[Second Edition.]

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PROVISIONAL SPECIFICATION.

Improvements in Receiving Apparatus for Wireless Telegraphy.

We, GUGLIELMO MARCONI, LL.D., D.Sc., and MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, both of Watergate House, Adelphi, London, W.C., do hereby declare the nature of this invention to be as follows:—

In wireless telegraphy it has been found advantageous to utilise trains or groups of electrical oscillations following one another at rapid and regular intervals, and in the Specification No. 20,119 of 1907 a method of producing and radiating regular trains of waves is described.

It is now common practice to tune the circuits of the receiver to the period of the oscillations or electric waves radiated, but this invention relates to a method of efficiently tuning the receiver to the period of the trains of oscillations, or to the impulses which result therefrom.

For this purpose we employ any suitable detector, such as a magnetic detector, electrolitic cell, Fleming valve, *etc.*, in circuit with the aerial, or in an associated resonating circuit; and preferably in a third circuit containing the right proportion of inductance and capacity, we place a suitable indicator of current impulses such as a telephone.

The electrical time period of the circuit containing the telephone or indicator should be such as to enable it to resonate to the period or frequency of the wave trains or resultant impulses transmitted from the sending station or to a harmonic of said period.

An intermediate circuit connected inductively to the two circuits and also containing inductance and capacity in the right proportions so as to cause it to resonate to the period of the wave trains received may be advantageously employed, and the selectivity of the circuit containing the indicator can be improved by loosely coupling that circuit to the other circuits.

The disturbing effects due to atmospheric electricity or to electrical impulses of a period different to that of the transmitter from which it is desired to receive can be further minimised in the following manner:—

The indicator is connected to two circuits each inductively associated, either directly or through an intermediate circuit, to the detector circuit, and the time periods of these two circuits are made such that one of them is in resonance with the period of the trains or impulses it is desired to receive while the other is slightly out of resonance, or, in other words, has a period differing slightly from that of the said impulses. The two circuits are so connected to the indicator that the currents or oscillations induced in them are opposed in polarity. By this method it is possible by the adjustment of the condensers and inductances to so balance the effects of the currents resulting from natural electrical disturbances or impulses different from those it is desired to receive, that their disturbing effect on the indicator is neutralised.

[*Price 8d.*]

The losses in the resonating circuits should be reduced to a minimum by using low resistance windings and condensers with small dielectric losses.

Dated this 16th day of August, 1909.

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COMPLETE SPECIFICATION.

Improvements in Receiving Apparatus for Wireless Telegraphy.

We, GUGLIELMO MARCONI, LL.D., D.Sc., and MARCONI'S WIRELESS TELEGRAPH COMPANY, LIMITED, both of Watergate House, Adelphi, London, W.C., do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

In wireless telegraphy it has been found advantageous to utilise trains or groups of electrical oscillations following one another at rapid and regular intervals, and in the Specification No. 20,119 of 1907 a method of producing and radiating regular trains of waves is described.

This invention relates to an improved method of tuning the receiver to the time period of the groups of oscillations.

Receivers for wireless telegraphy very commonly contain two circuits the first a high frequency circuit embracing or inductively coupled to the antenna and containing the detector (such as a magnetic detector, an electrolytic cell, a Fleming valve, *etc.*) and the second a low frequency circuit connected to the detector and containing an indicator such as a telephone.

According to this invention we employ a receiver of this type in which the indicator in a separate low frequency circuit is inductively coupled to the low frequency circuit of the detector and we independently tune both these circuits to the time period of the groups of oscillations which when a telephone is employed should preferably be such as to cause the production of a clear musical note.

Figure 1 shows a magnetic receiver m having its primary winding connected to an elevated conductor and to earth in the ordinary manner. The secondary winding s is joined to a coil i^1 and to an adjustable condenser c forming a circuit resonant to the note. The coil i^1 is inductively coupled through a variable coupling with the coil i^2 which forms part of a second resonant circuit containing also a variable condenser c^1 and a telephone t. If these two circuits be independently tuned to the period of the impulses or wave trains received and loosely coupled together, the telephone will give the strongest response to that period. If the transmitter be emitting wave trains which are regular but short compared with the intervals between them it will be found that the two circuits can be tuned to harmonics of the fundamental as well as to the fundamental.

Figure 2 shows a similar arrangement in which a Fleming valve or rectifier is employed in place of the magnetic receiver. In this figure s represents the secondary of the oscillation transformer or jigger of which the primary p is in the aerial circuit, v is the Fleming valve or rectifier, b the battery for

rendering the valve filament incandescent, r is a variable resistance to adjust the valve filament to the correct intensity the best adjustment being found by trial and c^1 is a variable condenser. One connection to the telephone transformer i^1 is taken off the negative pole of the battery, the other connection being taken direct to one end of the jigger s.

The circuit containing i^1 and c^1 can be tuned to the frequency of the wave trains. Loosely coupled with this resonant circuit is another containing an inductance i^2, a variable condenser c^2 and the telephone t. This circuit can also be tuned to the frequency of the wave trains and to that of the circuit containing i^1 and c^1, and when each of these two is in resonance with the group frequency the greatest selectivity will be obtained.

An intermediate circuit i^3, c^3, i^4 (Figure 3), connected inductively to the two circuits and also containing inductance and capacity in the right proportions so as to cause it to resonate to the period of the wave trains received, may be advantageously employed, and the selectivity of the circuit containing the indicator can be improved by loosely coupling that circuit to the other circuits. The resistance and dielectric losses in this intermediate circuit must necessarily be kept down to a minimum to obtain the best effect.

The disturbing effects due to atmospheric electricity or to electrical impulses of a period different to that of the transmitter from which it is desired to receive can be further minimised in the following manner:—

In Figure 4 is represented an intermediate circuit x inductively coupled to the primary circuit i^1 c^1 and to the telephone circuit z, all of which circuits are tuned to the frequency of the wave trains. A fourth circuit y is coupled to both i^1 and z, and given a natural period differing by a small percentage from that of the wave train frequency and from the period of the other circuits.

This circuit is coupled to the circuit z in such a way that any effects produced by y tend to oppose similar effects produced by x in the circuit z. Thus the circuit i^1 c^1 being damped to a fairly high degree takes up effects from the wave circuits and oscillates in its own period but each oscillation is highly damped. Consequently single impulses acting on i^1 c^1 will produce in x and y almost equal effects and therefore in z practically no effect. But any train of impulses following one another with a frequency equal to that of the circuits i^1 c^1 and x will produce a much larger effect in x than in y which is not in tune and therefore these trains of impulses will affect z whereas the single impulses will not do so.

We prefer to wind our coils such as s, i^1, *etc.*, where practicable in one layer and it is advisable to choose a telephone t the diaphragm of which has a natural period of or near the group frequency of the wave trains being used.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In wireless telegraph receivers the combination of two circuits containing respectively a detector and an indicator and each tuned to the group frequency of the trains of waves substantially as described.

2. In wireless telegraph receivers forming the subject matter of Claim 1, the combination of an intermediate resonant circuit between the circuits containing the detector and the indicator, all three circuits being tuned to the group frequency of the trains of waves substantially as described.

3. In wireless telegraph receivers forming the subject matter of Claims 1 or 2 the combination of two intermediate resonant circuits between the circuits containing the detector and the indicator one of which intermediate circuits is in resonance with the group frequency of the trains of waves it is desired to receive, while the other is slightly out of resonance, the two being so arranged that disturbing currents induced in them by the circuit containing the detector

will have opposing effects on the circuit containing the indicator substantially as described.

4. Wireless telegraph receivers substantially as described with reference to the drawings.

Dated this 16th day of March, 1910.

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(2nd Edition)

SHEET 1.

Fig. 1.

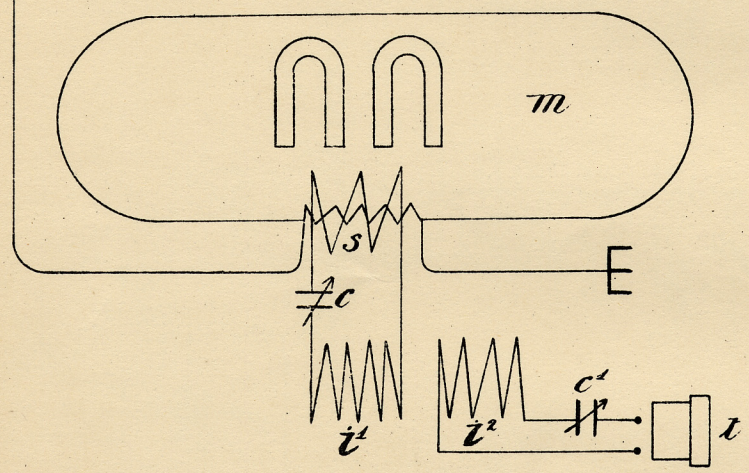
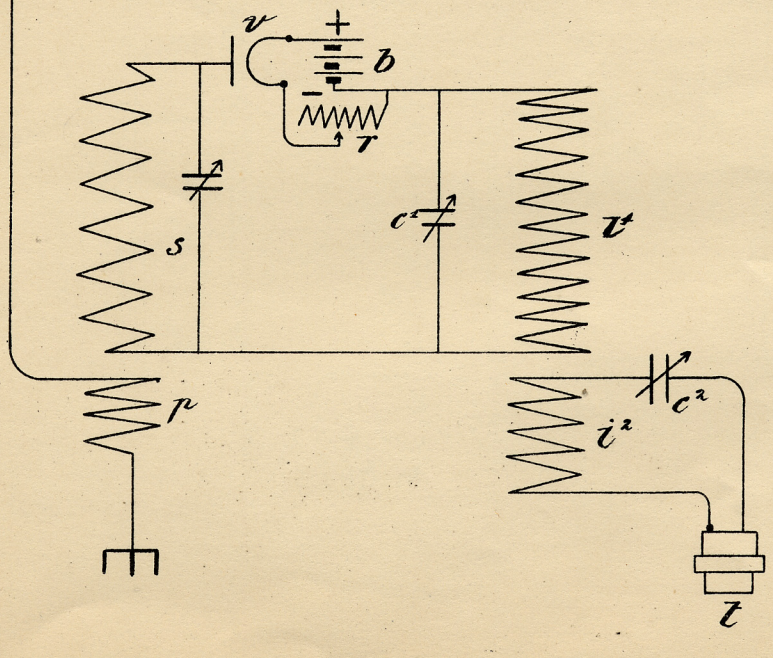


Fig 2



[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 3.

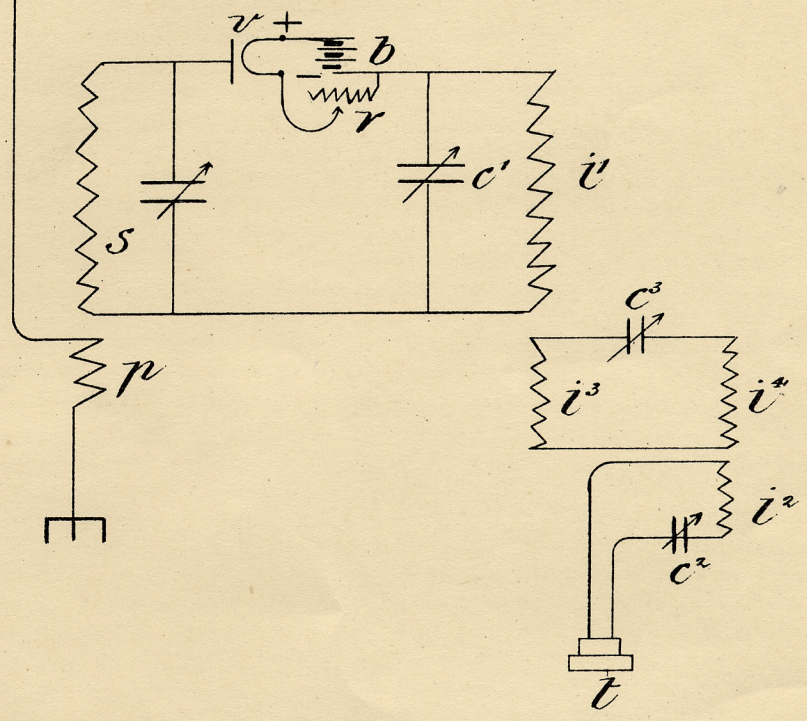
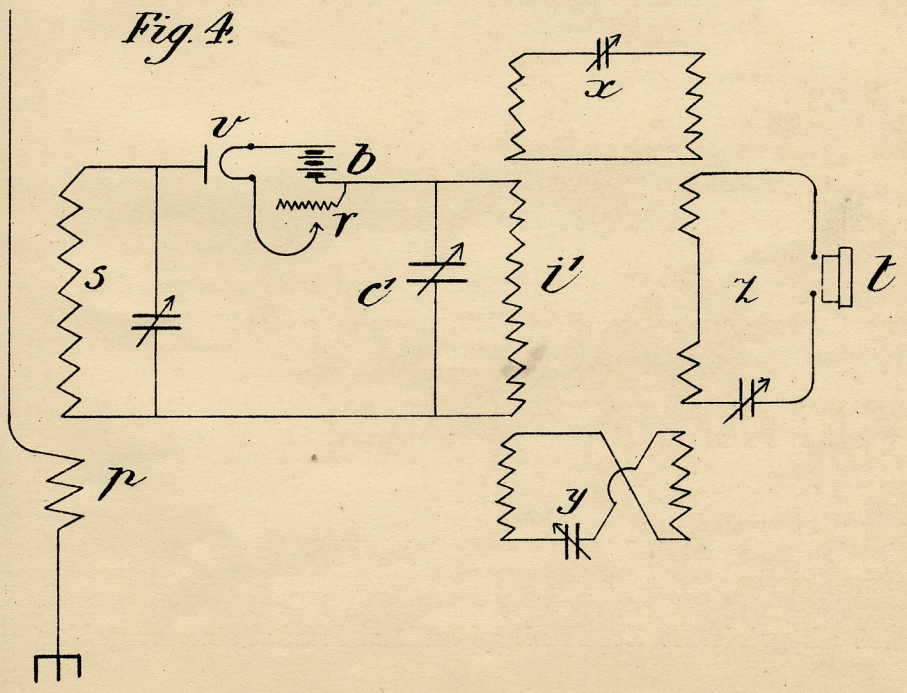


Fig. 4.



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