To all whom it may concern:

Be it known that I, Harold H. Beverage, a citizen of the United States, residing at Riverhead, in the county of Suffolk, State of New York, have invented certain new and useful Improvements in Radioreceiving Systems, of which the following is a specification.

My present invention relates to radio receiving system, and more particularly to a system which permits of the simultaneous reception of a plurality of signals at a single receiving station.

In my prior application, Serial No. 372, filed April 10, 1920, issued June 7, 1921 as Patent No. 1,681,489, I have described and claimed a form of horizontal receiving antenna which is especially adapted for the efficient reception of signals.

The object of my present invention is to provide a method of and means for utilizing an antenna of the form described in my prior application for the simultaneous reception of a plurality of signals of different wave lengths. I have pointed out in the above mentioned application that with a long receiving antenna extending in the general direction of transmission of the signaling waves to be received signaling currents produced in the antenna by waves coming from any particular transmitting station will be strongest at the end of the antenna farthest from the transmitting station, while current produced by waves coming from the opposite direction will be a minimum at that point. The antenna described is preferably aperiodic so that the strength of the signaling currents produced therein is substantially independent of the wave length.

In carrying out my invention, I utilize an antenna of this type and impress from the antenna upon a plurality of receiving circuits which are resonant to the frequencies of the different signaling waves to be received, currents produced in the antenna at a selected point. Each receiving circuit selects the particular signaling wave which it is desired to receive in that circuit without interfering with the selection of the desired waves by any of the other receiving circuits. In order to improve the reception, I also provide means for impressing upon each receiving circuit a current selected from another point in the antenna which will be of the proper intensity and phase to neutralize in each receiving circuit disturbing currents produced therein either by interference from undesired waves or by strays.

The novel features which I believe to be characteristic of my invention are set forth in the appended claims. The invention itself, however, both as to its organization and method of operation, together with further objects and advantages thereof, will best be understood by reference to the following description taken in connection with the accompanying drawings in which Figs. 1 to 4, inclusive, show diagrammatically four different circuit arrangements whereby by my invention may be carried into effect.

As indicated in the drawings, I provide a long horizontal receiving antenna made up of two conductors 1 and 2 which are grounded at the ends 3 and 4. If this antenna is constructed with distributed constants of such value that the current wave therein travels at the same velocity as the ether wave, the current wave in the antenna will gradually build up and become a maximum at the end farthest from the transmitting station. If the velocity of the current wave in the antenna differs somewhat from that of the ether wave, then for a certain distance the waves will add but a point will finally be reached where one wave will be so far in advance of the other that the two will be in phase opposition. Interference will then occur and the current wave will start to decrease. In any case, the antenna should preferably be constructed with such constants that the length at which the current wave becomes maximum will be at least as great as a half wave length of the signaling wave to be received. Currents produced at the end 3 by ether waves traveling from that end to the end 4 will have substantially a zero value at the end 3 and will increase to a maximum value at the end 4. In the same way currents produced by ether waves traveling from the end 4 toward the end 3 will have a minimum value at the end 4 and a maximum value at the end 3. In order to prevent reflection of the current waves flowing in the antenna from the ends, the ground connections may be made through resistances having a value substantially equal to the surge impedance of the antenna. In the present case, I have indicated such a grounding resistance 5 at the end 4 of the antenna.
A similar grounding resistance may be used at both ends of the antenna if desired. In Figs. 1 and 2, I have indicated the receiving station as being located at the end 4 of the antenna. In order to be able to receive at this point currents produced by waves traveling from the end 4 toward the end 3 which consequently are a maximum at the end 3, the antenna conductors may be employed as a transmission line for transmitting signaling currents from the end 3 of the antenna to the receiving apparatus. In order to accomplish this the currents in the antenna conductors flowing toward the end 3 are caused to flow to ground through the primary winding 6 of a transformer, the secondary 7 of which has its terminals connected to conductors 1 and 2 respectively. As a result the signaling currents flowing to ground at 3 produce currents flowing in opposite directions in the conductors 1 and 2. In other words, the conductors 1 and 2 form the two sides of a transmission line which is completed in the arrangement shown in Fig. 1 by means of the two coils 8 and 9 of a goniometer located at the end 4 of the antenna. The point 10 between the two coils of the goniometer being connected to ground at 4 and the mid point of the secondary 7 being connected to ground at 3, substantially no current will be produced in the ground connection 4 by means of the signaling currents conveyed over the transmission line.

Two secondary coils 11 and 12 which are associated with the goniometer coils 8 and 9 are included in two resonant receiving circuits which include inductances 13 and 14 and tuning condensers 15 and 16. While for simplicity I have indicated only two receiving circuits, as many receiving circuits as desired may be employed.

The current produced in the receiving circuits may be impressed upon the two sets of receiving apparatus 17, 18, which may be of any desired form. The distributed inductance and capacity of the antenna do not remain constant, but change more or less with frequency. This may be due to lesser depth of penetration into the earth at higher frequencies. It may also happen that the antenna will be partially unbalanced to signals and strays coming from the side except when the antenna length bears a definite relation to the wave length. If, therefore, the reception of several signals is to be carried on simultaneously, and if these signals differ greatly in wave length, an adjustment of the damping resistance 5 will render the antenna perfectly unidirectional for only the wave length for which the damping resistances is adjusted. While when properly adjusted the antenna has decided unidirectional properties, mathematical analysis indicates and experience shows that at the end farthest from the transmitting station small currents will under some conditions be produced by waves coming from the opposite direction even though the ground resistance is properly adjusted to prevent reflection. For these reasons it is desirable in order to secure the best results to balance out in the receiving circuit undesired currents produced by these different factors. This balancing action is accomplished in the arrangement shown in Fig. 1 by connecting in series with the ground connection at 4 the primary windings of two intensity couplers 19 and 20, the secondary connection at 4 the primary windings of two 80 to phase rotators 23 and 24 respectively, these phase rotators being included in the receiving circuits. The currents flowing to ground at 4 are currents built up on the antenna conductors in parallel by the ether waves traveling from the end 3 toward the end 4. By selecting currents from the ground connection at 4 and regulating the phase and intensity of the currents selected, it is possible to neutralize in the receiving circuits the effect of substantially all currents produced therein by waves coming from a different direction from that of the desired signaling waves.

It will be noted that in the arrangement shown in Fig. 1 the primaries 19 and 20 of the intensity couplers are connected in series with the damping resistance 5 thus making the damping circuit inductive. The inductive reactance can be neutralized by a series condenser for a single wave length but for other wave lengths the damping circuit will be reactive either capacitive or inductive, and the undesired currents which will be reflected from the end 4 of the antenna and impressed upon the receiving sets will be greater than will be the case if the damping circuit were pure resistance.

In the arrangement shown in Fig. 2, this disadvantage is overcome by employing an electron discharge amplifier 25 having its input circuit connected to the resistance and having the primaries 19, 20 of the intensity couplers included in the output circuit. Since the input circuit of this amplifier is pure resistance the damping circuit is also a pure resistance. In the arrangement shown in Fig. 2 also the goniometer coils 8 and 9 are replaced by a single primary winding 26 which is coupled with the individual secondary windings 11 and 12.

The arrangement shown in Fig. 5 differs from that shown in the preceding figure in that the receiving station is located at the end of the antenna farthest from the transmitting station. The desired signaling currents, therefore, which flow through the conductors 1 and 2 in parallel flow to ground through the primary winding 27, which is coupled to the individual secondaries 11 and 130.
12. In this case, the antenna is used as a transmission line for transmitting back to the end 3 of the antenna the currents desired for neutralization purposes. These currents are impressed from the primary winding 26 upon the secondary winding 28, which is included in the input circuit of the amplifier 23. The method of operation to secure neutralization of undesired currents is the same as with the arrangements shown in the preceding figures.

In Fig. 4 I have shown an arrangement of the apparatus whereby the receiving station may be located at a point between the ends of the antenna. In this case, the desired signaling currents which travel from the end 4 of the antenna toward the end 3 are fed back over the antenna as a transmission line to a point where the receiving station is located, and caused to flow through the primary winding 29 which is connected across the two antenna conductors at that point. The currents for neutralization purposes produced by waves traveling from the end 3 toward the end 4 of the antenna are caused to flow through the ground connection at 30, which is made to the mid point 31 of the winding 29. A high inductance choke coil 32 is included in this ground connection and the input circuit of the amplifier 25 is connected to the terminals of this choke coil. In other respects the operation is the same as the operation of the arrangement shown in the preceding figures.

While I have shown and described the preferred embodiments of my invention, it will be apparent that it is by no means limited to the particular circuit arrangements shown as many modifications in the arrangement of the circuits, the location of the receiving apparatus, and the type of apparatus employed may be made without departing from the scope of my invention as set forth in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, located at a point along the length of said antenna, means for impressing upon said receiving circuits currents produced in said antenna at the point where the receiving circuits currents are located and means for impressing upon said receiving circuits currents produced in said antenna at a different point along its length.

2. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, located at a point along the length of said antenna, means for impressing upon said receiving circuits currents produced in said antenna at the point where the receiving circuits currents are located and means for impressing upon said receiving circuits currents produced in said antenna at a different point along its length.

3. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, located at a point along the length of said antenna, means for impressing upon said receiving circuits currents produced in said antenna at the point where the receiving circuits currents are located and means for impressing upon said receiving circuits currents produced in said antenna at a different point along its length.

4. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, located at a point along the length of said antenna, means for impressing upon said receiving circuits currents produced in said antenna at the point where the receiving circuits currents are located and means for utilizing said antenna as a transmission line for transmitting to said receiving circuits currents produced in said antenna at a different point along its length.

5. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, located at a point along the length of said antenna, means for impressing upon said receiving circuits currents produced in said antenna at the point where the receiving circuits currents are located and means for impressing upon said receiving circuits undesired currents produced in said antenna at the point where the receiving circuits are located.

6. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, located at a point along the length of said antenna, means for utilizing said antenna as a transmission line for transmitting to said receiving circuits currents desired signaling currents produced in said antenna at a distant point and means for impressing upon said receiving circuits undesired currents produced in said antenna at the point where the receiving circuits are located.

7. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, located at one end of said antenna and means for impressing upon said receiving circuits currents produced in said antenna at the end where the receiving circuits are located and at a distant point along the length of the antenna.

8. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, located at one end of said antenna and means for impressing upon said receiving circuits undesired currents produced in said antenna.
at the end where the receiving circuits are located, and desired signaling currents produced in said antenna at a distant point along the length of the antenna.

9. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits located at one end of said antenna, means for impressing upon said receiving circuits undesired currents produced in said antenna at the end where the receiving circuits are located and means for utilizing said antenna as a transmission line for transmitting to the receiving circuits desired signaling currents produced in said antenna at a distant point along the length of the antenna.

10. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing desired signaling currents received upon said antenna upon each of said receiving circuits and means for impressing upon each of said receiving circuits currents derived from said antenna and of suitable phase and intensity to neutralize therein the effect of undesired currents received upon said antenna.

11. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing upon said receiving circuits desired signaling currents produced in said antenna at one point and means for impressing upon said receiving circuits currents produced in said antenna at another point and of suitable phase and intensity to neutralize in the receiving circuits the effect of undesired currents received upon said antenna.

12. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits located at a point along the length of the antenna, means for impressing upon said receiving circuits desired signaling currents produced in said antenna at a distant point and means for impressing upon said receiving circuits currents produced in the antenna at the point where the receiving circuits are located and of suitable phase and intensity to neutralize in the receiving circuits the effect of undesired currents received upon said antenna.

13. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits located at one end of the antenna, means for impressing upon said receiving circuits desired signaling currents produced in said antenna at a distant point, and means for impressing upon said receiving circuits currents produced in the antenna at the end where the receiving circuits are located and of suitable phase and intensity to neutralize in the receiving circuits the effect of undesired currents received upon said antenna.

14. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits located at one end of the antenna, means for utilizing said antenna as a transmission line for transmitting to said receiving circuits desired signaling currents produced in said antenna at a distant point, and means for impressing upon said receiving circuits currents produced in the antenna at the end where the receiving circuits are located and of suitable phase and intensity to neutralize in the receiving circuits the effect of undesired currents received upon said antenna.

15. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, and means for impressing upon each of the receiving circuits currents produced in both of the ground connections.

16. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing upon each of the receiving circuits currents produced in the ground connection at one end and means for impressing upon each of the receiving circuits currents produced in the antenna at a point remote from said ground connection.

17. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing upon each of the receiving circuits currents produced in the antenna at a point remote from said ground connection for utilizing said antenna as a transmission line for transmitting to each of the receiving circuits currents produced in the antenna at a point remote from said ground connection.

18. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality or resonant receiving circuits, means for impressing upon each of the receiving circuits currents produced in the ground connection at one end and means for impressing upon each of the receiving circuits currents of adjusted phase and intensity derived from the ground connection at the opposite end.
mission line for transmitting to each of the receiving circuit currents produced in the ground connection at one end and means for impressing upon each of the receiving circuits produced in the ground connection at the opposite end.

20. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing upon each of said receiving circuits desired signaling currents produced in one of said ground connections, and means for impressing upon each of said receiving circuits currents produced in the other ground connections and of suitable phase and intensity to neutralize therein the effect of undesired currents received upon said antenna.

21. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for utilizing said antenna as a transmission line for transmitting to each of said receiving circuits desired signaling currents produced in one of said ground connections, and means for impressing upon each of said receiving circuits currents produced in the other ground connection and of suitable phase and intensity to neutralize therein the effect of undesired currents received upon said antenna.

22. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, a primary winding in which desired signaling currents produced at one point in said antenna are caused to flow, a plurality of secondary windings coupled to said primary winding and associated with the respective receiving circuits, and means for impressing upon each of said receiving circuits undesired currents produced in said antenna at another point.

23. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, a primary winding associated with said antenna in which desired signaling currents produced at one point in said antenna are caused to flow, a plurality of secondary windings coupled to said primary winding and associated with the respective receiving circuits, and an individual primary and secondary winding for impressing upon each of said receiving circuits undesired currents produced in the ground connection at one end of said antenna are caused to flow, a plurality of secondary windings coupled to said primary winding and associated with the respective receiving circuits, and means for impressing upon each of said receiving circuits undesired currents produced in the ground connection at the other end of said antenna.

25. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, a primary winding in which desired signaling currents produced in the ground connection at one end of said antenna are caused to flow, a plurality of secondary windings coupled to said primary winding and associated with the respective receiving circuits, and means for impressing upon each of said receiving circuits undesired currents produced in the ground connection at the other end of said antenna.

26. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, a primary winding associated with said antenna in which desired signaling currents produced at one point in said antenna are caused to flow, a plurality of secondary windings coupled to said primary winding and associated with the respective receiving circuits, an individual primary and secondary winding for impressing upon each of said receiving circuits undesired currents produced in said antenna at another point, and means for adjusting both the phase and intensity of the undesired currents thus impressed upon the receiving circuits.

27. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, a primary winding in which desired signaling currents produced in the ground connection at one end of said antenna are caused to flow, a plurality of secondary windings coupled to said primary winding and associated with the respective receiving circuits, an individual primary and secondary winding for impressing upon each of said receiving circuits undesired currents produced in the ground connection at the other end of said antenna, and means for adjusting both the phase and intensity of the undesired currents thus impressed upon the receiving circuits.

28. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing upon said receiving circuits desired signaling currents produced 130
in said antenna at one point, an electron discharge device having an input circuit associated with said antenna at another point and an output circuit having means associated therewith for impressing upon said receiving circuits currents of a desired phase and intensity.

29. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing upon said receiving circuits desired signaling currents produced in said antenna at one point, an electron discharge device having an input circuit associated with said antenna at another point and an output circuit which includes a plurality of primary windings, a secondary winding associated with each of said primary windings and means for impressing upon each of said receiving circuits from an individual secondary winding a current of a desired phase and intensity.

30. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing upon said receiving circuits desired signaling currents produced in one of the ground connections of said antenna, an electron discharge device having an input circuit upon which currents produced in the other ground connection may be impressed and an output circuit having means associated therewith for impressing upon said receiving circuits currents of a desired phase and intensity.

31. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends, a plurality of resonant receiving circuits, means for impressing upon said receiving circuits desired signaling currents produced in one of the ground connections of said antenna, an electron discharge device having an input circuit upon which currents produced in the other ground connection may be impressed and an output circuit which includes a plurality of primary windings, a secondary winding associated with each of said primary windings, and means for impressing upon each of said receiving circuits from an individual secondary winding a current of a desired phase and intensity.

32. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at at least two points, a plurality of resonant receiving circuits, means for impressing upon each of said receiving circuits desired signaling currents produced in one of said ground connections, and means for impressing upon each of said receiving circuits undesired currents produced in another of said ground connections.

33. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at at least two points, a plurality of resonant receiving circuits, means for impressing upon each of said receiving circuits desired signaling currents produced in at least two points, a plurality of resonant receiving circuits, means for utilizing said antenna as a transmission line for transmitting to each of said receiving circuits desired signaling currents produced in one of said ground connections, and means for impressing upon each of said receiving circuits undesired currents produced in another of said ground connections.

34. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at at least two points, a plurality of resonant receiving circuits, means for impressing upon each of said receiving circuits undesired currents produced in one of said ground connections, and means for impressing upon each of said receiving circuits undesired currents produced in another of said ground connections.

35. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at at least two points, a plurality of resonant receiving circuits located at a point along the length of said antenna adjacent to one of said ground connections, means for impressing upon each of said receiving circuits currents produced in the adjacent ground connection and in one other ground connection.

36. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at at least two points, a plurality of resonant receiving circuits located at a point along the length of said antenna adjacent to one of said ground connections, means for impressing upon each of said receiving circuits undesired currents produced in a distant ground connection, and means for impressing upon each of said receiving circuits undesired currents produced in the adjacent ground connection.

37. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at at least two points, a plurality of resonant receiving circuits located at a point along the length of said antenna adjacent to one of said ground connections, means for impressing upon each of said receiving circuits desired signaling currents produced in a distant ground connection, and an electron discharge device having an input circuit associated with the adjacent ground connection and an output circuit having means associated therewith for impressing upon each of said receiving circuits currents of a desired phase and intensity.

38. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at at least two points, a plurality of resonant receiving circuits located at a point along the length of said antenna adjacent to one of said ground connections, means for impressing upon each of said receiving circuits desired signaling currents produced in a distant ground connection, and an electron discharge device having an input circuit associated with the adjacent ground connection and an output circuit having means associated therewith for impressing upon each of said receiving circuits currents of a desired phase and intensity.
said ground connections, means for impressing upon each of said receiving circuits desired signaling currents produced in a distant ground connection, an electron discharge device having an input circuit associated with the adjacent ground connection and an output circuit which includes a plurality of primary windings, a secondary winding associated with each of said primary windings, and means for impressing upon each of said receiving circuits from an individual secondary winding a current of a desired phase and intensity.

39. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends and which has distributed constants of such value that electric waves produced therein by desired signaling waves will be propagated along its length at such a velocity that increments of current produced in the antenna at points along its length by desired signaling waves in the ether will add to the current flowing therein through a distance which is at least equal to a half wave length of the desired signaling wave, and a plurality of receiving circuits associated therewith which are resonant to the frequencies of a plurality of signaling waves which it is desired to receive.

40. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends and which has distributed constants of such value that electric waves produced therein by desired signaling waves will be propagated along its length at such a velocity that increments of current produced in the antenna at points along its length by desired signaling waves in the ether will add to the current flowing therein through a distance which is at least equal to a half wave length of the desired signaling wave, and a plurality of receiving circuits associated therewith which are resonant to the frequencies of a plurality of signaling waves which it is desired to receive, means for impressing upon each of said receiving circuits desired signaling currents produced in one of said ground connections, and means for impressing upon each of said receiving circuits produced in the other ground connection and of suitable phase and intensity to neutralize therein the effect of undesired currents received upon said antenna.

43. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends and which has distributed constants of such value that electric waves produced therein by desired signaling means will be propagated along its length at such a velocity that increments of current produced in the antenna at points along its length by desired signaling waves in the ether will add to the current flowing therein through a distance which is at least equal to a half wave length of the desired signaling wave, a plurality of receiving circuits associated therewith which are resonant to the frequencies of a plurality of signaling waves which it is desired to receive, a primary winding in which desired signaling currents produced in the ground connection at one end of said antenna are caused to flow, a plurality of secondary windings coupled to said primary winding and associated with the respective receiving circuits and means for impressing upon each of said receiving circuits undesired currents produced in the ground connection at the other end of said antenna.

44. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends and which has distributed constants of such value that electric waves produced therein...
by desired signaling waves will be propagated along its length at such a velocity that increments of currents produced in the antenna at points along its length by desired signaling waves in the ether will add to the current flowing therein through a distance which is at least equal to a half wave length of the desired signaling wave, a plurality of receiving circuits associated therewith which are resonant to the frequencies of a plurality of signaling waves which it is desired to receive, means for impressing upon said receiving circuits desired signaling currents produced in said antenna at one point, an electron discharge device having an input circuit associated with said antenna at another point and an output circuit having means associated therewith for impressing upon said receiving circuits currents of a desired phase and intensity.

45. A receiving system for radio signals comprising an aperiodic horizontal receiving antenna which is grounded at both ends and has distributed constants of such value that electric waves produced therein by desired signaling waves will be propagated along its length at such a velocity that increments of currents produced in the antenna at points along its length by desired signaling waves in the ether will add to the current flowing therein through a distance which is at least equal to a half wave length of the desired signaling wave, a plurality of receiving circuits associated therewith which are resonant to the frequencies of a plurality of signaling waves which it is desired to receive, and which are located at a point along the length of said antenna adjacent to one of said ground connections, means for impressing upon each of said receiving circuits desired signaling currents produced in a distant ground connection, an electron discharge device having an input circuit associated with the adjacent ground connection and an output circuit which includes a plurality of primary windings, a secondary winding associated with each of said primary windings, and means for impressing upon each of said receiving circuits from an individual secondary winding a current of a desired phase and intensity.

46. The method of operating a radio receiving system comprising a horizontal aperiodic receiving antenna which is grounded at both ends and a plurality of receiving sets which consist in impressing upon said receiving sets currents produced in said antenna at a single selected point by a plurality of desired signaling waves of different frequencies.

47. The method of operating a radio receiving system comprising a horizontal aperiodic receiving antenna which is grounded at both ends and a plurality of receiving sets which consist in impressing upon said receiving sets currents produced in one of the ground connections of said antenna by a plurality of desired signaling waves of different frequencies.

48. The method of operating a radio receiving system comprising a horizontal aperiodic receiving antenna which is grounded at both ends and a plurality of receiving sets which consists in impressing upon said receiving sets currents produced in said antenna, at a single selected point and neutralizing the effect in each receiving set of undesired currents therein by impressing thereon currents of equal intensity and opposite phase derived from a different selected point in said antenna.

49. The method of operating a radio receiving system comprising a horizontal aperiodic receiving antenna which is grounded at both ends and a plurality of receiving sets which consists in impressing upon said receiving sets currents produced in one of the ground connections of said antenna by a plurality of desired signaling waves of different frequencies and neutralizing the effect in each receiving set of undesired currents therein by impressing thereon currents of equal intensity and opposite phase derived from the other ground connection.

50. The method of operating a radio receiving system comprising a horizontal aperiodic receiving antenna which is grounded at both ends and a plurality of receiving sets which consists in impressing upon said receiving sets currents produced in said antenna at a single selected point by a plurality of desired signaling waves of different frequencies, and impressing upon each receiving set currents derived from another selected point in said antenna.

51. The method of operating a radio receiving system comprising a horizontal aperiodic receiving antenna which is grounded at both ends and a plurality of receiving sets which consists in impressing upon said receiving sets currents produced in one of the ground connections of said antenna by a plurality of desired signaling waves of different frequencies, and impressing upon each receiving set currents derived from the other ground connections.

52. The method of operating a radio receiving system comprising a horizontal aperiodic receiving antenna which is grounded at both ends and a plurality of receiving sets which consists in impressing upon said receiving sets currents produced in said antenna at a single selected point by a plurality of desired signaling waves of different frequencies, impressing upon each receiving set currents derived from another selected point in said antenna, and separately adjusting both the phase and intensity of the last mentioned currents.
53. The method of operating a radio receiving system comprising a horizontal aperiodic receiving antenna which is grounded at both ends and a plurality of receiving sets which consists in impressing upon said receiving sets currents produced in one of the ground connections of said antenna by a plurality of desired signaling waves of different frequencies, impressing upon each receiving set currents derived from the other 10 ground connection, and separately adjusting both the phase and intensity of the last mentioned currents.

In witness whereof, I have hereunto set my hand this 29th day of April, 1921.

HAROLD H. BEVERAGE.

Certificate of Correction.

It is hereby certified that in Letters Patent No. 1,434,985, granted November 7, 1922, upon the application of Harold H. Beverage, of Riverhead, New York, for an improvement in "Radioreceiving Systems," errors appear in the printed specification requiring correction as follows: Page 1, line 10, for the word "system" read systems; page 2, strike out present line 80 and insert instead windings 21 and 22 of which are connected; page 4, line 118, claim 18, for the word "or" read of; page 5, line 5, claim 19, before the word "produced" insert the word currents; same page, line 16, claim 20, and page 8, line 117, claim 51, for the word "connections" read connection; page 8, line 3, claim 44, and line 28, claim 45, for the word "currents" read current; same page, line 56, claim 46, for the word "consist" read consists; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 9th day of January, A. D., 1923.

[SEAL.]  
KARL FENNING,  
Acting Commissioner of Patents.