No. 757,802. PATENTED APR. 19, 1904.

A. E. WOODWARD & H. SHOEMAKER.

WAVE RESPONSIVE DEVICE.

APPLICATION FILED JULY 9, 1903.

NO MODEL.

FIG 1.

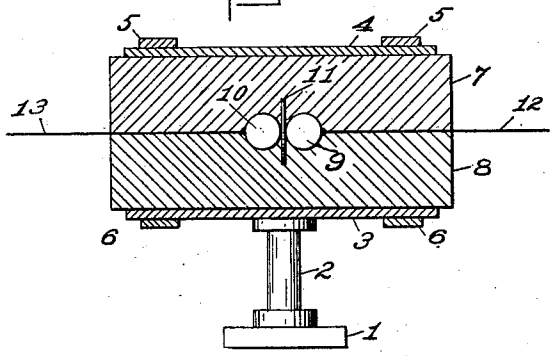


FIG 2.

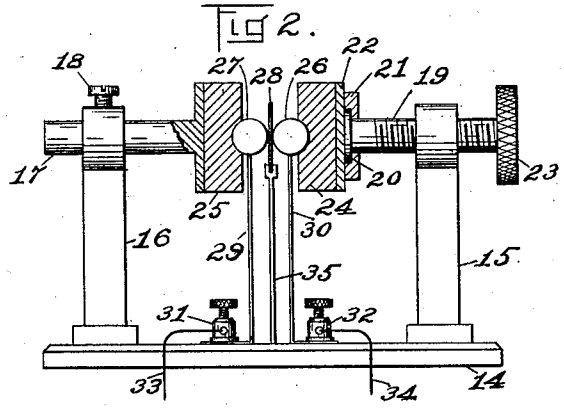
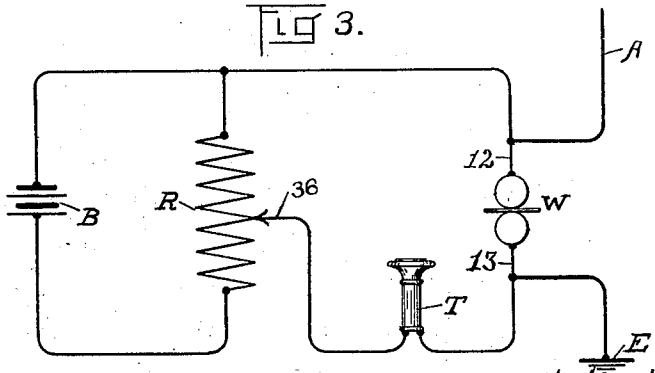


FIG 3.



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No. 757,802. Patented April 19, 1904.

UNITED STATES PATENT OFFICE.

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WAVE-RESPONSIVE DEVICE.

SPECIFICATION forming part of Letters Patent No. 757,802, dated April 19, 1904.

Application filed July 9, 1903. Serial No. 164,769. (No model.)

To all whom it may concern:

Be it known that we, ALBERT E. WOODWARD, residing at Nashua, county of Hillsboro, State of New Hampshire, and HARRY SHOEMAKER, residing at Philadelphia, county of Philadelphia, State of Pennsylvania, citizens of the United States, have invented a new Wave-Responsive Device, of which the following is a specification.

Our invention relates to wireless signaling systems in which the energy representing the message or signal is of the electroradiant form and transmitted through the natural media.

Our invention relates more particularly to the receiving apparatus and resides in a device and circuit arrangements where the received electroradiant energy is detected and recorded.

Our invention consists of a device for responding to electrical waves or electroradiant energy and comprising metallic members in contact with each other and having the property when subjected to the influences of electroradiant energy of varying the contact resistance. This resistance variation is made use of to control or modify the condition of a signal or message recording circuit.

Essentially our device consists of a polished metallic member in contact with a member of aluminium or the like over a relatively small area. In the preferred form it consists of an aluminium disk pressed upon on both sides by polished steel balls, the steel balls being connected to the receiving-circuit in the same relation as practiced with wave-responsive devices of other forms.

Reference is to be had to the accompanying drawings, in which—

Figure 1 is a sectional view of the wave-responsive device, the essential elements being shown in elevation. Fig. 2 is a view, partly in section and partly in elevation, of a modified arrangement. Fig. 3 is a diagrammatic view of the circuits of a wireless receiving system employing the wave-responsive device herein described.

At 1 is represented a base from which extends a pedestal 2, upon which is mounted the wave-responsive device.

3 and 4 are channel-shaped metallic members embraced between the clamping members 5 and 6.

7 and 8 are masses of rubber or other like resilient material, between which are held the polished steel balls 9 and 10. Between these balls is held an aluminium disk 11, pressed upon on both sides by the balls 9 and 10 in virtue of the rubber pieces 7 and 8, which are under compression within the members 3 and 4 and held by the clamps 5 and 6. To the ball 9 is connected the conductor 12, and to the ball 10 is connected the conductor 13. These conductors serve to connect the device in the receiving-circuit of a wireless signaling system in a manner well known in connection with wave-responsive devices of other types. The steel balls are bright and clean, while the aluminium disk has a coating of oxid. In place of steel and aluminium other metals and conductors may be employed; but I find the device as herein described extremely sensitive and certain in its operation.

The device is of the self-restoring type—that is, one which returns of itself and practically instantly to approximately its normal resistance after the cessation of the effects of electroradiant energy. It requires no jarring or tapping, as in the case of numerous wave-detecting devices more commonly known as the "coherers."

It is a feature of this device that the pressure between the contacts is relatively great, such pressure being supplied by the rubber or other resilient material or equivalent device, as heretofore described.

In Fig. 2, 14 represents a base of insulating material upon which are erected the standards 15 and 16. Through the upper end of standard 16 is an opening in which is secured the rod 17 by means of the set-screw 18. At one end of the metallic rod 17 is a flange, to which is secured a mass of rubber 25. In the upper end of standard 15 is a screw-threaded opening through which passes the screw 19,

having a flanged end 20 embraced by the member 21, which latter is secured to the piece 22. By turning the thumb-screw 23 the flange 20 rotates relatively to the members 21 and 22, forcing the member 22 either to the right or to the left. 24 is a second piece of rubber secured to the member 22. The steel balls 26 and 27 are pressed by the rubber pieces 24 and 25 against the aluminium member or disk 28. To steady the balls 26 and 27 and the disk 28, the light resilient standards 29, 30, and 35 are employed. The standards 29 and 30 are of metal and serve at the same time as electrical connection to the balls 26 and 27. The lower ends of the standards 29 and 30 are bent at right angles and secured to the base 14, and to these horizontal portions are secured the binding-posts 31 and 32, from which extend the conductors 33 and 34, respectively, serving to connect the device in circuit.

Referring to Fig. 3, A represents the usual aerial conductor of a receiving-station, between which and the earth-plate E is connected the wave-responsive device W, as herein described, by means of conductors 12 and 13. A local circuit is controlled by this wave-responsive device W and includes the telephone-receiver T or other recording device and a portion of the resistance or impedance R. B represents a battery or other source of energy across whose terminals is connected the resistance or impedance R. When the rider 36 is at the lower terminal of the resistance R, the full potential of the source B is exerted upon the local circuit, including the wave-responsive device W and the telephone-receiver T. When, however, the rider 36 is in any other position—as, for example, as shown in Fig. 3—a less potential is exerted upon the local circuit. By this arrangemnt, styled a "potentiometer," any desired potential may be impressed upon the local circuit, and it may be varied by very small increments, so as to obtain that potential which is best suited to the particular wave-responsive device used, especially with regard to the pressure exerted upon the contacts of the wave-responsive device.

The operation of the device is as follows: When electroradiant energy impinges upon the aerial conductor A, a difference of potential or other effect due to such electroradiant energy is manifested at the terminals of the wave-responsive device W, resulting in an instantaneous change in the resistance at its contacts, resulting in a change in resistance in the local circuit, which in turn results in a change in the current flowing through the telephone-receiver T, causing therein a click. Immediately upon the cessation of the electroradiant energy the wave-responsive device W returns instantly and automatically to approximately its original resistance and is in condition to respond to succeeding electroradiant energy.

Though the wave-responsive device W is herein shown as directly connected in series with the aerial conductor, it is to be understood that it may be connected in a circuit in inductive relation with the aerial circuit or in any other relation, as well understood in the art.

What we claim as new, and desire to secure by Letters Patent of the United States, is—

1. A wave-responsive device comprising a disk of aluminium in contact with a plurality of conductors in series therewith and a mass of rubber for exerting pressure at the contacts.

2. A wave-responsive device, comprising a disk of aluminium in contact with a plurality of masses of steel and a mass of rubber for exerting pressure at the contacts.

3. A wave-responsive device, comprising a disk of aluminium in contact with a plurality of masses of steel in series therewith and a mass of rubber for exerting pressure at the contacts.

4. A wave-responsive device comprising a disk of aluminium in contact with a plurality of masses of polished steel, and in series therewith and a mass of rubber for exerting pressure at the contacts.

5. A wave-responsive device comprising an aluminium disk in contact on each side with a conductor and a mass of rubber for exerting pressure at the contacts.

6. A wave-responsive device, comprising a plate of aluminium in contact on each side with a non-oxidized conductor and a mass of rubber for exerting pressure at the contacts.

7. A wave-responsive device, comprising a plate of aluminium, and in contact on each side thereof with a mass of steel and a mass of rubber for exerting pressure at the contacts.

8. A wave-responsive device, comprising an aluminium conductor and an oxidized conductor in contact therewith, and a mass of rubber surrounding said conductors and exerting pressure at the contact.

9. A wave-responsive device, a mass of aluminium, a mass of polished steel in contact therewith, and a mass of rubber for exerting relatively great pressure at the contact.

10. A wave-responsive device comprising an aluminium mass, a mass of non-oxidized conductor in contact therewith over a relatively small area, and a mass of rubber for exerting relatively great pressure at the contact.

11. A wave-responsive device comprising an aluminium plate and non-oxidized conductors in contact therewith on each side thereof, and a mass of resilient material surrounding said plate and conductors.

12. A wave-responsive device comprising

an aluminium plate, a steel ball in contact with each side thereof, and a resilient mass surrounding the plate and balls for exerting pressure at the contact.

13. A wave-responsive device comprising a disk of aluminium in contact with a plurality of conductors in series therewith and a mass of resilient material surrounding said disk and conductors.

14. A wave-responsive device comprising a mass of aluminium in contact with a plurality of masses of steel and a mass of resilient material surrounding said masses of aluminium and steel.

15. A wave-responsive device comprising a mass of aluminium in contact with a plurality of masses of steel in series therewith and a mass of resilient material surrounding said masses of aluminium and steel.

16. A wave-responsive device comprising a mass of aluminium in contact with a plurality of masses of polished steel and in series therewith and a mass of resilient material surrounding said masses of aluminium and steel.

17. A wave-responsive device comprising an aluminium disk in contact on each side with a conductor and a mass of resilient material surrounding said disk and conductors.

18. A wave-responsive device comprising a plate of aluminium in contact on each side with a non-oxidized conductor and a mass of resilient material surrounding said plate and conductors.

19. A wave-responsive device comprising a plate of aluminium and in contact on each side thereof with a mass of steel and a mass of resilient material surrounding said plate and mass of steel.

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