H. C. CAYLEY.

RECEIVER FOR WIRELESS SIGNALING.

APPLICATION FILED APR. 21, 1908.

925,291. **Patented June 15, 1909.**

2 SHEETS—SHEET 1.

Fig. 1,

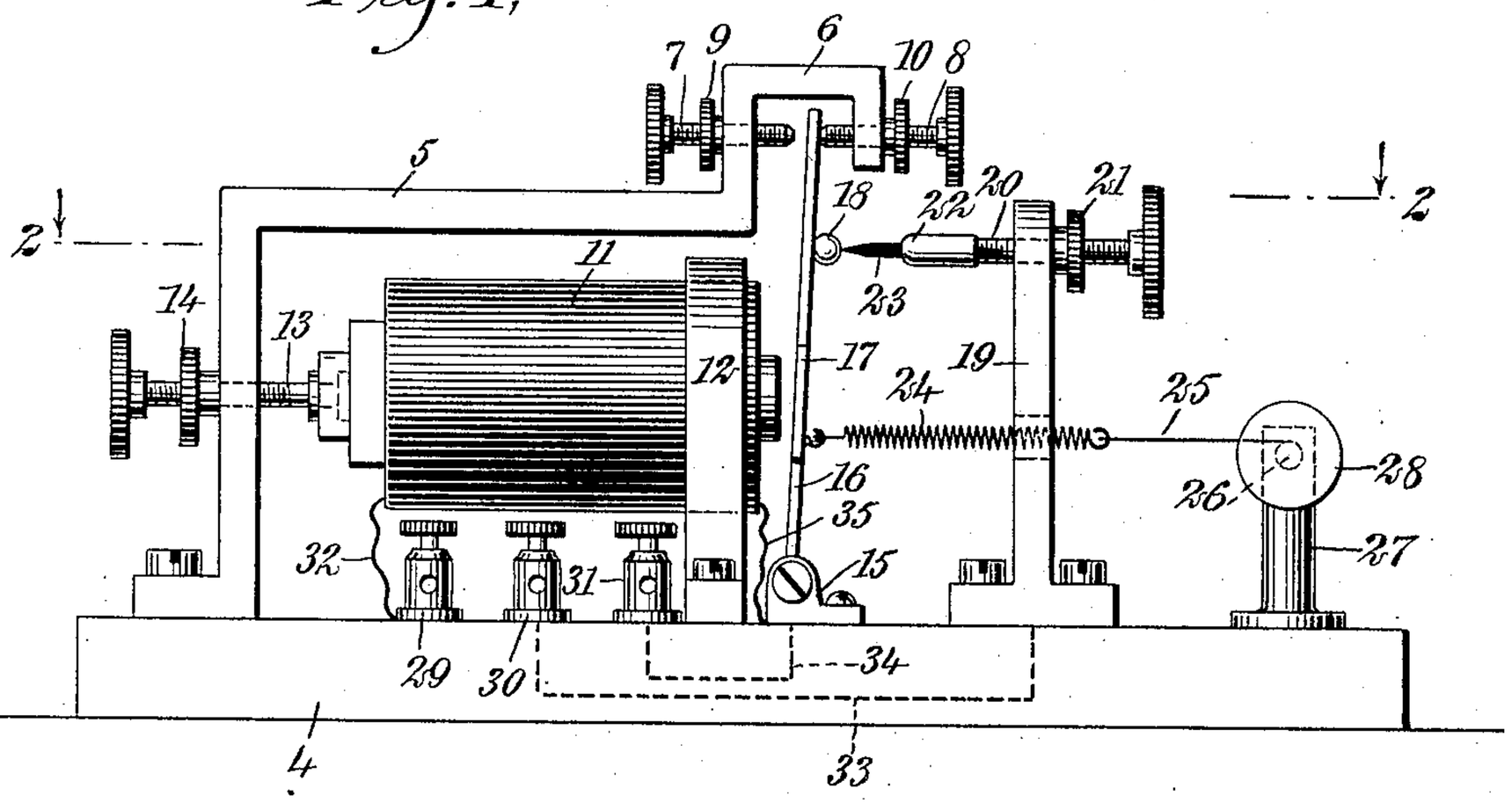
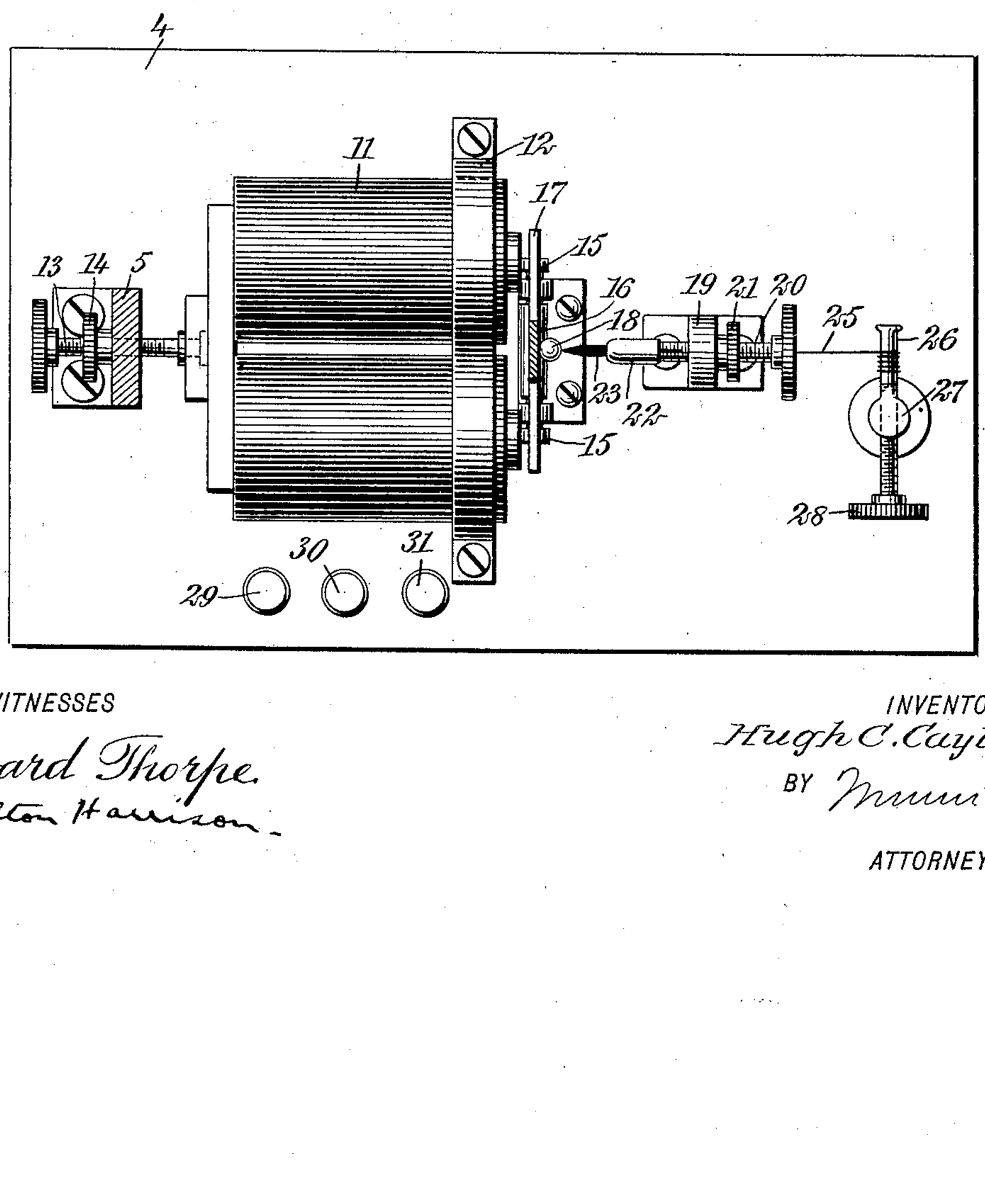


Fig. 2,



WITNESSES

Edward Thorpe.

Walton Harrison.

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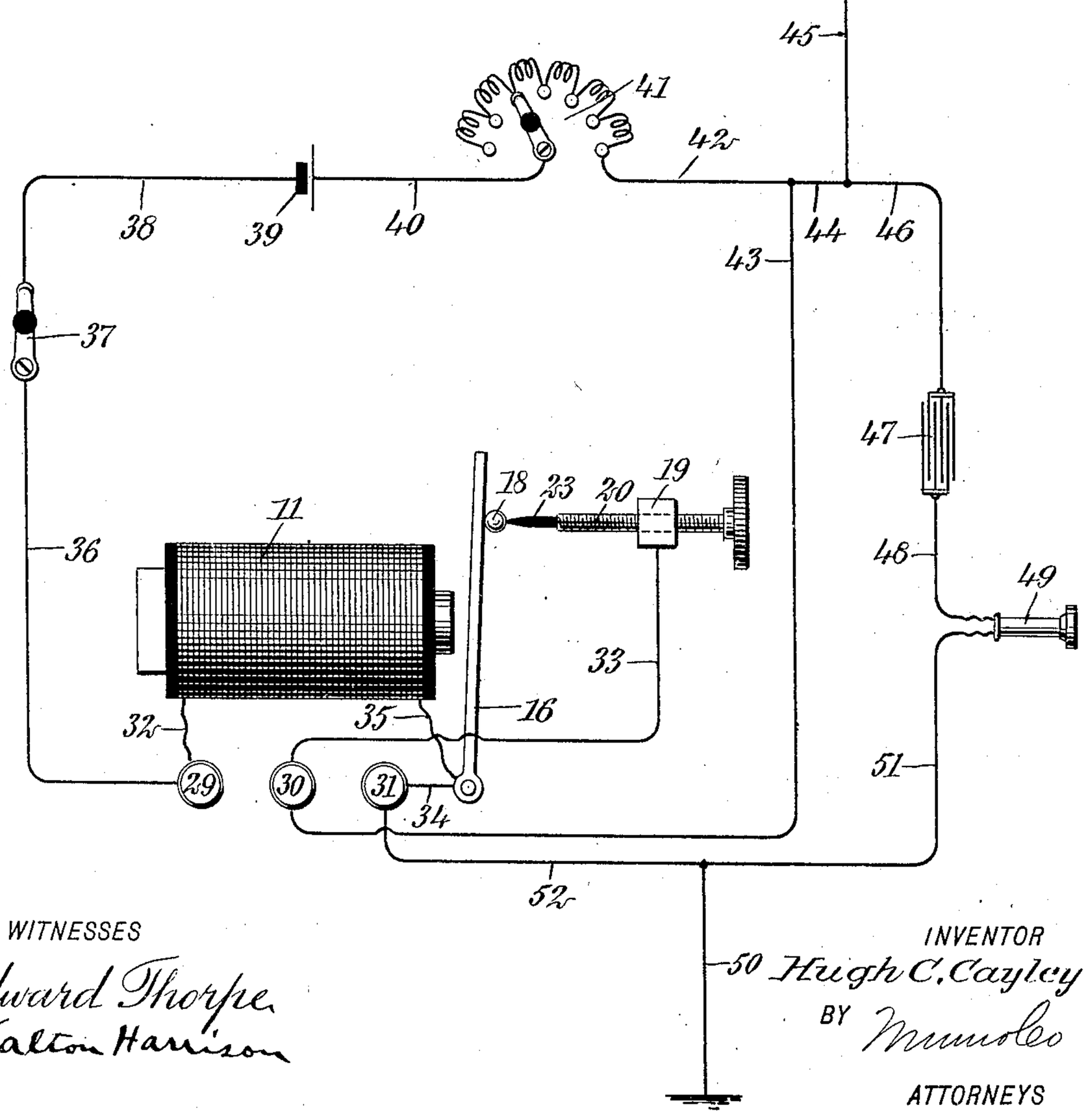
Fig. 3.



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UNITED STATES PATENT OFFICE.

HUGH CHARLES CAYLEY, OF RIVERSIDE, CALIFORNIA.

RECEIVER FOR WIRELESS SIGNALING.

No. 925,291. Specification of Letters Patent. Patented June 15, 1909.

Application filed April 21, 1908. Serial No. 428,399.

To all whom it may concern:

Be it known that I, HUGH CHARLES CAYLEY, a citizen of Great Britain, and a resident of Riverside, in the county of Riverside and State of California, have invented a new and Improved Receiver for Wireless Signaling, of which the following is a full, clear, and exact description.

My invention relates to wireless signaling, my more particular purposes being as follows: 1, to provide an improved wave detector; 2, to provide for making this detector not only self-restoring but also self-adjusting within certain limits; 3, to provide a number of hand-operated adjustments more or less independent for the purpose of increasing the sensitiveness of the detector; 4, to connect the detector and its accompanying parts in a circuit so arranged as to subject the receiver or indicating mechanism to current changes and to cause the exaggeration of said changes for the purpose of rendering the indications loud and clear.

Reference is to be had to the accompanying drawings forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of my improved detector its general form being somewhat analogous to that of a Morse relay, the control of the detector by the waves being partly due to the agency of a steel ball in contact with a sharp point of graphite; Fig. 2 is a horizontal section through the detector, taken upon the line 2—2 of Fig. 1 looking in the direction of the arrow. Fig. 3 is a diagram of the wiring of the receiving station, including the wave detector and its accompanying parts.

Mounted upon a base 4 is a bracket 5 of metal, this bracket being provided with a substantially U-shaped portion 6 through which extend screws 7, 8, and fitted upon these screws are locking nuts 9, 10. An electro magnet is shown at 11 and encircling this magnet is a metallic hook 12, the latter being secured upon the base for the purpose of supporting the magnet. An adjusting screw 13 extends through the bracket 5 and is swiveled to the magnet 11. This adjusting screw is encircled by a locking nut 14 which may be jammed against the bracket 5.

Bearings 15 support an armature lever 16 provided with a portion 17 serving as an armature, the armature lever 16 carrying a steel ball 18. A bracket 19 is mounted upon the base 4 and supports an adjusting screw 20, and encircling this adjusting screw is a locking nut 21 adapted to jam against the bracket 19. The inner end of the screw 20 terminates in a sleeve 22, and mounted within this sleeve is a point 23 of graphite, this point being sharp and adapted to be engaged by the ball 18 when the armature swings outwardly or to the right according to Fig. 1.

A spring 24 is connected with the armature 17 and also with a thread 25, the latter being wound partially upon a revoluble stem 26 supported upon a boss 27 and provided with a milled head 28. By turning the milled head the tension of the spring 24 may be regulated at will. Binding posts 29, 30, 31 are mounted upon the base 4. The binding post 29 is connected with the magnet 11 by a wire 32. From the binding post 30 a wire 33 leads to the bracket 19. The armature lever 16 is connected by a wire 34 with the binding post 31. A wire 35 connects the magnet 11 with one of the bearings 15.

In order to connect up the wave detector I run a wire 36 from the binding post 29 to a hand switch 37 and connect the latter by a wire 38 with a battery 39. From this battery I run a wire 40 to a rheostat 41 and to the latter I connect a wire 42. A wire 43 is connected with the wiring 42 and with the binding post 30. A wire 44 is connected with the wire 43 and with an aerial 45. A wire 46 is connected with this aerial and with the wire 44. The wire 46 leads to a condenser 47 which is connected with a telephonic receiver 49 by aid of a wire 48. A ground wire is shown at 50 and is connected with the receiver 49 by a wire 51, and with the binding post 31 by a wire 52.

The rheostat 41 may contain considerable inductance. This is for the purpose of preventing oscillations set up in the aerial from following the battery wires 38, 40 and 36.

The operation of my device is as follows: The adjusting screws 8 and 20 are so manipulated that the steel ball 18 normally rests lightly in contact with the sharp point 23 of graphite. Electromagnetic waves now strike the aerial 45 and set up oscillations in the following circuit: aerial wire 45, wires 44, 43, binding post 30, wire 33, bracket 19, screw 20, point 23, steel ball 18, armature lever 16, wire 34, binding post 31, wire 52, wire 50, to ground. The oscillations thus

pass through the imperfect contact made by steel ball 18 and the graphite point 23. The resistance of the imperfect contact is thus lowered by the oscillations and the local battery circuit is completed as follows: battery 39, wire 40, rheostat 41, wires 42, 43, binding post 30, wire 33, bracket 19, screw 20, graphite point 23, steel ball 18, armature lever 16, wire 35, magnet 11, wire 32, binding post 29, wire 36, switch 37, and wire 38 back to battery 39. This energizes the magnet 11 and causes the armature lever to move toward the magnet. This movement, however, draws the steel ball 18 away from the graphite point 23, thereby breaking both the circuit affected directly by wave action and the local battery circuit. The breaking of the battery circuit deënergizes the magnet 11 and allows the armature lever to resume its normal position which it readily does under the action of the spring 24. This, of course, closes both the local circuit and the oscillation circuit, and consequently the armature lever under control of the magnet repeats its movement so long as the waves continue to energize the aerial.

The parts are so adjusted and proportioned, and the tension of the spring 24 is so regulated, that the battery current passing through the magnet 11 is never sufficient to move the armature lever 16 except when the oscillations, due to wave action, are passing through the point 23 and the steel ball 18. This adjustment is not at all difficult to attain, for the reason that the resistance made by the imperfect contact is so high that the amount of battery current normally passing through the same is negligible.

It will be noted that both of the circuits above traced are so arranged that the battery current does not pass directly through the receiver 49. The condenser 47 conserves the battery current and enables it to affect the receiver 49 without the necessity for including this receiver directly in the circuit through which the direct battery current passes. The "extra" current due to the self induction of the windings on the electro magnet (when the resistance of the imperfect contact is varied) increases the action of the telephonic receiver, through which it passes on its way to the condenser. This is accomplished by simply connecting the condenser 47 and receiver 49 in parallel with the aerial and with the ground, and also with a portion of the battery circuit. The receiver is thus energized by pulsations of a frequency corresponding with movements of the armature lever 16, these pulsations being preferably of the order of some hundreds per second and varying with the adjustment of the spring 24. The strength of the battery and the condition of the rheostat 41 are affected more remotely by the other adjustments above described. When, therefore, the aerial 45 is energized by waves, the receiver 49 emits a tone which, for any given adjustment of the parts, is always of the same pitch but which is broken into dots and dashes, the direction of which is controllable from the transmitting station, each dot and each dash being made up of a considerable number of separate impulses from the battery and having the same frequency as the strokes of the armature lever, as above described.

The invention above described makes use of the fact that when electromagnetic waves are caused to affect an imperfect contact consisting of two members, and at the same time one of these members is moved rapidly to and fro relatively to the other member, so as to successively close and break the connection between them so that the imperfect contact is completely decohered by each complete movement taking place between its members, the imperfect contact is rendered exceedingly sensitive to wave connection. The instant the waves stop, the coherence of the imperfect contact stops also, and this practically leaves the local circuit open so that the electromagnet 11 is no longer energized, or at least it is not energized to such an extent as to draw its armature and move the armature lever 16. I have also found that with a wave detector constructed as above described and connected in a circuit containing a condenser and receiver as indicated in Fig. 3, the ultimate effect of the wave energy upon the receiver is greatly increased, by virtue of the extra current set up in the wiring of the magnet, and the sensitiveness of the receiver consequently improved by virtue of the fact that the pulsations of the battery current being conserved by the condenser, and increased by the self induction, greatly increase the electric energy passing through the receiver.

One great trouble with wave detectors heretofore employed is the lack of means for proper adjustment. The instrument above described has quite a number of adjustments used for slightly different purposes and yet all contributing to a common end. For instance, the adjusting screw 13 is used for varying the position of the magnet 11 relatively to the armature 17, and in doing this has an effect upon the imperfect contact. The adjusting screw 20 affects this contact directly by handling the point 23 relatively to the point 18. The adjusting screw 26, by controlling the tension of the spring 24, regulates the degree of pressure normally exerted by the ball 18 against the point 23. The screw 8 also affects the pressure, for the reason that the armature lever in its stroke to the right, according to Fig. 1, not only moves the ball 18 against the point 23, but also lodges the upper end of the lever against the adjusting screw 8. The adjusting screw 7 governs the play of the armature

lever, and consequently has an effect upon the frequency of the battery pulsations, and consequently upon the tone emitted by the receiver 49.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a wave detector, the combination of an imperfect contact comprising two members, one of which is movable relatively to the other, an armature lever connected with said movable member, a magnet for controlling said armature lever, a battery circuit connected with said imperfect contact and with said magnet, and a shunt circuit connected with said battery circuit and including a condenser and a telephonic receiver.

2. The combination of an aerial wire, a ground wire, an imperfect contact interposed intermediate said aerial wire and said ground wire, a condenser, and a telephonic receiver connected in series with each other and in parallel with said imperfect contact, a battery circuit connected upon opposite sides of said imperfect contact so as to cause the current to flow through said imperfect contact, an electromagnet connected with said battery circuit so as to set up by inductance extra currents therein, and mechanism actuated by said magnet for decohering said imperfect contact.

3. The combination of an imperfect contact comprising a plurality of members, means for moving one of said members relatively to another so as to control a continuous current tending to flow through said imperfect contact, a magnet disposed adjacent to said means for the purpose of actuating the latter, a direct current circuit connected with said magnet and with said imperfect contact, said circuit being controllable by said imperfect contact, an indicating device and a condenser connected in series with each other and in parallel with said circuit, and means for subjecting said imperfect contact to the action of electromagnetic waves.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

HUGH CHARLES CAYLEY.

Witnesses:

HERMAN GEORGE WILSON,

ADELIA I. FORD.