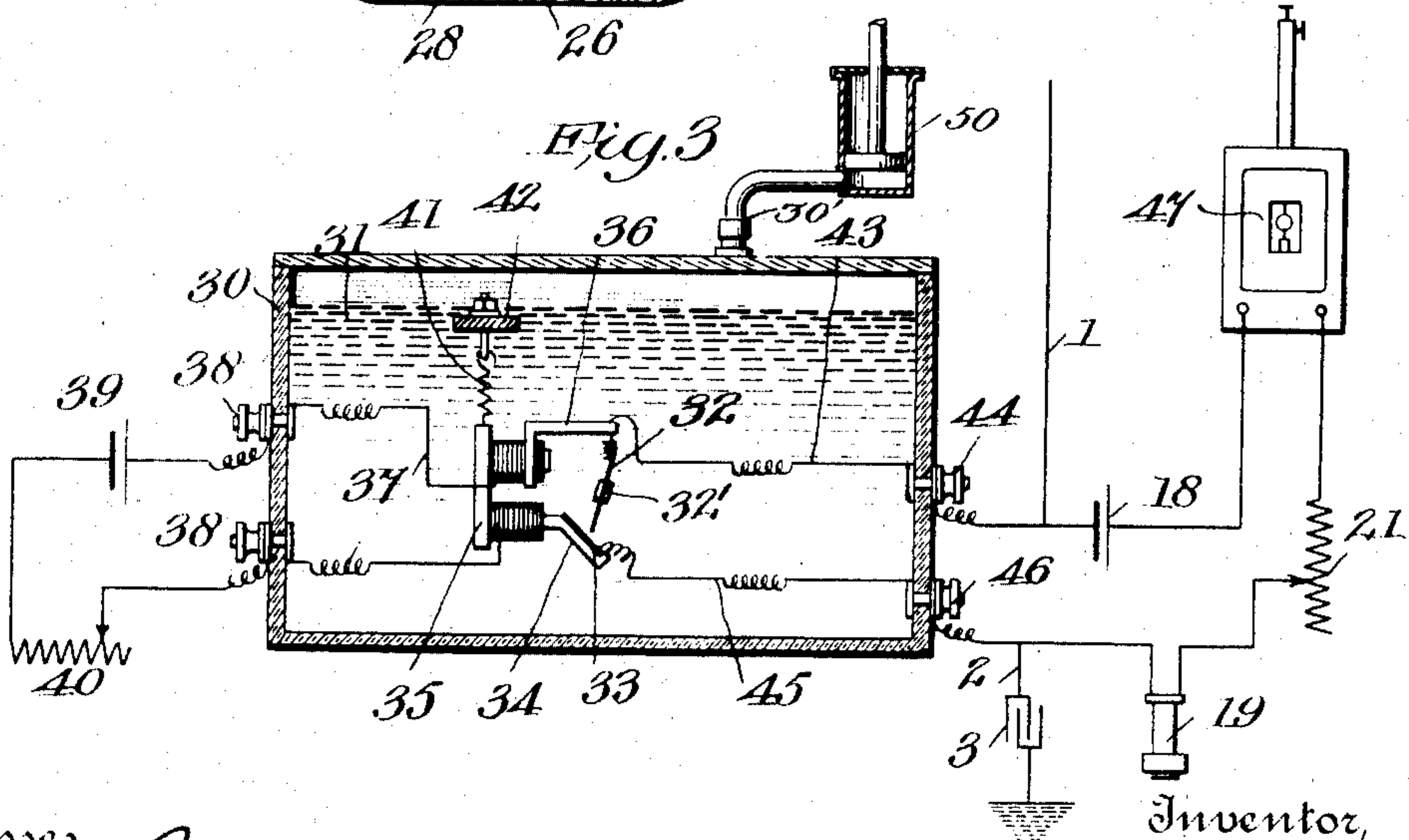
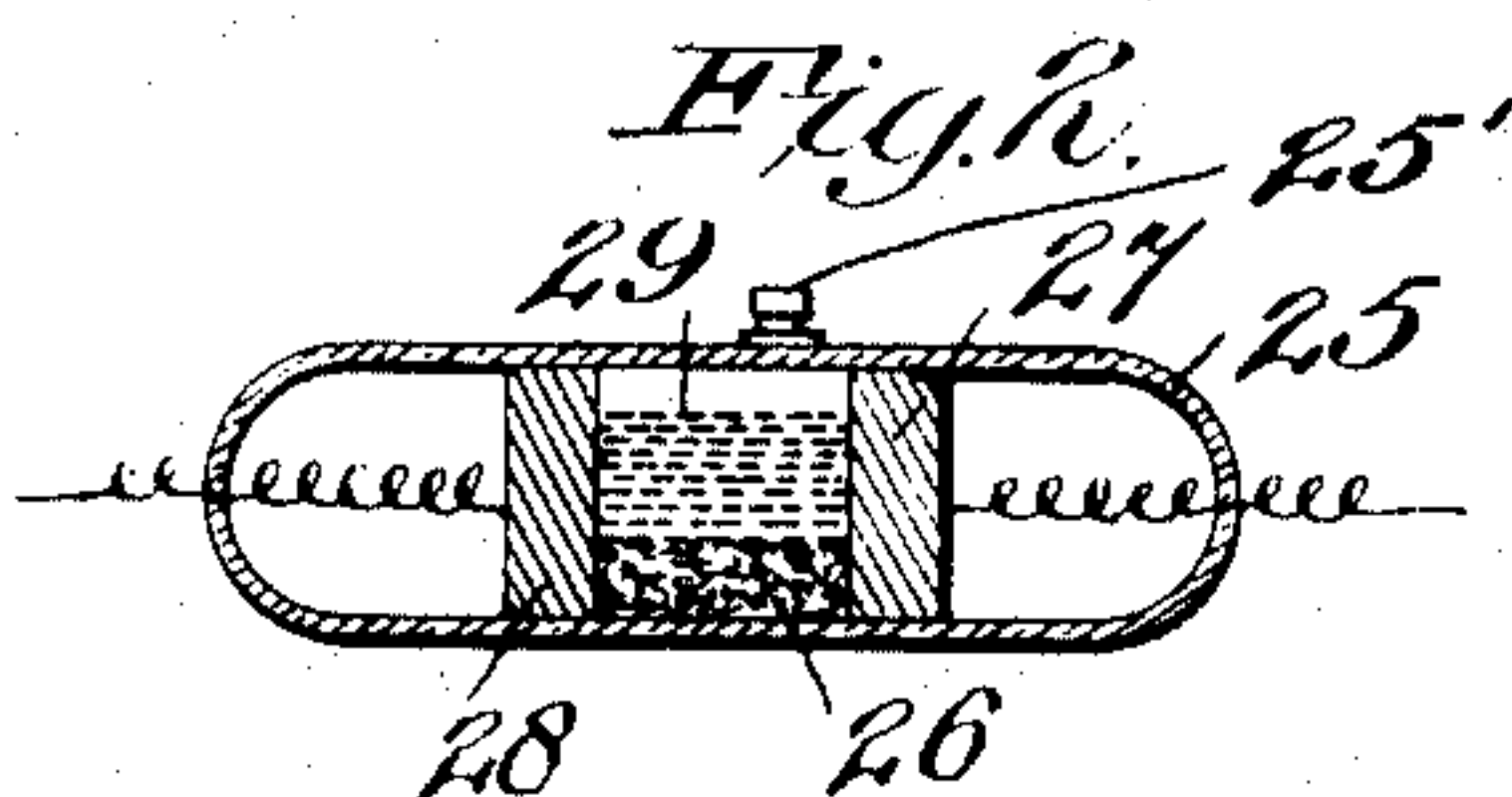
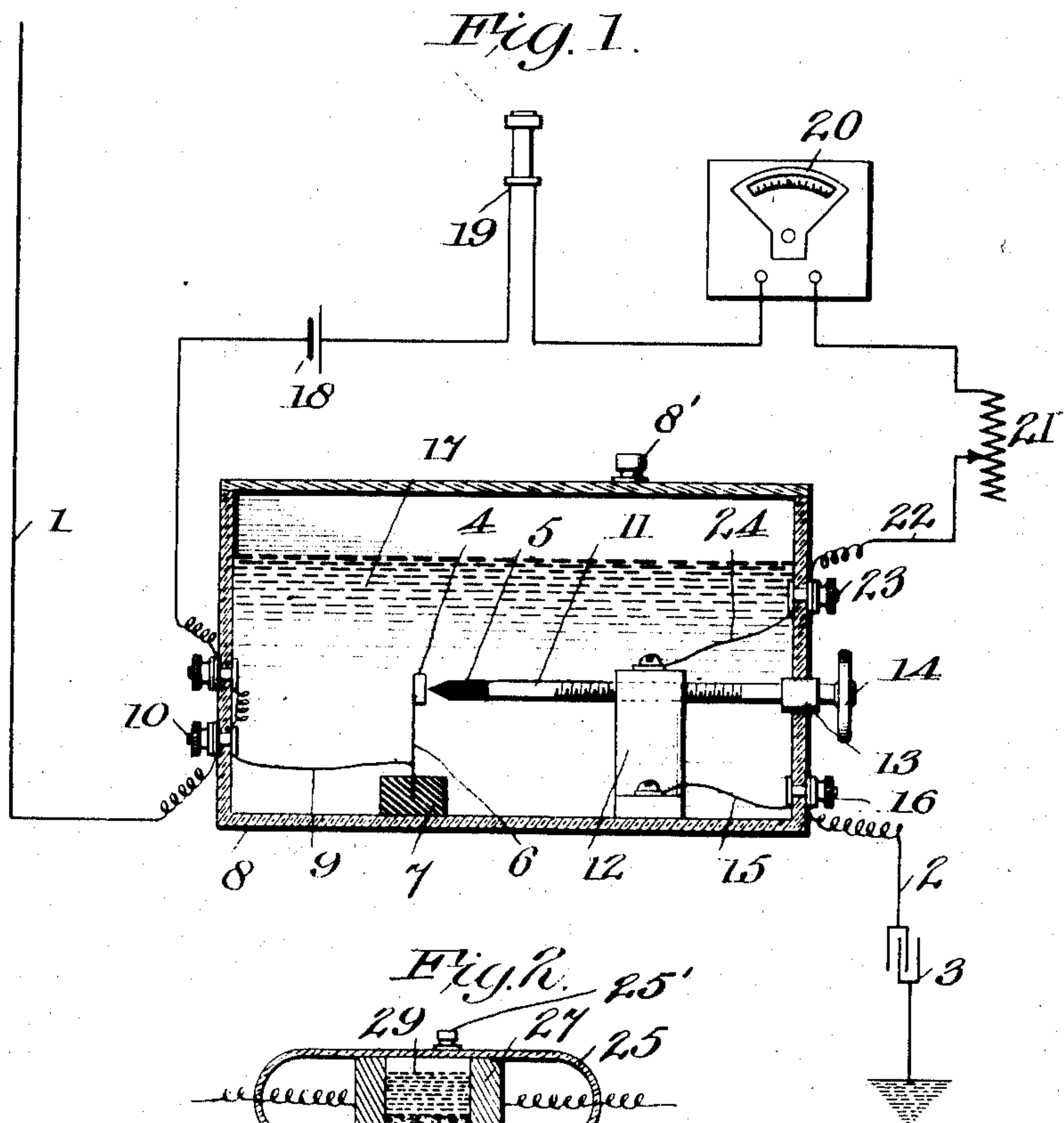


No. 883,437.

PATENTED MAR. 31, 1908.

L. D. WILDMAN.  
RECEIVER FOR SPACE SIGNALING SYSTEMS.

APPLICATION FILED JULY 24, 1906.



Witnesses  
*Geo. H. Byrnes.*  
*John H. Holt.*

Inventor,  
*L. D. Wildman,*  
by *Wilkinson & Fisher,*  
Attorney S.



# UNITED STATES PATENT OFFICE.

LEONARD D. WILDMAN, OF SAN FRANCISCO, CALIFORNIA.

## RECEIVER FOR SPACE SIGNALING SYSTEMS.

No. 883,437.

Specification of Letters Patent.

Patented March 31, 1908.

Application filed July 24, 1906. Serial No. 327,591.

*To all whom it may concern:*

Be it known that I, LEONARD D. WILDMAN, a citizen of the United States and captain in the United States Army, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Receivers for Space Signaling Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in devices for detecting electrical oscillations or Hertzian waves, and is designed especially for use as receiving apparatus for so-called wireless telegraphs or other space signaling systems.

The primary object of this invention is the production of an imperfect contact detector of the above character which shall be highly sensitive to received electrical oscillations, but responsive to the smallest extent possible to vibrations due to the unsteady foundation upon which the apparatus may be placed, to vibrations due to concussion, or to other causes not intended to affect the said detector, and which shall be self-restoring after the passage of the signaling impulses. This tendency to respond to extraneous vibrations has heretofore been one of the chief faults of imperfect contact receivers, causing them to make false signals. By my present invention this difficulty is overcome.

Another difficulty which is experienced with imperfect contact receivers hitherto used is the change of resistance thereof due to the oxidation of the contacts caused by the passage of minute sparks between such contacts. My invention overcomes this difficulty also, by reason of the fact that the contacts in my receiver are immersed in oil. My coherer differs from certain prior self-decohering receivers which rely upon the subsequent oxidation of contacts to produce the insulating film. In my receiver this insulating film is produced by the oil, which, being under pressure, instantly passes between the contacts after the passage of the signaling impulse.

A third difficulty has been that with a continued passage of a number of sparks or signals, there has been a tendency to minute, partial welding of the two contacts, and my invention overcomes this difficulty and in-

stantly restores the separating film between the contacts.

A further object of my invention is the production of a simple and efficient call-up device which is attainable from the fact that by means of my improved detector, I am enabled to maintain the electrical condition of a circuit practically constant at all times except when signal oscillations are received.

The detector by which I am enabled to accomplish the above objects while of the imperfect contact type, differs from all other imperfect contact devices for the purposes herein named, in that the movable contact or contacts, or both fixed and movable contacts, if there be a fixed contact, are either wholly or partly immersed in a liquid of such a nature that the film between the contacts will be readily punctured by the Hertzian waves, while the body of the liquid will take up and dissipate oscillations other than electrical oscillations imparted to the liquid and which are not intended to operate said contacts and which will also act to damp the movement of the movable contact or contacts. The liquid which best fulfils the foregoing requirements should flow freely and be of an insulating nature, such for example as oil, which has been used with great success.

Another improvement in some forms of this detector is the additional pressure of air or a gas, which may be added to the top or any portion of the oil, by means of an air pump or other device, for giving pressure, the purpose of which is to create an additional head upon the oil, facilitating quick closure of the puncture of the film of oil between the contacts, if there be any such film.

The specific arrangements by which the principle of my present invention may be carried out are many, and I shall not herein attempt to describe them all. For the purpose of illustrating the principle of my invention, however, I have herein shown and described three simple specific forms thereof in the accompanying drawings, in which:—

Figure 1 is a semi-diagrammatic view of a space signaling receiving station embodying one form of my said invention; Fig. 2 a longitudinal cross sectional view of a filings coherer embodying my said invention, and Fig. 3 a semi-diagrammatic view of a space signaling receiving station embodying another form of my said invention.

Referring first to the form of the invention shown in Fig. 1 of the accompanying draw-



ings, 1 represents the antenna or vertical wire, and 2 an earth connection which may or may not include the condenser 3. Obviously a suitable artificial capacity may be substituted for the earth. Connected between the antenna and the connection 2, are the detector contacts 4 and 5. While I do not confine my invention to the use of any specific material for these contacts, I prefer to make the contact 4 of silver or platinum and the contact 5 of graphite. The contact 4 in the case shown is mounted upon a resilient arm 6 of conducting material, which may be a copper spring secured at its lower end to an insulating base 7 made fast within a suitable receptacle 8, which latter is preferably of glass, hard rubber or other insulating material. Any other suitable support for the contact 4 by which the same may be held subject to movement by received electrical oscillations may be employed. The said contact 4 is in electrical connection with the vertical wire 1, as for example, through conductor 9 and binding post 10.

The contact 5, which in this case is the stationary contact, is mounted upon one end of a screw 11 supported by and arranged to travel in a stationary supporting bracket 12, the said screw passing through a suitable stuffing box 13 in receptacle 8 and provided at its end outside of said receptacle with a milled or other suitable head 14. The contact 5 is in electrical connection with the earth connection 2 through the screw 11, bracket 12, conductor 15 and the binding post 16.

The receptacle 8 contains a liquid 17, preferably oil, which, in the case shown, entirely covers or submerges the contacts 4 and 5. The contact 5 may be adjusted so as to make imperfect electrical contact with the contact 4 or be entirely out of electrical engagement therewith. The apparatus will work well in either case.

The receptacle 8 may be made air tight and a valve 8' provided in its top through which air or gas may be pumped into the receptacle and additional pressure thereby caused on top of the fluid 17. This extra pressure improves the action of the device.

For the purpose of receiving signals I may connect in shunt around the contacts 4 and 5 a local circuit which may include a source of current 18, preferably a closed circuit or gravity-battery, telephone receiver or other translating device 19, an indicating instrument 20, which in the case shown is a millimeter, and a rheostat 21 for varying the electro-motive force of said circuit, the latter being electrically connected by conductor 22, through binding post 23 and conductor 24 to bracket 12. In case a millimeter is employed, as stated, it will be found convenient to use one with a large scale.

With a given adjustment of the contacts 4 and 5, the indicating instrument 20 may be

made to normally stand at a certain scale indication. For example, with a millimeter which I have used, reading to 2 milliamperes over the entire scale, the needle normally stands at 4/10 with a given battery.

When signal oscillations are received on the antenna, coherence between contacts 4 and 5 becomes apparently better and the pointer of the indicating instrument moves say to a position where it indicates 5/10, but not with sufficient damping to indicate dots and dashes. The movement of the millimeter pointer, however, indicates the reception of electric signaling impulses.

Since the coherence of the contacts 4 and 5 will differ with the strength of the signals received and since the deflection of the pointer of the indicating instrument will vary with the varying degrees of such coherence, it is possible with this arrangement and with a given set of stations, to tell just which station is sending. For this purpose the scale of the indicating instrument may be calibrated to indicate the different stations. Obviously in such a case the antenna would not be attuned. One of the advantages of this arrangement is that one can always set or adjust the imperfect contacts by bringing the pointer of the indicating instrument back to a given scale division, such for example as to the 4/10 division hereinbefore mentioned, when no signals are coming in. One can, therefore, by a mere glance at the indicating instrument tell whether the apparatus is properly adjusted.

It will be obvious that with the contacts 4 and 5 subject to vibration by influences other than the signaling oscillations, such an arrangement would fail. This difficulty, however, is entirely overcome in my present invention by the action of the liquid in the receptacle 8, which action I believe to be the following: The liquid (preferably oil) absorbs and dissipates such vibrations as may be imparted to it from extraneous sources, and therefore either entirely prevents the force of such vibrations from ever reaching the movable contact or lessens the force of such as do reach it, and in the latter case acts to so damp the movement of the movable contact as to render such movement either nil or inappreciable. There may also be other mechanical or physical reasons why the liquid bath improves the action of the detector.

The telephone receiver 19 may be used for the reception of regular dot and dash or other signals intended for the station. If, however, the local shunt circuit is used merely to operate the call-up device, the telephone receiver may obviously be omitted.

In Fig. 2 I have shown a filings coherer constructed according to my invention, in which 25 indicates an ordinary coherer glass tube, 26 the coherer particles between con-

70

75

80

85

90

95

100

105

110

115

120

125

130



tacting plates 27 and 28. This coherer differs from those hitherto used in having the particles 26 submerged in a bath of oil 29, or other suitable freely flowing insulating liquid 5 contained in the tube 25. The contact established by such a coherer is practically constant, as may be shown by a galvanometer connected in circuit therewith. With the contacts not submerged, the deflection 10 of the galvanometer fluctuates perceptibly, while with the contacts submerged, it remains practically constant. The bath not only takes up vibrations, but keeps the contacts in good conditions and this is true in all 15 forms of the invention herein described. The coherer, Fig. 2, may also be provided with a valve 25', through which air and gas may be pumped into the coherer to force pressure on the fluid 29.

20 In Fig. 3 I have shown another specific arrangement of apparatus embodying my invention. In this form of the invention I employ a receptacle 30 which may be substantially the same as the receptacle 8, and 25 in this receptacle is placed a liquid 31 which may be the same as liquid 17, that is, a preferably freely flowing liquid such as oil or other liquid having the necessary properties. A valve 30' having a similar function to the 30 valve 8' may be connected to a compression pump 50, for the purpose of increasing the pressure of the liquid in the receptacle.

For the detector contacts I employ a needle 32 of magnetic metal and a preferably 35 very hard smooth graphite plate 33. The plate 33 may be supported in any suitable position, in order to give more or less surface of contact with the needle preferably inclined as in the case shown, by an extended 40 pole piece 34 of a magnet 35, to which pole piece the said plate may be secured in any desired way. The needle contact 32 is movably suspended from an insulating support 36, which is also secured to said magnet and 45 may or may not include a blade 32' for additional dumping. The coils of the magnet 35 are connected by flexible conductors 37 to suitable binding posts 38 in circuit with a source of current 39, preferably a closed circuit 50 battery, and rheostat 40.

The magnet 35, together with the detector contacts are suspended by means of spring or other resilient suspension 41 from a suitable rigid support 42, said magnet and con- 55 tacts being submerged in said liquid 31.

By varying the resistance of the circuit, including battery 39 and the magnet coils, the attraction of the said magnet on the needle 32 may be varied, and by this means a 60 very delicate and efficient adjustment of the contact 32 relative to the contact 33 may be effected.

The contact 32, in the case shown, is electrically connected by flexible conductor 43 65 through a binding post 44 to the antenna 1,

while the contact 33 is electrically connected by a flexible conductor 45 through binding post 46 to the earth wire 2, which latter may or may not be connected to earth through condenser 3. In this case the local shunt 70 circuit around the detector contacts may contain the same parts as in the arrangement illustrated in Fig. 1. In Fig. 3, however, I have shown a reflecting galvanometer 47 as replacing the millimeter 20. In this 75 case the calling stations may be indicated by the position of a reflection on a scale or screen. The galvanometer 47, however, should not be too sensitive.

By suspending in the liquid 23 the whole 80 self contained device comprising the magnet and contacts carried thereby, the liability of said contacts to become affected by extraneous vibrations other than received electrical oscillations, is greatly diminished and is further 85 diminished by making the suspension resilient.

I have had devices of this character in adjustment for many days at a time and have found that the reading of a millimeter connected 90 in circuit therewith at the end of the time to be exactly the same as when the instrument was first adjusted and this in spite of blows by means of a hammer given a table on which the said apparatus was supported, 95 and also in spite of ordinary jars or vibrations which naturally occurred in a portable house in which the apparatus was kept.

Having described several specific forms of apparatus embodying my invention of which 100 there may be still other modifications, what I claim is:—

1. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor arranged to be excited by said oscillations, relatively movable conducting surfaces 105 in close proximity to each other, means normally separating said contacts but permitting contact when said oscillations are received on said conductor, said means reestablishing said separation after the passage 110 of each oscillation, and means to damp the movement of said surfaces.

2. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor to be set in a state of electrical excitation 115 by said oscillations, relatively movable conducting surfaces in close proximity to each other, means separating said contacts and operated upon by said oscillations received 120 on said conductor, establishing an electrical contact, said means reestablishing said separation after the passage of each oscillation, and damping means surrounding the contact portion of said conducting surfaces. 125

3. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor to be set in a state of excitation by said oscillations, conducting surfaces in close proximity to each other and relatively mov- 130



able, a film separating said surfaces and adapted to be punctured by the passage of said oscillations received on said conductor, and a non-conducting bath in which said  
5 conducting surfaces are submerged which re-establishes said separating film.

4. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor to be set in a state of excitation by  
10 said oscillations, conducting surfaces in close proximity to each other and relatively movable, a self-restoring liquid film separating said surfaces and adapted to be punctured by said oscillations received on said conductor,  
15 and an oil bath in which said conducting surfaces are submerged.

5. Receiving apparatus for space signaling by Hertzian oscillations, comprising an antenna, relatively movable conducting surfaces located in close proximity to each  
20 other, a self-restoring film separating said surfaces and adapted to be punctured by oscillations received on said antenna, a bath of non-conducting liquid in which said conducting  
25 surfaces are submerged, and means for placing said liquid under compression.

6. Receiving apparatus for space signaling by Hertzian oscillations, comprising an antenna, a capacity, relatively movable conducting surfaces normally in imperfect electrical  
30 contact between said antenna and said capacity, a bath of non-conducting liquid in which said conducting surfaces are submerged, and means for placing said liquid  
35 under pressure.

7. Receiving apparatus for space signaling by Hertzian oscillations, comprising an antenna, a capacity, relatively movable conducting surfaces normally in imperfect electrical  
40 trical contact between said antenna and said capacity, a bath of oil in which said conducting surfaces are submerged, and means for placing said oil under pressure.

8. Receiving apparatus for space signaling  
45 by Hertzian oscillations, comprising an antenna, conducting surfaces normally in imperfect electrical contact and relatively movable, a non-conducting mobile liquid normally interposed between said conducting surfaces,  
50 and means for placing said liquid under pressure, whereby said contacts will be brought into contact during the passage of said oscillations and immediately separated by said liquid after the passage of the oscillations.

55 9. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor to be set in a state of electrical excitation by said oscillations, conducting surfaces located in close proximity to each other and  
60 relatively movable, means interposed between said surfaces adapted to be punctured only during the passage of said oscillations received on said conductor, a bath of mobile non-conducting substance, and means for

elastically suspending said conducting surfaces therein. 65

10. Receiving apparatus for space signaling by Hertzian oscillations, comprising an antenna, conducting surfaces normally in imperfect electrical contact and relatively movable, means interposed between said surfaces  
70 adapted to be punctured only during the passage of said oscillations received on said antenna, a bath of oil, and means for yieldingly suspending said contacts in said bath. 75

11. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor to be set in a state of excitation by said oscillations, conducting surfaces located in close proximity to each other and relatively  
80 movable, means interposed between said surfaces adapted to be punctured during the passage of said oscillations received on said conductor, means for damping the movement of said surfaces, and magnetic means  
85 for adjusting the normal relative positions of said surfaces.

12. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor to be set in a state of excitation by  
90 said oscillations, conducting surfaces located in close proximity to each other and relatively movable, means interposed between said surfaces adapted to be punctured during the passage of said oscillations received on  
95 said conductor, a bath of mobile non-conducting liquid in which said surfaces are submerged, and magnetic means for adjusting the normal relative positions of said surfaces.

13. Receiving apparatus for space signaling  
100 by Hertzian oscillations, comprising a conductor to be set in a state of excitation by said oscillations, relatively movable conducting surfaces yieldingly held in close proximity to each other in circuit with said  
105 conductor, a bath of non-conducting liquid in which said contacts are suspended, magnetic means for adjusting the normal relative positions of said surfaces, and for placing said liquid under pressure. 110

14. Receiving apparatus for space signaling by Hertzian oscillations, comprising an antenna and a capacity, relatively movable  
115 conducting surfaces normally in imperfect electrical contact between said antenna and said capacity, a magnet to adjust the normal relative position of said surfaces, a bath of oil, yielding supporting means for suspending both said magnet and said conducting  
120 surfaces in said bath, one of said surfaces being normally attracted towards the other by said magnet, and means to adjust the strength of the said magnet.

15. Receiving apparatus for space signaling by Hertzian oscillations, comprising an  
125 antenna and a capacity, relatively movable conducting surfaces normally in imperfect electrical contact between said antenna and



said capacity, a magnet to adjust the normal relative position of said surfaces, a bath of non-conducting liquid, yielding supporting means for suspending both said magnet and said conducting surfaces in said bath, one of said surfaces being normally attracted towards the other by said magnet, and means to adjust the strength of said magnet.

16. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor to be set in a state of excitation by said oscillations, conducting surfaces in close proximity to each other and relatively movable, a self-restoring liquid film separating said surfaces and adapted to be punctured by said oscillations received on said conductor, means to damp the movement of said surfaces, and a deflection instrument connected in shunt around said surfaces and adapted to indicate the adjustment of the conducting surfaces by the amount of the deflection.

17. Receiving apparatus for space signaling by Hertzian oscillations, comprising a conductor to be set in a state of excitation by said oscillations, relatively movable conducting surfaces in close proximity to each other and in circuit with said conductor, an oil bath in which said conducting surfaces are submerged, means for placing said oil bath under pressure, and a deflection instrument connected in shunt around said surfaces and adapted to indicate the relative position of said surfaces by the amount of the deflection.

18. Receiving apparatus for space signaling by Hertzian oscillations, comprising an antenna, relatively movable conducting surfaces normally in imperfect electrical contact and in circuit with said antenna, a bath

of oil, means for placing said oil under pressure, means yieldingly suspending said contacts in said bath, and a deflection instrument connected in shunt around said surfaces and adapted to indicate stations calling.

19. Receiving apparatus for space signaling by Hertzian oscillations, comprising an antenna and a capacity, relatively movable conducting surfaces normally in imperfect electrical contact between said antenna and said capacity, a magnet to adjust the normal relative position of said surfaces, a bath of movable non-conducting liquid, yielding supporting means for suspending both said magnet and said conducting surfaces in said bath, one of said surfaces being normally attracted towards the other by said magnet, means to adjust the strength of the said magnet, and a deflection instrument connected in shunt around said surface and adapted to indicate the stations calling by the amount of the deflection.

20. Receiving apparatus for space signaling by Hertzian oscillations, comprising an antenna, conducting surfaces relatively movable by oscillations received on said antenna and located in close proximity to each other, a circuit including an indicating instrument connected in shunt around said surfaces, and means acting upon said surfaces to maintain the electrical condition of said circuit normally constant.

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

LEONARD D. WILDMAN.

Witnesses:

FRANK N. MOSEBY,  
E. W. BUCKLEY.