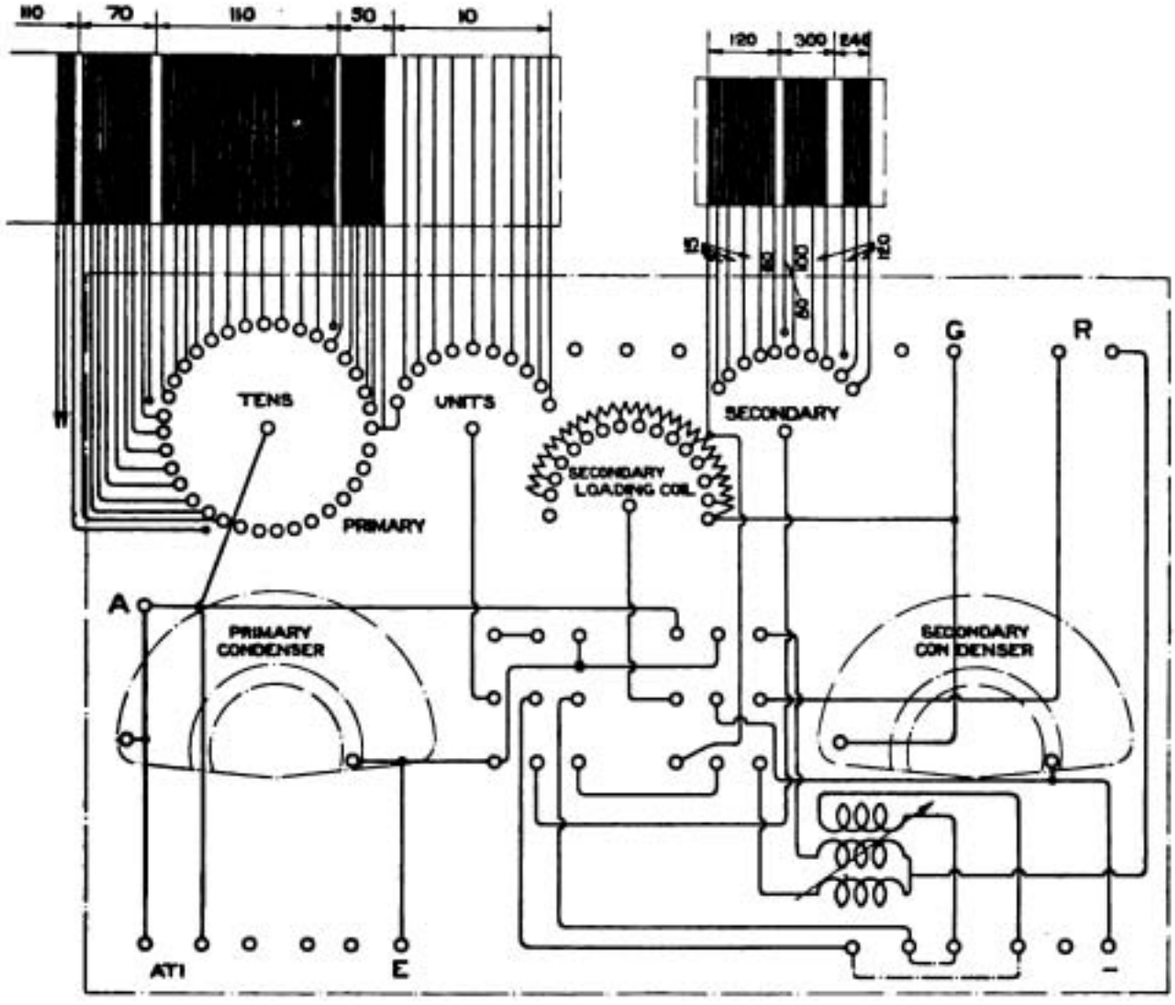


Fig. 9.
Diagram of Connections.
Panel Receiving Tuner—Range 600 to 3,500 metres.

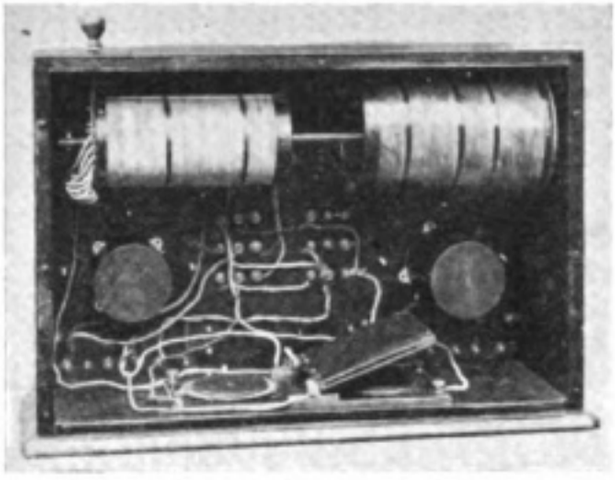


Fig. 10.

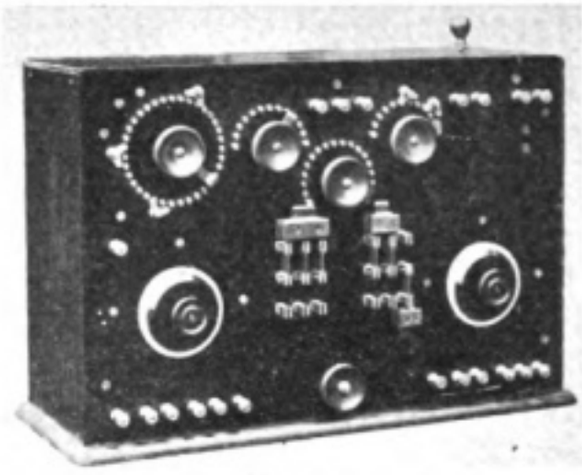


Fig. 11.

wavelengths ranging from 600 to 25,000 metres. The following additional data may be of interest :—

Insulation resistance of primary coil to earth = over 100 megohms.

Insulation resistance of secondary coil to earth = over 100 megohms.

Resistance of primary coil = 41 ohms.

Resistance of secondary coil = 111·3 ohms.

THE FIRST LINK OF THE IMPERIAL CHAIN

THE Home link of the Empire Chain of Wireless Stations has been completed. The opening of the station was inaugurated by the Postmaster-General (Mr. Kellaway) on Thursday, August 18th.

The station, which is located at Leafield, about fifteen miles west of Oxford, was planned under the contract made in 1913 between the Post Office and the Marconi Company for the establishment of an Imperial Chain of Wireless Stations. A considerable amount of work was done on the station by the Marconi Company prior to the date of the cancelling of the contract by the Post Office in 1914, owing to circumstances created by the war. The ten 300-foot steel tubular masts had been completed by the Marconi Company, and about the same amount of work had been done on the next link in the chain—the Cairo station at Abu Zabal.

In 1919 Parliament sanctioned the expenditure of £170,000 for the completion of the two stations, and work was carried on under the direction of the Post Office.

Although the official opening of the station took place on August 18th, the station was completed some little while before that date and thorough tests had been made, reports on signals having been received from such stations as St. John's (Newfoundland), Bermuda, Gibraltar, Malta and Jamaica.

At present the Leafield Station is to be used both for transmitting and receiving, but work has begun on another site at Banbury, which is destined to be the receiving station, when Leafield will be used for transmission only and duplex simultaneous working will then be possible. The transmitter is a continuous wave arc set, designed by Mr. C. F. Elwell.

THE FIRST LINK OF THE IMPERIAL CHAIN

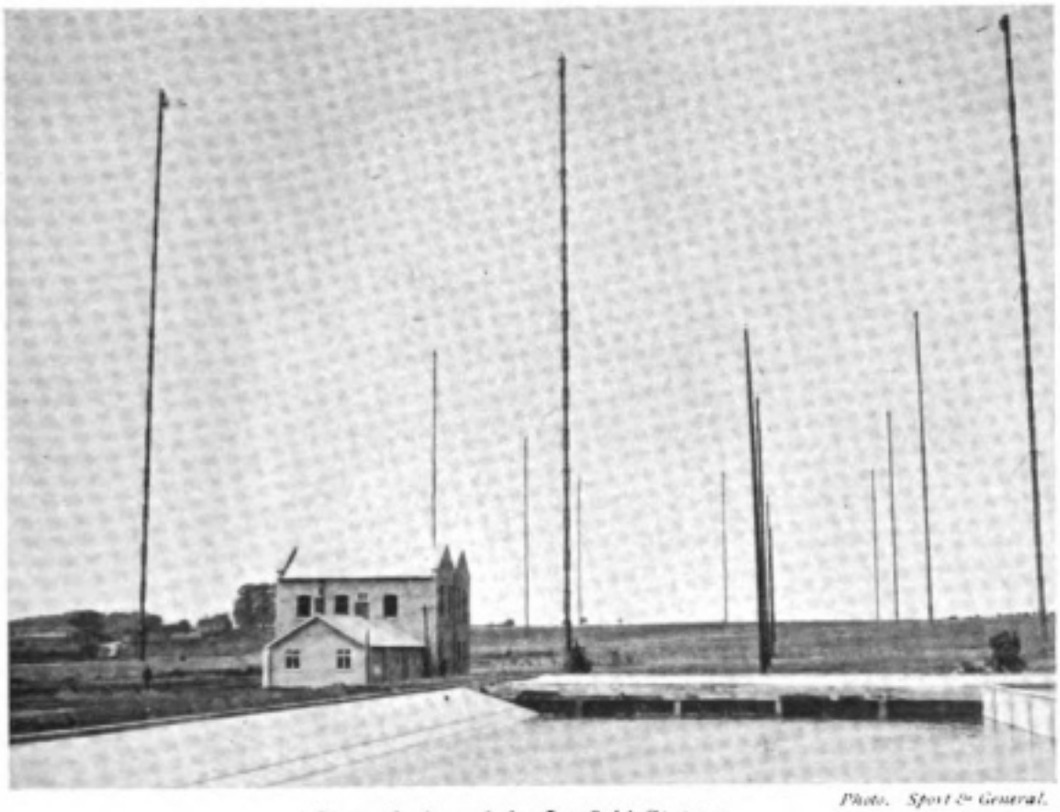


Photo. Sport & General.

General view of the Leafield Station

Visitors to the station on the occasion of the inauguration included Sir Thomas Williams, of the London & North-Western Railway, and Mr. Blackemore (who are both members of the Post Office Advisory Council), Admiral of the Fleet Sir Henry Jackson (Chairman), Colonel Cusins (of the Signals Experimental Establishment, Woolwich), Mr. E. H. Shaughnessy (Head of the Wireless Section of the G.P.O.), Mr. F. O. Brown (Technical Officer of the Radio Research Board), and Colonel Crawley (Deputy Inspector of Wireless Telegraphs, G.P.O.).

Two messages were transmitted by the Postmaster-General, as follows :—

"The Postmaster-General sends greetings to all British stations within range on the occasion of the completion of this the first station of the Imperial Wireless Chain, and trusts that the station will help to knit still closer the bonds which bind together the different parts of the Empire."

"The Postmaster-General sends greetings to all European stations and to other Foreign stations in range on the occasion

Photo. Sport & General

The Postmaster-General receiving the first message.

of the completion of this, the first high-power station owned by the British Post Office, and trusts that the development of wireless communication will help to knit still closer the bonds of amity which bind the British Empire to all other States."

A large number of replies to these messages were received.

In a brief speech the Postmaster-General mentioned that the Post Office had asked the Radio Research Board to investigate the prospects of wireless telephony in Imperial communications.

The station at Abu Zabal, he said, was expected to be ready in about three months' time. Leafield and Abu Zabal would then maintain direct communication, whilst the latter station would also be employed for communication with Mesopotamia, and perhaps for broadcasting news for India.

CORRESPONDENCE

CONCERTS GIVEN BY THE NEDERLANDSCHE RADIO-INDUSTRIE DEN HAAG, HOLLAND.

To the Editor of THE WIRELESS WORLD.

SIR,—I have just returned from the Hague, after visiting the above firm, and they inform me that the expense of transmitting these Concerts on Thursdays and Sundays has now become very considerable. In addition to having to pay a large tax to the Dutch Government for their permission to transmit, they have to pay a considerable figure for the services of the orchestra which they employ on Thursday evenings and the artistes who perform for them on Sunday afternoons. They are also proposing to considerably increase their transmitting power, which will necessitate the purchase of new generators, the construction of a much larger transmitting set and the erection of a bigger aerial. They say that if it is the general wish that they should continue these concerts, they would much appreciate subscriptions from this country towards the cost. They have put the matter before the Dutch Wireless Societies, and their proposal has found much favour.

I am sure that the Dutch Concerts are much appreciated in this country, and that nearly all amateurs would welcome their continuance, especially on higher power. Perhaps, therefore, in order to show their appreciation and support, British amateurs will be only too pleased to subscribe for this purpose, and I suggest that a subscription list should be immediately opened and subscriptions collected, preferably by yourself.

W. W. BURNHAM.

Deptford, S.E.
August 12th, 1921.

[If it is the desire of readers to contribute to the above we shall be pleased to receive subscriptions, which should be addressed to—The Editor, *The Wireless World*, 12/13, Henrietta Street, Strand, London, W.C.2, the envelopes being marked "Dutch Concerts."

We should appreciate letters from all interested in these concerts, expressing their views relative to the above.—ED. *W.W.*]

To the Editor of *The Wireless World*.

Sir,—Some few months ago you were kind enough to advertise my name in *The Wireless World* by way of assisting me in starting a wireless club in this district. I am sorry to say at that time I could not seem to get any number of interested people to back me up. But after steady perseverance I am now pleased to be able to tell you that I have managed to get a fair number of gentlemen together, including Captain E. J. Hobbs, the writer of the article in June 25th issue, and who has kindly consented to become President. I am calling a second meeting this next Friday, the 12th, when our principle business will be to find a suitable room and form a suitable working Committee. The Club will be called the Bournemouth and District Radio Club. I will keep you informed as to the working of same.

Hill Garage, Winton, Bournemouth.
August 8th, 1921.

T. H. DYKE,
Hon. Secretary

Bournemouth and District Radio Club.

To the Editor of *The Wireless World*.

Sir,—The President of this Society has sent a letter to the Wireless Society of London respecting the suggestion of weekly wireless telephone transmission by the Marconi Co. Apparently nothing further has been published in connection with this, and as we are anxious that something should be done, shall be glad if you can devote a small space in your next publication, encouraging other provincial societies to follow our lead.

It seems to have been intimated by the P.O. representative at the last annual conference that if other societies wished for these transmissions something might be done to provide same.

This Society will do all that lies in its power to assist in bringing about this desirable end, and the Committee will be glad, therefore, if you will give our movement your assistance in the way I have previously mentioned.

JOS. W. PALLETT,
Hon. Secretary.

Leicestershire Radio Society.

CORRESPONDENCE

To the Editor of *The Wireless World.*

Sir,—Under the heading, "A Universal Amplifier, suitable for all Wavelengths," by Mr. A. A. Campbell Swinton, F.R.S., is described a transformer coupled H.F. amplifier, with tuned transformer primaries. First, I must apologise for offering comments on a paper prepared by so eminent an experimenter.

I have used a somewhat similar H.F. amplifier circuit for some time past (using only two valves), the transformer windings being together in the same slot (run on together). In my case, however, the secondary of the transformer is tuned; the result obtained being very good. If some reader, with the necessary technical knowledge, would comment on the respective merits of the two methods, it would probably be of interest to other readers. As far as I am able to judge, with my limited technical knowledge, the tuned secondary *should* give better results. From experiment we have learned that a receiving circuit *can* be made to oscillate by tuning the plate circuit, and *also* by coupling the plate circuit inductively to the A.T.I., *without* having tuned the plate circuit; but in my experience there is nothing to choose between the results, either for C.W. or spark. This being the case, it would appear that the plate circuit variations of the first valve will truly follow those of the grid circuit, *without* the necessity of tuning the plate circuit. Also it would appear that, for the maximum transference of energy to the secondary of the transformer (however close the coupling), this circuit must be tuned. This *is* done in the circuit described above; reaction up to, or beyond the point of oscillation, being obtained by the presence, on the operating table, of the transformer. The A.T.I. and reaction coil formerly used, can now be used as a variometer for tuning the aerial circuit. Using this method, coupling of A.T.I. and transformer is adjusted until oscillation just commences for C.W., and just does *not* commence for (spark and telephony), when the aerial and transformer secondary circuits are exactly in resonance. Tuning is *very* critical, and *many* more 600 metre stations can be read for this reason alone. With the writer's 100 ft. aerial, with 70 ft. top, 50 ft. and 30 ft. high, the above set and one L.F. step of amplification, the Dutch concert has been just heard with the telephones 1 ft. from the head, and under favourable circumstances (three valves in all). The set is only a few yards from the 500-volts D.C. traction circuit, and it is easy to understand that from 30 to 100 kilowatts, fluctuating at audio frequency, in an earth return circuit a few yards from the aerial, creates more noise in the telephones (even with H.F. amplification) than does three-quarters of a kilowatt, radiating over a circle (?) whose radius is the distance from Leicester to Holland.

T. S. SKEET.

P.S.—It is generally necessary to use the coupling in the *opposite* sense, *i.e.*, to prevent oscillation, instead of as usual, to *cause* oscillation.

To the Editor of *The Wireless World.*

Sir,—I have read the letter of your correspondent "Experimenter," re the aerial, and both myself and friends would be pleased if he would furnish us, through the medium of your paper, with further particulars.

ALDERLEY.

WIRELESS NEWS


ΝΕΑ
ΗΜΕΡΑ
ΤΕΡΓΕΣΤΗΣ
ΤΑ ΡΑΔΙΟΤΗΛΕΓΡΑΦΗΜΑΤΑ
ΤΟΥ ΑΣΥΡΜΑΤΟΥ ΔΕΚΤΟΥ ΤΗΣ «Ν. ΗΜΕΡΑΣ»
ΕΞΑΚΟΛΟΥΘΕΙ ΥΠΟΥΡΓΙΚΗ ΚΡΙΣΙΣ ΕΝ ΙΤΑΛΙΑ
ΔΗΛΩΣΕΙΣ ΤΟΥ ΔΟΚΤΟΡΟΣ ΡΟΖΕΝ ΕΙΣ ΤΟ ΡΑΓΧΕΤΑΓ

The above photograph is of the front page of a copy of a Greek newspaper "Nea Emera" (the New Day). This newspaper, with several other Greek newspapers, owns a Marconi wireless station from which is derived daily intercepts of official news.

In this particular issue the whole of the news of the front page and most of that of the second page is obtained from this source.

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 Society wishes to announce that the new Session will open with a Meeting at the end of September, the exact date to be announced later. Will Members desirous of offering to read Papers before the Society kindly communicate with the Hon. Secretary, Leslie H. McMichael, M.I. Radio E., 32, Quex Road, W. Hampstead, N.W.6., as early as possible, as the Committee has in hand the arrangement of the Syllabus for the Session.

Edinburgh Wireless Club.

(Affiliated with the Wireless Society of London.)

Hon. Secretary, 9, Ettrick Road, Edinburgh.

At our last general meeting, the Chairman, Mr. Crichton, addressed the meeting in a very enthusiastic manner, encouraging them to further efforts in the way of suggestions for fostering interest in Club meetings.

He then proposed that the name of the Club be altered, the principal reason being that as we are first and foremost a body meeting for the purpose of holding discussions, etc., in wireless and other radio matters, the name "Club" is liable to cause, and has already caused, an erroneous impression of our weekly congregations. A large number of members' friends and acquaintances seem to have got hold of the idea that our meetings are of the social order, and are perhaps more "wet" than "wireless."

He therefore proposed that the name "Edinburgh and District Wireless Society" should be used in future.

After discussion it was decided that the Club be called "The Edinburgh and District Radio Society" as from this date. This name being generally approved by the meeting.

The Wireless Society of Hull and District.

(Affiliated with the Wireless Society of London.)

The annual meeting in connection with the above Society was held on July 21st, at the Metropole, Mr. G. H. Strong, President, occupying the chair.

The Hon. Secretary and Treasurer presented his report and balance sheet, which were considered very satisfactory. Taking into consideration that this was the Society's first year, progress had been made, and interest maintained. A number of new members had been obtained, and a fair number of the members now held P.O. licences. It was thought that if the Society could obtain the use of a suitable room, to be used entirely by the members, and an up-to-date receiving set installed, greater interest with an increase in members would be the result.

Several important matters were down on the agenda for discussion, including the question of raising funds. Eventually a small sub-committee was elected to go into this matter, also the question of holding a dance during the winter months. A number of members expressed the opinion that a kind of mutual aid society among the members would be an advantage, and the Hon. Secretary therefore undertook to prepare a list of all members willing to render assistance to others, together with their special qualifications. It was agreed upon that a question box be brought into operation at the meetings.

Capt. Dennis, R.E., offered the use of a room for the meetings of the Society at the headquarters of the Royal Corps of Signals (T), and this was accepted with thanks, Capt. Dennis's offer being much appreciated.

The meetings fixed for August 18th and September 22nd will be held as usual at the Metropole, and the meetings, commencing with October, at the new room situated in Park Street.

The election of officers and committee resulted in the following being elected:—

President, Mr. G. H. Strong (re-elected); Vice-Presidents, Capt. R. Dennis, R.E., Mr. H. Strong (re-elected); Hon. Secretary and Treasurer, Mr. H. Nightscales (re-elected); Hon. Auditor, Mr. G. H. Featherstone (re-elected); Committee, Messrs. Featherstone, Snowden, Nicholson and Jephcott.

The Hon. Secretary, whose address is 16, Portobello Street, Hull, will be pleased to give full particulars re membership to any person interested in the study of wireless and allied subjects.

North Middlesex Wireless Club.

(Affiliated with the Wireless Society of London.)

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

The seventy-first meeting was held at the Club's headquarters, Bowes Park, on Wednesday, August 10th. There was a good attendance, and after the usual Morse code practice, the chair was taken by the President, who called on Mr. W. A. Saville to give his demonstration of his set, which has been constructed specially to allow of receiving a large range of wavelength on one instrument. Mr. Saville is an enthusiast of pancake and basket coils, believing the practical results to be as good as those obtained by cylindrical ones. The relative merits of these two types of coils always evokes great discussion among members.

Mr. Saville explained the construction of his set, the workmanship of which was excellent. He then took the set apart to show the construction, after which he connected it to the Club's aerial and gave a practical proof of its possibilities. After a vote of thanks had been moved and carried with enthusiasm, the meeting closed.

Folkestone and District Wireless Society.

(Affiliated with the Wireless Society of London.)

Hon. Secretary, H. Alec S. Gothard, A.M.I.R.E., 8, Longford Terrace, Folkestone.

The above Society, having been in formation for six months, it was decided to call a special general meeting. This meeting was held at headquarters, on Friday, August 5th, at 7.30 p.m., Mr. A. G. Mills (Vice-Chairman) taking the chair.

The Hon. Secretary presented a cash statement for the past six months, showing that the total receipts were £9 9s., and total payments £9 3s. 9d., leaving a balance of 5s. 3d., besides which there are eight outstanding subscriptions, making a total balance of £4 9s. 3d. After this statement had been discussed, it was suggested by the Hon. Secretary that an official Hon. Treasurer be elected, and after much discussion, it was proposed by the Chairman, and seconded by the Hon. Secretary, that Mr. R. W. Piper be elected Hon. Treasurer. Carried unanimously.

The meeting was adjourned at 8.45 p.m.

Full particulars of the Society may be obtained from the Hon. Secretary.

Glevum (Gloucester) Radio and Scientific Society.

(Affiliated with the Wireless Society of London.)

A highly interesting demonstration was given in the Royal Infirmary grounds, on Saturday, July 23rd, by our Secretary, Mr. J. Mayall.

This demonstration was very well attended, and the takings proved a welcome addition to the proceeds. Very good telephony results were obtained, and the music was highly appreciated.

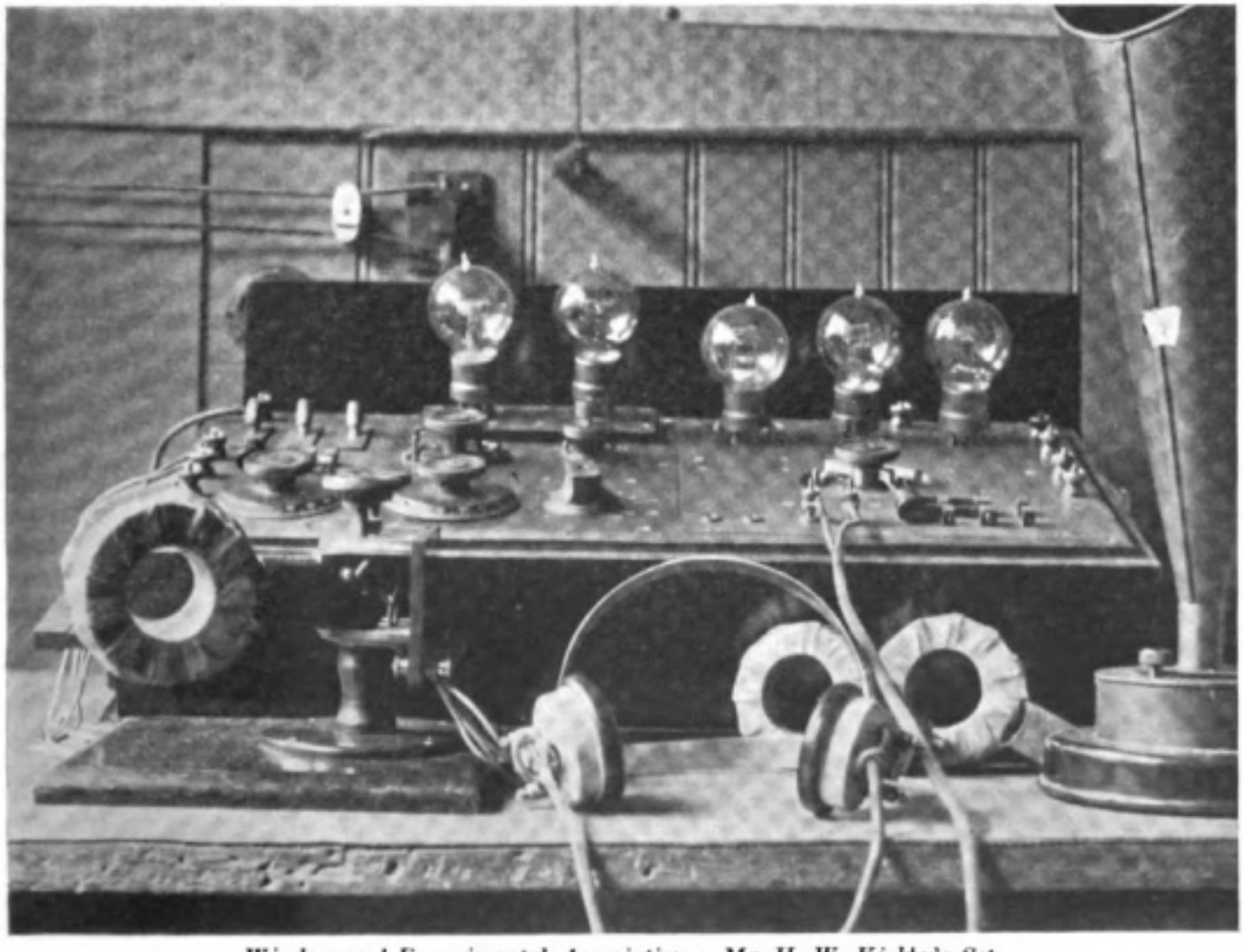
Messrs. Burnham & Co., of Deptford, London, kindly sent down a quantity of wireless apparatus of all kinds, in which our patrons took a great interest.

Other demonstrations are being arranged, not only in telegraphy but also in telephony, in various places. Our new session reopens on the first Monday in October, when our Secretary has promised us some new members and a very good winter programme.

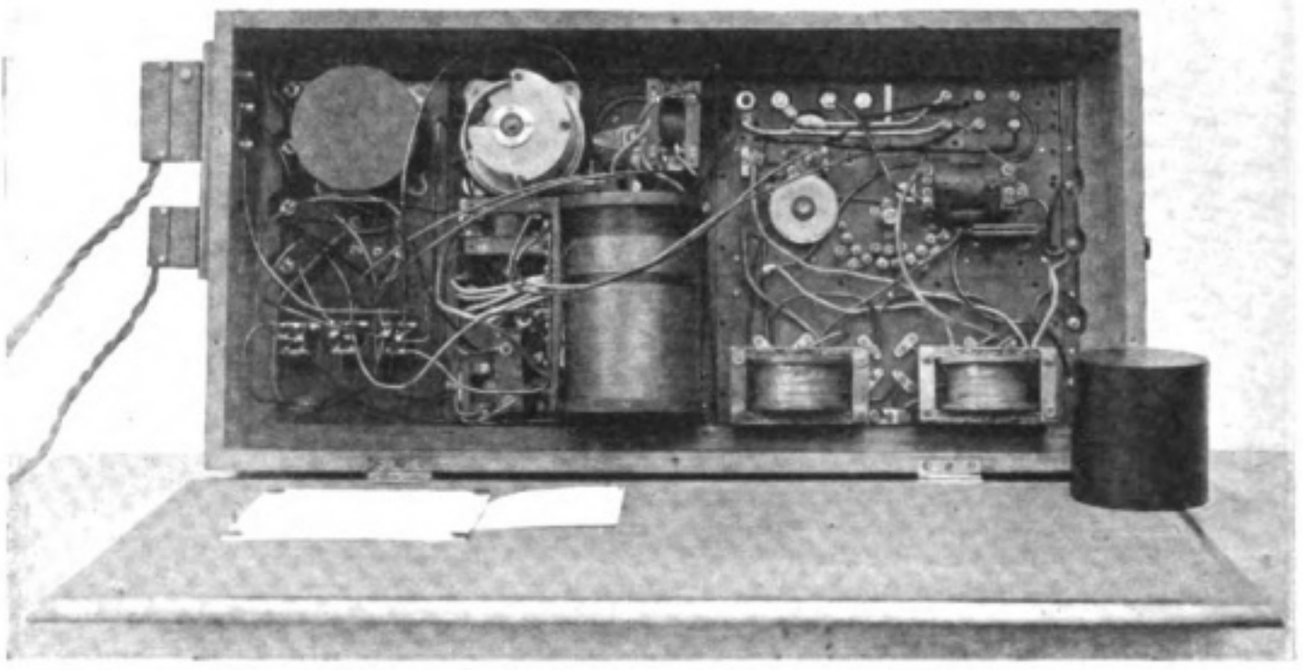
We have now secured a large room at the Ram Y.M.C.A. Building, which will be fitted up as a permanent station and weekly Club-room.

The monthly meetings will take place in the lecture room, at the Technical School, as before, and occasional demonstrations will be given at the Midland and Royal Hotel.

The Secretary will gladly welcome all who are interested in wireless telegraphy, telephony, or any other scientific matter, either at the Technical School, Y.M.C.A., or Midland and Royal Hotel, on meeting nights, or at his private address—"Burfield," St. Paul's Road, Gloucester—where his very fine station, 2MZ, sending and receiving, may be examined, any other evening, by appointment.



Wireless and Experimental Association. Mr. H. W. Kirkby's Set.



Wireless and Experimental Association. Mr. H. W. Kirkby's Set open.

The Gloucester Wireless and Scientific Society.
(Affiliated with the Wireless Society of London.)

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

A meeting of the above Club was held on July 14th, at which a very entertaining lecture was given to the members by the President, Mr. F. J. Freeman, B.Sc. The lecture was upon some of the electrical problems of static electricity, and was illustrated by some striking experiments. A very hearty vote of thanks was passed by all present.

A meeting of the above Club was held on August 11th, when Mr. G. T. Peck showed a home-made two-valve amplifier and detector of unique design. Some excellent signals were obtained, and the set much admired as an efficient one over a large wavelength range.

Dartford and District Wireless Society.
(Affiliated with the Wireless Society of London.)

The usual fortnightly meeting of the above Society was held on Friday, August 12th, 1921, at Dartford Grammar School, a good attendance of members being recorded.

Dr. L. J. Miskin presided, and a very excellent selection of apparatus was brought up by the members for demonstration. A W.R. 160 receiving set, by Messrs. F. O. Read & Co., which, in conjunction with a Mk. IV 3-valve amplifier and loud speaker, gave splendid results. A 3-valve R.A.F. experimental set was also tried, giving good results.

All persons interested in wireless and desirous of becoming members, are invited to communicate with the Hon. Secretary and Treasurer, Mr. E. C. Deavin, 84, Hawley Road, Wilmington, Dartford.

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

Sixteen members participated in a very enjoyable "field day" on July 16th, the party being entertained by Mr. A. Woodcock (Hon. Treasurer) at his bungalow near Streetly. Each member of the party was asked to take either a portable set, a pair of telephones, a high-tension battery, or an accumulator, the result being that an excellent collection of apparatus was obtained without overloading members. Very good signals were obtained, using as an aerial a piece of insulated wire attached to a tree.

Arrangements are now well in hand for the club's second "Wireless Exhibition," the date of

The Field Day of July 16th.

which has not yet been fixed, but will probably be arranged for the end of September. Manufacturers and vendors of wireless apparatus who desire to avail themselves of this opportunity of exhibiting their goods to Midland experimenters are requested to communicate with the Hon. Secretary immediately, as space is being reserved in rotation. The exhibition, which will be held on four consecutive days, will be on a much larger scale than formerly, an attendance of at least a thousand being already assured.—Hon. Secretary, Mr. Frank S. Adams, 110, Ivor Road, Sparkhill, Birmingham.

Halifax Wireless Club.

On Wednesday evening, July 27th, we had a very successful and instructive evening. After the new members had been welcomed we settled down to a "Questions and Answers" evening. Commencing with the question as to whether high resistance telephones, or low resistance and transformer, are preferable for efficiency, the subjects touched upon ranged from the relative advantages of resistance coupled or transformed coupled amplifiers, to the possibility or otherwise of a sharply selective set, which only requires adjusting from 180 to 20,000 metres by the operation of a variable condenser.

Many of our new members are in possession of the P.M.G.'s permit, but the only results produced by their sets are the at present very prevalent Xs, and they, at least, would profit by the "out of the orthodox" meeting.

After the President had been fined coffees round for daring to mention the word "electrons" twice within the space of 10 minutes (a rule made by him some months ago), the more experienced members set to work by diagrams and explanations to clear up the many points on which the less experienced were doubtful.

Such an evening as this (it is our third) can be recommended as a very helpful gathering. It is amazing the number of difficulties experienced by individual members, which have cropped up and been solved by other members. At the same time it gives the opportunity to the more modest member (of whom we have quite a few even in Halifax) to ask questions he would hardly care to ask an expert lecturer.

In Halifax we are well supplied with telephony. Our Club station 2GU, and 2KD (Mr. P. Denison), keeps our interests very much alive, and Wakefield, Leeds, Sheffield, and Manchester are all well received. These transmissions came in for a good deal of criticism at our meeting, and had these gentlemen heard some of the congratulatory remarks passed about them and their sets, they would have felt no little satisfaction at the appreciation their efforts are giving to their unknown hearers.

Our meeting came to an abrupt termination by the request of a member for the best circuit on which to receive the Dutch concert, using a carborundum crystal and a frame aerial.

Hon. Secretary, Louis J. Wood, Clare Hall, Halifax.

Wireless and Experimental Association.

The Wireless and Experimental Association of Peckham is fortunate in many respects, not the least of which is the originality and resource of some of its members. One, Mr. H. W. Kirkby, at a recent meeting, exhibited a set which he had constructed, mainly from Disposals Board parts, which embodied several very desirable features. Proper to the set are the usual A.T.I. and reactance, ranging in scope between 300 and 1,900 metres. Home-made honeycomb coils starting at 1,800 metres can be used in the usual De Forest style, and carry the receptivity of the set as high as is ever necessary. The first valve is used as a detector, and even with the whole of the other four in use, the set is extremely quiet in the sense of being free of parasitic noises, though the neighbourhood is certainly less peaceful when all is going full blast. The telephones can be plugged in at the plate of the second valve, or carried into the plate of the fifth. The bottom of the case is hinged, making everything very accessible, and in spite of the wealth of terminals and "points," the wiring

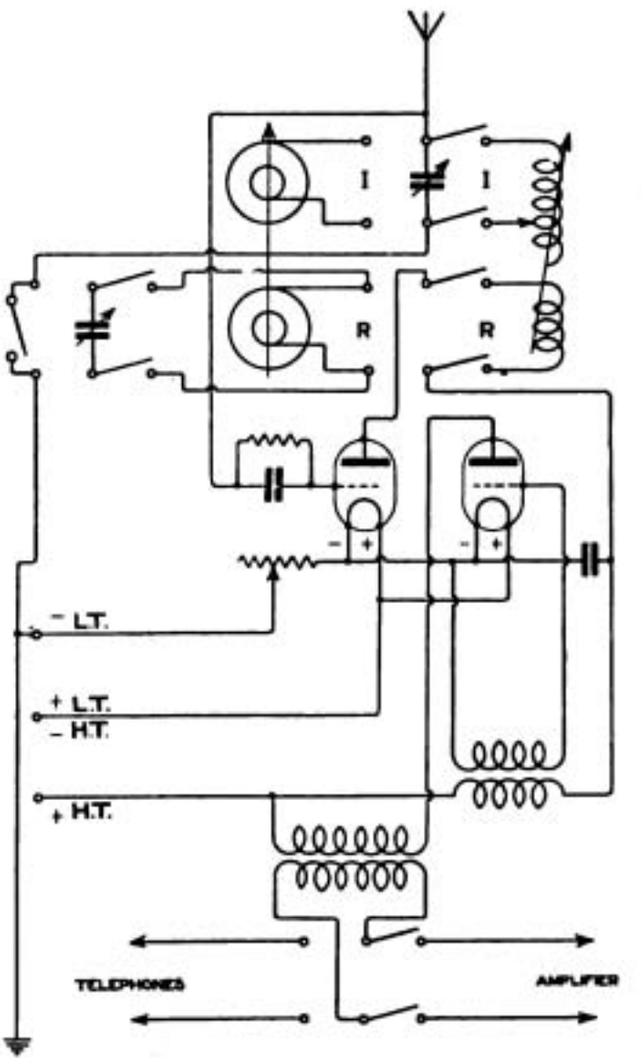


Diagram of Mr. H. W. Kirkby's Set.

is by no means mazy. Indeed, Mr. Kirkby seems to have achieved Mr. Tingey's desideratum, a sweet simplicity of construction. The photographs are by Mr. F. W. Kirkby, the brother of the constructor of the apparatus.

The Willesden Wireless Society.

An informal meeting was held on Friday, August 5th, the usual Tuesday's meeting being postponed owing to the holidays. During the earlier part of the evening, Mr. Picker demonstrated another portion of his receiving set. This consisted of a single valve receiver in a cabinet containing all apparatus necessary for reception between 200 and 15,000 metres wavelengths. Extremely creditable results were obtained, as everything except valves, telephones and batteries, was made up and put together by Mr. Picker.

The Society's own receiving set then came up for discussion, and the final details of our proposed 3-valve amplifier were decided upon. The set is to be mounted on a baseboard, and each piece of apparatus will have its own terminals. The set is nominally designed for L.F. amplification, but it will be quite easy to reconnect for H.F. amplification, or to any special arrangement desired for demonstration purposes. Telefunken valves will be used, as the Hon. Secretary has been able to secure a batch of these from the Disposals Board at a low figure. Results obtained from private sets using these valves prove them to be quite suitable. After all these points were decided upon, various members volunteered to carry out the necessary making of parts, and we hope to be in possession of an efficient and useful amplifier in the course of a meeting or so.

Application has been made to the Wireless Society of London for affiliation, we hope to hear from them soon after their forthcoming Committee meeting.

Particulars of membership can be obtained from the Hon. Secretary, Mr. F. A. Tuck, 87, Mayo Road, Willesden, N.W.10.

Ilford and District Radio Society.

Hon. Secretary, Mr. L. L. Vizard, 12, Seymour Gardens, Ilford.

A most successful meeting of the Society was held on July 20th at the Secretary's house, there being quite a good number present. The chair was taken by Mr. Welch, and after the minutes of the previous meeting were read and confirmed, the Chairman called upon Mr. Carpenter, of the Marconi Scientific Instrument Company, to deliver his lecture.

Mr. Carpenter dealt with the construction of an efficient single-valve receiver to cope with a range of wavelengths of from 200 metres to 23,000 metres, and ably demonstrated how this could be done by means of basket and slab inductances. The Marconi "Round No. 16" circuit was also explained, and one or two members who are using that circuit were able to speak very highly of it.

The evening was ended with many questions being asked, and a hearty vote of thanks was accorded to Mr. Carpenter for a most interesting lecture.

A meeting was held on Wednesday evening, August 3rd, at the Society's headquarters. The chair was taken by Mr. Welch, the Vice-President, and after the Secretary had read the minutes, Mr. Welch was called upon to deliver his lecture on "The Principles of Wireless Reception." All points of interest were ably demonstrated on the blackboard, and a lively discussion followed. The meeting was concluded by a hearty vote of thanks being accorded to Mr. Welch.

The Wireless Society of Dorsetshire.

The above Society has recently been formed for the purpose of promoting and assisting in every way the work of all amateurs and workers in Dorset, who are requested to communicate immediately with the Hon. Secretary, Mr. I. Chapman, "Abbotsford," Serpentine Road, Poole, for purposes of registration and organisation of the districts.

Smethwick Experimental Wireless Club.

Mr. R. H. Parker, Hon. Secretary, Radio House, 31, Wilson Road, Smethwick, Birmingham.

A meeting of the above was held at the Club's headquarters, Municipal Technical School, Smethwick, on August 9th, Mr. Adams, F.I.C., F.C.S. (Vice-President), in the chair.

After the usual buzzer practice, Mr. C. Grew kindly brought his 6-valve amplifier and loud speaker. A very interesting evening was spent listening to some local telephony which was quite audible all over the room.

The Club is very fortunate in including amongst its membership some ex-naval and army operators, from whom the junior members receive much assistance.

Would all those interested please communicate with the Hon. Secretary, who will forward all particulars.

Westcliff and District Wireless Club.

In accordance with the wishes of numerous amateurs in this district interested in wireless, it is proposed to form a club in order to assist members to improve their existing installations by the mutual exchange of ideas and experiences. Beginners and those desirous of taking up this most interesting hobby will be instructed how to build their own receiving sets or to acquire them inexpensively. It is proposed to obtain the use of a club-room where lectures will be given in non-technical language to beginners, and where debates can be held by more experienced members. Those desirous of joining are requested to write to Captain F. Harper-Shove, Devon Lodge, Lydford Road, Westcliff-on-Sea.

King's College Wireless Society.

The above has just concluded with great success its first College term as a Society.

Three papers have been read. Prof. E. Wilson, our vice-president, made clear to us the principles underlying the magnetic detector in a very interesting way.* We were specially pleased to welcome Messrs. P. R. Coursey, B.Sc., and P. W. Harris, as visitors at the reading of this paper.

* See *The Wireless World*, 8, pp. 170–174, June 11th, 1921.

Mr. C. C. Redshaw showed us various receiving circuits, which he had found efficient, and raised a variety of points promoting an interesting discussion.

Mr. F. S. Robertson, M.I.E.E., read a paper on the construction of wireless valves. We were lucky to be able to hear some as yet unpublished results of his research, and to be shown some of the remarkable ingenuity that has been used in the investigation of occurrences inside a sealed tube.

In accordance with the wishes of several members who were being introduced to W/T for the first time, the officers of the Society conducted, during the lunch hour, some informal "talks" on the scientific principles involved.

Among the apparatus which a sub-committee is at present installing in the Society's room, is a magnetic detection, kindly presented to us by Marconi's Wireless Telegraph Co., Ltd., on behalf of *The Wireless World*.

The Society has at present 46 members. Mr. G. R. Gould has been elected president for the autumn term in place of Mr. W. R. T. Skinner, who has completed his course at the College. The new Hon. Secretary has yet to be elected. Communications should be sent to Mr. G. R. Gould, 4, Bedford Place, W.C.1.

Bolton Wireless Society.

A meeting was held at the Heaton Village Club, Bolton, on July 14th, 1921, when it was decided to form the abovenamed Society.

The following officials were elected :—Secretary, Mr. O. Stott ; Treasurer, Mr. Waller ; Committee, Messrs. Walch, Pilkington and Chadwick.

About 15 enthusiasts have joined the Society, and it is proposed to make a good valve set as soon as a suitable room is procured.

In the meantime Mr. Waller has kindly promised the use of his 4-valve set.

Will anyone interested please communicate with Mr. O. Stott, Moss Bank House, Smithills, Bolton.

Hounslow and District Wireless Society.

We have held weekly meetings since our last report, and continue to make excellent progress. For a very young society it is very good, thanks to our members, who are very enthusiastic and turn up regularly every week. We should be glad to receive visits from other societies. We would also like to ask some of the clubs near Hounslow if they could arrange for one or two of their members to come over to us on a Thursday evening and give us a lecture on wireless. We should be very glad of this, and it would prove to be of great assistance to our young members. Will secretaries think of this and get in touch with me. I shall be glad to hear from them. I hope any gentlemen interested in wireless and living in or near Hounslow will come along on Thursday evenings to the Mission Hall, Pears Road, Hounslow, or communicate with Mr. A. J. Rolfe, Hon. Secretary, 20, Standard Road, Hounslow.

Epsom and District Amateur Radio Society.

The above Society wishes to inform readers that they have made a few alterations as regards members holding offices.

The name and address of the Hon. Secretary is Mr. H. N. Penfold, 32, The Parade, Epsom, Surrey, and that of the Treasurer, Mr. J. B. Plenty, c/o Mrs. Starke, 28, Hook Road, Epsom, Surrey.

The Society hopes to get going strongly during the coming winter.

The Rugby and District Wireless Club.

Owing to the lack of suitable accommodation, the Committee of the above Club have decided to suspend activities during the summer months, with a view to commencing again in the autumn.

Would any gentleman in the locality who has a room to spare kindly communicate with the Secretary, Arthur T. Cave, 3, Charlotte Street, Rugby.

St. John's Wood.

A reader, Mr. G. R. Garratt, of 35, Abbey Road, St. John's Wood, N.W.8, is anxious to get in touch with amateurs of his district, with a view to the formation of a club.

Watford.

Mr. G. Bevan asks why there is no wireless club in Watford, where the number of amateurs seems to justify the establishment of one. Mr. Bevan's address is 44, Queen's Road, Watford, and he will be pleased to give his assistance in starting a society.

Wireless at Scout Jamboree.

On Saturday, July 16th, the Conway and District Boy Scout's Association held a Jamboree and exhibition in the grounds of Conway Castle.

Among other exhibits a wireless section created much interest as it was the first time that such an exhibition had been seen in the town.

In addition to amateur receiving apparatus exhibited, a demonstration was given with a III Ultra Burnham Receiver (very kindly loaned by Messrs. Burnham & Co., of Deptford). The results obtained with this set were really wonderful. A loud speaker was not available, and it was at first thought that it would be rather inconvenient for the public to put on headgear, but signals from most stations were readable yards from the telephones—Malta coming in especially loud. The method of valve control is excellent, and the advantages of being able to switch in any number of valves at will were made very obvious.

The set did not arrive until just before the Jamboree commenced, and there was no opportunity of "testing it out." However, everything went off without a hitch.

That the wireless section created a great deal of interest and materially assisted to make the Jamboree a success is evident from the fact that the wireless tent was "crowded out" from the commencement of the show until late in the evening. —H. Russell Jones, A.S.M., I C Wireless Section.

Note.—The Editor is always pleased to receive photographs of interest for publication with Club Notes.

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.**

R.L.T. (Oxford)—(1) Yes.

(2) Use a valve as a note magnifier, and arrange as shown in diagram. (Fig. 1.)

(3) V24; 6 volts on filament, 30 volts on the anode. R, 4—6 volts on the filament, 50 volts on the anode.

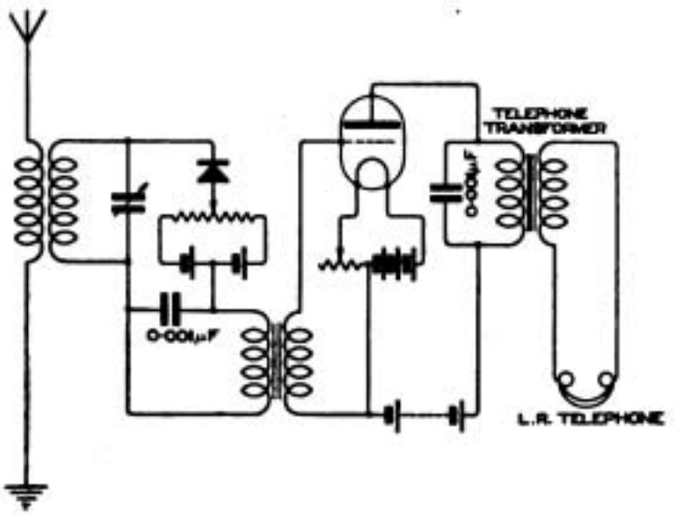


Fig. 1.

TYRO (Yarmouth).—(1) The aerial series condensers should be smaller than you suggest, say ¼ as large in each case. The buzzer circuit is not quite correct; arrange as in Fig. 2.

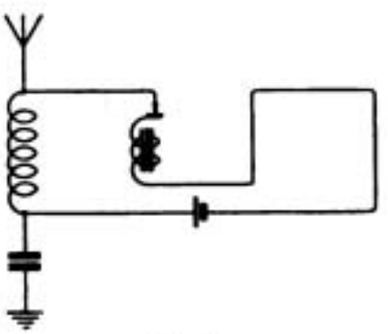


Fig. 2.

(2) Wavelength maximum will be 4,500 ms.

(3) Count all the spaces when the condenser is in its maximum position.

G.H.V. (Shrewsbury).—(1) and (2) The type of coil suggested is all right singly, but the combined arrangement will be inefficient in various ways. If you use coils of this type the largest would have to be about 2′ long by 9″ in diameter, wound with No. 30, and the smallest, say, 5″ long by 3″ in diameter, wound with No. 24. Intermediate coils to suit your own convenience.

(3) This depends on the type of circuit you propose to use. For all round purposes 0·001 mfds. is very useful.

(4) See Fig. 4, page 218, June 25th issue.

J.F.B. (Bedford Park).—(1) and (2) In grid condenser working, the operating point must always be high on the characteristic, a signal producing a fall in the plate current. For reasons we have no space to enter into, too much positive volts on the grid may considerably spoil results, and only experiment in each case can determine which of the connections you suggest will be the better. There is no difference in H.T. battery efficiency.

(3) No.

(4) Not efficiently. If you try it no special connections are necessary—merely leave out the condenser which would be used to tune the circuit. Make the inductance as large as reasonably convenient.

"SPARKUS" (Parkstone).—(1) Your suggested circuit is all right, except that the grid circuit should be closed by a variable tuning condenser—the omission is probably an oversight. It is not necessary to have separate filament resistances for each valve. A circuit using one stage of H.F. amplification instead of one of the stages of L.F. amplification shown, would be more efficient for the purpose that you have in view, but would be less easy to design and construct.

(2) A loud speaker can be introduced as suggested; the resistances of its windings will determine whether it would be better in series or in parallel with the original telephones; find out which is the better by experiment.

S.E.P. (Enfield).—(1) The method you suggest has not, to the best of our belief, found any practical application, but appears fairly sound theoretically. You would have to determine the best value for the condenser in each case, experimentally. Do not make it too leaky; you are bound to get a certain amount of loss of signal strength in any case. You should be able to work it using common batteries if you run entirely separate leads to each piece of apparatus, and introduce choke coils in the leads if necessary.

K.S.L. (Bournemouth).—(1) We cannot say the reason for the hum you complain of. We should have suspected the A.C. supply, but your statements as to the pitch, if correct, negative this. Your single circuit receiver is exceedingly bad.

The hum will probably affect H.F. amplification as well as L.F., but possibly not to the same extent.

(2) Formula is true for any complete circuit in which L and C can be regarded as the total lumped inductance and capacity in the circuit. There are no simple correction terms for cases in which this is not the case.

(3) From about 2·0 to 5·0, depending on the kind.

(4) Almost any good oil of fairly high flash-point is suitable.

W.E.D. (Reading).—(1) Yes, quite suitable.

(2) Not in place of the blocking condenser. It could be used with advantage either in series or in parallel with the A.T.I.—preferably the latter if the set has not already one in this position.

H.M.M. (Nunhead).—(1) The set sketched is quite O.K., with the exception of the series condenser marked 0·0005 mfds. in the grid of the last valve. This would prevent satisfactory working, and is not required. Also a potentiometer is of very little use in a set of this type.

(2) Anode resistances and leaks are about right. Intervalve condensers would probably be better if smaller. Best values can only be found by experiment.

(3) β corresponds to the barometric characteristic. See page 274 of July 23rd issue.

G.L.H. (Cambridge).—(1) We do not like the mixed transformer and resistance amplifier. Otherwise the set is quite O.K.

(2) Not suitable for C.W. as it stands—it would be necessary to introduce a reaction coil in the plate circuit of the first valve, nearest to the valve.

(3) Telephone transformer about 3 oz. of No. 42 for the H.R. side, and 4 oz. of No. 32 for the L.R. side. Intervalve transformer, presumably meant to be H.F., will depend on the wavelength required. See an article appearing shortly.

(4) V24, or other low voltage valves would be best for a set of this type.

SPARKS (York).—(1) This depends on the thickness of the paper. If this is 4/1000" you will require 38 sq. cms. to each pole. If the thickness is different from this, the amount required will be inversely proportional to the thickness.

(2) Very unlikely. You might try a set of type similar to the single-valve long-wave receiver recently described, but it is very doubtful if you will get results at such a distance.

(3) Either of these may be used for certain purposes. For methods, see the issues for October of last year.

(4) There is little work except the Dutch concerts being done at regular times. Near London there are various aircraft stations, and demonstrations as advertised in this magazine by makers of apparatus, but we doubt if you will hear any of these.

H.B. (Forest Gate).—(1) We cannot state the required capacity without a knowledge of the inductance to be used with it. A good value, supposing the inductance to be suitable for it, would be about 0·0003 mfds.

(2) Probably due to your using too much reaction for telephony, for which it is necessary that the set should not be in an oscillating state, as for C.W.

(3) There are various possibilities. The most likely appears to be oscillation in your set, as above. Possibly the amplifier is wrongly connected up, or is of a bad type, giving considerable distortion. For the Dutch concerts you will probably require at least one stage of H.F. amplification.

(4) If you have a wavemeter you can buzz the circuits and tune them by it. If not, note the tuning points of various stations of known wavelength and judge from these the values suitable for intermediate wavelengths.

J.L.R. (Leicester).—(1) The general arrangement of your circuit is all right, but it would be better to arrange the filament resistance to control the currents to both valves. We cannot give the capacities of your condensers, as you do not give the thickness of dielectric of any of them. The A.T.C. is certainly too small, and the tuned circuit condenser probably also. The inductance of the closed circuit should be considerably increased.

(2) This would be possible, but would involve spoiling the two circuits already shown. It would be better to add another coil, in the plate circuit of the first valve, and coupled to the jigger secondary.

H.B.S. (Wallington).—(1) This is evidently due to a short circuit in the leads or the valve, or possibly a wrong connection. See if you still get the effect with the valve removed.

(2) There is no very cheap way. The best is to use a valve rectifier, such as the "Tungar" type of the B.T.H. Co.; but this would, however, cost several pounds to instal.

(3) (*a*) A single layer coil, 8" × 5", wound with No. 22. (*b*) A coil of the same size, wound 4-pile with the same wire, would be quite suitable.

P.B. (Reading).—(1) The circuit suggested is of very poor type, and would be inefficient in many ways. Separate filament batteries, as shown, would be essential. Your second circuit would be quite satisfactory, or you could use any of the two circuit H.F. amplifiers given in these columns recently.

(2) The windings suggested should be satisfactory, but you may require rather more of the slabs than you suggest for the maximum wavelength. C1 and C3 might with advantage be somewhat bigger, particularly C3. A potentiometer is of no use for the second valve, but might be used with advantage for the first.

(3) Enamelled wire may be used if great care is taken not to damage the insulation. Single silk would be better, and double silk still better.

(4) (I) is probably UA, as suggested. We cannot identify (II) from the description given, which is suggestive of the effect of C.W. on a spark receiver, or even of certain types of atmospheric.

J.M.C. (Bombay).—(1) The receiver should be quite satisfactory, except that we do not think you will require nearly as much A.T.I. as you suggest, unless the aerial on the ship in question has been considerably altered since we saw it last.

(2) This should be satisfactory, but we should prefer to omit the shunt condenser.

(3) Probably somewhat less sensitive, but more stable and easier to manage.

(4) Only those given above.

F.A.S. and H.J.M. (Rochester).—(1) O.K., except for the leak resistances, which should be about 5 to 10 megohms for each valve; and that the lower end of the A.T.I. should be connected to the earth lead (this was probably an oversight).

(2) Yes.

(3) This depends on the wavelength required Several will be required if the range is considerable' Compare values given in various descriptions of, sets in the magazine.

(4) Core about ½" in diameter and 4" long. H.R. winding 3 oz. of No. 44, L.R. winding 6 oz. of No. 30.

(5) About 100 ohms; the exact value is not critical.

RADIOTEL (Ealing).—(1) and (2) Primary, 9"×6", wound with No. 22. Secondary, 5"×4", wound with No. 26.

(2) For such a range a good pile-wound coil would probably give the best results, but a coil of honeycomb type would be much easier to make. Or you might use several basket coils placed side by side. The reaction coil may be of similar type to the tuning coil, or may be a single layer coil arranged to slide over the whole tuning coil; if so, it should be wound with about No. 32 wire in order to get sufficient inductance.

L.T. (Hither Green).—(1) This receiver can be adapted for valve detection and L.F. amplification, but is not very suited for H.F. amplification or the use of reaction, owing to the close fitting of the circuits. For valve detection, put the valve filament and grid across the secondary condenser instead of the present crystals. For L.F amplification after crystal detection, use a step-up L.F. transformer instead of the telephones.

(2) With either of these arrangements the range would probably be not more than 2 or 3 times the crystal range.

D.P.F. (Cheltenham).—The results given are quite good, but sets of this type are always prone to amplify strong stations far more than necessary, while giving poor amplification of weaker stations. You might try a step-up transformer introduced at the point LE, but we do not think you will improve results much without H.F. amplification. Reception of the Hague concerts at your distance without this is very unlikely.

J.A.M. (Cape Town).—(1) The apparatus suggested will be quite suitable.

(2) Connect as in Fig. 4, page 218, June 25th issue, introducing the telephone transformer in the usual way.

(3) None.

(4) Such a set is not possible. For satisfactory frame aerial work at least three valves are necessary.

E.J. (Farnborough).—(1) We are afraid that instructions for making a combined transmitter and receiver, even of simple type, are out of the scope of these columns, particularly as you appear to have no knowledge of the subject.

(2) These signs have significance as shown in Fig. 3.

Fig. 3.

CHEMICUS (London).—(1) The circuit suggested is quite correct, but would be made more useful by the addition of a reaction coil in the plate circuit of the valve, coupling with the tuned circuit inductance.

(2) Desirable for long wavelengths, but must be kept small, *e.g.*, not greater than 0·0004 mfds.

(3) Grid leak 5 megohms, grid condenser 0·0001 mfds, condenser 0·0005 mfds., telephones 4,000 ohms.

(4) For a H.F. amplifier, the more efficient of the two, see Fig. 4.

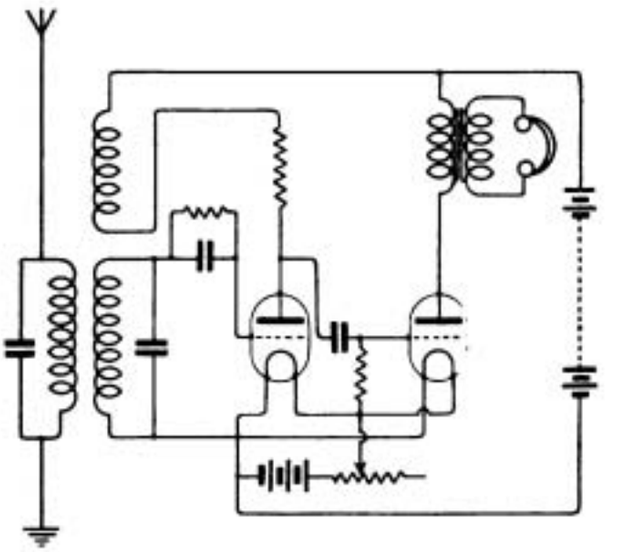


Fig. 4.

CUSTOS (Bradfield).—(1) Except for the fact that electrostatic reaction can only be used on an even number of valves, there is little to choose between them. Electromagnetic is possibly somewhat more manageable.

(2) You should get fairly good results from such stations as Croydon. Perhaps your capacities are rather large, or you are allowing the set to oscillate?

(3) The only really cheap form of loud speaker is that of Fig. 2, page 792, of February 19th issue. This is, of course, not highly efficient, but other types are given in the article. All of them will require more power than you are likely to get from one valve.

(4) The symptoms certainly point to the H.F. transformer being defective. The type of construction is fairly good; it is very likely that they are more suitable for a longer wavelength. The suggested alternative is possible, but it would be better to wind the coils in alternate sections rather than right on top of each other.

QUESTIONS AND ANSWERS

G.H.D. (Leigh)—(1) We think you might have completed the filament connections for two valves in parallel from the scores of diagrams of this arrangement which have appeared recently. However, we redraw it in Fig. 5.

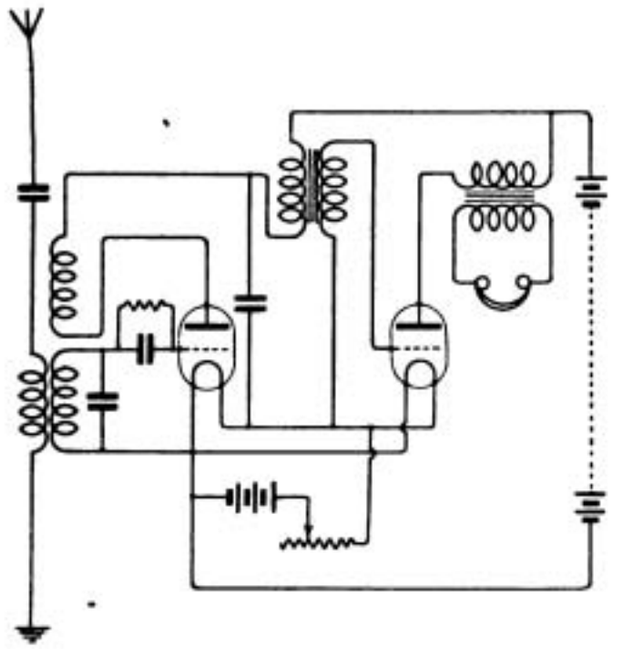


Fig. 5.

(2) Yes, and yes. The reaction coil need not be tuned.

(3) Circuit may be simplified, as suggested, without serious loss of efficiency.

G.T. (Dover).—(1) As requested, we give a diagram (Fig. 6) for adding a valve as a L.F. amplifier to a simple crystal set, but this is hardly an efficient way of using a valve.

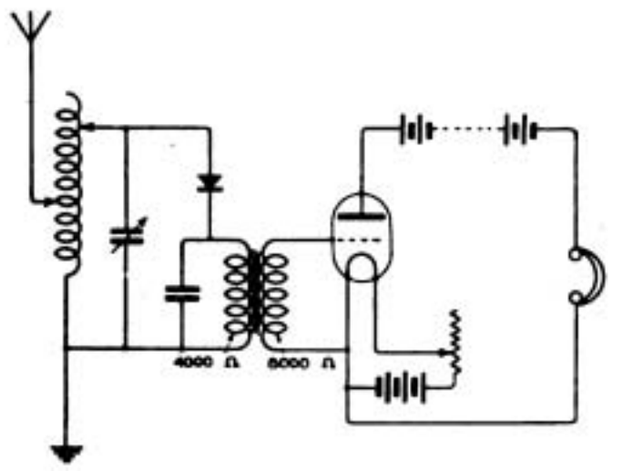


Fig. 6.

(2) V24 valve will do.

(3) You may, if you use the valve with reaction on high frequency, but not as in the circuit given.

TIMEKEEPER (Wellingborough).—We give in Fig. 7 a suitable circuit for adding a stage of

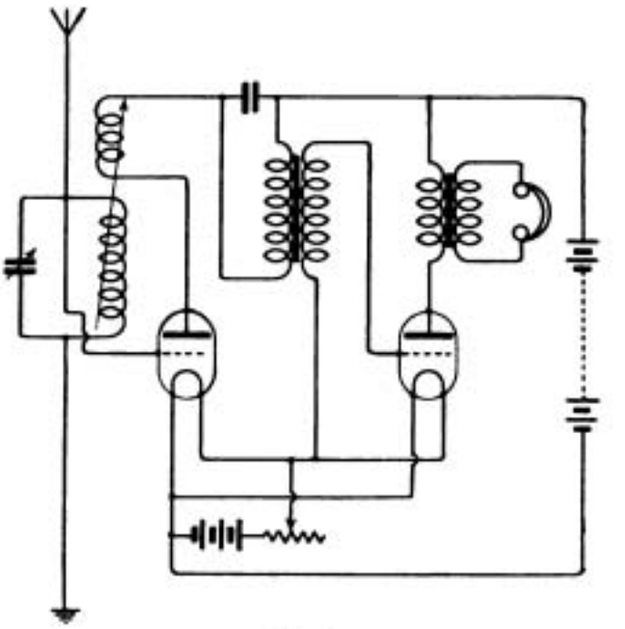


Fig. 7.

L.F. amplification to the single valve long-range receiver recently described.

M.A.J. (Pengam).—(1) See Fig. 8.

(2) The wavelength as shown will be about 9,000 ms. This is much higher than necessary. Rewind the A.T.I. with No. 22 or No. 24.

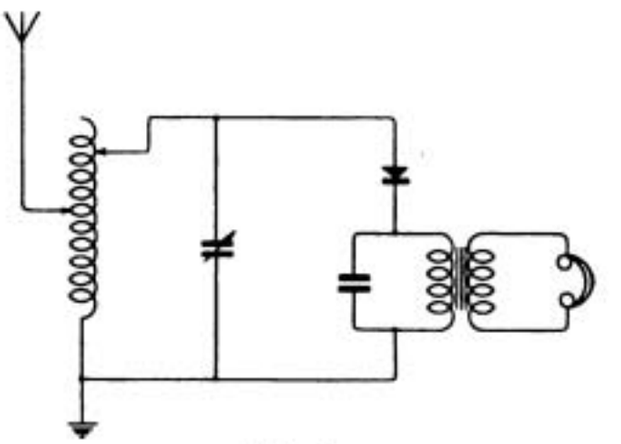


Fig. 8.

R.C.M.R. (Eastbourne).—(1) GFM Catewater, GFF Felixstowe, GFZ Howden ; others not known.

(2) This cannot be done efficiently, as there is always a serious hum in the receiver if it is tried. The only practicable way is to use the supply with any convenient form of rectifier to charge accumulators, which can be used on the set when not on charge.

(3) After the end of the ordinary time signals the actual times of the first and last dots of the astronomical time signals is sent, repeated in

each case twice. The notation used may be illustrated by an example. If the time of the last dot were 11 hrs. 35 mins. 17·32 secs., this time would be indicated as follows: — · · · —, followed by the figures 351732.

G.H.J. (Limehouse).—(1) Your aerial is certainly rather short. If possible lengthen it over the two gardens.

(2) You will get better results with an outside aerial.

(3) A valve could be added as a low-frequency amplifier.

(4) No.

D.H. (Nottingham).—(1) and (2) We cannot give a winding for this wavelength without further particulars as to your set. For such a short wavelength and for spark signals the honeycomb is distinctly less good than the single layer type. If you must have honeycomb coils, try about six layers of No. 24 for the primary and nine layers of No. 26 for the secondary, putting several tappings on each.

(3) Yes, the coupling could be made sufficiently tight in this way.

A.Y.Z. (Kilmarnock).—(1) The letterpress in the article referred to states that no tapping is required, while the diagram 2 shows both inductance variable. Fixed inductances only give a relatively small range of wavelength with a given variable condenser, and therefore to extend the range of wavelength obtainable it is desirable to make the inductance variable by the use of tappings, as well as the condenser.

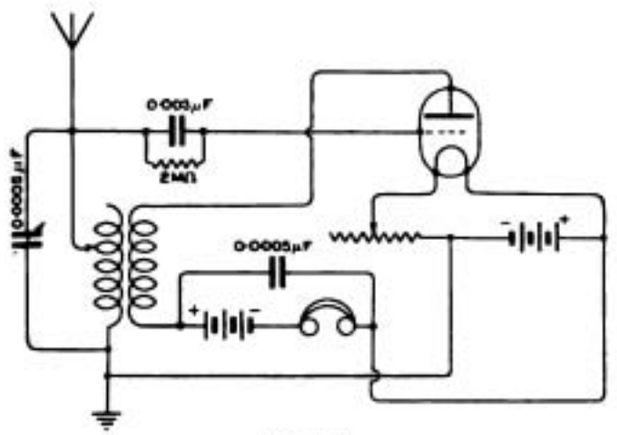


Fig. 9.

(2) and (3) Arrange the circuit as in the diagram, Fig. 9. Make the A.T.I. 5" in diameter by 8" long, wound with No. 24. Reaction coil may be 4" in diameter and 6" long, wound with No. 28. The A.T.I. should have a few tappings, but there is no need for tappings on the reaction coil in this case.

E.P.C. (Wimbledon).—(1) The type of circuit you suggest is not a possible one, owing to the fact that you cannot use capacity reaction on a single valve, and your scheme shows only one valve available for reaction purposes. You will have to adopt the normal arrangement of inductive reaction on the first valve, followed by crystal rectification and L.F. amplification, of which you will find several diagrams in recent issues.

(2) Yes.

(3) See the diagram, Fig. 10. The battery must

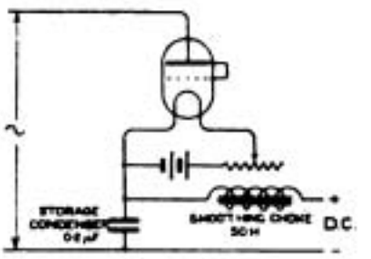


Fig. 10.

be well insulated from earth. You can try an R valve if you only want a few milliamps. The method is of very little use for reception.

M.S.H. (Chiswick).—(1) You should get 3,000 ms. with no loading coil, 4,700 ms. with one of the coils, and 6,000 ms. with the two coils.

(2) Approximately 0·001 mfds.

(3) A complete list was given in the April 30th issue.

J.S. (Brighton).—(1) We regret that we have no information with regard to an instrument of this name.

(2) If the set has a detector and telephone it should be possible to adapt a valve as a low-frequency amplifier. Connect the telephone terminals through a step-up low-frequency transformer to the grid and negative filament lead of the valve. Include the telephones in the anode circuit of the valve.

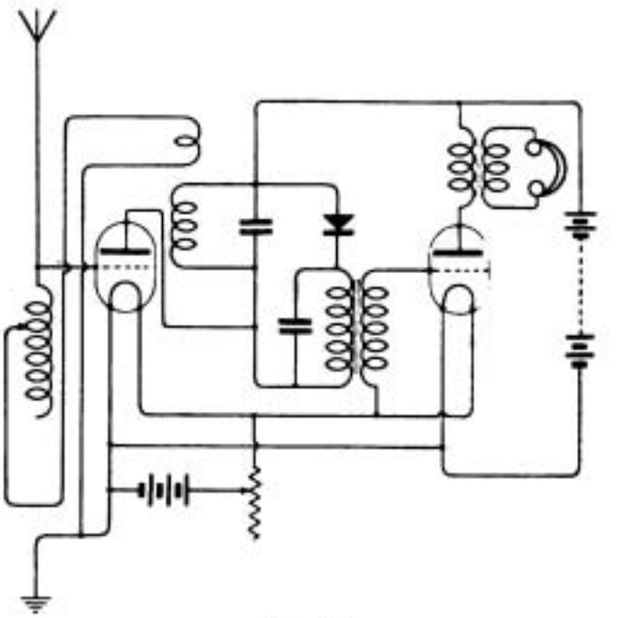


Fig. 11.

W.E.R. (Scarborough).—(1) Rearrange the circuit as in Fig. 11. A circuit of this type will need careful handling to avoid radiation during reception.

THOTH (Bombay).—(1) With H.R. telephones a series connection is generally best, because other parts of the circuit, such as the detector, have a resistance which is generally higher than that of the telephones. With L.R. telephones a parallel connection is generally better. For maximum efficiency the connection should always be such that the total resistance over all the telephones as connected should be as nearly as possible the same as the resistance of the rest of the circuit in which they are placed.

C.E.M. (Cowes).—(1) For a 3-valve amplifier as desired see the diagram Fig. 12.

(2) A 4-ft. frame, wound with 30 turns of No. 22 slightly spaced. Use with a loading coil in series, and a 0·001 mfds. condenser across the whole.

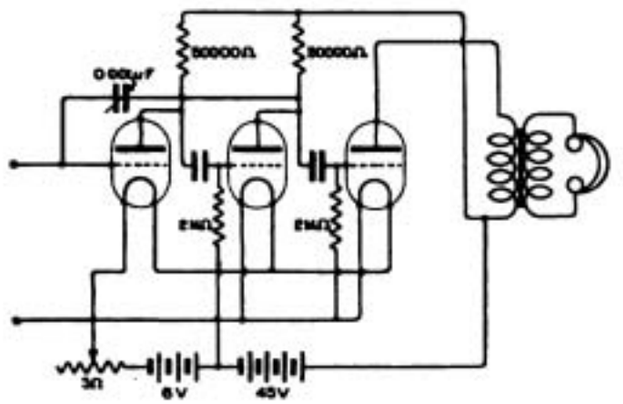


Fig. 12.

(3) For frame aerials, see issues for May 29th and June 12th, 1920. For slab inductances, see issues for October 2nd, 16th and 30th, and December 11th, 1920.

(4) This is much too small; use nothing less than 3 to 4 ft.

NEPHEW (London).—(1) Very useful. Many examples of single valve circuits for which this apparatus is useful have been given in recent issues.

(2) Yes, certainly. A fair amount of telephony should be heard near London on wavelengths up to about 1,000 ms.

ELECTRON (Tottenham).—(1) Circuit is O.K, except that telephone condenser should be connected across the H.T. battery as well as the telephones. It would be advantageous to increase the H.T. battery to about 35 volts.

(2) For C.W. reception a sliding inductance does not give a sufficiently fine adjustment, and therefore a variable condenser should be used.

(3) To receive spark, do not short the reaction coil. Weaken the reaction coupling until the set does not oscillate, and then readjust until almost at the point at which oscillation commences again; this gives the most sensitive point for spark reception.

(4) About 5,000 ms.

W.N.M. (Melton Mowbray).—(1) If you mean the short-wave tuner, an article by P. R. Coursey, in the March 5th issue, shows how this can be done.

(2) Telephony can be received on any spark receiver, if adjusted to the correct wavelength. It is usually weak on crystals, and requires amplifying.

(3) To use a 6-volt 20 amp. hour accumulator for the filaments and about 50 volts (say, 15 pocket lamp batteries) for the anode circuit are required. These need not be costly.

INKPOT (Birkenhead).—(1) Try four basket coils 16 cms. outside diameter and 4 cms. inside diameter, wound full with No. 26.

(2) In the article in question there was given the simplest arrangement, not necessarily the best.

(3) The filament current of a good French valve is about 0·7 amps. You may have a fairly low resistance leak causing the battery to run down, or else the accumulator is not fully charged when put into use.

(4) No.

F.G.C. (Cheddar).—(1) About 0·0005 mfds. with a switch for series or parallel connection with the A.T.I.

(2) Try a plain solenoid inductance, made up on a 6″ diameter former, wound with 12″ of No. 24 enamel wire, with a sliding control.

(3) 120 ohms., with a telephone transformer.

(4) The No. 16 crystal receiver has an A.T.I. of 4,000 mhys., and is intended to tune an aerial of approximately 0·001 mfds. capacity to 4·000 ms. On small amateur aerials of capacity approximately 0·0002 mfds., it will only tune to 1,800 ms. It is obvious that the addition of a valve to the set will not remedy this. An additional loading inductance is necessary.

F.B. (Portsmouth).—(1) The magnetic detector is practically useless for an amateur aerial, except perhaps for extremely strong signals. The inductance required to tune to any wavelength limits the current, so that the detector is very inefficient. You will do well to try a crystal set.

(2) The magnetic detector is usually connected in a circuit as in Fig. 13.

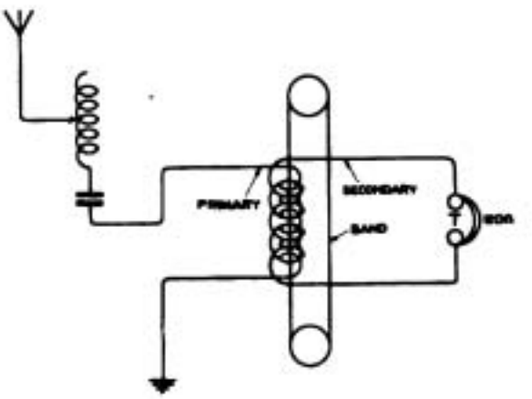


Fig. 13.

(3) It will not be of any great advantage.

(4) Either will give results.

FIZZ (Exeter).—(1) The circuits of Fig. 1 and Fig. 2 are both incorrect, No. 1 especially.

With a 2-slide set it is advisable to use a condenser to tune the detector circuit. On page 156, May 28th issue, is shown a single circuit crystal set, and a 2-slide set on page 218, June 25th issue.

(2) Use a capacity of about 0·002 mfds.

(3) Some carborundum will give good results without a potentiometer. Also zincite-bornite is very good.

(4) If signals are very loud the sensitive point is probably gradually upset, and it cannot be remedied with that type of detector.

J.E.G. (Leeds).—(1) Results will be very poor indeed, with a crystal receiver and a frame aerial.

(2) Not very much.

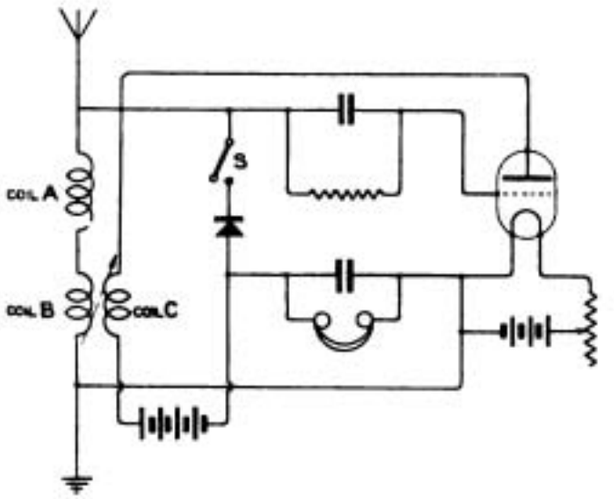


Fig. 14.

(3) If you cannot use an outside aerial a 3-valve high-frequency amplifier will give good results with a 4' frame. Wind it with 30 turns of No. 20, and use it in conjunction with a loading coil.

C.W.J. (Bristol).—(1) Inductance 25,000 mhys. Capacity 0·0006 mfds.

(2) Yes. Connect the telephone terminals of the tuner to T.S.F. terminals of the amplifier, and set the switch to B.F. This will amplify the signals given by the tuner crystal. Or connect the valve terminals of tuner to T.S.F., and set tuner switch to "valve," and amplifier switch to H.F. Then the first valve acts as a detector. Your diagram is correct except that a leak should show across the grid condenser.

(3) No.

(4) The letters stand for the French equivalents of—high frequency, low frequency, earth telegraphy and wireless telegraphy.

MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED.

In submitting the accounts for the year ended December 31st, 1920, the Directors do so with the full knowledge that many matters remain unsettled, and consequently the accounts cannot reflect the true strength of the Company's position.

The credit balance of Profit and Loss Account for the year amounted to £297,681 14s. 10d., which, added to the balance brought forward from the last account, leaves to the credit of Profit and Loss Account a sum of £1,242,134 1s. 11d. From this have to be deducted the following dividends:—On Preference Shares 7 per cent. paid on January 31st, 1921, £17,500; on the Ordinary Shares an interim dividend of 5 per cent. paid on January 31st, 1921, £130,458 14s. 6d.; leaving available for distribution a balance of £1,094,175 7s. 5d. The Directors recommend payment of further dividends for the year ending December 31st, 1920:—On the Ordinary Shares, 10 per cent. (making 15 per cent. for the year), £261,108 5s. 2d.; on the Preference Shares 5 per cent. (making 12 per cent. for the year), £12,500; leaving a balance to carry forward to next account, £820,567 2s. 3d.

A large amount of the Company's business during the past year has been with foreign countries. In consequence of the unfavourable rates of exchange which obtained during the year, substantial sums of money have been retained abroad on deposit or invested in foreign government securities. At the end of December, when the Company's accounts were closed, foreign currencies showed a very considerable depreciation, materially affecting the Profit and Loss Account for the year. There has been a marked improvement in recent months, but the Directors, believing that in the course of time a further appreciation in foreign exchanges will be experienced, regard it to be in the interests of the Company that these moneys should, for the present, remain abroad.

There has still been no settlement with any of the Government Departments in respect of any of the Company's claims arising out of the War or the services rendered during the War, therefore no sum in respect of any of these claims figures in the year's accounts. Some progress, however, has been made. An important and controlling patent used very largely by the Navy, Army and Air Force was challenged by the Admiralty. The matter was referred for arbitration to the late Lord Moulton, who gave his award on August 2nd, 1920. He found that the patent was valid, and was infringed.

At the Annual General Meeting of the Company, held on August 24th, 1921, the Dividends as recommended by the Directors were approved.

SHARE MARKET REPORT.

The market is still very dull where Wireless Shares are concerned and a further depreciation in prices has taken place during the last fortnight.

Prices as we go to press, August 25th, are:—

Marconi Ordinary	£1	17	6
,, Preference	£1	17	6
,, Inter. Marine	£1	2	6
,, Canadian		6	6
Radio Corporation of America:—			
Ordinary		8	6
Preference		9	0

The WIRELESS WORLD

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THE OFFICIAL ORGAN OF THE WIRELESS SOCIETY OF LONDON

VOL. IX. No. 39. SEPTEMBER 17TH, 1921 FORTNIGHTLY

LOUD-SPEAKING TELEPHONES—III.

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

IN previous articles considering various forms of loud-speaking telephone apparatus we have not yet discussed any which differ essentially in principle from the usual form of telephone except in the mechanism used to impart the vibratory motion to the diaphragm. In all of them a diaphragm of some form is employed. In at least one pattern of instrument, however, the diaphragm has been dispensed with entirely, and other means used to set the air in the horn into vibratory motion. The true function of the diaphragm in all ordinary patterns of telephone is merely by its vibratory movements to impart similar vibratory or oscillatory movements to the air in contact with it so that a sound wave can be set up and propagated outwards from the horn. The diaphragm is perhaps the greatest restraining factor which hampers the setting up of large amplitude air vibrations by the telephone instrument, since its natural elastic properties prevent large movements except under the application of excessively large forces. These elastic restraining forces can be lessened by making the diaphragm larger and of thinner material, but this introduces fresh troubles in the form of distortion of the sound emitted from the instrument. All elastic bodies like diaphragms or reeds possess what is usually known as a natural period of vibration —that is to say, if their form is disturbed by the application of a force (provided that the force is not too great and does not exceed the "elastic limit"), they will resume their original form or position not immediately but only after the execution of a series of vibratory movements. The frequency of these free vibrations is always the same provided no changes are made in the vibrating material—such as by altering its weight by loading—and provided the oscillations are not too highly damped by the friction of the surrounding medium or fluid. If the damping caused in this way exceeds a certain quantity the oscillations will be damped out completely, and the deflected body will simply return to its original position without oscillations.

Whenever a periodic force is applied to an elastic body the amplitude of the movement set up in that body will be greatest when the frequency of the applied force is very close to the free or natural vibration frequency of the body itself. Hence, in the case of the telephone, the vibration of the diaphragm will have the greatest amplitude when the frequency of the currents flowing through the windings of the instrument approximates to the natural frequency of vibration of the diaphragm. As the frequency of the currents approaches this value the amplitude will increase, so that in the case of a complex waveform like speech certain of the harmonics that happen to approach the diaphragm's vibration frequency will be over-emphasised

in relation to the others. This evidently leads to distortion.

In practical working it is desirable to choose a diaphragm (or reed, as the case may be) having a natural vibration frequency considerably higher than the normal or mean frequency of the currents on which the instrument is to be operated. There will then be as little distortion as possible for the major portion of the sound waves.

When the weight of the diaphragm is reduced while retaining its size constant, its elastic forces become weaker and its natural frequency is reduced, so that this modification cannot be carried very far or too much distortion will be introduced. Similarly, if the size of the diaphragm is increased, its natural frequency is lowered. These facts render it extremely difficult to build a telephone receiver that is capable of emitting a large volume of sound without considerable distortion of that sound. Evidently, therefore, if some means could be found of dispensing with the diaphragm and yet setting the requisite volume of air into movement, the production of really loud sounds might become possible without introducing this resonance distortion.

If it is merely a question of the instrument producing a noise, of course resonance may be utilised in order to gain increased amplitude of the diaphragm for a given current through the magnet windings, but even for Morse signalling this method is seldom practicable, since when it is employed a short impulse or "dot" signal applied to the apparatus becomes lengthened out to a "dash" owing to the vibrations persisting after the applied forces are removed. The less the damping of the vibrating system is made, the greater will be its amplitude of vibration for a given applied force, but the longer will its vibrations persist after that force is removed. The conditions of large amplitude, obtained by resonance and rapid response to high speed signals, are therefore antagonistic to one another, while speech reproduction would evidently be nearly impossible with such an instrument.

The main function of the horn used with most forms of loud-speaking telephone is to enable a greater volume of air to be set in motion without increasing the size of the diaphragm which is producing the air movements. The fundamental frequency of the diaphragm can thus be maintained at a reasonably high value, although the horn itself may also introduce further resonance troubles.

Many attempts have been made to overcome the difficulties introduced by the diaphragm. The telephones of the Brown type, which have already been described in these columns, are one of the best known examples of such an attempt, the elastic diaphragm in them being replaced by a reed which actuates a rigid aluminium disc (cone shaped) the purpose of which is merely to set the air in motion without calling into play its elastic and vibratory properties.

Another instrument in which they have been overcome, and overcome more successfully, is the Stentorphone*, a loud-speaking apparatus, the invention of Mr. H. A. Gaydon, which is manufactured by Messrs. Creed & Co. In this instrument rapidly pulsating blasts of air are released into the horn by an appropriate valve, and these puffs set up the main air movements in the

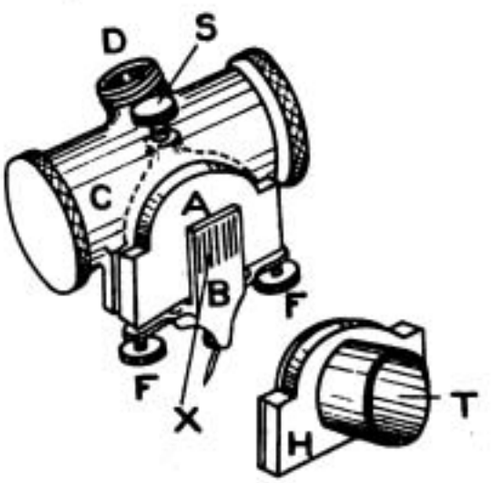


Fig. 1.
Valve Box of Stentorphone with valve in position but front plate removed. (Note—The details of the clamping for the front plate H *have been omitted from the sketch.)*

* Named after Stentor, a Greek herald, reputed to have a voice like thunder.

body of the horn and thus give rise to the sound waves.

The chief problem in the design of this apparatus lies in the construction of the valve, which, while being rigid enough to control the emission of the rapid puffs of compressed air, must also be of a sufficiently light construction to enable it to follow the rapid movements necessary for the establishment of useful sound or speech waves. In addition to this the valve must have complete control of the air emission, from complete closure of the aperture to maximum opening depending upon the loudness and the waveform of the sound to be emitted.

The movements of this valve can evidently be effected by electromagnetic means, using appropriate magnet windings, or it may be moved mechanically, as for example by a needle actuated by a gramophone record.

The essential features of the valve are shown in Figs. 1 and 2, from which it can be seen to consist of two flat pieces of metal A and B, through which slots X Y have been milled to allow the passage of air. These two pieces are pressed flat together, their contact surfaces being machined and polished so as to form an airtight joint. One of these valve surfaces form the front of a box C, which acts as an air-chamber and filter. This box is packed with gauze and cotton wool to filter out dust particles, etc., from the air. Compressed air at about 10 lbs./in.^{2} is supplied to this box by a flexible connection at D. The front plate of the valve is made as small and light as practicable to permit of its easy movement by the applied forces.

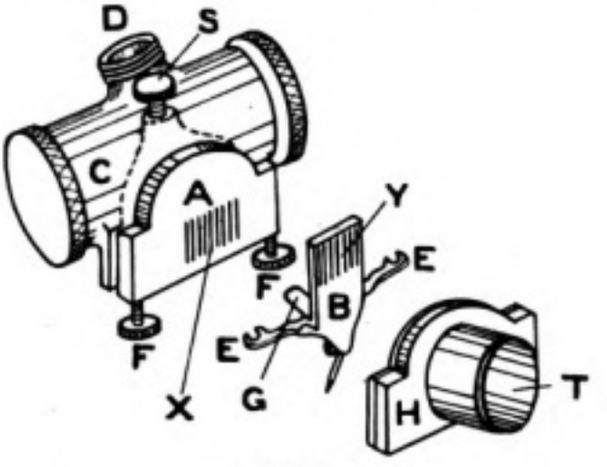


Fig. 2.

Valve Box of Stentorphone showing valve B *removed from seating* A. *(Note—Clamping details for* H *have been omitted.)*

It is held in place by a spring fitting EE, and pivots about two small hardened knife edges or needle points in a similar manner to the well-known needle lever arm of a gramophone sound-box. Its lower end is usually fitted with a needle holder for use on a gramophone record, but this may obviously be replaced by an electromagnetic attachment to use the instrument as a direct loud-speaking telephone receiver, or the needle may simply rest on the reed or tongue

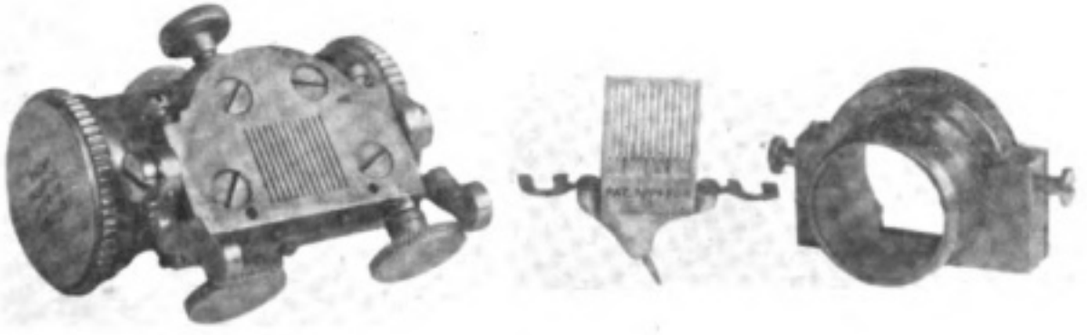


Fig. 3.

Valve Box of Stentorphone showing component parts. (The clamping clips for the front plate can be seen in this illustration.)

of a telephone or quick acting relay, so as to transmit the vibrations to the valve.

The arrangement of the valve and its attachments may be better seen from Fig. 2, in which it is shown separated from its seating by releasing the springs EE from the screws FF.

When correctly mounted in position the valve B is pressed into contact with the valve seating A, so that the bars in B just cover up the slots in A and completely prevent the passage of air until the valve is vibrated by the gramophone needle or other mechanism. When it is moved in this way—away from and towards its seating—the volume of air that passes out depends upon the movements of the valve, and so reproduces the sound.

A special spring G is provided to press the valve on to its seating, and the force on this spring (applied by the screw S) needs to be adjusted to exactly balance the air pressure acting on the back of the valve (and tending to open the valve), so that for the normal air pressure the valve is in equilibrium, and is thus easily controlled.

The front plate H fits on over the valve B, so as to form an enclosure for it, and also to provide an outlet T for connecting to the horn. The appearance of these various parts may be seen from the photograph in Fig. 3, while the manner in which the apparatus is mounted for use on a gramophone is shown in Fig. 4.

Fig. 4.

The Stentorphone, showing arrangement of Valve Box on Tone Arm of Gramophone. (Note flexible tube leading compressed air to valve box, and spring on tone arm to counterbalance weight of valve box.)

The volume of sound emitted from this instrument can be controlled by a regulator valve in the air supply pipe, but a more effective control is obtained by means of a by-pass which allows some of the sound-modulated air to escape into the cabinet instead of all passing into the horn. The lever of this control can be seen on the right hand side of Fig. 4. In this way the sound output can be adapted to a small room, or it can be sufficient to fill a large hall such as Olympia.

A USEFUL EXPERIMENTAL SINGLE VALVE PANEL

By E. McT. Reece.

THE chief uses of the valve as applied to the reception of wireless signals may be briefly enumerated as follows :—

1. To amplify the high frequency currents set up by the incoming waves.
2. To rectify these high frequency currents to enable them to operate a telephone or similar instrument.
3. To amplify the resulting low frequency impulses.
4. To act as a generator of high frequency currents for the purpose of receiving continuous waves by the heterodyne method.
5. Under suitable conditions to combine the duty mentioned in 4 with those of 1 or 2, or both.

The serious valve-worker, as soon as he has gained a little experience in the handling of a valve, should try for himself different circuits embodying the above functions in as many combinations as possible. The practical knowledge thus gained is worth books full of theory.

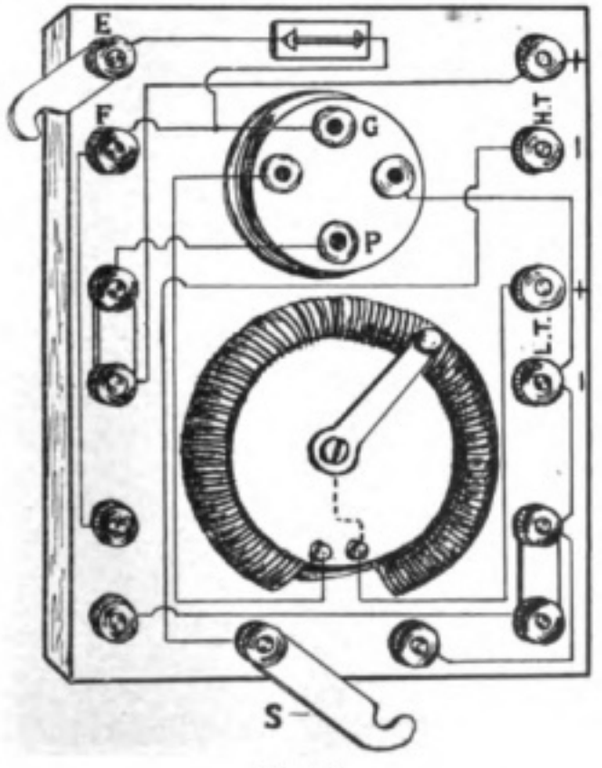


Fig. 1.

[Editor's Note : Wire shown in Author's Fig. 1 as joined to left-hand side of terminal F should be connected to terminal E not to F.]

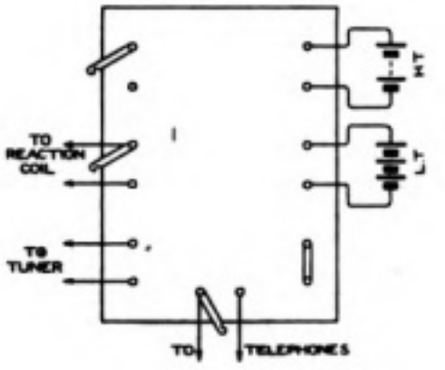


Fig. 2a.

In carrying out these experiments it is of the utmost help to be able to change over from one type of circuit to another with as little inconvenience as possible, and as the connections of the high and low-tension batteries and filament resistance do not vary in many of the circuits, the writer has found the simple valve panel illustrated in Fig. 1, exceedingly useful.

It consists of a box (a small cigar-box is suitable), measuring about 7 ins. × 5½ ins.

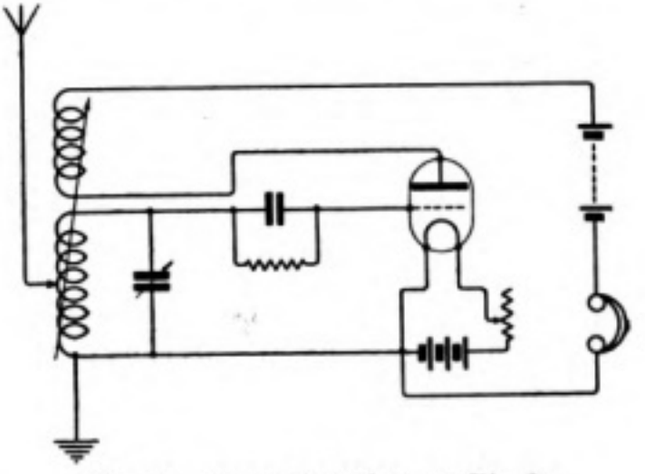


Fig. 2b. Connection scheme to Fig. 2a.

× 1¼ ins., preferably with the top formed of a piece of ebonite on which to mount the valve-holder and filament resistance. The former should be of a kind suitable for the valve in use, the cheaper form of variable resistance being the variety illustrated, wound on ebonite or hard wood.

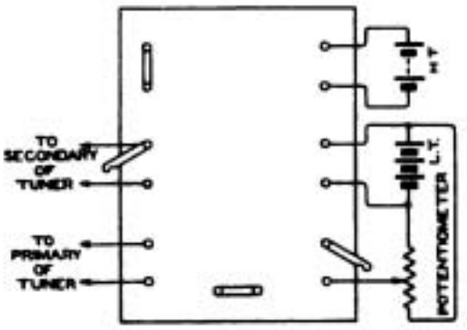


Fig. 3a.

The connections are as shown, and it will be noted that they differ from those used in somewhat similar panels in that four extra terminals are fitted—two for short-circuiting the grid condenser and leak when not in use, and two for use when a potentiometer is included in the circuit.

The grid condenser and leak may be fitted in the box or may be connected when required to terminals E and F, which are shorted when the condenser is not in use.

The shorting strips are made of ½ in. brass or copper strip, shaped as in "S" Fig. 1.

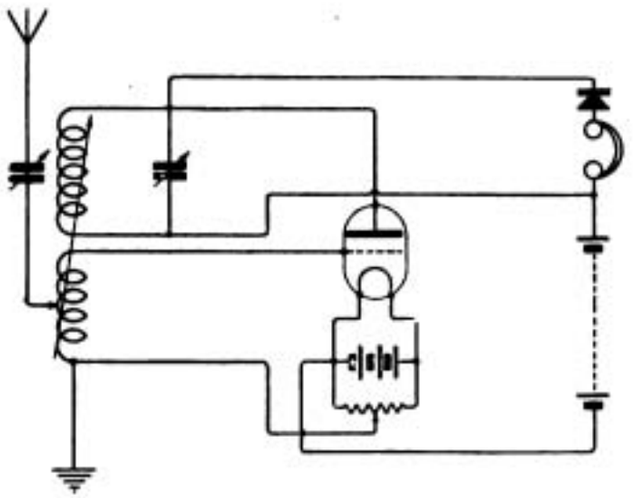


Fig. 3b. Connection scheme to Fig. 3a.

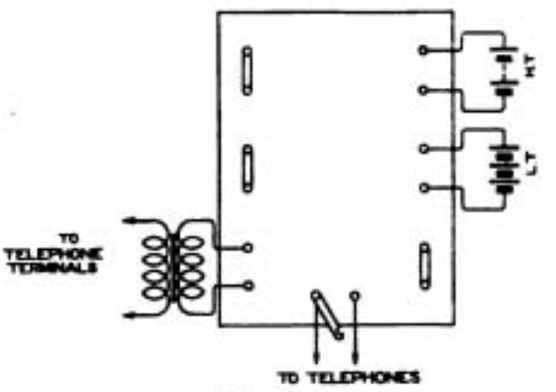


Fig. 4a.

Figs. 2, 3 and 4 are skeleton diagrams indicating the position of the strips and external wiring when using a few simple well-known circuits, and these connections, of course, may be modified to suit the reader's own apparatus and requirements.

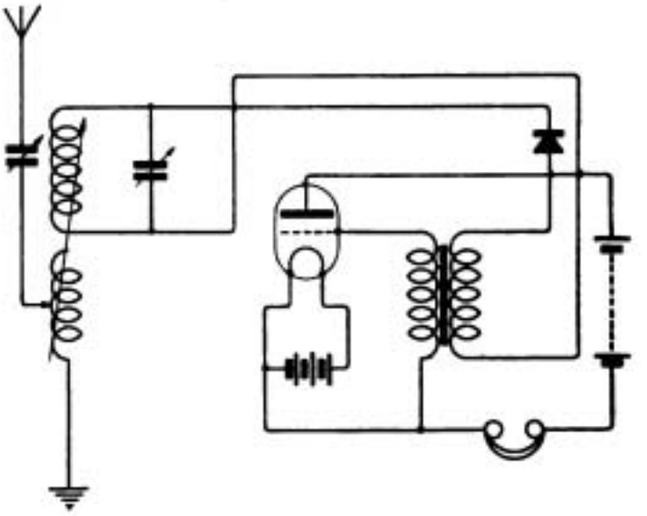


Fig. 4b. Connection scheme to Fig. 4a.

It is not the writer's intention to describe these circuits, but just to indicate the convenience of having, for experimental purposes, a few extra terminals and strips for shorting portions of the circuit as necessary—a method much to be preferred to the twisting together of two or three bits of wire, which generally manage to break away unseen.

A few such panels made up for use when building up multi-valve circuits, will well repay the extra expense and initial trouble involved, and will be especially valuable to those who have not yet tried controlling the filament current of each valve separately.

THE CONSTRUCTION AND ERECTION OF A MAST

By Brian H. Colquhoun.

MANY wireless enthusiasts experience great difficulty in setting up their aerials, in obtaining suitable masts, and in erecting them. The following suggestions may be of some use to those to whom the above difficulties have presented themselves. I have made use of all these suggestions myself, and have found them most useful. My present aerial is similar to the one I am about to describe, and nothing could be more successful.

The simplest and cheapest mast to erect is one made of gas or steam piping. Any plumber or builder would supply the necessary lengths of piping.

The Postmaster-General limits all amateurs' aerials to a maximum height of 100 ft., and this height is easily attained by such a mast as is described here, provided the few directions are carried out to the letter, and the details of the piping are managed in a reasonable way. Care must be taken in obtaining the right thickness of piping, length of sections, number of guys, and so on.

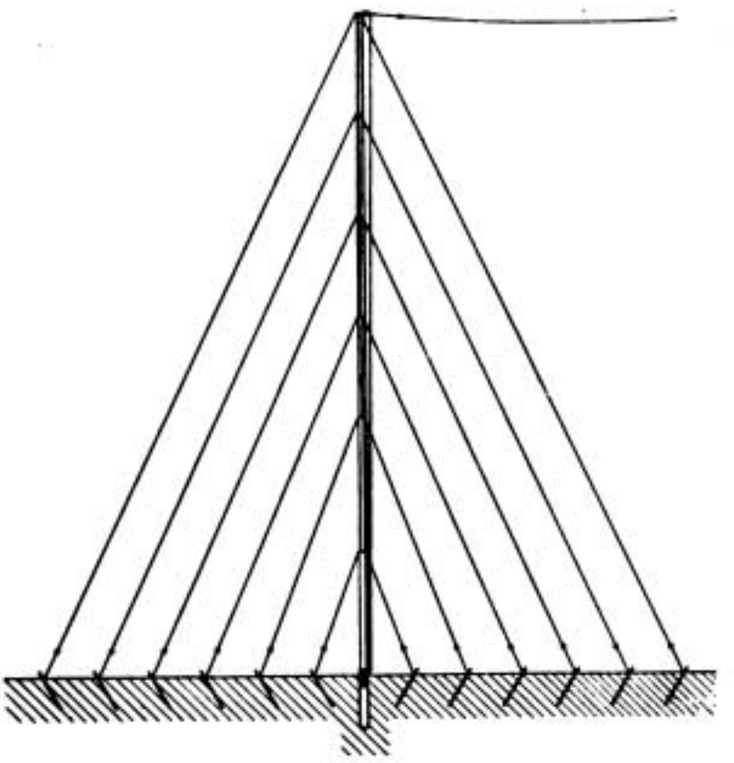


Fig. 1.

A 100-ft. mast would require about six sections of piping, say, two 20-ft. lengths and four 15-ft. lengths (Fig. 1.) The top length would then be ¾ in., or better, ½ in. in diameter, and each section going down would be a ¼ in. greater in diameter than the one next above it.

Thus, for a 100-ft. mast, the lowest section would be about 2 ins. in diameter, and for a mast about 50 ft. with three or four sections, the bottom length would be 1¼ ins. or 1½ ins. in diameter. The joints from one section to another are made by reducing collars (Fig. 2.)

The best height for one of these masts is from 50 to 65 ft. This combines maximum height and safety with ease and simplicity in erection.

The guys are an extremely important item. The best material for them is stranded steel wire. Seven 30-wire (seven strands of S.W.G. 30) is the most convenient, as it is very tough and strong, easy to work with, and yet not very expensive. Guys should be attached at every joint in sets of four, that is to say, four guys at each joint (Fig. 2.) For a 100-ft. mast there might be rather more than one set of guys, but never less than one to each joint. A 55-ft. mast should have twenty guys, five sets of four each. Each guy should have one peg, which should be driven far and hard into the ground, and all the pegs belonging to the guys on one side of the mast should be arranged in a row, a line drawn along which should pass through the mast. Thus, for a 55-ft. mast there would be four rows of five pegs each. Two adjacent rows would naturally be at right angles to each other, while two rows on opposite sides of the mast would be in line with one another.

This is not only undoubtedly the best

arrangement for the guys, but also gives them a neat and tidy appearance.

There are many ways in which the ground end of the mast may be fixed. For ordinary receiving purposes, probably the best is to get a short length of steel piping, about 2 ft. long, just large enough to fit over the lowest section of the mast, and to close the end of this. It may be hammered straight into the ground so as to form a socket for the mast.

Fig. 2.

If the aerial is to be used for transmitting, the foot of the mast should be insulated from the ground, as also should the guys. The guys are easily insulated by inserting a small insulator in each guy near the ground, but the mast is not so easily insulated. The simplest thing is to make a socket of some insulating material, or to insert a layer of some insulating material between the mast and its socket.

When all the material has been collected, the sections should be joined together, and all the guys attached. The longest ladder possible should then be obtained, and the mast laid along it, the foot of the mast being at the foot of the ladder. At this point it will be necessary to get a few friends and neighbours to help. One person should be at the end of each guy. I have had a mast " crashed " through not having sufficient helpers, and allowing some to take more than one guy. Several strong men should be told off to raise the ladder, and it should be one man's job to shout directions to the various people on the guys. When all is ready, the people on the two sets of guys whose pegs lie on the opposite side of the foot of the mast to that on which the mast itself lies, pull gently on their guys, those on the guys attached highest up pulling hardest. At the same time the ladder is raised. Someone should be standing at the foot of the ladder, to which the foot of the mast is attached in such a way that it can be easily undone. The people on the other two sets of guys do not pull at all yet, but merely hold their guys ready to pull at a moment's notice, when the mast is practically upright. As the ladder is raised, and the two first-mentioned sets of guys are pulled, the mast will probably bend into all sorts of extraordinary shapes, but this does not matter at present. The main object is to get the mast upright, and providing the people on the guys do not allow too much bending, this is a simple matter. When the mast is nearly up, the two remaining sets of guys should be pulled gradually, till they are being pulled to the same extent as the first two sets, though, of course, always obeying the orders of the directing man. Now the foot of the mast should be untied from the ladder and the ladder lowered as quickly as possible. This done, the people who were managing the ladder should take hold of the mast and lift it slowly and gently into its socket.

Now comes the straightening, as the mast probably looks something like a serpent! The straightening should begin from the bottom end of the mast. The four guys at the first joint should be manipulated so that the mast becomes straight to the first joint, and these guys should then be attached to their respective pegs. The guys should be rather on the tight side than on the loose. Next the mast should be straightened up to the second joint by means of its four guys, which should then be attached to their pegs. Straightening should then be continued up to the third joint, and so on right up to the top, till all the guys are fixed to their proper pegs.

There is one thing worth mentioning that should be done while the mast is lying on the ground, and which, if forgotten, will necessitate taking the whole mast down again. This unnoticeable little thing is the pulley attached

to the top of the mast, and the wire passing over it for pulling the aerial up and down. The pulley is a thing which should be carefully chosen. The flange should be deep, and there should be absolutely no chance of the wire which passes over it slipping off and getting jammed. I have had to take a mast down through fixing an unsuitable pulley to it. The wire passing over the pulley should be twice as high as the mast, so that, when it is half over the pulley, both ends should reach the ground, and, when erecting the mast, the two ends should be tied tightly to some point near the bottom of the mast, so that the wire cannot get loose or flap about.

When the mast is up, straightened, and properly guyed, the aerial may be hoisted. This should be done carefully and slowly, especially if the pulley at the top of the mast is not a particularly good one. Of course, if the aerial is to be supported by a mast at each end, both must be erected before the aerial is hoisted, but very often the chimney of a house or some such object is good enough for one end of the aerial, in which case it is better that it should be the end to which the leading-in wire is attached.

As to the size of the aerial ; the Postmaster-General limits this to a maximum length, including the leading-in wire, of 100 ft. for a single wire aerial, or 140 ft. where two or more wires are used. That is to say, for a two-wire aerial a total length, including the leading-in wire, of 70 ft. of double wire.

If a two or more wire aerial is used, the wires should be held apart by spreaders, made strong but light, and the wires should not be closer together than 1½ ft., in fact, 2½ ft. would be a better distance.

The aerial wires must be insulated, not necessarily from the spreaders, but certainly from the pulling-up wires. It is much better to have one insulator in the pulling-up wire, where it is attached to the spreader, than two in parallel in the aerial wires or anywhere else. Those insulators are best which have as large a surface as possible.

The material of which the aerial wire is made is not important so long as it is a good conductor of electricity, and does not corrode with the weather. The following are generally made use of for aerial wires : phosphor-bronze, silicon-bronze, enamelled copper, bare copper.

The leading-in wire should be joined to the aerial wire or wires at one end near the spreader, in other words an inverted L should be used. A "T" aerial could be used, but, in view of the Postmaster-General's restrictions as to size, an inverted L would prove more efficient. The leading-in wire should not be brought down closer than about 3 ft. to any wall or building, excepting where it is actually led into the operating room, and then it should be brought in at right angles to the wall if possible. It has been found that a lot of power is lost, especially with C.W. signals, if the leading-in wire is brought down close to the wall of a house or any large earthed body. This loss is due to capacity effects. Where the leading-in wire enters the house or operating room, it should be insulated from the wall, either by passing it through a tube of some insulating material set in the wall or by some other suitable means. This is of special importance if the aerial is to be used for transmitting.

However, as mentioned before, several other little differences should be made if there is any question of transmission. The strength of such a mast as I have described is fairly large, always providing that the guys are looked after properly, and that the pegs are kept driven firmly into the ground. I have climbed three-quarters of the way up a 40-ft. mast to replace a faulty guy, and the whole time the mast never "turned a hair."

It is possible to erect wooden masts, but there are several disadvantages to them. They must be made in sections of not more than 4 or 5 ft. long each, so there must be many sections even for a mast of 40 ft., which is about the maximum height for a wooden mast. Great difficulty is experienced in joining the sections satisfactorily

together, and in erecting the mast section by section, as it cannot be joined together on the ground and then raised like a steel mast. As more sections are added and the mast gets higher, it becomes extremely unwieldy and shows extraordinary springiness, and a tendency to assume strange shapes. This puts great strain on the joints, which consequently, very often get sprung unless considerable skill is shown by the people on the guys. Owing to the number of sections and the nature of the mast, a great many guys are necessary; also a mast such as this offers a very large wind resistance, which is an added disadvantage. The weight of a wooden mast is also very considerable.

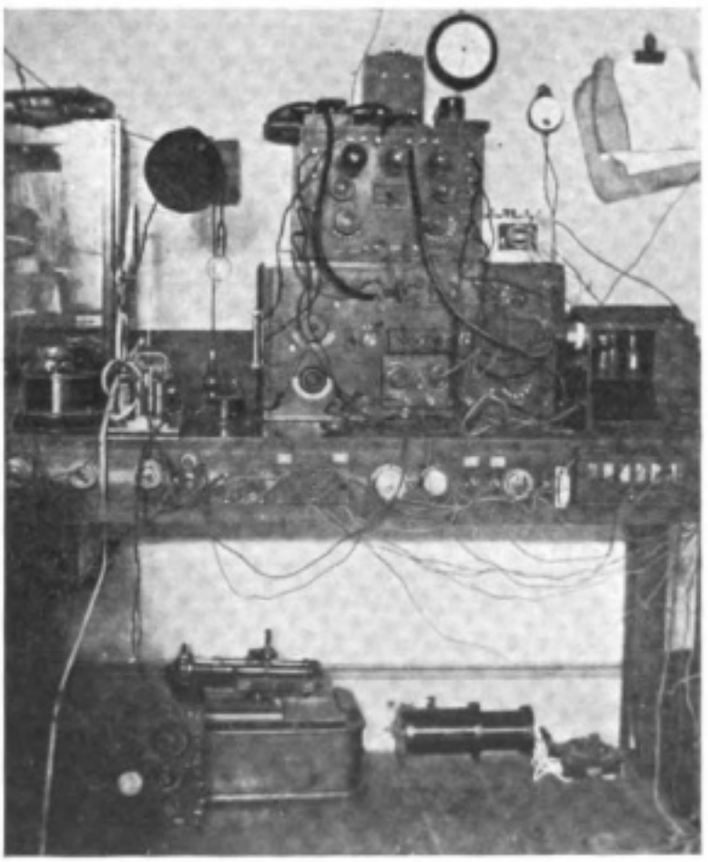
Steel masts have none of these drawbacks, for guys are only needed at larger distances apart. Springiness does not assert itself so much, and the mast cannot get sprung. If it bends, it can be straightened by the guys once it is up. Consequently it is fairly safe to say that, for the amateur at least, a steel mast is better than a wooden one.

AN AMATEUR STATION IN WEST LONDON

By H. Carter Bowles.

THE accompanying photograph shows the general arrangement of my set. The receiver is three-valve and by suitable arrangement of change-over switches it is possible to employ any circuit of high frequency in the set, without disturbing wiring. By a switch at the top of receiver it is possible to cut out the existing A.T.I. and employ "Burndept," pancake, or any other inductance. The lower box holds the high tension units and accumulators, while the front ebonite panel is made to act as the switchboard. Two condensers are seen to the left of panel, and by a change-over switch one can be used for "fishing" for answering telephony. I have found this very convenient in use.

A reconstructed T.B. three-valve amplifier, seen at the right, works the Siemens relay and tape machine, also loud speaker to the left on bench.



A Photograph of the Apparatus.

The dash board of bench is used to hold voltmeters, etc., for charging batteries. This is accomplished by 10-volt 5 amp. dynamo, driven by ¼-horse motor in another room.

The dictaphone seen under bench has recorded the concerts of 2FQ and 2LW, which is received with great clarity and using four valves Croydon is easily understood on the next floor.

The major portion of the set has been made up

of odd "*Junk*," as I am the fortunate possessor of a good workshop with lathes. Most of the amateur stations round London come in perfectly well, and by putting loud speaker near land line telephone I have entertained many friends in their homes. I am troubled by A.C. mains 50 periods, which is very difficult to eliminate, but I am now making a Nodon valve as described in *The Wireless World* recently, to charge accumulators.

The receiver circuit is to the design of Mr. F. O. Read, of Messrs. Burnhams, and has given me every satisfaction.

WIRELESS CONCERTS IN AID OF ST. DUNSTAN'S

By Oswald J. Carpenter, A.M.I. Radio E.

CONSIDERABLE interest was evinced in the Wireless Telephone Concerts radiated from the Soho Works of the Marconi Scientific Instrument Company, Ltd., for the benefit of St. Dunstan's Exhibition of Work, held at the Beaver Hut, Strand. The programme extended over the period July 21st to 30th, and transmissions were given four times daily with a wavelength of 450 metres.

The transmitting apparatus employed one of the new A.T. 25 valves as a generator of persistent oscillations and a system of modulation was used whereby speech currents traversing the secondary winding of a transformer were caused to vary the filament-grid voltage of the valve, the characteristics of the generated energy following these variations. The anode feed current was 23 milliamperes at 450 volts = 10 watts, and the normal aerial current was 0·5 ampere. The inductance windings were composed of Litzendraht wire and were arranged in "pancake" fashion, the plate-grid coupling being continuously variable—an important feature when using the circuit shown. A solid-back microphone and a high-ratio transformer were used, the primary circuit being supplied with current from a six-volt battery. Had it been essential to restrict the number of batteries, the filament heating unit might have been employed for this purpose. The microphone was suspended by cords and the mouthpiece attached to a waxed cardboard funnel which acted as a collecting agent and lessened resonance effects. The arrangement was found to be so sensitive that the *sotto voce* remarks of people in the transmitting room were sometimes inconveniently audible at the receiving station. The transmitting aerial is 70 feet long, of the twin-wire type, and is 70 feet above ground. The effective height is lessened by the presence of large masses of metal in the dielectric area and, in addition, the aerial is enclosed by telegraph and telephone wires on three sides.

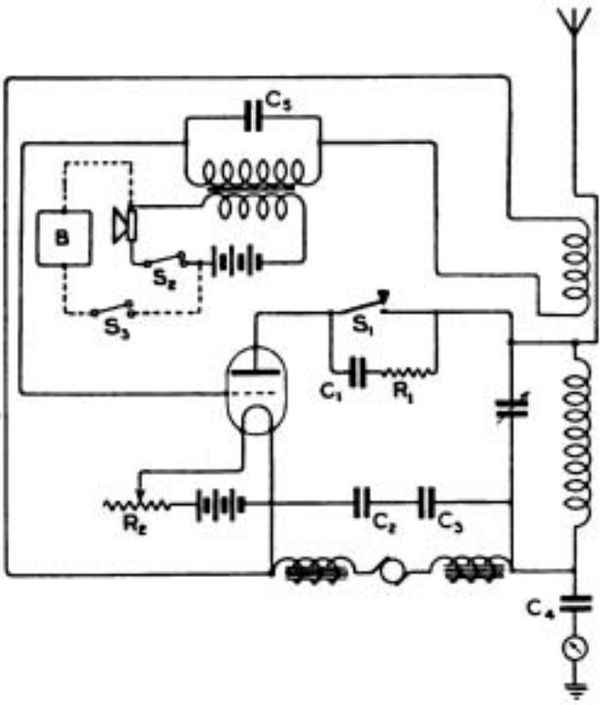
The reception of speech and music was reported by many amateurs within a radius of fifty miles, and the concerts were successfully received by a Bristol amateur, Mr. Gerald Marcuse, whose station is 110 miles distant. It is believed that this latter feat constitutes a record for a 10-watt telephone transmission in daylight. A standard Marconi "55D" amplifier was employed.

The Co-Optimists from the Royalty Theatre, Charles Coborn ("The Man who Broke the Bank at Monte Carlo"), James Tell (the Blind Tenor), Doris O'Brien, Mr. Raynor Hunt, F.R.C.O., and other artistes gave their services, and one and all enjoyed the eerie feeling of performing to an invisible audience.

At the Beaver Hut a "55" amplifier and M.24 magnifier amplified the signals so that they were loudly audible in each of twenty-eight pairs of telephone receivers. Members of the public visiting the Exhibition availed themselves wholeheartedly of the

opportunity of listening-in, and, on a basis of three minutes per person, it is estimated that some 4,000 people became acquainted with the wonders of wireless telephony in this way.

Questioners were busy, as usual. A long dash on the 600-metres wave aroused the curiosity of one dear old lady, and on being informed that it emanated from a ship, she said: "Yes, of course, I can hear the engines"! Faint interference from local alternating current mains may have been responsible for the "engine" effect.



R_1 10,000 *ohms*
C_1 0·01 μF
C_3 5 ,,
C_2 5 ,,
C_4 0·02 ,,
C_5 0·01 ,,

R_2 3 *ohms to pass* 1½ *amps.*
S_1 *C.W. Signalling Key.*
S_2 *Telephone Switch.*
S_3 *Tonic Train Switch.*

Referring to the circuit diagram: the dotted lines serve to indicate the attachment of a buzzer and cut-out switch, the inclusion of which renders the circuit suitable for the transmission of telephony, continuous wave, or tonic train (interrupted C.W.). With careful adjustment and the employment of suitable apparatus, articulation is quite as good and speech as strong as when an additional valve and air and iron core impedance coils are employed for the "choke control" method of modulation. The initial and maintenance costs are, of course, considerably lower than is the case with the two-valve system, and it is feasible to use dry-cell batteries for the anode supply, although it would appear desirable to restrict their application more especially to cases of emergency. Where a direct-current generating unit is installed, iron-core choking coils must be placed in series with each lead. In this connection the writer has found the secondary windings of 4-inch or 5-inch induction coils to prove very effective in smoothing out irregularities due to commutator "ripple." It is possible to vary the impedance of these extemporised choking coils by rendering the cores free to slide within them.

Two condensers connected in series should be placed across the generator, as shown. When pressures higher than 800 volts are used it will be advisable to insert a third condenser.

With regard to operation of the apparatus, the filament of the valve should be rendered incandescent a few moments before the high voltage supply is applied to the anode. The switching arrangements for the various forms of transmission are as follows:—

Continuous Wave.—Open S_2 and S_3, signal by S_1.

Telephony.—Open S_3, close S_1 and S_2.

Tonic Train.—Open S_2, close S_3, signal by S_1.

It is interesting to note that the efficiency of the grid-control method of modulation diminishes with increase of wavelength and for this reason it is not advisable to employ the arrangement shown for waves of over 1,000 metres length.

THE INSTITUTION OF ELECTRICAL ENGINEERS.

At a meeting of the Privy Council, held at Buckingham Palace, on Wednesday, 10th August, 1921, the petition of the Institution for a Royal Charter of Incorporation was approved, and a Royal Charter has now been granted.

His Majesty the King has also been graciously pleased to intimate his willingness to become Patron of the Institution.

SHORT-WAVE SIGNALLING ACROSS THE ATLANTIC.

IT will doubtless be recalled that in February of this year some tests were conducted to investigate the possibility of establishing wireless communication across the Atlantic Ocean between United States and British wireless amateurs using the power and wavelength normally granted to them in their licences. Unfortunately, these tests were unsuccessful in that in no case did the signals heard by our receiving stations tally with those sent out from the other side. Doubtless many factors contributed to this failure, amongst which the following were probably of considerable importance :—

1. The short duration of the tests (three evenings only) ;
2. The very short time of transmission allotted to each sending station ;
3. Interference by harmonics radiated from European high-power stations ; and in many cases—
4. Interference caused by "heterodyne radiation" from other listening stations.

It has therefore been proposed by the American Radio Relay League that another series of tests shall be held this autumn, in which a more serious attempt will be made to definitely establish communication, and it is hoped that all enthusiastic wireless amateurs in this country will again co-operate in listening for the American signals.

According to the latest information received from the American Radio Relay League, the tests will commence on December 8th, and will continue until December 17th, 1921, thus giving a more prolonged test and less liability to disturbance by bad atmospheric conditions. Further, in order to increase the chances of success, and to meet the difficulty (2) mentioned above, no American sending station will take part who has not previously passed certain preliminary transmission tests, and has been able to establish reliable *overland* communication over a range of at least 1,000 miles.

There will thus be fewer entrants—only the very best stations being picked—and a longer period of transmission will therefore be allotted to each. Receiving stations on this side will therefore stand a much better chance of picking up the stations, since more time will be available for tuning-in in each case. Every attempt will be made to adjust the transmitting wavelengths to be as nearly as possible the same, but small variations will be unavoidable, so that it will be necessary for the receivers to alter their tuning round about 200 metres to be sure of covering the range of all the sending stations.

With reference to difficulty (3) referred to above, we can only hope to eliminate the trouble as much as possible by careful construction of the receiving circuits, keeping the resistance and losses as low as possible, so as to increase the sharpness of tuning. Difficulty No. 4, however, is avoidable if all receiving stations will agree to help each other in this respect, and to avoid the use of any form of self-oscillating, or "autodyne" receiver. The necessary heterodyne for receiving the C W. signals should be an *entirely separate unit*, and should *not* be coupled to the aerial circuit, but to the receiving circuits near the detecting valve. In this way the radiation from the aerial can be reduced to a minimum.

Valve receivers with high-frequency amplification will, of course, be essential for the purpose of these tests, and doubtless many stages of such amplification will be desirable.

The wavelength to be used will be 200 metres, and the power used by the American transmitting stations will not exceed 1,000 watts. The tests will commence at 11.30 p.m. G.M.T., and it is hoped that this earlier time will encourage many more to take part in the tests.

It is also hoped that some prizes will be offered by wireless manufacturers in this country, to be awarded to any amateur who is successful, as in the case of the last tests. In this event the judging of the winners will

be on the same lines as those laid down on that occasion.

All who intend to take part in these tests are requested to send in their names to the undersigned, stating :—

1. Name.
2. Address.
3. Type of receiver to be used.
4. Size of aerial.
5. Greatest distance from which short-wave signals have already been heard.

Further particulars as to these tests will be published in subsequent issues of *The Wireless World*, as soon as they are available.

PHILIP R. COURSEY,
c/o The Wireless Press, Ltd.,
12/13, Henrietta Street,
London, W.C.2.

WIRELESS DEMONSTRATION.

On Saturday, the 27th August, a wireless demonstration, kindly arranged by Mr. J. D. Dallas, M.I.E.E., for the benefit of the staff, employees and friends of The County of London Electric Supply Company, took place at their fifth Horticultural Exhibition and garden party held at "Oaklands," Cavendish Road, Clapham Park, S.W.

Great interest was shown by the assembly in the Morse signals and telephony received. The thanks of the party are due to Mr. W. J. Crampton and Mr. W. W. Burnham, who both most kindly transmitted music.

Messrs. Sullivan kindly loaned a loud speaker and transformer, and Messrs. Mitchells a wavemeter, all of which proved most useful.

DIRECTORY OF AMATEUR STATIONS.

ADDITIONS.

Call Letters.	Power in Watts.	Wave-lengths in Metres.	Hours of Working.	System.	Name and Address.
2 FB	—	—	7-9 p.m. B.S.T.	Telephony - -	W. Ison, Watford.
2 FR	—	180	Various	Spark - -	S. Rudeforth, 54, Worthing Street, Hull.
2 FU	10	180 1,000	8.30–10.30p.m. B.S.T.	Spark, C.W. and Telephony.	E. T. Manley, Jnr., 27, Home Park Road, Wimbledon Park, S.W.19.
2 JZ	10	1,000	8.30–10.30 p.m.	C.W. and Telephony.	R. D. Spence, Craighead House, Huntly, Aberdeenshire.
2 KM	—	180	Various	Spark- - -	C. Stainton, 44, Kimberley Street, Hull.
2 LR	10	1,000	—	C.W. and Telephony.	John Scott-Taggart, 6, Beattyville Gardens, Ilford.
2 MB	10	180 1,000	7.30–9.30 p.m. G.M.T.	C.W. and Telephony.	E. H. Jeynes, 67, St. Paul's Road, Gloucester.
2 MD	10	180 1,000	8–10 p.m. Wednesday and Saturday.	Spark, C.W. and Telephony.	C. Chipperfield, Victoria Road, Oulton Broad, Lowestoft.
2 NM	—	180 1,000	9–11 p.m. B.S.T.	C.W. and Telephony.	G. Marcuse, Little Coombe, Coombe Dingle, near Bristol.
2 NO	10	200 1,000	7–8 p.m. Monday and Friday, B.S.T.	C.W., Tonic Train and Telephony.	H. R. Adams, Crescent Cabinet Works, Walsall.
2 NR	—	—	—	—	J. K. Hassall, " Eureka Lodge," Rotherwood, Ashby-de-la-Zouch.
2 OA	—	1,000	—	Telephony - -	F. Townsend, 46, Grove Lane, Ipswich.

A Correction.

Messrs. F. O. Read & Co., Ltd., notify us that their station, **2 HR**, particulars of which appeared on page 329 of August 30th issue of *The Wireless World*, is licensed only for 180 metres, and not 1,000 as stated. Times of transmission are now 5–7 p.m. instead of 7–10 p.m.

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.

Newcastle and District Amateur Wireless Association.

(Affiliated with the Wireless Society of London.)

The last meeting of the Association was held on Thursday, August 18th. There was a very good turn-out of members, and a very interesting evening was spent. The Society has now acquired a three-valve receiving panel for permanent installation in the Club-room. This instrument was constructed and tested by Mr. Burdis, and turned over to us at the "cost of materials" only. This was paid out of the "Voluntary Fund." The receiver comprises one H.F. amplifier, one detecting and one L.F. amplifying valve. Members are very much indebted to Mr. Burdis for the trouble he has taken and for the splendid workmanship he has put into his self-imposed job.

With reference to the coming winter session, any member who can contribute a paper or demonstration is asked to communicate with the Secretary, Mr. Colin Bain.

Blackpool and Fylde Wireless Society.

(Affiliated with the Wireless Society of London.)

On Thursday, August 4th, the Blackpool and Fylde Wireless Society held, at their headquarters, the Café Waldorf, Church Street, Blackpool, another of their series of lectures, the lecturer being in this case Mr. L. R. Blackburn, who took as his subject "Radio Telegraph and Telephone Transmitter and Receiver."

He informed his audience that the title of his lecture was the name given to a system of radio telegraphy and telephony, in which a message can be telegraphed simultaneously with a radio telephone conversation, the circuit of which has many new and novel features, amongst which are the following :—

Telegraph signals and telephone conversations may be transmitted in such a way that the telephone conversation cannot be received continuously in logical sequence. The transmitter will operate on a single antennæ and will radiate a telephone conversation on either a carrier wave or signal carrier wave on intermittent blocks of speech, and will simultaneously transmit telegraph signals on the signal carrier wave. The receiving circuit will work in conjunction with the transmitter, comprising a single antennæ system with a plurality of co-operative oscillating circuits adapted to respond to the carrier and signal carrier wave, and piece together or combine the blocks of telephone conversation and simultaneously receive the telegraph signals. In other systems for the simultaneous transmission of radio telegraph signals it has been customary to employ two distinct oscillating circuits energised by separate transmitters. It has also been proposed to utilise a commutating circuit in a multiplex system for transmitting a plurality of radio telegraph signals having different frequencies. Another system is that by which radio telephone or telegraph signals may be transmitted in a semi-secret way by employing a rotating contact breaker in the antennæ circuit. Another suggestion is that telegraph and telephone signals may be transmitted simultaneously on a single wavelength. In the system referred to first, secret communication has been successfully established by radio telephone simultaneously with the transmission of telegraph signals between the Bureau of Standards, Washington, U.S.A., and the United States Naval Air Station, Anacostia, D.C. The telegraph signals could not be heard in the telephone receiving circuits and the telephone conversation did not interfere with telegraph reception. It was also impossible to receive intelligently the telephone conversation with standard receiving apparatus. Mr. Blackburn went on to describe the different systems illustrated by blackboard diagrams.

The lecture was in two parts, the first being a detailed description of the radio telegraph and telephone transmitter, the second (held a week later, on August 11th) on the radio telegraph and telephone receiver.

At the close of the second part a question arose through a member pointing out a possible correction of the wiring of the circuit. This caused so much discussion that the matter had to be adjourned until the following Thursday, August 18th, when what promises to be a most interesting and enlightening debate will take place, especially as there are a number of experts in the Society.

Some members of the Blackpool and Fylde Wireless Society at their headquarters.

At the close of the lecture Mr. C. Sheffield Doeg, the Hon. Secretary, informed the assembly that they had amongst them that night Mr. Walter Emmott, President of the Halifax Wireless Club, who then arose and conveyed to his listeners a message of good wishes from his own Club. He

went on to say that although the Halifax Wireless Club had over seventy-five names on the register, only about twenty members ever turned up at once: but he would far rather have ten enthusiastic members than one hundred lukewarm ones.

Mr. C. S. Doeg then replied to Mr. Emmott, and thanked him for his message, and said that on behalf of the Blackpool and Fylde Wireless Society he very greatly appreciated his remarks, and that he was very pleased to have him amongst them, and should either he or any member of his club ever visit Blackpool, they would find a welcome at the headquarters of the local Society. Mr. Doeg, then referring to the lecture just completed, proposed a vote of thanks to Mr. Blackburn, which was ably seconded by Mr. W. A. Frost, and was carried unanimously.

Mr. T. Sharples, the chairman, then brought the evening to a close by saying a few appropriate words, including an endorsement of the Hon. Secretary's invitation to the Halifax Wireless Club given to the local Society's distinguished visitor.

Wireless and Experimental Association.

(Affiliated with the Wireless Society of London.)

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

At the meeting at the Central Hall, Peckham, on Wednesday, August 17th, the usual half-hour buzzer practice opened the proceedings. Members were then asked to give their opinion on the effects of a patent "smoother" for H.T. generator currents, invented by one of the members and tried during the week on a neighbouring transmitting set. The opinions favoured a continuance of the trials and a subsequent critical discussion.

A short lecture was given by the Secretary on insulators, with special reference to the paraffins, and this was followed after the usual interval with another lecture on skin effects in stranded aerials and the differences between a copper wire whose surfaces were protected with enamel and one which was allowed to oxydise and sulphate in the air.

On Wednesday, August 24th, after the usual buzzer practice and minutes of the previous meeting Mr. Horwood read a short treatise on Paraffins and Oils and their Origins. The chairman then asked for detailed reports on his transmission of the previous Sunday afternoon, and the replies showed close attention and a critical faculty on the part of his listeners-in. Mr. Knight then gave a diagram for a short wave tuner, and other questions arising dealt with the solubility of copper in mercury. A long discussion followed on the disaster just then reported of the R.38.

Captain Donisthorpe will lecture to the Association on his "Thermagnion" Valve.

Sheffield and District Wireless Society.

(Affiliated with the Wireless Society of London.)

Although no papers have been read before the above Society during the summer, interest has been maintained in the form of two "outings," in the neighbouring country.

The first "outing" was of a purely social nature,

Fig. 1.

A group of members of the Sheffield and District Wireless Society taken during the "outing" at Monsal Dale.

Fig. 2.

Portable set at work.

and consisted of a char-a-banc drive to Monsal Dale, where a very enjoyable afternoon was spent.

The photograph (Fig. 1), shows a group of several of the members.

The other "outing" (Figs. 2 and 3), was more of a technical nature, and consisted of experiments with portable transmitting sets, working in conjunction with a fixed controlling station.

The object of the experiments was to determine the effect on signal strength that intervening mountainous country produced.

Fig. 3.

Experiments with a portable set.

Useful information was obtained which will form the subject of a paper during the coming winter session.

Hon. Secretary, Mr. L. H. Crowther, A.M.I.E.E., 156, Meadow Head, Norton Woodseats, Sheffield.

The Willesden Wireless Society.

A meeting was held on Tuesday evening, August 16th, and the Hon. Secretary demonstrated a B.T.H. portable set, by permission of Messrs. The British Thomson-Houston Co., Ltd., Rugby. Splendid results were obtained without any aerial, the high power stations coming in very clearly. The lecturer demonstrated the direction-finding powers of the apparatus, by means of a small oscillating set in the corner of the room. This set was connected up and the portable receiver picked it up at once, and also indicated the wavelength of the slab inductances which were being used.

The receiver was then connected up to our temporary aerial, also to earth by means of the terminals provided. We then had the Air Ministry and other stations audible throughout the room, using only the pair of low resistance telephones, belonging to the set.

A lecture was given on Tuesday, August 23rd, by Mr. Dunham, of the Marconi Co., entitled "The Design of a L.F. Amplifier." The most efficient methods of connecting up were described, and the method of designing the intervalve transformers was explained. Keen interest was taken in the lecture and discussion, as this type of receiver is a favourite one with our members.

Cambridge and District Wireless Society.

A very successful meeting was held on Wednesday evening, August 17th, on the grounds of the Cam Sailing Club, Waterbeach, permission kindly having been given by the officers of that Club. An aerial was erected between the tall flag-mast and the mast of a sailing boat The receiving instruments, consisting of a crystal set with a valve for high-frequency amplification, were lent by the Hon. Secretary, Mr. H. W. Taylor. A crystal portable set was also demonstrated by Mr. J. J. Butterfield with excellent results.

The instruments having been duly connected, members "listened in" by means of the various telephones available. Signals were received on both sets quite distinctly, but with the valve amplifier the signals were greatly magnified, and ships were distinctly heard in communication, as well as many land stations. Members of the Cam Sailing Club, took the opportunity afforded them of "listening in," but as the messages were in Morse, little was understood. The members were hoping to receive some wireless telephony, but owing to a threatened thunderstorm, it was deemed advisable to dismantle the apparatus and prepare for the return journey to Cambridge. Any person interested in the subject of "Wireless," should communicate with the Hon. Secretary, Mr. H. W. Taylor, Camden House, Park Terrace. The next meeting will be held at the large room of the Photographic Society, Ram Yard, on Wednesday, September 28th, at 7.30 p.m., when Mr. Farren will read a paper on "Aerials." An aerial has now been erected at Ram Yard so that members may test their apparatus.

Bradford-on-Avon Wireless Society.

A few old members of the Bradford-on-Avon Amateur Wireless Association, together with others interested in wireless, held a meeting on Tuesday, August 16th, and decided to reform that Society, which was founded in 1913. Mr. J. A. Cooper, who was Secretary to the Association in 1914, said that in view of the successful work done by the Association in 1913-1914 and by at least four of its members in the Signal Service during the war, he felt encouraged to make an attempt to reform the Club. He was assured by old members that he would have their support. Further, his own private wireless station was again working, and, subject to the approval of the Postmaster

General, he was in a position to offer the Club, if re-formed, the use of the station for experimental work. Their President in 1913-1914, Lord Fitzmaurice, had signified his willingness to continue in office, and altogether he had every reason to hope that the Club would be restarted and do useful work.

He had discussed the matter with old members and they had come to the conclusion that the old constitution and rules were somewhat unsuitable. New rules embodying a fresh constitution has been prepared, copies of which were in their hands. Mr. Cooper went on to explain the rules and after some discussion it was agreed to rescind the old rules and substitute those which had been drawn up.

The Club has been re-named The Bradford-on-Avon Wireless Society. Lord Fitzmaurice has accepted the office of President. The following have been elected to the Committee. Mr. E. Cooper, Chairman; Mr. Hickley (of Messrs. George Spencer, Moulton & Co., Ltd.), Vice-Chairman; Mr. H. Helps, Honorary Secretary and Treasurer; Mr. L. Boxwell, member in charge of instruments; Mr. J. Beazer, Honorary Librarian; Messrs. E. and J. A. Cooper were elected honorary members of the Society.

Subject to the approval of the P.M.G., members of the Society will be able to use the wireless station from 6.30 p.m. to 9.30 p.m. each evening, or at other times by arrangement.

A 4,000 metres receiving circuit with crystal detector is already in working order, and it is hoped shortly to add an 8,000 metre circuit as designed by Capt. E. J. Hobbs, M.C., with valve detector and a three-wave R.N.A.S. Tb amplifier.

Mr. Boxwell, in the course of some remarks, stated that he looked forward to the time when the Society should also have transmitting circuits, enabling it to communicate with Mr. Wilcox and other amateurs in neighbouring towns, such as Bath and Trowbridge. He understood that there were some amateur stations in Trowbridge, and he hoped that their owners would join the Society. He strongly emphasised the necessity of letting only qualified operators use the valve circuits, and a programme of training for associate-members was proposed. Mr. Boxwell undertook to help inexperienced amateurs in every possible way.

After some further discussion the meeting closed. The Secretary, Mr. H. Helps, 4, Ivy Terrace, Bradford-on-Avon, will be glad to give any information regarding the Society to anyone interested. Each member of the Committee has a copy of the new rules, which may be seen on application. Future meetings of the Society will be held at the County Secondary School, Bradford-on-Avon, by kind permission of the Governors.

Ipswich and District Wireless Society.

Acting Hon. Secretary, F. T. G. Townsend, 46, Grove Lane, Ipswich.

A meeting is to be held on Thursday, September 22nd, at 8 p.m. in the Chemistry Lecture Room of the Municipal Secondary School, Tower Ramparts, Ipswich, to which all those in the district interested in wireless telegraphy and telephony are invited

The object of the meeting is to inaugurate a wireless society, and to arouse local interest in the science.

It is hoped that there will be a large and representative attendance of enthusiasts in order that the Society may be established on a sound basis. The prospects for the coming season are excellent, and it is hoped that before long the Society may possess a first-class station.

Before the meeting there will be an exhibition of wireless apparatus by local amateurs. Will manufacturers, retailers, etc., kindly submit price lists etc., for club use.

Bournemouth and District Radio Club.

The above Club held its first general meeting August 24th, at the Winton Branch of the Y.M.C.A., at which place our Club-room is to be. Capt. Hobbs took the chair at 7.15, and opened the meeting by reading the minutes of the previous meeting, and explaining, for the benefit of those present who could not attend our last meeting, various items which were under discussion. Mr. Riceman, Divisional Secretary of the Y.M.C.A., kindly provided light refreshments in the way of coffee and cakes, to the great satisfaction of all present, which were most heartily enjoyed, together with the business of the evening. All the necessary objects of the meeting were most satisfactorily discussed, including the question of obtaining the necessary permits from the P.M.G.

Members of the Bournemouth and District Radio Club will have the full advantage of the Y.M.C.A. Club-room in addition to the Radio Club. Our new home is at present under reconstruction, but nevertheless, everybody is heart and soul in the matter, and we are having a real big opening meeting and Club-room warming on October 5th, when there will be something doing. In the meanwhile, we shall be busy in getting together various items of apparatus, etc., etc., together with a pair of masts which have been most kindly given in by Mr. Riceman, who has also promised to see us financed with no less a sum than £10. We have another offer of a mast from Mr. Alexander, together with apparatus from various other interested gentlemen. Our yearly subscription is fixed at 14s. 6d. per year for members living within three miles of the Club House, and 8s. 6d. per year for those living over three miles. We are also, at our further meeting, endeavouring to arrange for the admission of juveniles and ladies on certain days for instructional purposes, etc. Altogether the Bournemouth Club promises to grow fast.

In closing the meeting Capt. Hobbs asked that a vote of thanks be accorded to Mr. Dyke, the Hon. Secretary, and Mr. Riceman, of the Y.M.C.A., for the valuable work they had done in bringing together the Y.M.C.A. and the B. & D.R.C. in such a good cause.—T. H. Dyke, Hon. Secretary.

Newark-on-Trent Wireless Society.

This Society, which was formed last winter, has, we are sorry to state, fallen through from lack of enthusiasm. However, it is thought that as there have been more wireless amateurs commencing experiments since then, and the Magnus Grammar School has installed a station, there seems no reason why a fresh start should not be made this season, with decidedly more success. Would anyone in Newark or district interested kindly communicate with Mr. Geo. T. Lindall, 6, Beech Avenue, Hautonville, Newark-on-Trent.

Chorleywood and District.

In connection with the Fifth Annual Land Cultivation Show, held at Chorleywood, Herts, on Saturday, August 27th, it was decided to give demonstrations of wireless telegraphy as an unusual and interesting "side-show."

Permission was readily obtained from the P.M.G. under the usual conditions. The aerial was the common 100-ft. single line, 16 ft. above the ground. A very efficient earth was provided by means of one of Messrs. Butler's copper earth mats, the results being excellent in spite of the ground being as dry as the proverbial bone. The set tunes from 600 metres to 15,000 metres, and is operated by three valves, 1 rectifying and 2 amplifying. By means of a Brown's loud speaker, kindly lent by the Economic Electric, Ltd., signals were made audible all over the tent, which was lent for the purpose by the 1st Chorleywood Troop B.P. Scouts, who also did Trojan work when the operator shut down for half-an-hour for tea, holding the tent against all comers.

The whole show was voted a huge success, a special note being made of the W/T demonstrations.

Will anyone who is interested in wireless in the Chorleywood district, kindly communicate with Mr. A. G. S. Richards, Hill Brow, Haddon Road, Chorleywood, with a view to forming a wireless society in the district.

Hounslow and District Wireless Society.

This Society has been making good progress, in spite of the holiday season, and things have not been slack enough to warrant our closing down. We therefore have carried on.

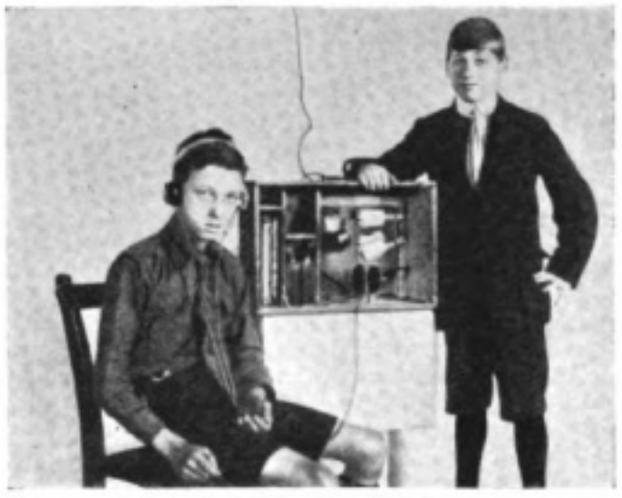
The Society gave a demonstration in wireless at the local hospital fete on August 27th. This proved a great success. We have to thank Messrs. Burnham, of Deptford, for loaning the apparatus, and Mr. F. O. Read, of Messrs. Burnham, for demonstrating. Mr. Read arranged the transmitting and receiving license, and we were allotted the call sign **2 OR** for this occasion. Messrs. Burnham supplied the apparatus, including one ultra III receiver, three-valve amplifier and loud speaker, and aerial wire. Our members erected the aerials the day before and dismantled them on Sunday. A good sum of money was received from the public, and this was handed over to the hospital, Messrs. Burnham and Mr. Read refusing to accept any consideration for their assistance. The members of this Society desire to thank them for their kindness and valuable assistance. Without them the Society would not have been able to give this demonstration. All members worked hard, thus enabling us to have a successful show. The above Society holds its meeting every Thursday, at 7.30 p.m., at the temporary club-room, the Mission Hall, Pears Road, Hounslow, and any gentlemen interested are invited to communicate with Mr. A. J. Rolfe, Hon. Secretary, 20, Standard Road, Hounslow.

A SCHOOL RECEIVING SET.

By W. WADE (Science Master, L.C.C.).

THE following illustrated description of a Wireless Receiving Set, constructed entirely by pupils of a London Council School, is offered in the hope that it may prove interesting both to wireless enthusiasts and to education authorities, as showing what can be successfully accomplished with small outlay and a little ingenuity.

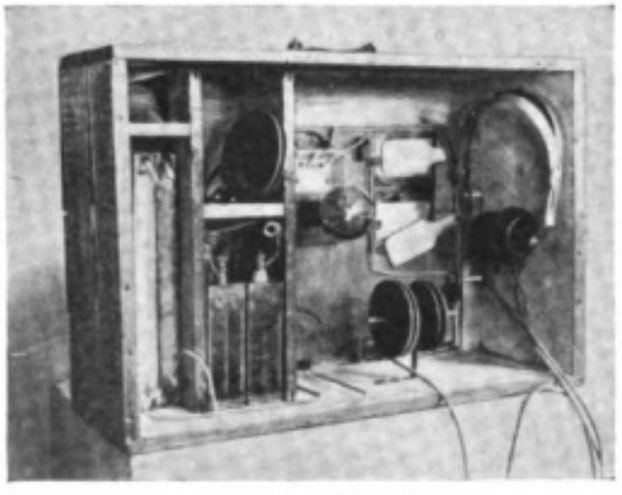
As will be seen from the illustrations the apparatus is quite self-contained, compact and portable. It is all fitted into a carrying case made from a condensed-milk box, partitions being added for H.T. battery (30 volts), accumulator (4 volts), and pancake coils. The latter are wound on wooden formers made from cigar boxes, and fitted with flexible connecting wires and plugs, while for ease in coupling they run upon a brass rod. The three coils shown give a wavelength range of about 600—6,000 metres. The circuit employed is the usual leaky grid condenser and magnetic reaction. The grid condenser is made from tinfoil and mica, mounted upon ebonite, and has a "pencil-line leak" running between the terminals. This shows quite clearly in the illustration just above the valve. All other terminals, etc., are mounted upon small pieces of scrap ebonite, and all leads encased in rubber sleeving, so that in spite of the fact that the base is merely thoroughly dry wood, the insulation is quite good. The curious "bat-like" arrangements on the right of the valve are the tuning condensers—mica and tin-foil again—but the "bat"—the moving plate—is made from sheet zinc and pivoted so that the amount of overlap (and hence the capacity) can be varied at pleasure. The tin-foil—the fixed plate— is well shellaced and pressed into close contact with the under side of the mica. A few drops of olive oil are run between the moving plate and the mica. This causes adhesion and also reduces the scratchiness when the plate is moved. The maximum capacity of each is about 0·0002—3 mfds. No attempt has been made at "instrument makers' finish," the whole idea being to keep the apparatus as simple



Two Wireless Pupils.

and crude as is consistent with efficiency. That the set *is* efficient is clearly proved by the fact that on a small improvised aerial, time signals from Paris and Nauen and also telephony from Croydon and elsewhere are all quite loud.

In this description I have purposely refrained from giving definite dimensions and minute details, but shall be pleased to supply them on request, or to answer any questions.



The Receiving Set.

The station has been licenced for over a year, during which time the set has given no trouble whatever.

As a means of demonstrating "how wireless works" it leaves little to be desired. Blackboard sketches alone leave pupils fairly cold and apathetic, but a "real working model" arouses untold enthusiasm, especially when that model has been constructed by themselves.

In conclusion, lest we be accused of helping to inflate the Education Rate, it is only fair to state that not one farthing of the incidental expense is borne by the Council.

AMATEUR WIRELESS AND THE POST OFFICE.

The following communication has been received from the General Post Office.

With reference to the restrictions hitherto in force on the manufacture, purchase, sale and possession of wireless apparatus, I am directed by the Postmaster-General to say that, in consequence of the lapse of Regulation 22 of the Defence of the Realm Regulations so far as Great Britain is concerned, such apparatus may now be made (or bought, sold or held) in Great Britain (but not in Ireland) without permit or restriction.

The supervision by the Post Office of dealings in such apparatus has accordingly ceased so far as Great Britain is concerned. As indicated above, Regulation 22 is still in force as regards Ireland.

I am to add that the Postmaster-General's licence under the Wireless Telegraphy Act, 1904, is still necessary before any apparatus for wireless telegraphy may be installed or worked. An arrangement has, however, been adopted for allowing "toy" sets of wireless apparatus to be used (in Great Britain only for the present) without formal licence, provided that the designs of the sets have been approved by the Postmaster-General and that the sets have been stamped or marked to that effect before sale. Firms or persons who desire to sell "toy" sets of apparatus for use under this agreement should furnish particulars (including illustrations or diagrams) of the apparatus, in order that the question of approving the designs of the sets may be considered. Where the designs appear suitable, it will be necessary to require that specimen sets shall be submitted for inspection before definite approval is given. Generally speaking, a "toy" set will be regarded as apparatus arranged for transmission and reception as a Hertzian oscillator, and not intended for connection to earth or to any aerial other than small rods with or without vanes. The range of such sets should not exceed 50 yards.

J. I. De Wardt,
for the Secretary.

General Post Office,
London.

September 1st, 1921.

WIRELESS TELEGRAPHY STATIONS IN OPERATION IN CONNECTION WITH CIVIL AIR ROUTES

THE following wireless stations are established for telegraphic operation in connection with civil air routes, and are tabulated by countries. The stations are classified as follows :—

Class "A."—Stations directly concerned with flying operations, whose routine is primarily intended for aircraft.

Class "B."—Stations indirectly concerned with flying operations, whose routine is not primarily intended for aircraft.

N.B.—All stations use a C.W. system, unless otherwise stated, and all times quoted are G.M.T.

I.—BRITISH ISLES.

1.—Class "A" Stations.

Station.	Call Signal.	Latitude.	Longitude.	Wavelength.	Routine.
Air Ministry	GFA	51°31′N.	0°07′W.	900 1400 1680	Wave calibration. Meteorological and Route Traffic Messages: Meteorological Synoptic Reports are issued daily at 0200, 0600, 0800, 1400 and 1900; General Inferences at 0915 and 2000. Hourly Route Meteor Messages. These are sent daily at 0735, 0835, 0935, 1035, 1135, 1235, 1335, 1435, 1535, 1635.
Castle Bromwich	GEC	52°31′N.	1°48′W.	900 1400	Radio-telephonic communication with aircraft in flight. Route Traffic Messages; Meteorological Reports to Air Ministry at 0700, 1000, 1100, 1300.
Croydon	GED	51°21′N.	0°07′W.	900 900	Radio-telephonic communication with aircraft in flight. Wireless telegraph routine as required.
Didsbury	GEM	53°26′N.	2°15′W.	900 1400	Radio-telephonic communication with aircraft in flight. Route Traffic Messages; Meteorological Reports to Air Ministry at 0725, 0745, 0945, 1025, 1145, 1325, 1345, 1545, 1625, 1825.
Lympne	GEG	51°05′N.	1°01′E.	900 900	Radio-telephonic communication with aircraft in flight. Wireless telegraph routine as required.
Pulham	GEP	52°24′N.	1°14′E.	900 1400	Radio-telephonic communication with aircraft in flight. Route Traffic Messages; Meteorological Reports to Air Ministry at 0105, 0705, 1205, 1705.
Renfrew	GER	55°52′N.	4°24′W.	900 1400	Radio-telephonic communication with aircraft in flight. Route Traffic Messages; Meteorological Reports to Air Ministry at 0715, 0735, 0935, 1015, 1135, 1315, 1335, 1535, 1615, 1815.

2.—CLASS "B" STATIONS.

Station.	Call Signal.	Latitude.	Longitude.	Wavelength.	Routine.
Goswick -	BVG	55°42′N.	1°54′W.	450 (Spark)	Transmits local meteor messages to Renfrew daily at 0730, 0930, 1130, 1330, 1530.
Lerwick -	GEL	60°09′N.	1°10′W.	600 (Spark) 900 (Spark) 1400 (Spark)	Communication with Wick for G.P.O., in case of necessity only. Meteorological Reports to Air Ministry (details will be issued shortly).
Poldhu -	MPD	50°02′N.	5°16′W.	2800 (Spark)	Weather bulletins daily at 0930, 2130.

3.—PROCEDURE.

The procedure to be adopted for wireless telegraph communication between aircraft and ground stations is that laid down in the "Handbook for Wireless Telegraph Operators of His Majesty's Postmaster-General."*

II.—BELGIUM.

4.—CLASS "A" STATIONS.

Station.	Call Signal.	Latitude.	Longitude.	Wavelength.	Routine.
Brussels -	BAV	50°25′N.	4°25′E.	1400 1680	(*a*) Synoptic Messages are issued daily at 0715, 1315 and 1815. (*b*) Route Traffic Messages as required. Hourly Route Weather Messages are issued daily at 0625, 0725, 0925, 1025, 1125, 1325, 1525

5.—CLASS "B" STATIONS.

Nil.

6.—PROCEDURE.

The wireless telegraph procedure for communication between aircraft and Belgian ground stations is similar to that in force in the British Isles, described in paragraph 3 above.

III.—FRANCE.

7.—CLASS "A" STATIONS.

Station.	Call Signal.	Latitude.	Longitude.	Wavelength.	Routine.
Le Bourget-	ZM	48°57′N.	2°25′E.	900 1400 1680	Radio-telephonic Routine with aircraft and with Lympne and Croydon. (*a*) Route Traffic Messages as required. (*b*) Synoptic Message at 0645. Hourly Route Meteor Messages are issued daily at 0730, 0830, 0930, 1030, 1130, 1230, 1330, 1530, 1630. Synoptic Message at 1145.

* Copies are obtainable from the Publishers of *The Wireless World*.

7.—CLASS "A" STATIONS—*continued.*

Station.	Call Signal.	Latitude.	Longitude.	Wavelength.	Routine.
St. Inglevert	AM	50°53′N.	1°44′E.	900 1400	Radio-telephonic Routine with aircraft and with Lympne. Route traffic messages as required.
Antibes	AK	43°35′N.	7°08′E.	1400 1680	Route traffic messages as required. Hourly route meteor messages.
Bayonne	AY	43°31′N.	1°30′W.	1400 1680	Route traffic messages. Hourly route meteor messages.
Bordeaux	AB	44°50′N.	0°42′W.	1400 1680	Route traffic messages. Hourly route meteor messages.
Lyons	AL	45°44′N.	4°56′E.	1400 1680	Route traffic messages. Hourly route meteor messages.
Marseilles	AX	43°25′N.	5°13′E.	1680	Hourly route meteor messages.
Maubeuge	AV	50°17′N.	3°58′E.	1200 1400	Hourly route meteor messages. Route traffic messages.
Montelimar	AQ	44°32′N.	4°48′E.	1680 1400	Meteorological work (constant watch not kept). Route traffic messages.
Nimes	AN	43°52′N.	4°25′E.	1200 1680	Hourly route meteor messages. —
Perpignan	AP	42°42′N.	2°53′E.	1400 1680	Route traffic messages. Hourly route meteor messages.
Toulouse	AU	43°35′N.	1°29′E.	1200 1680	Hourly route meteor messages. —

8.—CLASS "B" STATIONS.

Station.	Call Signal.	Latitude.	Longitude.	Wavelength.	Routine.
Eiffel Tower (Paris).	FL	48°52′N.	2°18′E.	2600 (Spark)	Weather reports are broadcasted daily at the following times:—France, 0245, 0815, 0415 and 1930; Europe, 1130.
Brest	FUE	48°23′N.	4°30′W.	2800	Weather reports are broadcasted daily at 0810, 1410 and 1840.
Cherbourg	FUC	49°38′N.	1°36′W.	2800	Weather reports are broadcasted daily at 0800, 1400 and 1830.
Strasbourg	C3	48°33′N.	7°47′E.	1480	Weather reports are broadcasted daily at 0740, 1340 and 1840.
Toulon	FUT	43°07′N.	5°55′E.	1350 (Spark)	Weather reports are broadcasted daily at 2040.

9.—PROCEDURE:—

As for stations in the British Isles, described in paragraph 3 above.

IV.—HOLLAND.

10.—CLASS "A" STATIONS.

Station.	Call Signal.	Latitude.	Longitude.	Wavelength.	Routine.
Soesterberg-	STB	52°08'N.	5°17'E.	1400	Meteorological and Route Traffic Messages. Route Traffic Messages are dealt with as required.
				1680	Meteorological Route Messages are issued daily at 0645, 0845, 1045 and 1245.

11.—CLASS "B" STATIONS.

Station.	Call Signal.	Latitude.	Longitude.	Wavelength.	Routine.
Scheven-ingen	PCH	52°06'N.	4°16'E.	1800 (Spark)	Weather Reports at 2315.

12.—PROCEDURE :—

As for stations in the British Isles, described in paragraph 3 above.

V.—OTHER COUNTRIES.

13.—CLASS "B" STATIONS ONLY IN OPERATION.

Country.	Station.	Call Signal.	Latitude.	Longitude.	Wave-length.	Time Table of Weather Reports.
Serbia	Belgrade ..	HFB	44° 50′ N.	20° 30′ E.	4600	0745, 1345.
Roumania ..	Bucharest ..	BNS	44° 27′ N.	26° 05′ E.	3000 (spark)	0600, 1400, 1900.
Hungary ..	Budapest ..	HB	47° 29′ N.	19° 03′ E.	3000 (spark)	1030
Spain	Carabanchal	EGC	40° 28′ N.	3° 43′ W.	2000 (spark)	1000, 1530, 2030.
Norway ..	Christiania ..	LCH	59° 55′ N.	10° 45′ E.	8000	0850, 1450, 2020.
—	Gibraltar ..	BWW	36° 10′ N.	5° 20′ W.	4800	0800, 1900
Sweden	Karlsborg ..	SAJ	58° 32′ N.	14° 31′ E.	4000	0840, 1940
Denmark ..	Lyngby ..	OXE	55° 46′ N.	12° 29′ E.	5000	0750, 1350, 1850.
Germany ..	Nauen ..	POZ	52° 39′ N.	12° 35′ E.	4700	0900, 1940.
Czecho-Slovakia	Prague ..	PRG	50° 05′ N.	14° 27′ E.	4000	0920, 1545, 2030.
Esthonia ..	Reval ..	ELN	59° 27′ N.	24° 45′ N.	1900	0840, 2200.
Italy	Rome ..	IDO	41° 52′ N.	12° 29′ E.	11000	0930, 2045
Austria	Vienna ..	OHL	48° 13′ N.	16° 22′ E.	5600	1000, 1540.
Poland ..	Warsaw ..	WAR	52° 13′ N.	21° 00′ E.	2100 (spark)	0855, 1530, 2020.

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.**

R.G.T. (Fulham).—(1) The circuit is good for a long-wave receiver.

(2) Wavelength range with a 0·001 mfds. parallel condenser is 12,500 ms., and with an additional 0·003 mfds. condenser will be 23,000 ms.

(3) Telephony is all on shorter waves, for which it will be advisable to make a special inductance unit, wound with thicker wire, such as No. 24.

(4) If used without a leak it is probably due to its getting charged up. If you are using a leak it is probably due to faulty insulation in the condenser.

J.G.D. (North Shields).—The supply of complete working drawings and data for a wireless control set for a model boat is quite outside the scope of these columns. Regarded from a wireless point of view the problem simply consists in the closing of a local circuit by means of a relay operated by a coherer or similar detector. After that the design of satisfactory control gear for operation by the local circuit ceases to be a wireless problem, and becomes purely electro-mechanical. An article on the subject appeared on page 385, Vol. VIII. No. 11 of *The Wireless World*.

W.R.A. (Johannesburg).—(1) We regret that the samples, which do not appear to have been fastened to the queries, have not come to hand.

(2) The term heterodyne is used for any method of beat reception of C.W., by means of locally-generated oscillations of approximately the same frequency as the signals. The term autodyne is used for the particular case of heterodyne reception, in which part or the whole of the circuits used for amplifying or detecting the incoming signals are also made use of to generate the required local oscillations.

(3) The power of LAF is approximately 500 kilowatts in the aerial.

(4) The greatest recorded wireless telephonic range is Arlington to Hawaii, 5,100 ms. The set with which this result was obtained was in no sense commercial, and is now of quite obsolete type.

PREWAR (Bridgnorth).—As you do not give any particulars of the size or windings of your loose coupler we cannot judge your wavelength range. Moreover, as the secondary of the loose coupler is not tuned by a condenser, the efficiency of the set will be very poor. You will probably only receive a few ships weakly.

M.A.R.H. (Bridlington).—(1) About 10" long. Such a coil would, of course, be of little use for short waves, owing to dead-end and self capacity effects.

(2) For a separate heterodyne set for use with a crystal receiver, see Fig. 1. The coils may be the same size, 16 cms. outside and 4 cms. inside diameter, full of No. 36 wire. Maximum wavelength range will be about 6,000 ms. A V24 valve should oscillate with this set, and only a few volts on the anode. See also the constructional articles in the June, 1920, issues.

(3) The honeycomb coils described in October 3rd, 1920, issue, are quite good, but no formula is available for accurate calculation of their inductance.

(4) See April 30th issue for complete list of times and wavelengths.

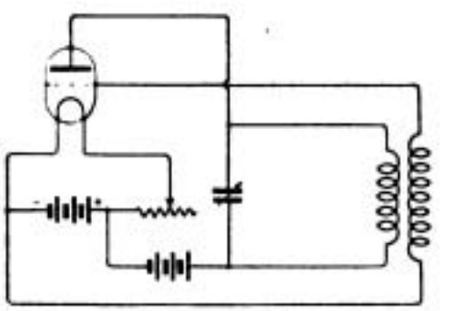


Fig. 1.

N.M. (London).—(1) A 3-valve amplifier is certain to be somewhat costly. We should recommend adding an additional valve to your present set as a note magnifier, several diagrams for doing which have been given recently. The circuit of a 3-valve amplifier is shown in the April 30th issue, on page 98. With your present set connect the aerial condenser across the loading inductance as well as the coupling coil, this will increase range to about 8,000 ms.

LAROLD (Brecon).—(1) and (2) The probable reason that the Dutch concert cannot be received is the aerial cannot be properly tuned to the correct wavelength—about 1,100 ms. With the small power used very careful tuning will be necessary at your distance, even with a multivalve amplifier. For this wavelength, connect the A.T.C. in series with the loose coupler winding only. As shown in the diagram the circuit is unbalanced. The aerial can be tuned to 14,000 ms., and the secondary circuit to 5,000 ms. only. Add considerably more inductance in the secondary circuit.

(3) Unless you have a separate heterodyne or can make the receiver oscillate, you will not get transatlantic stations at all. With a heterodyne you should get Tuckerton, Sayville, New Brunswick, and Marion under favourable conditions.

(4) Make application to the G.P.O., stating type of apparatus, wavelength range and power, and also for what useful purpose it is intended to be used.

INQUIRER (Dover).—(1) 0·00015 mfds.

(2) Not very much.

(3) For a most efficient short wave set use the same circuit, but with single layer solenoids instead of pile windings.

(4) Yes.

J.R. (South Norwood).—(1) Use No. 22 up to about 4,000 ms., and then No. 26 for the remainder.

(2) As coils of this type do not admit of accurate computation we cannot give exactly the inductance of coils of any particular dimensions. Experiment by winding two or three coils, with thickness of winding say $\frac{1}{8}$", $\frac{1}{4}$" and $\frac{3}{8}$", and test the range of wavelengths obtainable with these either by a wavemeter or by stations of known wavelength. From the results you will be able to judge the thickness required for the various ranges you require. You are unlikely to get as big a range for each coil as you suggest without getting bad tuning at the ends of the condenser.

(3) This depends on the circuit used. If you have two circuits with reaction, both circuits must be tuned to the received wavelength, and therefore more than one secondary coil will be required.

(4) Some of the coils may be used for reaction, but for the long wavelengths probably one or two additional coils will be required.

"BRAINY" (South Hackney).—The detailed design of an elaborate set of this type is quite outside the scope of these columns. The design of the set you refer to probably represented about a week's work. The alterations you require would necessitate almost complete re-design of the set, which would take nearly as much time as the original design. We think that the working out of the alterations yourself would justify your claim to the *nom-de-plume* which you have adopted.

"RADIO" (Crouch End).—(1) Yes, there is an evident error. The values given on page 879 are the more nearly correct.

(2) The set was designed for use without a grid condenser. You can try one if you like, and can fit it in, but we take no responsibility for the success of the alteration.

(3) A winding of this type is rather difficult to get neat. You will find it best to make the crosses at the corners, running the wire down to the next corner, as shown in your third sketch.

(4) Capacity 0·0004 mfds.

(5) This is too small for the purpose required.

J.W. (Oldham).—(1) We have not space to deal adequately with the question here, but refer you to Fig. 4, page 68, April 30th issue, and the accompanying letterpress. For further information on details not there given consult the constructional articles of Vol. VIII.

(2) Difficult to state, so much depending on whether finished components are bought, or only raw materials. If everything possible is made, *i.e.*, almost everything but the valves and batteries, the cost, including these items, might be from £6 upwards.

(3) With careful construction and handling it should do so.

L.B. (Blackpool).—(1) The probable reason for lack of success is merely the thoroughly bad type of aerial employed. At any cost avoid doubling it back on itself in the way shown.

(2) On a standard aerial, about 1,500 ms.; on the aerial submitted, somewhat less, but with very poor results.

(3) Diagram given to **J.P. (Boscombe)** below shows one good type of amplifier.

(4) You might increase the inductance in each circuit, but the most important thing is to improve the aerial.

C.H.C. (Croydon).—(1) A loading coil should be introduced into this set in exactly the usual way, viz., in series with the loose coupler primary. You will probably find it necessary to increase the closed circuit inductance also.

(2) A loose coupler is preferable but not essential.

(3) We do not think a complete list is published, but information appears at times in this magazine.

(4) About 4,000 ms.

J.P. (Boscombe).—(1) Diagram Fig. 2 shows a circuit of the type suggested.

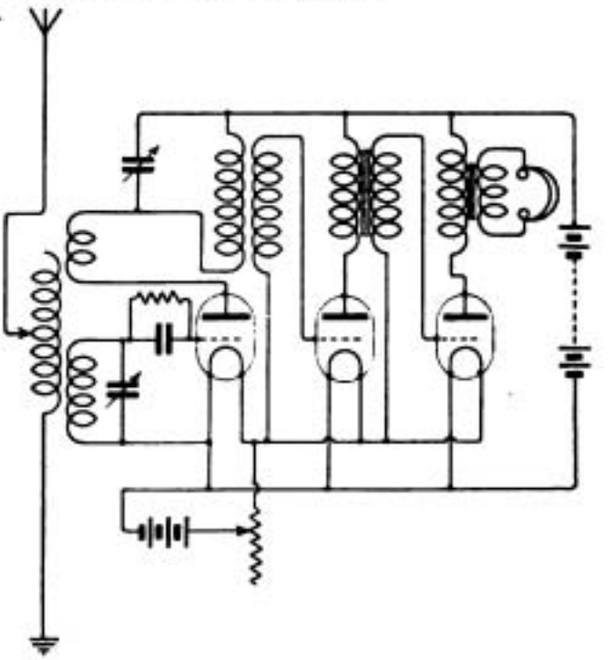


Fig. 2.

(2) A telephone transformer is almost essential with a set of this type.

F.V.O. (Lausanne).—(1) The set described is of quite good type, and should give satisfactory results. From the very little information you give it is quite impossible to say why you get nothing. There are various possibilities, such as no stations transmitting near enough to you, reaction coupling in the wrong sense and too tight, or faulty telephones or valves.

(2) About 1,500 ms.

(3) We have no further information about this method. We are extremely sceptical about the results claimed for it, and do not advise you to waste any further time with it.

4) See Fig. 2, page 98, April 30th issue. The plate coils shown for the first two valves may be non-inductive resistances of about 80,000 ohms if desired. A reaction coil may be inserted in the plate circuit of the first valve and coupled with the closed circuit inductance.

MOSBAT (Birmingham).—Only four questions, please. (1) Circuit shown is incorrect, and we are not quite clear how it is intended to work. Maximum useful wavelength for a set of this type without reaction is about 3,500 ms.

(2) About 0·004 mfds.

(3) 60 volts.

(4) (*a*) 0·002 mfds. (*b*) We cannot say, as we do not understand the purpose of this condenser.

(5) & (6) Say about 5′, wound with No. 34.

F.B.S.E. (Troughstones).—(1) The single wire aerial, but if possible increase the height considerably, as signals will not be strong so far inland.

(2) Very unlikely with a single valve.

(3) Yes, provided you use enough of it; say not less than 30 square yards of the finest mesh obtainable.

(4) 8 p.m. on Thursdays, and 2 p.m. on Sundays.

R.H.P. (Birmingham).—(1) Set is of quite good type, but some of the dimensions are unsuitable. The A.T.I. should be 10″ × 8″ of No. 22. Closed circuit condenser 0.001 mfds. Grid condenser about 0·0002 mfds.

(2) With alterations as suggested, about 4,000 ms.

(3) Yes.

(4) It will prevent the reception of faint signals on or near the wavelength on which the station is transmitting at any given time, but will not otherwise trouble you.

H.S.J. (Sunderland).—Grouping eight questions in pairs under four headings does not make them four questions. We give replies to the first four questions asked. (You have answered your own query with regard to condensers in parallel in your sketch.)

(1) No; the 30,000 mhys coil is quite useless as shown, and would be of very little use anywhere else in a set of this type.

(2) If you omit this coil the set is of quite good type, but suffers from the usual disadvantages of an auto-coupled set, *i.e.*, too tight coupling.

(3) Rewind the double slide coil with No. 24, and add a certain amount of loading coil, say another coil of the same size and winding.

(4) Maximum wavelength will then be about 3,000 ms.

" JIMSON " (Keighley).—(1) " A " is rather better for long waves, and " B " for short waves, say up to 1,500 ms. Do not short-circuit parts of H.F. transformers not actually in circuit.

(2) A crystal is fairly good, but not quite so good as a valve with grid condenser.

(3) (*a*) Y and Z are not reaction coils. They should be pure resistances, of about 50,000 ohms each. (*b*) See article on H.F. transformers appearing about with this.

(4) Both circuits are quite good subject to the above remarks, and the fact that it is not necessary to make the plate resistance of " A " variable. The grid condensers would be better somewhat smaller than 0·0002 mfds.

G.A.H. (Farnborough).—(1) Increase the A.T.I. to 12″ × 8″, wound with No. 24, and the coupler secondary to 6″ × 5″, wound with No. 30. Make the closed circuit condenser 0·0008 mfds.

(2) The method suggested is quite applicable to pancake coils.

(3) Coils may be 1″ internal diameter, and 9″ external diameter, wound with No. 26. You would require four for the aerial circuit, and two for the closed circuit. Tuning of the aerial circuit would not be easy with coils of this type without a condenser.

(4) Wire for each coil will weigh about 4 ozs.

K.E.W. (Kristiania).—(1) Connect the Turner relay in *via* the terminals L and E of the relay diagram. The iron core transformer should take the place of the telephone transformer of the set referred to, but should be step-up and not step-down as is usual with the majority of telephone transformers.

(2) Try our advertisers. The price (new) runs about £12.

(3) August 21st, 1920.

(4) The size of wire will only make a slight difference in the inductance of the frame. Wind it with No. 18, or stranded wire of about the same total thickness. The inductance approximates fairly closely to the value you require.

P.O.S. (Acklington).—(1) Probably not quite so efficient. A decrease in the working anode voltage of a valve is generally only obtained at the expense of a certain amount of efficiency.

(2) There is very little to choose in efficiency between any of the makes advertised in our columns. The type you mention should be quite good.

(3) The coils should have about 16 layers of No. 28 wire.

(4) Forming in paraffin wax leads to a loss of efficiency owing to increased self capacity. This loss due to self capacity may become very considerable in a coil embedded in wax. In general, for good results, no more than the absolute minimum possible of any such substance as wax or shellac varnish should be used on a receiving coil.

R.G.W. (Huntington.— (1) There is no golden rule for overcoming induction of this type, which is generally rather difficult to deal with. The best things to try are (*a*) altering the disposition of the apparatus, (*b*) screening it, and in particular such parts as a telephone transformer, with metal, which should not be too close to the windings, and (*c*) balancing out, by means of a pick-up coil, specially introduced to pick up more of the induction.

(2) A valve would probably give you still more induction trouble.

L.L. (Edinburgh).—(1) On the whole we rather prefer aerial No. 2.

(2) You will get better results by bringing the wire down outside the house. Bringing it down inside the house will not entitle you to use more wire, and even if it did, increasing the number of the wires will not do you much good. You should increase the length up to the limit allowed by the P.M.G.

(3) You should get ship stations, and land stations such as Cullercoats and Stonehaven.

(4) The circuit of Fig. 2, page 277, July 23rd issue is about the best. With suitable dimensions of coils you should get most of the bigger European stations with it.

W.H.K. (Fulham).—(1) No. 28.
(2) No. 40.

R.O.P. (Scarborough).—(1) and (2) See Nos. 16, 17, 18, 19, 20, and 21 of Vol. VIII, for full working instructions for a set of this type.

(3) Write to the Secretary of the G.P.O., applying for a licence, giving in the first instance a brief outline of the type of set you propose to use.

R.G.M. (Birmingham).—The reason for the bad reception of telephony that you complain of is almost certainly low frequency oscillation set up by the note magnifiers. It is very difficult to design a set with as many as three stages of note magnification placed near each other without getting howls of this nature set up by inter-action of the note magnifier circuits. Weakening the H.F. reaction coupling will, of course, not cure this. Incidentally, your H.F. reaction is probably very inefficient, as the reaction coil is on the earth side of an iron-cored coil which is not shunted by a condenser. To cure the howls complained of, either separate the note magnifier circuit several feet from each other, or better still, substitute a stage of H.F. amplification for the first stage of L.F. shown. The H.T. voltage used should be quite sufficient for this set.

"BILLY" (Morecambe).—(1) This station appears to be either the Air Ministry (GFA) or Paris (Le Burget) (ZM). Surely it is easier for you to listen for the call sign if you can read the transmission than for us to tell you from the little information you give.

(2) See the list in the August 6th issue.

(3) A.T.I., internal diameter 2 cms., external diameter 22 cms., wound with No. 24. Closed circuit coil similar, but with external diameter only 18 cms.

(4) Coils will be quite suitable

G.C. (Barrow).—A key to the Eiffel Tower time signals on page 138 of the issue for May 15th, 1920. For the scientific time signals, the groups of figures sent later give the times of the first and last dots of the series. The figures ignore the hour, but give the minute and second to two decimal places. For instance, for a dot sent at 11 hrs. 31 mins. 21·29 secs., the group of figures sent later would be 312129.

A.S.H. (Chelsea).—(1) The circuit is all right as shown, provided that the negative side of the H.T. battery is earthed, and not the positive, as shown in your sketch.

(2) Both are desirable, but of the two the grid potentiometer is the less essential.

(3) Fig. 3.

C.H.N. (Portland).—(1) The set shown in the cut submitted appears to be of quite good type, and should give fairly satisfactory results. Of course, on such a small aerial, signals will not be very strong with a crystal. If possible, increase the length of the aerial.

(2) No other apparatus, except the aerial and its insulators, and the earth connection, will be necessary. A couple of dry cells and a potentiometer for the crystals would be worth experimenting with, but do not appear essential.

H.C.H. (Victoria).—(1) About 1,000 ms.

(2) No. Increase the size of the A.T.I. to about 10" × 6", wound with No. 22.

(3) About No. 18, or the equivalent in stranded wire.

(4) It is quite hopeless to attempt to receive the Dutch concerts on an elementary crystal circuit of this type. To do this you would probably require about three valves, with a good two-circuit receiver and reaction coil.

A.L. (New Brighton).—(1) The inductance of the coil in question is 9,600 mhys. It is only in quite a special sense that a coil has a wavelength. This wavelength, which is that to which it would resonate if unconnected to anything else, depends on the self capacity of the windings, and is therefore quite incalculable. Moreover, if found, this quantity would be almost useless for judging the capabilities of the coil when used in a receiver.

W.H.A. (Denton).—We are afraid your diagram is almost unintelligible. We do not know what the item marked "anode" is intended to represent, as it appears to have very little connection with the valve. There are also leads shown apparently not connected to anything. In order that we may be able to help you, any diagram *must show clearly the essential wiring connections* of a circuit. As far as we can make it out, your circuit appears all right, except that you show a grid leak without

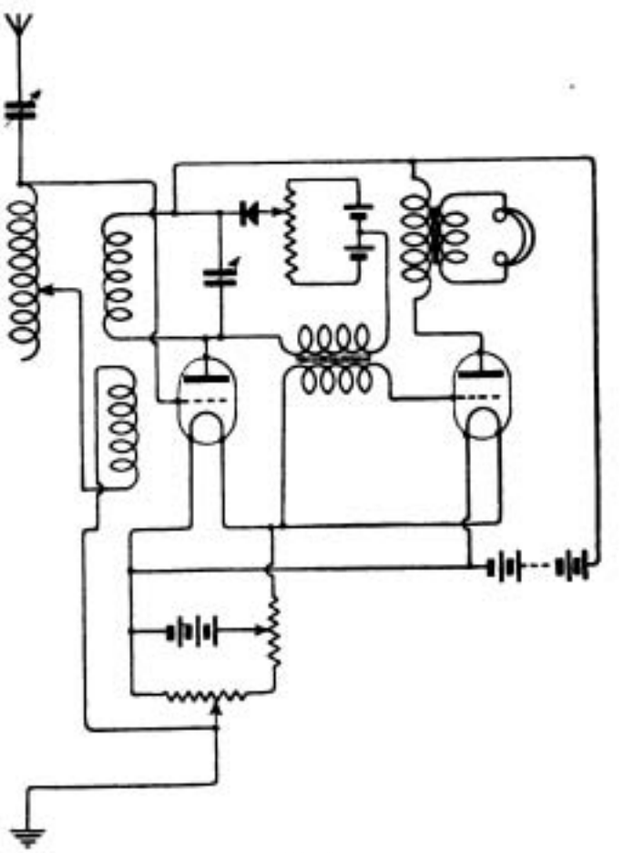


Fig. 3.

a grid condenser, which is, of course, quite useless. If this is merely a slip of the pen, it is probable that to increase strength of signals you will have to add a stage or two of L.F. amplification.

H.L. (Wimbledon).—(1) Use two of the pancakes in the plate circuit. For the grid you might use two others of them, getting a variometer effect if desired by varying their mutual coupling. The absence of a grid leak is due to the employment of a soft valve. For a hard valve a grid leak should be included.

(2) Probably.

(3) Preferably use glass, say a large test tube with walls as thin as possible.

(4) A 1/1 transformer wound with, say, No. 46 to as high a resistance as possible would be best. Failing that, your suggestions are about equally meritorious.

D.G.B. (South Shields).—The general arrangement of your receiver is quite O.K., except for the fact that you have provided reaction coupling to the aerial circuit as well as to the closed circuit. This is going out of your way to make the aerial radiate, and is quite wrong. You can omit A.T.C. for short waves, but retain it for long waves. Maximum wavelength about 5,000 ms. The No. 36 wire will not be needed.

A.J.M. (Kilburn).—(1) The circuit of Fig. 4, page 218, of the June 25th issue should be suitable.

(2) For 0·00005 mfds. you would require one plate of dielectric with 2 sq. cms. of overlap.

(3) For 0·0005 mfds. use one plate with overlap of 20 sq. cms.

(4) For 0·001 mfds. as above, but with two plates.

R.G.M. (Birmingham).—(1) The power is given as $^1/_2$ kw, see *Wireless World*, February 19th, 1921, p. 805.

(2) The extra distance of the Hague probably explains the poorness of your results. Your set would be considerably improved by dispensing with the parallel A.T.C. on such a wavelength. Also you should put a condenser across the terminals marked "to L.F. amplifier," and if the amplifier does not already contain one, introduce an L.F. intervalve transformer at this point.

(3) Probably.

(4) We have no information.

E.G.N. (Harrow).—(1) This may be done if desired, provided, of course, that the constructional alterations necessary for mounting this type of valve can be made.

(2) The only alteration necessary will be an increase in the H.T. voltage to about 60.

B.D.W. (Newport, Mon.).—(1) The circuit is of ultraudion type, and we believe would work fairly well when suitably adjusted, but would be difficult to control and adjust. We do not recommend it in view of your expressed requirements.

(2) A = 0·001 mfds.; B, try 0·0002 mfds. The coils should be honeycomb.

(3) Control of oscillation would be by means of the condenser B, but would probably not be convenient or easily managed.

(4) Soft valves would be almost essential.

"ELECTRICIAN" (Winchester).—Full particulars of a set which should meet your requirements were given in Nos. 16 to 21 of Vol. VIII. This is a frame aerial set with 4 valves, but you might omit one of the H.F. amplifying valves if you wish to. Below this it is not advisable to go. The 2-valve set you mention is not of much use except for the reception of high power stations at no great distance.

H.W.P. (Whitehaven). — (1) Fig. 2 is, of course, the proper connection. The probable reason for your results is a defective condenser; tissue paper does not sound very promising as a dielectric. The crystal is also rather doubtful.

(2) Many joints in an aerial are almost certain to weaken signals; how much they do so depends on how carefully they are made.

(3) With a good condenser of 0·0003 mfds. you should get ships and land stations up to 3,000 ms.

(4) If your potentiometer were wound with No. 36 Eureka wire to a resistance of about 400 ohms., instead of with No. 26, apparently copper, to a resistance of about 10 ohms., you would not be troubled with battery noises.

E.T.R. (Bristol).—(1) As shown, only 3,000 ms., though the aerial circuit will tune to 8,000 ms. Rewind anode circuit coil with about No. 32.

(2) Alteration would have to be on the lines of Fig. 1, page 217, of June 25th, in which, however, the transformer connected to the grid of the second valve should have been shown with an iron core.

(3) Yes, if the resistance-condenser method frequently sketched is used.

(4) See reply to (1) above.

E.D.B. (South Croydon).—(1) The circuit given in Fig. 4 will give the desired results.

(2) Yes.

(3) No modification is necessary for telephony, except that the reaction coupling should not be tight enough to cause oscillation.

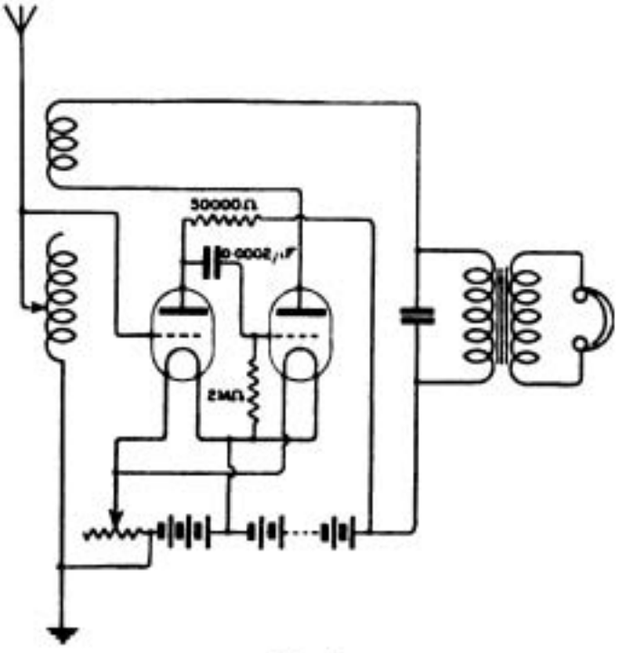


Fig. 4.

H.W.B. (Biddulph Moor).—(1) Yes.

(2) & (3) This piece of apparatus is essentially an L.F. amplifier. To adapt it for C.W. reception it would be necessary (*a*) to remove condenser marked 0·00045 mfds., and place grid and filament across the closed circuit condenser (*b*), substitute a suitable H.F. transformer for the L.F. transformer shown, and (*c*) introduce a reaction coil in the plate circuit of the first valve, between the plate and the transformer (see Fig. on page 252, July 9th issue).

(4) Quite suitable for this set.

H.C.H. (Victoria).—(1) Yes, it is the best that you can do.

(2) Use a potentiometer with the dry cell for the crystal. The set is otherwise quite O.K. for a simple crystal circuit.

(3) You do not state the gauge of the wire. In any case the inductance is small, and you will probably only get ship and coast stations on 600 ms.

(4) 0·0003 mfds. is O.K., but 2 mfds. is too big for a telephone condenser, especially with H.R. telephones. Try about 0·002 mfds.

L.F. (Erith).—(1) For a suitable 2-valve receiver see reply to **E.D.B. (Croydon)**, on p. 399.

(2) No; for twice the wavelength about four times the number of turns on the inductance are required.

(3) It will most probably be quite suitable.

H.W. (St. Austell).—(1) Yes, it is approximately 0·002 mfds.

(2) Yes.

(3) Make a condenser similar to the one you describe in (1).

(4) We regret that we have no information on this point.

C.M.H. (Bromley).—(1) "Perikon" is a name given to the zincite-chalcopyrite crystal combination.

(2) Yes, certainly.

(3) Copper wire would be much better, owing to the high specific resistance of iron, and also the excessive high frequency resistance in wire of this material.

(4) Suggested aerial should be very good.

C.W. (East Greenwich).—(1) As you omit the most important dimension, viz., the distance between the plates, we cannot make the calculation. Capacity is probably of the order of 0·001 mfds.

(2) The aerial circuit is very inefficient with so large a parallel condenser on such a short wavelength. Present range of circuit is barely 2,000 ms. Make a considerably bigger loose coupler. Put the 0·0015 mfds. condenser across the telephones.

(3) Yes.

(4) No; it runs for twelve months.

G.A.R. (Small Heath).—(1) The circuit is quite O.K., but the frame should preferably be considerably larger for only two valves. Make it with sides about 3' long.

(2) For 0·0005 mfds., two foils with an overlap of 5 × 1 cms. For 0·001 mfds., three foils with the same overlap.

QRU (Newcastle).—(1) Circuit is given in Fig. 5.

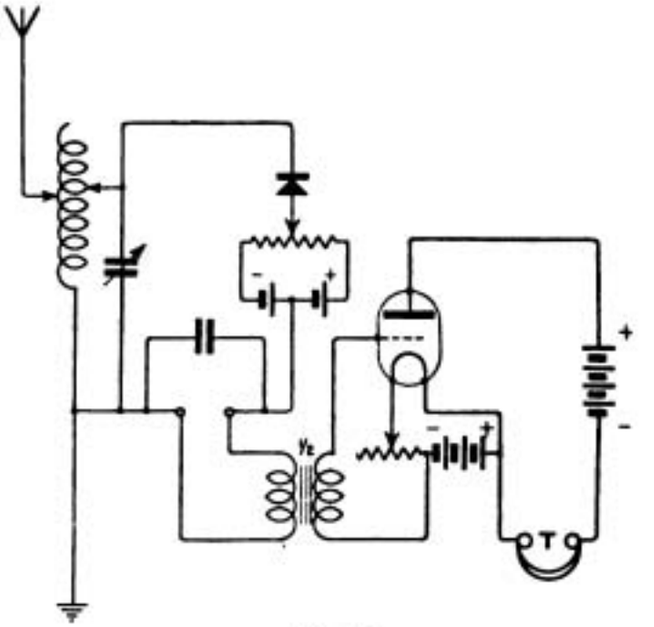


Fig. 5

(2) Approximately 1,200 ms.

(3) It will increase the wavelength of the secondary circuit, but not that of the aerial.

(4) Loose coupler primary 6" in diameter, wound with 12" of No. 26. Secondary 5" in diameter, wound with 10" of No. 28. Loading coil 6" in diameter, 14" long, full of 26.

"AMATEUR" (Tamworth).—(1) See reply to **G. C. (Barrow)** on page 398.

(2) The circuit given to **QRU (Newcastle)** above shows about the simplest way of adding a valve to a set of this type.

CORRECTION.—In the article entitled "Some Useful Graphs and Tables for Wireless Amateurs," by J. F. Herd, on pp. 262–265 of the July 23rd, 1921, issue of *The Wireless World*, the values given for the factor *F* in Table I on page 263 should all be divided by 10 in order to give correct results for the calculations. They will then agree with the values of the same factor given by the curves in Fig. 1.

SHARE MARKET REPORT.

There has been practically no business done in the Wireless Group during the last fortnight.

Prices as we go to press, September 7th, are:—

Marconi Ordinary	£1	16	3
,, Preference	£1	16	3
,, Inter. Marine	£1	2	6
,, Canadian		6	6
Radio Corporation of America:—			
Ordinary		8	3
Preference		8	9