No. 860,051. PATENTED JULY 16, 1907.

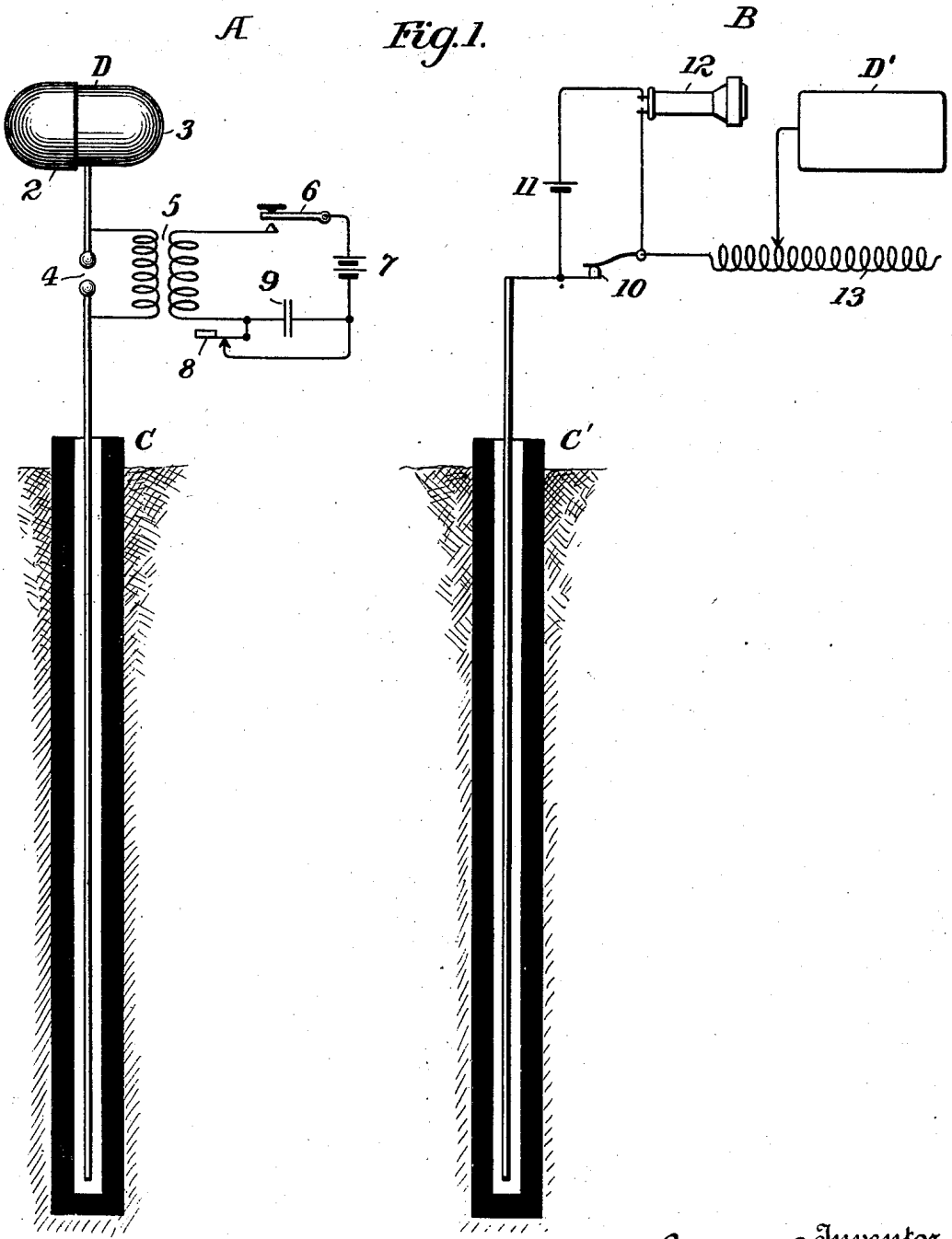
J. MURGAS.

CONSTRUCTING ANTENNÆ OF WIRELESS TELEGRAPHY.

APPLICATION FILED FEB. 17, 1906.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

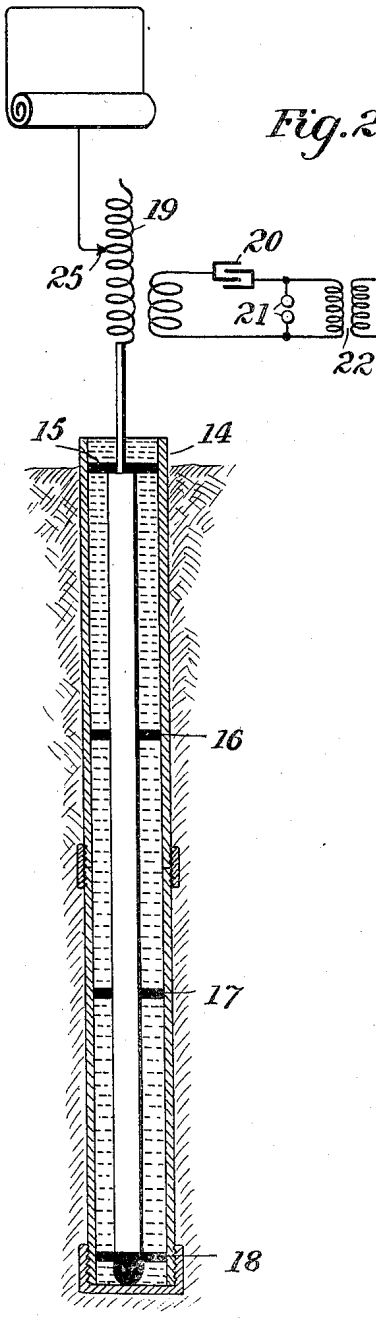
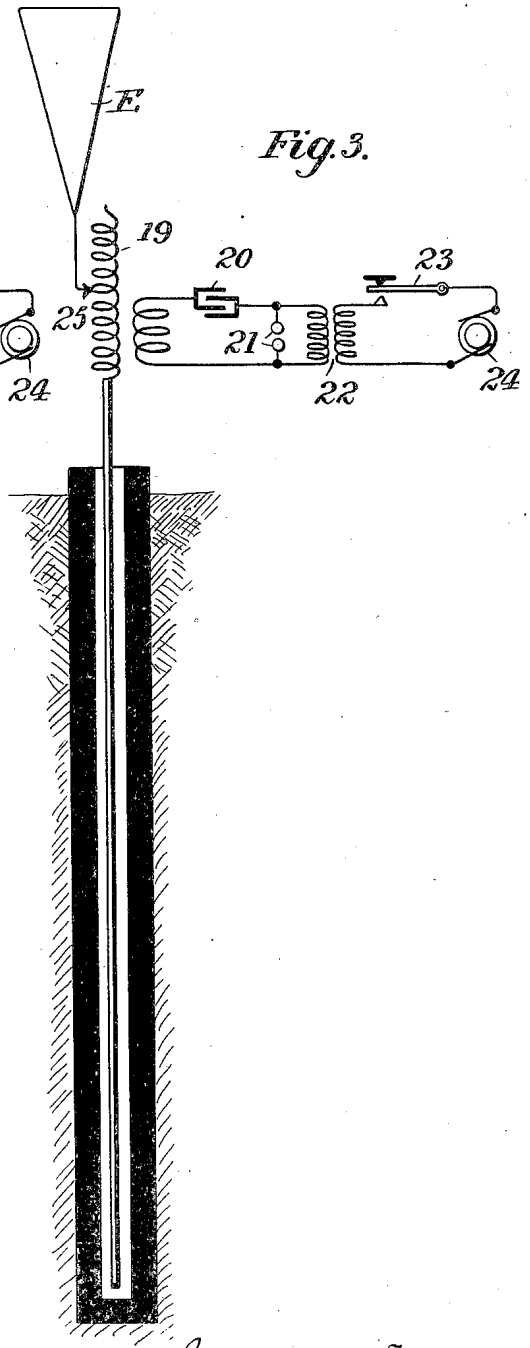


Fig. 3.



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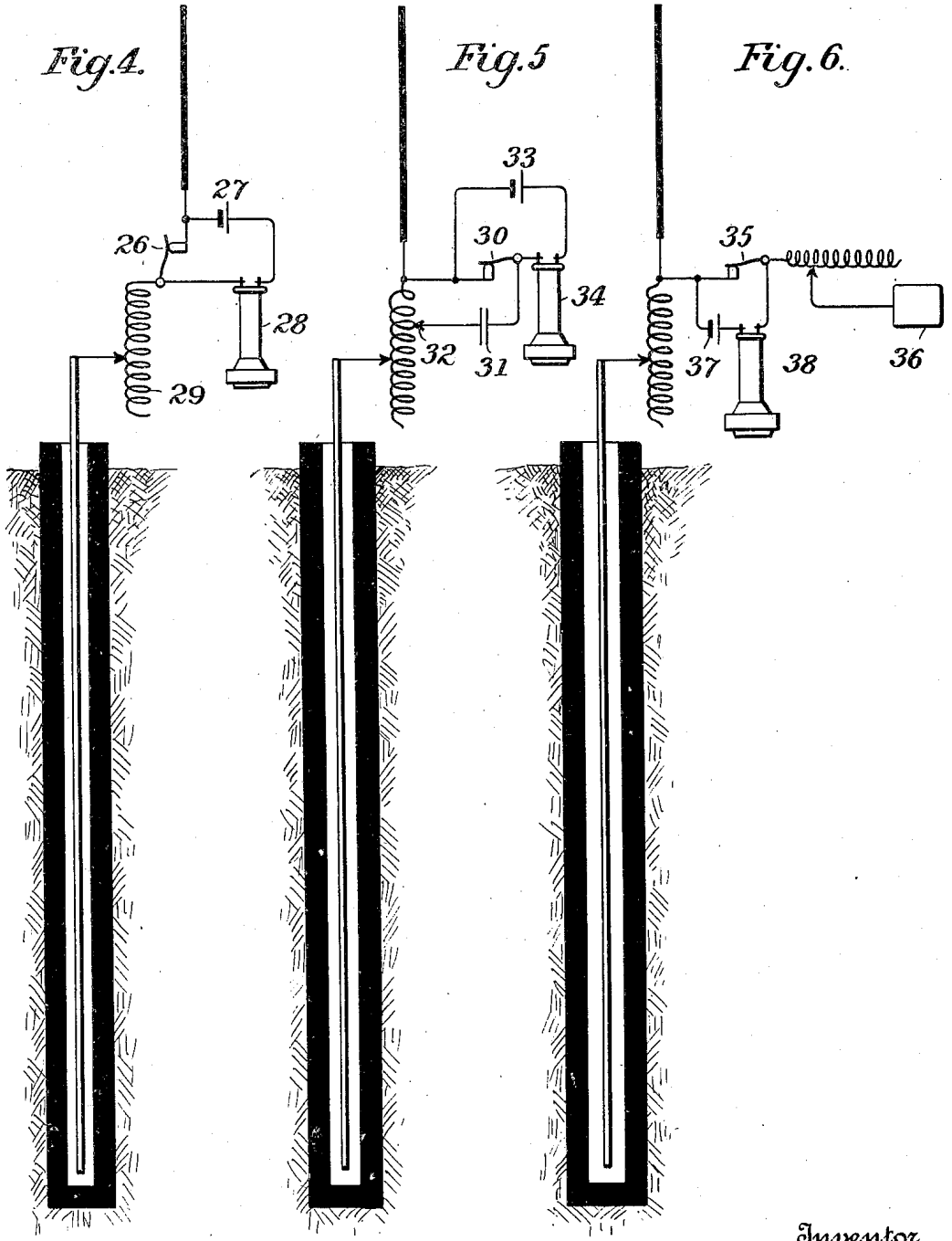
3 SHEETS—SHEET 3.



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CONSTRUCTING ANTENNÆ OF WIRELESS TELEGRAPHY.

No. 860,051. Specification of Letters Patent. Patented July 16, 1907.

Application filed February 17, 1906. Serial No. 301,646.

To all whom it may concern:

Be it known that I, JOSEPH MURGAS, a citizen of the United States, residing at Wilkes-Barre, in the county of Luzerne and State of Pennsylvania, have invented certain new and useful Improvements in Constructing Antennæ of Wireless Telegraphy, of which the following is a specification.

This invention relates to the wireless transmission of intelligence.

The object of the invention is to provide means whereby the oscillatory impulses are more vigorously propagated and more distinctly received than heretofore and whereby earth currents, unless distinctly of an oscillatory character, have no influence upon the receiving apparatus.

Other objects will appear hereinafter.

It has heretofore been the practice to connect the apparatus at a wireless station to the earth upon one side and upon the other side to an aerial antenna or antennæ.

According to the present invention, the station apparatus is not connected to the ground at all. At that point on one side of the apparatus at which the earth connection is usually made, I connect an antenna of a length equal to that of the aerial antenna heretofore used, the length of which is found by well known rules. On the other side of the station apparatus I connect a capacity at the point where the aerial antenna is usually connected.

It will now be observed that my invention involves an inversion of the usual construction. Instead of being aerial, my antennæ extends into the earth while the capacity connected upon the other side of the station apparatus corresponds to the capacity usually obtained by an earth connection.

Any transmitting or receiving apparatus which can be employed in connection with the usual aerial antenna can be made use of in connection with the present invention but I prefer to employ certain forms as will be hereinafter set forth.

I am aware that so called "artificial grounds" have been employed in which the station apparatus has been connected with a plate which was insulated from the earth but these plates were in no sense antennæ and therefore differ from the present apparatus in which the member which extends into the earth and is insulated therefrom is an antenna, being analogous to the usual aerial antennæ.

In the accompanying drawings which illustrate the invention Figure 1 is a diagram showing a system having receiving and transmitting stations embodying the invention; Fig. 2 is a diagram showing a transmitting apparatus with a modified construction of the ground antenna and also modified constructions of other parts; Fig. 3 is a diagram showing a transmitting station having a similar arrangement of circuits to that shown in Fig. 2, but with an aerial antenna substituted for the concentrated capacity shown in the previous figures as connected upon the opposite side of each station apparatus from the ground antenna; and Figs. 4, 5 and 6 different arrangements of receiving apparatus.

Referring to the drawings, each system of transmission comprises a transmitting station A and a receiving station B. The apparatus at each station, either transmitting or receiving, comprises upon one side an antenna C and upon the other side a capacity D.

In the apparatus of the transmitting station of Fig. 1, a tube of insulating material, it may be bituminized fiber conduit, having its lower end closed is sunk in the earth. Within this tube extends the ground antenna C of suitable length. The capacity D consists of two telescoping cylinders 2 and 3 whereby the capacity is rendered adjustable so that the vertical element may be attuned as is well understood. A spark gap 4 is interposed between the capacity D and the antenna C. A well known form of oscillator is connected across the spark gap and comprises the transformer 5 having its secondary connected across the spark gap and its primary connected in circuit with a sending key 6 a source of electricity as a battery 7, and an interrupter 8. To reduce sparking a condenser 9 may be connected across the interrupter.

The construction of the ground antenna C′ of the receiving station is the same as that described with reference to the transmitting station and is connected upon one side of the receiving apparatus, the capacity D′ being connected on the other side. Between the antenna and capacity is connected a suitable wave detecting means comprising a suitable imperfect contact 10 about which are connected a battery 11 and a telephone receiver 12. The capacity is not in this case, shown as adjustable and to provide means for attuning the vertical element, an adjustable inductance 13 may be connected between the capacity and antenna. The operation of the detecting means will be understood without further explanation.

The manner of transmitting intelligence being analogous to that of the well known aerial transmission, it need not be described further.

In Fig. 2, the capacity for the vertical element is adjustable being a suitably supported sheet of conducting material, the capacity being varied by rolling up or unrolling the sheet. The construction in relation to the antenna is also varied somewhat. Instead of an insulating tube being sunk in the earth and the antenna extended therein, a metal tube 14 is placed in the earth and the antenna is supported therein by means of insulating supports 15, 16, 17 and 18 and the moisture is excluded and the insulation rendered more secure by filling the tube about the antenna with oil. Between the capacity and antenna is connected a

suitable oscillator which is shown as comprising a transformer 19 having its secondary connected in the vertical element and its primary connected in circuit with a condenser 20, a spark gap 21 and the secondary of a transformer 22, the primary of the transformer 22 being connected in circuit with a sending key 23 and an alternating current source 24. This oscillator is well understood. The secondary of the transformer 19 is extended as shown to form an inductance more or less of which may be included in the vertical element by the sliding contact 25. In this case the vertical element may be attuned by varying its inductance or capacity.

In Fig. 3 is shown the apparatus for a transmitting station in which the arrangement and construction is the same as in Fig. 2, except that an insulated aerial antenna E, in this case shown as multiple, is substituted for the concentrated capacity of the vertical element of the previous figures and the antenna is constructed as in Fig. 1.

In Fig. 4 are shown aerial and ground antennæ as in the last preceding figure, except that the aerial is single, an imperfect contact being connected to the vertical element, and about the imperfect contact a battery 27 and telephone receiver 28 are connected. An adjustable inductance 29 is connected between the antennæ for purposes as described in connection with the receiving apparatus of Fig. 1.

In Fig. 5, the vertical element is as in the last preceding figure except that the period of the circuit of the detecting means can be varied independently of that of the vertical element. The imperfect contact 30 is connected across a variable portion of the inductance of the vertical element in series with a condenser 31 by means of a sliding contact 32. Across the imperfect contact a battery 33 and telephone receiver 34 are connected in series.

In Fig. 6 is shown what may be termed an "open circuit" receiving apparatus. The vertical element is the same as in the last figure but instead of the detecting means being connected across the inductance of the vertical element, one terminal of the imperfect contact 35 is connected with the vertical element and the other terminal is connected with a capacity 36 which is not otherwise conductively connected. Across the imperfect contact a battery 37 and telephone receiver 38 are connected. An adjustable inductance 39 may be connected in the detecting circuit to provide means for adjusting the period of that circuit.

While the invention has been illustrated in what are believed to be its best embodiments, it may be embodied in other structures than those shown and is not therefore limited thereto.

Without limiting myself to the precise construction and arrangement shown, what I claim as new and desire to secure by Letters Patent, is

1. A wireless telegraph station comprising a wave apparatus, and an antenna connected to the wave apparatus between the apparatus and the earth extending into the earth and insulated from the latter.

2. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, and a capacity upon the other side of the apparatus.

3. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter and an aerial antenna upon the other side of the apparatus.

4. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, a capacity upon the other side of the apparatus and an inductance connected between said antenna and capacity.

5. Wireless station apparatus comprising an antenna extending into the earth and insulated therefrom, an aerial antenna upon the other side of the apparatus and an inductance connected between said antennæ.

6. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, a capacity upon the other side of the apparatus and an adjustable inductance connected between said antenna and capacity.

7. Wireless station apparatus comprising an antenna extending into the earth and insulated therefrom, an aerial antenna upon the other side of the apparatus and an adjustable inductance connected between said antennæ.

8. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, a capacity upon the other side of the apparatus, detecting means having one terminal connected with said antenna and a capacity connected with the other terminal of said detecting means.

9. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, an aerial antenna upon the other side of the apparatus, detecting means having one terminal connected with said antennæ and a capacity connected with the other terminal of said detecting means.

10. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, a capacity upon the other side of the apparatus, detecting means having one terminal connected with said antenna, a capacity connected with the other terminal of said detecting means, and an inductance connected between said antenna and the first mentioned capacity.

11. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, an aerial antenna upon the other side of the apparatus, detecting means having one terminal connected with said antennæ, a capacity connected with the other terminal of said detecting means, and an inductance connected between said antennæ.

12. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the ground and insulated from the latter, a capacity upon the other side of the apparatus, detecting means having one terminal connected with said antenna, a second capacity connected with the other terminal of said detecting means and an inductance connected between said detecting means and said second capacity.

13. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the ground and insulated from the latter, a capacity upon the other side of the apparatus, detecting means having one terminal connected with said antenna, a second capacity connected with the other terminal of said detecting means and an adjustable inductance connected between said detecting means and said second capacity.

14. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, an aerial antenna upon the other side of the apparatus, detecting means having one terminal connected with said antennæ, a second capacity connected with the other terminal of said detecting means and an inductance connected between said detecting means and said second capacity.

15. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, an aerial antenna upon the other side of the apparatus, detecting means having one terminal connected with said antennæ, a second capacity connected with the other terminal of said detecting means and an adjustable inductance connected between said detecting means and said second capacity.

16. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, a capacity upon the other side of the apparatus, detecting means having one terminal connected with said antenna, a second capacity connected with the other terminal of said detecting means, an inductance connected between said antenna and the first mentioned capacity and a second inductance connected between said detecting means and said second capacity.

17. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, a capacity upon the other side of the apparatus, detecting means having one terminal connected with said antenna, a second capacity connected with the other terminal of said detecting means, and adjustable inductance connected between said antenna and the first mentioned capacity and a second adjustable inductance connected between said detecting means and said second capacity.

18. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, an aerial antenna upon the other side of the apparatus, detecting means having one terminal connected with said antennæ, a capacity connected with the other terminal of said detecting means, an inductance connected between said antennæ and a second inductance connected between said capacity and detecting means.

19. Wireless station apparatus comprising an antenna upon one side of the apparatus extending into the earth and insulated from the latter, an aerial antenna upon the other side of the apparatus, detecting means having one terminal connected with said antennæ, a capacity connected with the other terminal of said detecting means, an adjustable inductance connected between said antennæ and a second adjustable inductance connected between said capacity and detecting means.

20. In a system for the wireless transmission of intelligence, the combination with sending apparatus, of a wave receiving apparatus, and an antenna connected to the wave apparatus between the apparatus and the earth, extending into the earth and insulated from the latter.

21. In a system for the wireless transmission of intelligence, the combination with sending apparatus of receiving apparatus, each of said apparatus comprising an antenna upon one side of the apparatus extending into the ground and insulated from the latter and a capacity upon the other side of the apparatus.

22. In a system for the wireless transmission of intelligence, the combination with sending apparatus of receiving apparatus, each of said apparatus comprising an antenna upon one side of the apparatus extending into the ground and insulated from the latter, a capacity upon the other side of the apparatus, and an inductance connected between said antenna and said capacity.

23. In a system for the wireless transmission of intelligence, the combination with sending apparatus of receiving apparatus, each of said apparatus comprising an antenna upon one side of the apparatus extending into the ground and insulated from the latter, a capacity upon the other side of the apparatus, and an adjustable inductance connected between said antenna and said capacity.

24. In a system for the wireless transmission of intelligence, the combination with sending apparatus of receiving apparatus, each of said apparatus comprising an aerial antenna on one side of the apparatus and antenna on the other side of the apparatus extending into and insulated from the ground.

25. In a system for the wireless transmission of intelligence, the combination with sending apparatus of receiving apparatus, each of said apparatus comprising an aerial insulated antenna on one side of the apparatus combined with antenna on the other side of the apparatus extending into and insulated from the ground.

In testimony whereof I affix my signature in presence of two witnesses.

JOSEPH MURGAS.

Witnesses:
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K. E. FERRY.