

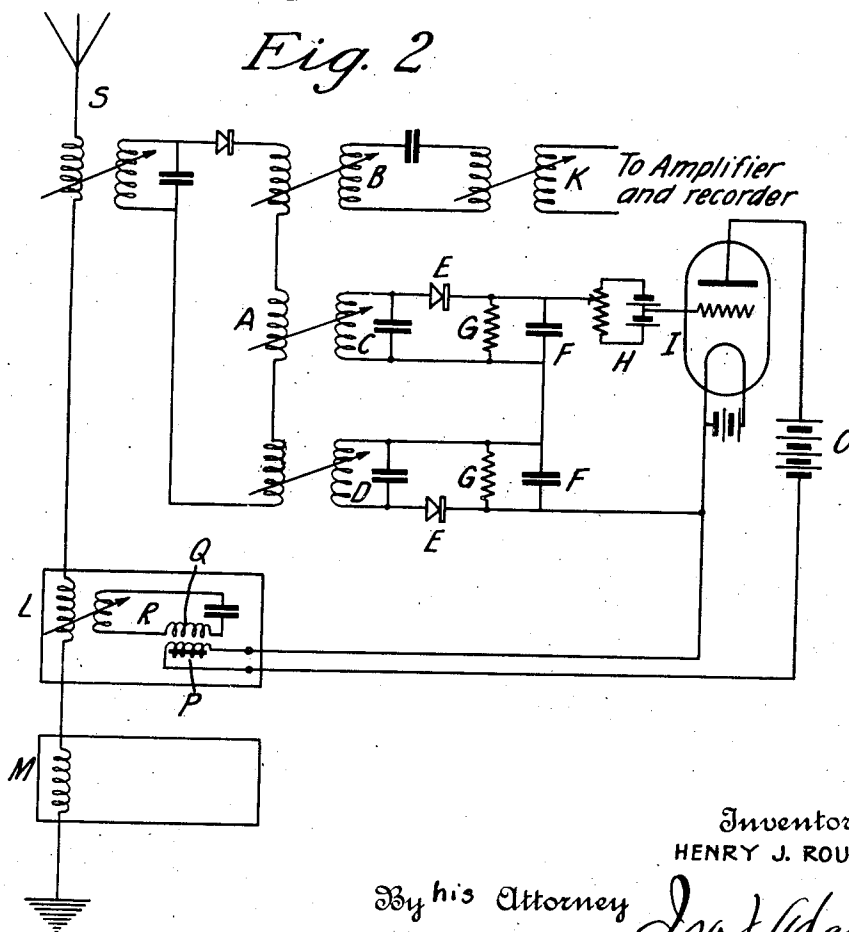
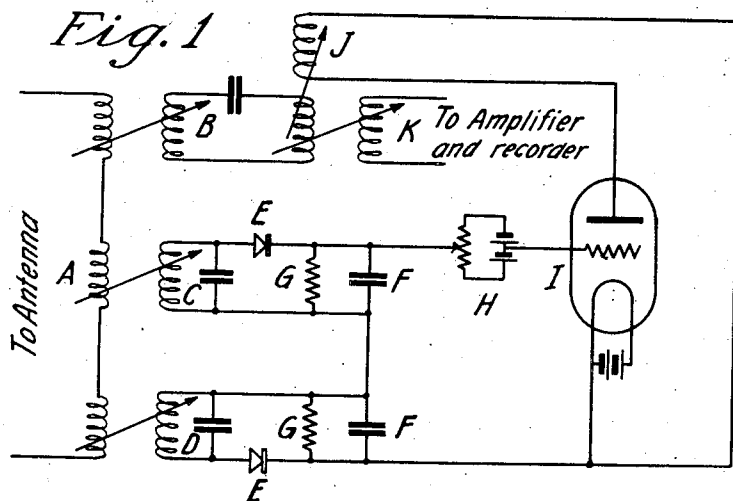
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RADIO SIGNALING SYSTEM

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RADIO SIGNALING SYSTEM.

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This invention relates to improvements in the reception of continuous wave wireless signals.

In some methods now in use in the beat reception of signals it is customary to employ circuits very accurately tuned to the beat note which of course requires great constancy in the length of the transmitted waves. It is, however, very difficult to maintain absolute constancy.

The object of this invention is to provide a method of and means for receiving continuous waves in which even with very accurately tuned circuits reception shall not be impaired by slight variations in the length of the incoming waves.

According to this invention I so arrange the receiving apparatus that when a variation occurs in the length of the incoming waves a corresponding variation is made either in the tune of the receiving circuit which is normally tuned to the normal beat frequency, or else in the frequency of the heterodyne.

With this object I preferably provide two subsidiary oscillatory circuits, one tuned to a frequency slightly greater than the normal beat frequency, and the other to a frequency slightly less than the normal beat frequency, and I apply beat currents to these two circuits which are connected through rectifiers to condensers shunted with resistances. The latter are arranged in series but in such a manner that normally there is no potential difference between the free terminals which are connected to the grid and filament of a valve preferably through an adjusting potentiometer. The alteration of the resistance of this valve when the beat frequency changes is caused to affect either the tune of the receiving circuit or the frequency of the heterodyne. In some cases, however, I may employ only one subsidiary circuit to alter the resistance of the valve.

In cases where the tune of the receiving circuit is to be corrected when the beat frequency varies owing to the slight variation in the frequency of the incoming waves, one of the two subsidiary beat circuits becomes more nearly in tune with the beat frequency which is prevailing at the moment than is the other and consequently the potential of

the grid of the valve is varied and is made to cause the necessary variation in the tune of the main beat circuit which is connected to the receivers so as to maintain it in tune with the prevailing frequency.

In cases where the heterodyne is to be varied so as to give a constant beat note with the signals in spite of variations of frequency of the latter, I preferably employ two heterodynes one of which is constant and the other variable and of different frequency from the first.

Beat currents due to the constant heterodyne and the signals are conveyed to the two oscillatory circuits as before so that when the length of the signal wave varies a differential effect is produced by these circuits and the valve alters the frequency of the variable heterodyne and so is arranged to keep constant the beat note which is due to it and the signals and which is conveyed to the receiving circuit.

Although I have illustrated and described my invention in connection with the usual radio receiving antenna system it is obvious that it can be used equally well in the so called "wired wireless" systems or in connection with any other devices which depend for their operation on the transmission of signals by high frequency waves. The word wireless as herein used is, therefore, to be construed as including these analogous systems as well as the more usual type of radio signaling systems.

My invention is illustrated by the accompanying drawings, Figure 1 of which is a diagrammatic representation of an arrangement whereby the tune of the receiving circuit is corrected while Figure 2 shows an arrangement whereby the frequency of the heterodyne is corrected.

In Figure 1, A is a circuit in which flow beat currents of a frequency N due to the incoming signals and to a heterodyne, B is a circuit accurately tuned to this frequency and coupled to the circuit A. C, D are two circuits also coupled to the circuit A and tuned the one to a frequency $N+n$ and the other to a frequency $N-n$, n being the amount of the variation of the beat frequency from the normal which can occur or for which it is desired to make provision. The circuits C and D are connected through

rectifiers E, E, to condensers F, F, shunted by resistances G, G. These resistances are connected together and the rectifiers are arranged between the free ends of the resistances and the circuits C, D, respectively. The free ends of the resistances also are connected through a potentiometer H to the grid and to the filament of a valve I respectively. In the anode circuit of said valve is an inductance J coupled to an inductance of circuit B which is also coupled to a circuit K leading to an amplifier and recorder.

When the currents in circuit A have the frequency N there is no potential difference between the free ends of the resistances G, G, so that the currents in circuits C, D, have no effect upon the resistance of the valve. The beat currents are therefore transmitted by the circuit B to the amplifier and recorder. Should, however, the frequency of the beat currents in circuit A change it becomes more nearly equal to the tune of C or D. There is therefore set up a potential difference between the free ends of the two resistances. In consequence the resistance of the valve is changed and owing to the action of inductance J the inductance of circuit B will be changed and the circuit will remain in tune with the currents in circuit A.

In the arrangement shown in Figure 2 there are two heterodynes L, M. The normal frequency of L is such as to produce beat currents of a frequency N to which the circuit B is tuned, while the frequency of M is such as to produce with incoming signals of the normal frequency beat currents of a frequency N' and the circuits C, D are tuned to frequencies $N' + n$ and $N' - n$ respectively. In the anode circuit of the valve I are connected a battery O and a coil P having an iron core provided with a second winding Q in the oscillatory circuit R coupled to the aerial S. So long as the frequency of the incoming signals is normal there is no potential difference between circuits C and D and therefore the beat currents due to the incoming signals and heterodyne M have the frequency N' . These currents produce no potential difference between the free ends of the resistances G, G. Should, however, the frequency of the incoming signals vary, the beat currents due to them and M will become more nearly in tune with either C or D. Consequently a potential difference will be set up between the free ends of the resistances. This will change the potential of the grid of the valve and the magnetizing through coil P will change the inductance of winding Q and therefore vary the frequency of heterodyne L to restore the frequency N in circuit A.

Having described my invention, what I claim is:

1. In a wireless receiving system, the com-

bination of a tuned circuit, a second circuit comprising a pair of portions electrically balanced for a certain frequency and unbalanced at nearby frequencies, and a relay co-operating with the second circuit adapted to change the tuning of the first circuit.

2. In a wireless receiving system, the combination of a tuned circuit, a second electrically continuous circuit comprising a pair of oppositely detuned portions and a relay co-operating with said portions, adapted to change the tuning of the first circuit.

3. In a wireless receiving system, the combination of a tuned circuit, a second circuit comprising a pair of oppositely detuned portions electrically balanced for a certain frequency and a vacuum tube cooperating with said portions having its output circuit electrically coupled to the first circuit and adapted to change the tuning thereof.

4. In a wireless receiving system, the combination of a tuned circuit, a second circuit comprising a pair of oppositely detuned portions balanced for a certain frequency and unbalanced for other frequencies, and a vacuum valve having its input circuit connected to said portions so as to respond to said unbalancing and its output circuit electrically coupled to said first mentioned circuit and adapted to change the tuning thereof.

5. In a wireless receiving system, the combination of a tuned circuit, and a second circuit comprising a pair of oppositely detuned oscillation circuits, a rectifier for each of said oscillation circuits, a resistance connected to each of said oscillation circuits, and a valve having its input circuit responsive to the relative potential drops across said resistances and having its output circuit coupled to an inductance of the first mentioned circuit for varying the tuning thereof.

6. In a wireless receiving system, the combination of a tuned circuit, a second circuit comprising a pair of oppositely detuned oscillation circuits, means for rectifying the currents of the last mentioned circuits, a resistance and a capacity in parallel to each of said last mentioned circuits, and a valve having its input circuit connected to said resistances and adapted to respond to their relative potential drops and having its output circuit coupled to an inductance of the first mentioned circuit for varying the tuning thereof.

7. In a wireless receiving system, a receiving circuit and means including a vacuum valve and associated circuits responsive to changes in the carrier frequency, said valve having its output circuit electrically coupled to said first-mentioned circuit whereby an alteration in the carrier wave frequency of the incoming signals is caused to vary the tune of said first-mentioned circuit.

8. In a wireless receiving system, the combination of a tuned receiving circuit, a second receiving circuit comprising a pair of portions electrically balanced for a certain frequency and unbalanced at nearby frequencies and a vacuum relay tube relay cooperating with the second receiving circuit adapted to change the tuning of the first circuit.
9. In a wireless receiving system, the combination of a tuned receiving circuit, a second electrically continuous receiving circuit comprising a pair of oppositely detuned portions and a vacuum tube relay cooperating with said portions, adapted to change the tuning of the first circuit.
10. In a wireless receiving system, the combination of a tuned receiving circuit, a second receiving circuit comprising a pair of oppositely detuned portions electrically balanced for a certain frequency and a vacuum tube cooperating with said portions having its output circuit electrically coupled to the first receiving circuit and adapted to change the tuning thereof.
11. In a wireless receiving system, the combination of a tuned receiving circuit, a second receiving circuit comprising a pair of oppositely detuned portions balanced for a certain frequency and unbalanced for other frequencies, and a vacuum valve having its input circuit connected to said portions so as to respond to said unbalancing and its output circuit electrically coupled to said first mentioned circuit and adapted to change the tuning thereof.
12. In a wireless receiving system, the combination of a tuned receiving circuit, a second receiving circuit comprising a pair of oppositely detuned oscillation circuits, a rectifier and a resistance connected to each of the last mentioned circuits, and a valve having its input circuit responsive to the relative potential drops across said resistances and having its output circuit coupled to an inductance of the first mentioned receiving circuit for varying the tuning thereof.
13. In a wireless receiving system, the combination of a tuned receiving circuit, a second receiving circuit comprising a pair of oppositely detuned oscillation circuits, means for rectifying the currents of the last mentioned circuits, a resistance and a capacity in parallel to each of said last mentioned circuits, and a valve having its input circuit connected to said resistances and adapted to respond to their relative potential drops and having its output circuit coupled to an inductance of the first mentioned receiving circuit for varying the tuning thereof.
14. In a wireless receiving system, the combination of a heterodyne receiving circuit, a receiving circuit normally tuned to the normal beat frequency, a third receiving circuit unresponsive for signals giving the normal beat frequency and responsive to alteration in frequency and means for causing the third circuit to vary the tuning of the beat frequency circuit.
15. In a wireless receiving system, the combination of a heterodyne receiving circuit, a receiving circuit normally tuned to the normal beat frequency, a third receiving circuit comprising a pair of circuits oppositely detuned from said beat frequency, said third circuit being balanced for said beat frequency and responsive to nearby frequencies, and means for causing the third circuit to vary the tuning of the beat frequency circuit in response to alterations of the normal beat frequency.
16. In a wireless receiving system, a receiving circuit and means including a vacuum valve and associated circuits responsive to changes in the carrier frequency, said valve having its output circuit electrically coupled to said first-mentioned circuit whereby an alteration in the carrier wave frequency of the incoming signals is caused to vary the potential of the grid of said valve which controls the tune of the receiving circuit.
17. In a wireless receiving system, the combination of a tuned circuit, two subsidiary oscillatory circuits, means for applying beat currents to these three circuits, a valve, resistances connected to the two subsidiary circuits and between the grid and filament of the valve, and means whereby an alteration in the potential of the grid alters the tune of the first mentioned circuit.
18. The method of receiving continuous waves which consists in applying a heterodyne thereto and causing a variation in the beat currents so produced due to a change in the frequency of the incoming waves to alter the tune of a receiving circuit.
19. The method of receiving continuous wave signals, which consists in applying a heterodyne thereto to produce a beat frequency and causing a change in the frequency of the incoming waves to alter the tuning of the beat frequency circuit.
20. The method of receiving continuous wave signals with a three electrode valve and a beat frequency circuit which consists in heterodyning the signal to produce a beat frequency, causing a change in the frequency of the incoming waves to affect the potential of the grid of the valve whereby the plate currents of the valve are altered and causing the plate currents to react upon the beat frequency circuit to affect its tuning.
21. The method of receiving continuous wave signals with a three electrode valve and a circuit which consists in heterodyning

the signals, causing a variation in the beat currents so produced due to a change in the frequency of the waves to affect the potential of the grid of the valve and causing
5 such alteration in potential to affect the tune of said circuit.

ceiving circuit, means for heterodyning incoming waves and means including a vacuum valve responsive to changes in frequency for
10 changing the tuning of the receiving circuit on a change in frequency of either the incoming waves or the heterodyning means.

22. In a wireless receiving system a re-

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