R. A. FESSENDEN.

SIGNALING BY ELECTROMAGNETIC WAVES.

APPLICATION FILED MAY 4, 1906.

928,371. Patented July 20, 1909.

FIG. 1.

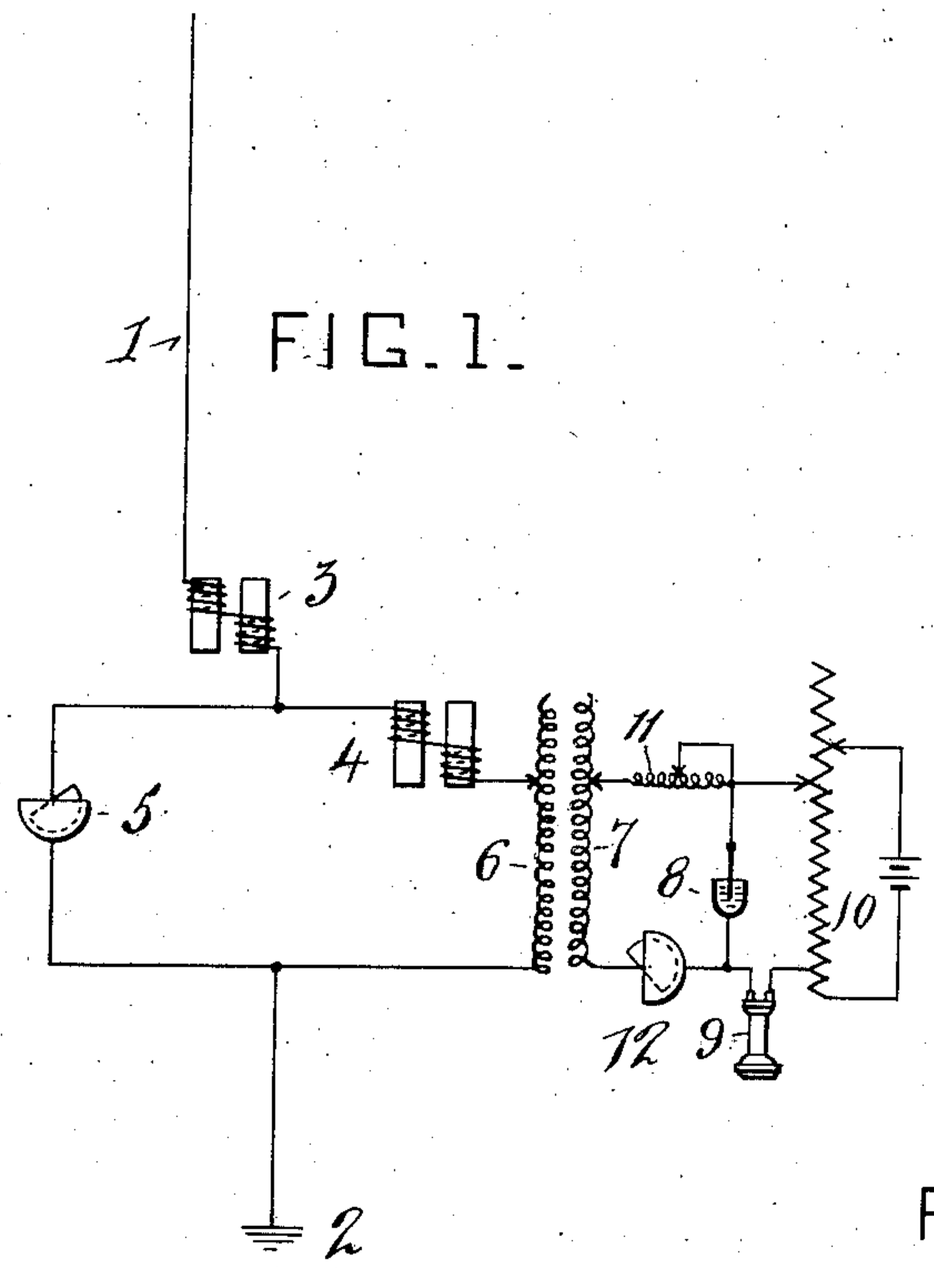


FIG. 2.

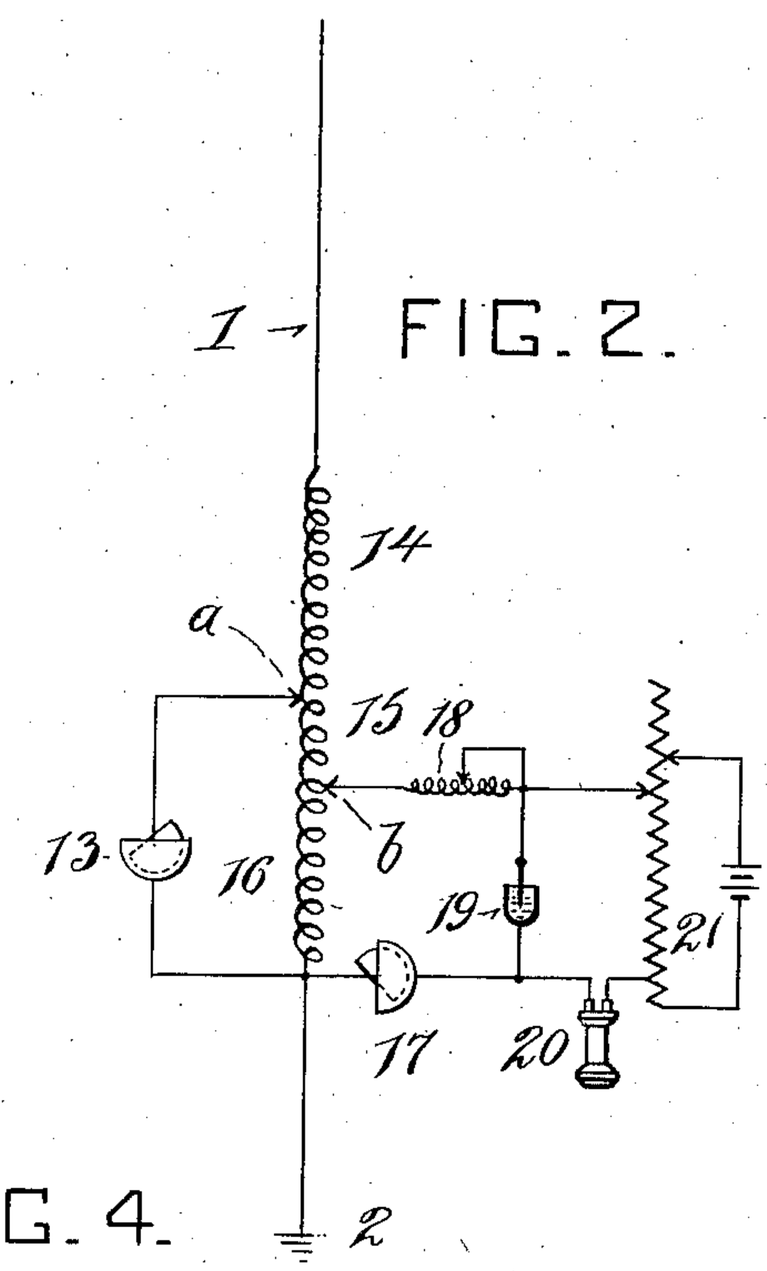


FIG. 3.

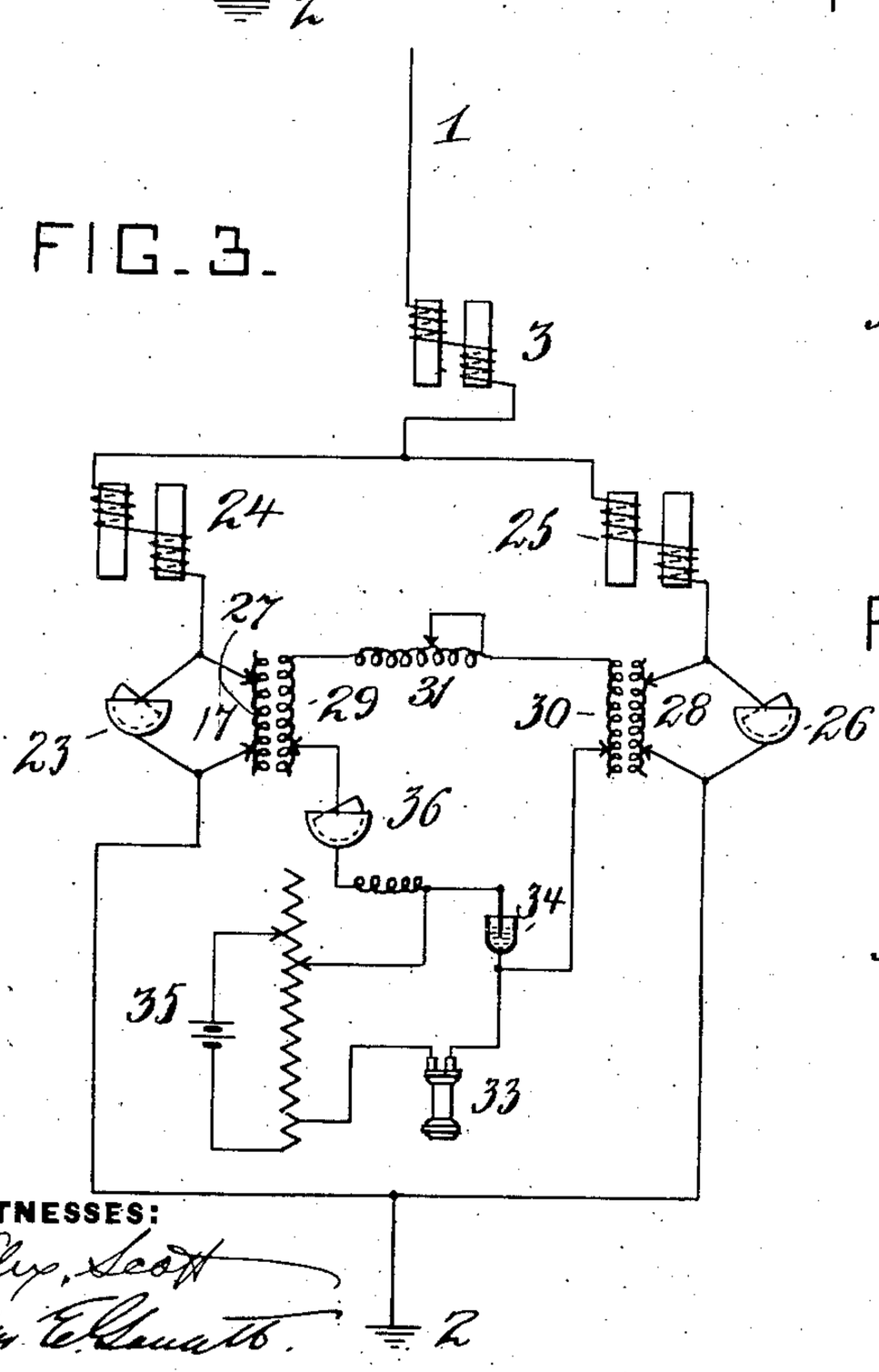


FIG. 4.

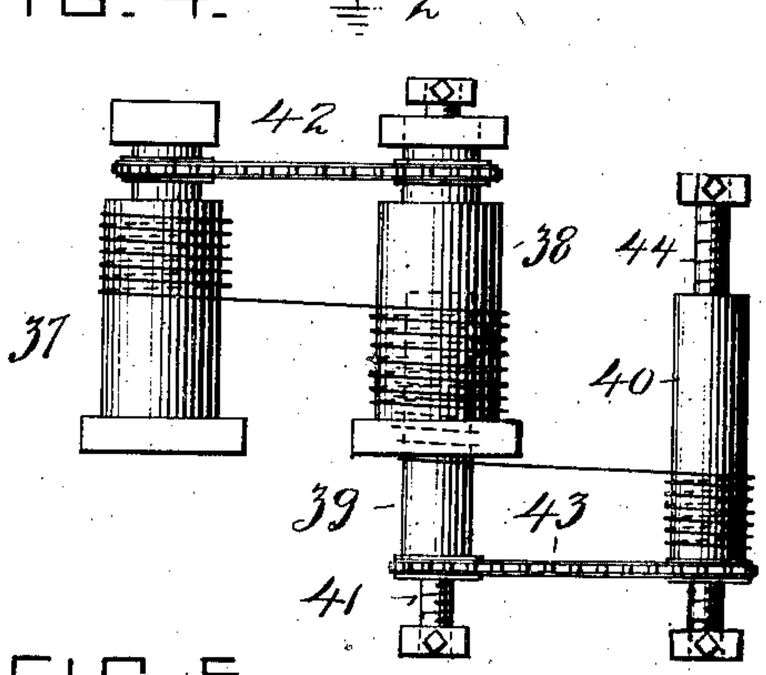
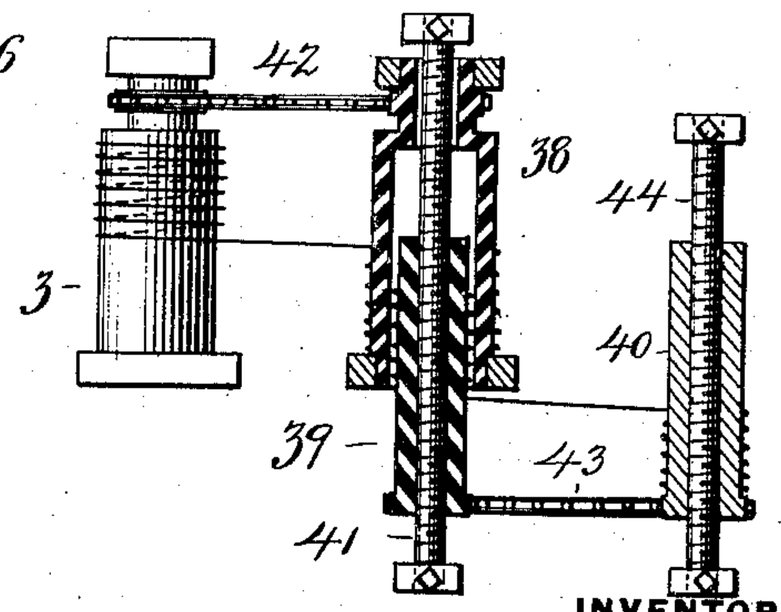


FIG. 5.



WITNESSES:

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SIGNALING BY ELECTROMAGNETIC WAVES.

No. 928,371. Specification of Letters Patent. Patented July 20, 1909.

Application filed May 4, 1906. Serial No. 315,266.

To all whom it may concern:

Be it known that I, REGINALD A. FESSENDEN, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Signaling by Electromagnetic Waves, of which the following is a specification.

My invention herein relates generally to wireless telegraphy, and more especially to provision for tuning the circuits in apparatus for this purpose, as hereinafter more fully described.

In the accompanying drawing forming a part of this specification, Figures 1, 2 and 3 illustrate diagrammatically different combinations of elements of my improved apparatus, and Figs. 4 and 5 show in plan and section a variable transformer.

In the practice of my invention, I provide a capacity and inductance in shunt to each other and in operative relation to the aerial, and a receiver in operative relation to the condenser and inductance circuit.

The aerial 1 is grounded as at 2, and has a variable inductance 3 in series therewith. The aerial Fig. 1 is also connected to inductances 4 and 6, in shunt to a condenser 5. The inductance 4 is preferably variable and the inductance 6 forms the primary of a transformer having a secondary 7. Both 6 and 7 are preferably constructed so as to be capable of adjustment, as illustrated in Fig. 4. A receiver 8, telephone 9, potentiometer 10, inductance 11 and condenser 12 are arranged in the circuit of the secondary 7. The condensers 5 and 12 are preferably adjustable, as is also the inductance 11. The aerial is preferably tuned to the frequency of oscillations which it is desired to receive, and also the shunt circuit 4, 5 and 6, either alone or in conjunction with the secondary circuit 7, 12, 8 and 11. The circuit 7, 12, 8 and 11 is also preferably tuned to the frequency which it is desired to receive.

In the construction shown in Fig. 2, the aerial 1, which is grounded as at 2, is connected in series with the inductance 14. The inductances 15 and 16, which are preferably adjustable, are shunted by the variable condenser 13. The receiver 19 is connected across the inductance 16. The circuit of the receiver 19 includes a variable inductance 18, an adjustable capacity 17, telephone 20, and potentiometer 21. Contact points *a* and *b* are adjustable.

The construction shown in Fig. 3 is especially applicable for use for the prevention of interference. The aerial 1 is grounded as at 2 and is connected to the variable inductances 3, 24 and 25. The aerial is also connected to inductances 27 and 28, which are arranged in shunt to the capacities or condensers 23 and 26. The inductances 27 and 28 form primaries whose secondaries are shown at 29 and 30. In the circuit with these secondaries are included the variable inductance 31, adjustable capacity 36, receiver 34, potentiometer 35 and telephone or other indicating instrument 33. The transformers have preferably a variable ratio of turns, the construction shown in Fig. 4 being conveniently used. The receiving system, with the exception of the circuit 1, 3, 25, 26, 28 and 2, is preferably tuned to the frequency which it is desired to receive, while this circuit is preferably adjusted empirically so as to cut out interference without weakening the received signals. Where, however, the sending station emits waves of two frequencies, the one circuit 1, 3, 24, 23, 27, and 2 is preferably adjusted to one frequency, and the circuit 1, 3, 25, 26, 28 and 2 to the other frequency.

The variable transformer shown in Figs. 4 and 5 consists of two pairs of drums 37, 38, and 39, 40, of which the drums 37 and 40 are preferably formed of metal or other conducting material, and are mounted in suitable bearings so as to be capable of rotation, while the drums 38 and 39 are formed of insulating material, the drum 39 being rotatable within the drum 38 and adjustable in and out of the same by means of the threaded rod 41 passing through drum or cylinder 39. The drums 37 and 38 are made of the same diameter and are adapted to be driven simultaneously by suitable connection, as, for example, the sprocket chain 42, shown. The drums 39 and 40 are also of the same diameter and are connected by a sprocket chain 43 or other suitable means. The drum or cylinder 40 is also adjustable longitudinally by means of a screw 44. A portion of a length of wire is wound on the drum 37, and another portion on the drum 38, and by rotating these drums the wire can be wound off of one and on to the other, and vice versa. A length of wire

is wound partially on the drum 39 and partially on the drum 40, and by rotating these drums the wire can be wound off of one and on to the other. It will be observed that as the wire is wound off or on the drum 39, it is moved axially out of and into the drum 38, and that the coils on the drums 38 and 39 will form the members of a transformer which can be varied by rotating these drums in the manner stated.

I am aware that the use of a shunt resonant circuit for producing selectivity in electro-magnetic apparatus is old. I am also aware that the use of a secondary operatively connected to an inductance in parallel with a condenser is old, where the short circuited coil of a short circuited dynamometer operates as a secondary. And I am also aware that this arrangement has been used in connection with an untuned aerial.

The interference preventer may be used with four branch circuits, with a sending station emitting two frequencies in this case, two of the branches are preferably tuned to the two frequencies which it is desired to receive, and the other branches are used as balancing branches to cut out interfering signals.

I claim herein as my invention:

1. In a receiving system for wireless telegraphy, an inductive connection with variable primary, a condenser, a detector for electromagnetic waves connected with the secondary of the inductive connection through said condenser, a condenser shunted with the primary, a variable inductance, an antenna connected with the primary through said inductance and connected with the ground.

2. In a receiving system for wireless telegraphy an inductive connection with variable primary, a receiving instrument for electric waves connected with the secondary of the inductive connection, a variable condenser connected with the primary to form a loop of low resistance for electric oscillations, an antenna, connections from said loop to the antenna and to the ground.

3. In a system for wireless telegraphy an inductive connection having a variable primary, a detector for electromagnetic waves in circuit with the secondary of said inductive connection, an antenna in circuit with the primary of said inductive connection through a variable inductance, and a condenser shunted about the variable primary.

4. In a receiving system for wireless telegraphy a circuit including a condenser and a detector for electromagnetic waves, a circuit including an elevated conductor and a variable inductance, and an inductive connection between said circuits having a primary, variable as to the number of its turns, in series with the variable inductance and elevated conductor.

5. In a receiving system for wireless telegraphy a circuit including a condenser and a detector for electromagnetic waves, a circuit including an elevated conductor and a variable inductance and an inductive connection between said circuits having a primary in series with the variable inductance and elevated conductor and having a secondary variable as to the number of its turns in series with the condenser and detector.

6. In a receiving system for wireless telegraphy an inductive connection having a primary and secondary variable as to the ratio of their turns, a detector for electromagnetic waves in circuit with the secondary, and an elevated conductor in circuit with the primary through a variable inductance.

In testimony whereof, I have hereunto set my hand.

REGINALD A. FESSENDEN.

Witnesses:
LEONARD MORGAN,
WILLIAM HELGEN.