R. A. FESSENDEN.

ELECTRIC SIGNALING.

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915,280.

Patented Mar. 16, 1909.

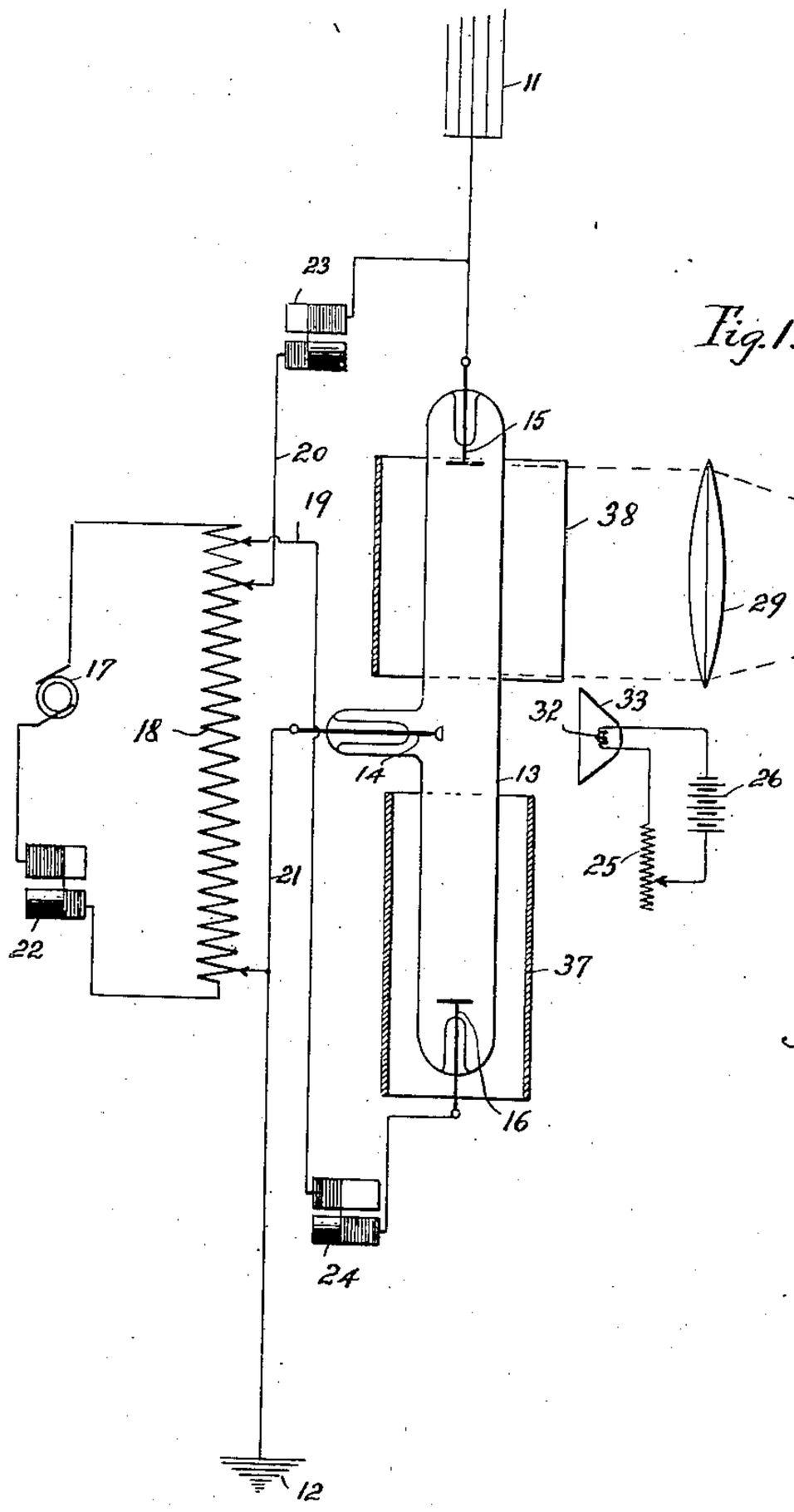
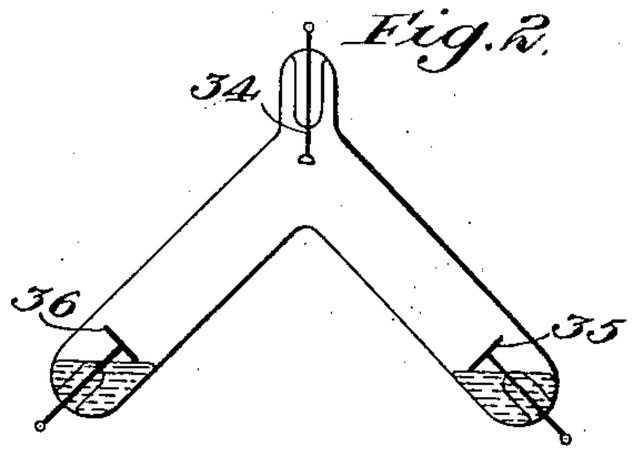


Fig. 1.

Fig. 2.



Witnesses

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UNITED STATES PATENT OFFICE.

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ELECTRIC SIGNALING.

No. 915,280. Specification of Letters Patent. Patented March 16, 1909.

Application filed February 8, 1907. Serial No. 356,383.

To all whom it may concern:

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

My invention relates to the art of electric signaling, and particularly to receivers for wireless telegraphy, its primary object being to provide a more reliable and sensitive means for receiving electric impulses, especially electro-magnetic waves, and producing signals thereby.

In the accompanying drawing Figure 1 is a diagram in partial section showing apparatus for carrying out my invention, and Fig. 2 shows in section a modified form of the receiver tube.

Vacuum tubes heretofore used as receivers for wireless telegraphy have not been found sufficiently sensitive and positive in their action, and especially for feeble impulses. I have experimentally discovered that the defects may be overcome as by using an improved differential vacuum tube containing gases, especially those of the helium type; and also by using differentially acting circuits. The efficiency is further improved by an essential arrangement of the parts one form of which is hereinafter specified.

In Fig. 1 the antenna 11 may be grounded as at 12, or not, and may be connected to the conductor 19 in other modifications. It is preferably tuned by any of the means well known in this art and may be used either with a secondary receiving circuit or without it as here shown. Connected with the antenna is a so-called vacuum tube 13, which may be of any desired shape, and may contain any suitable gas such as hydrogen, nitrogen, helium, argon, neon, etc., the ones named of the helium group having been found especially advantageous. The tube is provided with terminals 14, 15, 16, of which intermediate terminal 14 is preferably made extremely small and composed of iridium. I provide a source of voltage 17, which may be either a continuous current source, or an alternating current source, and is here preferably shown as a high frequency alternator, having preferably a frequency approximately the same as the frequency of impulses to be received. It is connected with a potentiometer 18 and may have a variable inductance or resistance 22 also in circuit. In this device one winding cylinder is metallic so as to short-circuit any number of turns of the wire desired. It will be understood that the outer ends of the coils on both cylinders are directly connected to the leads, and while on the insulating cylinder the whole length of wire is traversed, the metallic cylinder directly connects the initial point with the last turn of wire wound thereon. The conductors 19, 20 and 21 make adjustable contact with the potentiometer, and may contain variable resistances or inductances 23, 24 as shown. The terminals of the tube 13 may be heated by any suitable means as for example 14 is shown heated by coil 32 excited by battery 26 and having in circuit the variable resistance or inductance 25, the heat being projected by a reflector 33. A screen 37 may envelop the terminal 16 and a reflector 38 around the upper end of the tube is preferably used in order to direct the radiation through a lens 29, whence it impinges on selenium cell or bolometer 30 to thereby operate the indicating mechanism such as the bell 31 having battery 27 in circuit. Otherwise the signals caused by radiation from the upper end of the cell 13 may be read directly, or of course the bell may be replaced by a galvanometer.

In operation the potential between electrodes 14 and 15 is so arranged by means of the potentiometer that no current will pass between these terminals or only a slight and comparatively non-luminous one, while the greater current passes between 16 and 14. The potentials here are so adjusted that when electro-magnetic waves strike the antenna 11, the steady balance of current is disturbed in the differential vacuum tube 13, and the luminous column is caused to pass, either intermittently or steadily between terminals 14 and 15, which will effect a signal as above described.

In the construction of parts I prefer to make the terminals 15 and 16 of such material as iridium or aluminum and they may be covered with an oxid of calcium or its equivalents barium or strontium.

In Fig. 2 I have shown a different form of the tube, made in a Y shape, and the terminals may consist of mercury with central metallic projection as 35 or 36. In this case the mercury may contain a small percentage of metallic calcium or its equivalents or potassium or sodium with advantage.

The above described apparatus has been

found to act as a very reliable and steady receiver, it being a great advantage, among other things, to have the discharge diverted to an entirely new terminal and directly cause a signal by its incidental effects rather than by changes in the current being discharged passing through a detecting instrument.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent, is the following:

1. A receiver for electro-magnetic waves comprising an exhausted tube containing gas of the helium group.

2. A receiver for electro-magnetic waves comprising a discharge tube with several paths of discharge acting differentially and means for shifting the path of discharge therein by the waves received.

3. A receiver for electric signaling comprising a differentially acting discharge tube with several terminals, and connected differential governing circuits adapted to have their balance changed to shift the discharge path by the passage of signal impulses.

4. A receiver for wireless telegraphy comprising a discharge tube with several discharge paths therethrough, means operated by electro-magnetic waves to shift the path of discharge, and means independent of the tube circuit for effecting a signal by such shifting of the discharge path.

5. A receiver for wireless telegraphy comprising a discharge tube and means for exciting it, connected differential circuits adapted to have their balance disturbed by the passage of electro-magnetic waves to shift the path of discharge in the tube, and means to observe such shifting of discharge.

6. The combination with a current source and discharge tube having a central terminal and two legs each provided with a terminal, of means actuated by electro-magnetic waves to shift the discharge from one leg to the other, and indicating means operated by said shifting of the discharge.

7. A receiver for electric signaling comprising an electric discharge tube, means to annul or balance off the effective discharge in a path therein, and means operated by the received impulses to disturb the balance and restore said discharge to produce a signal.

8. A receiver for electric signals comprising a discharge tube with several alternative paths of discharge, and means, comprising a receiving circuit operatively connected to a terminal of the discharge tube for shifting the path of the discharge therein on receipt of the transmitted impulses.

9. A receiver for electric impulses comprising a discharge tube with several alternative paths of discharge and means comprising a receiving circuit operatively connected to a terminal of the discharge tube for altering the normal potentials between the terminals and so causing the path of the discharge therein to be shifted on receipt of transmitted impulses.

Signed at Brant Rock in the county of Plymouth and State of Massachusetts this 6th day of February, A. D. 1907.

REGINALD A. FESSENDEN.

Witnesses:

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