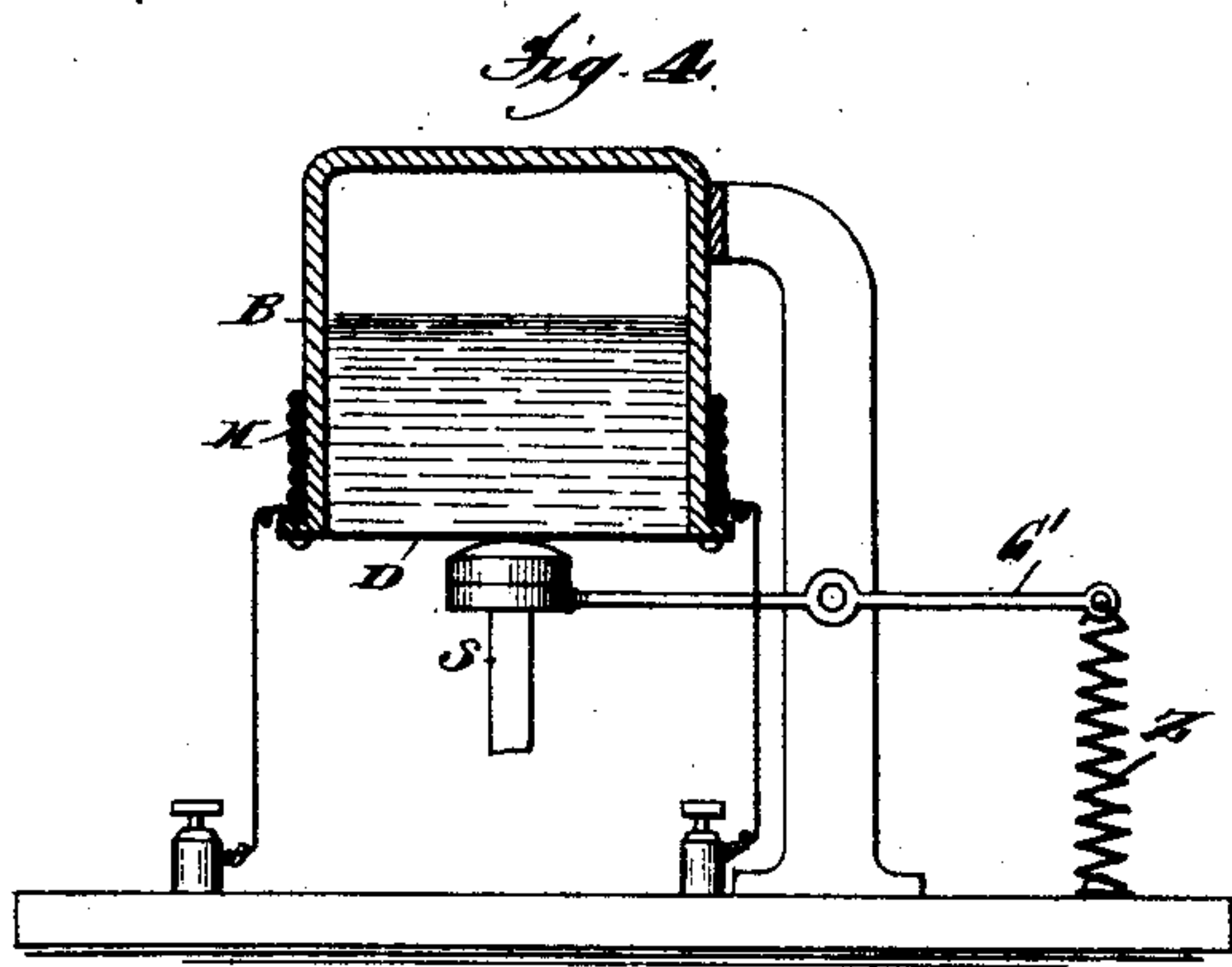
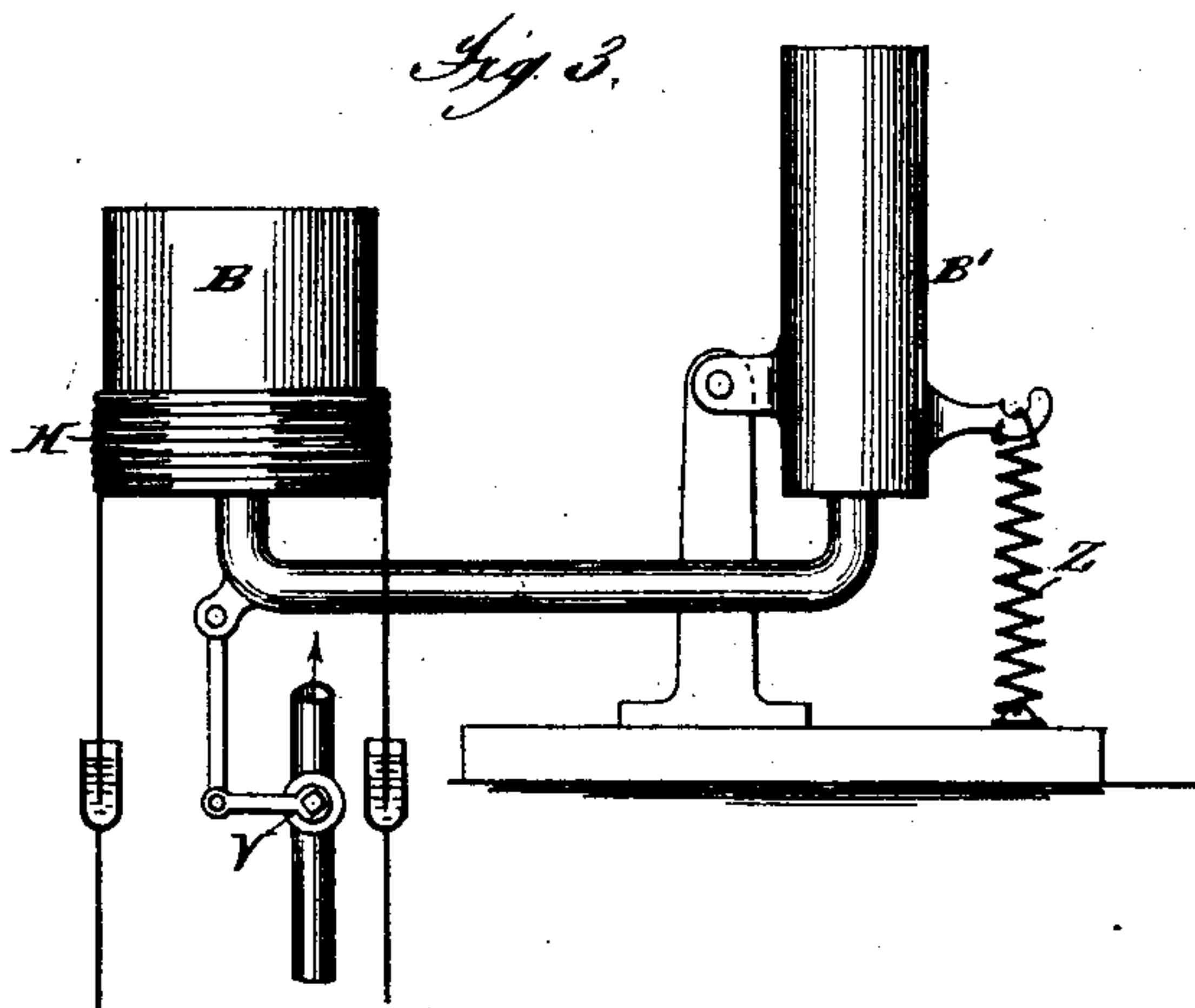
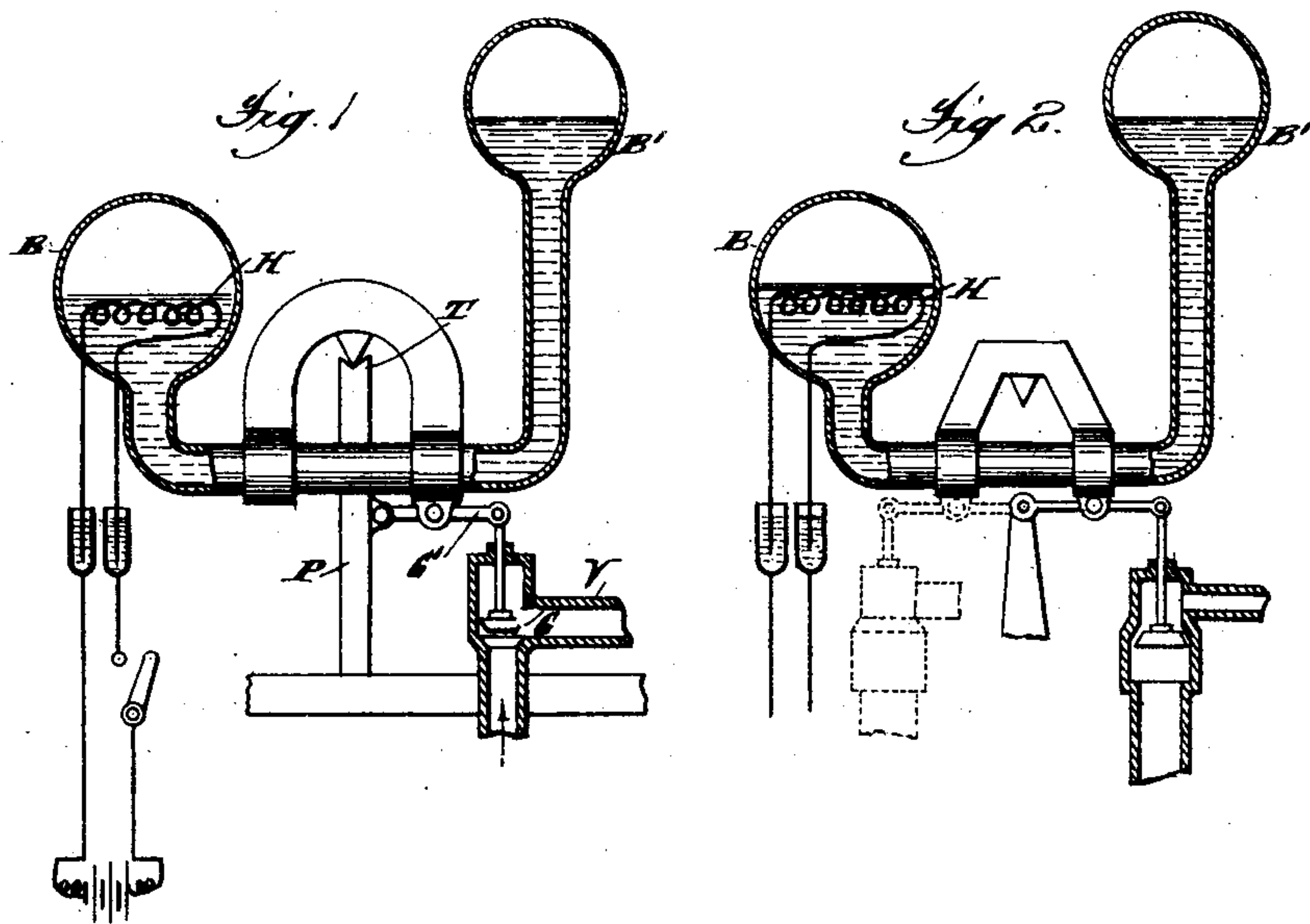


(No Model.)

E. THOMSON.  
ELECTRIC VALVE CONTROLLER.

No. 423,965.

Patented Mar. 25, 1890.



Attest:  
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# UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

## ELECTRIC VALVE-CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 423,965, dated March 25, 1890.

Application filed November 28, 1887. Serial No. 256,306. (No model.)

*To all whom it may concern:*

Be it known that I, ELIHU THOMSON, a citizen of the United States, and a resident of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Electrical Valve-Operating Mechanism, of which the following is a specification.

My invention relates to valve-operating mechanism which is operated electrically by the heating effects of a current of electricity upon a confined body of volatile liquid.

My present invention is one of the useful applications of that form of my broad invention covered by previous applications, wherein I utilize in a variety of ways the bodily movement of a confined body of volatile liquid caused by the pressure of vapor generated above the surface of that liquid by the passage of an electric current through a coil or other resisting part of a circuit placed in heating proximity to said liquid.

For the purpose of the present invention the bodily movement of the confined body of liquid produced in the described manner may be made to actuate the valve-controlling mechanism in a variety of ways, as by disturbing the equilibrium of the apparatus in which the liquid is confined, or by causing the liquid in its movement to press outwardly a yielding wall or side of the receptacle, or in a variety of other ways, which may be readily understood.

For the purpose of illustrating the operation of my present invention I have shown in the accompanying drawings several arrangements of devices for accomplishing the result.

In the accompanying drawings, Figure 1 is an elevation of an apparatus, partly in section, wherein the valve is shown as closed by the tipping of a balanced or pivoted receptacle due to the movement of the liquid from one side to the other under the heating influence of the coil. Fig. 2 is a similar view of substantially the same apparatus arranged to close a valve upon the passage of the heating-current. Fig. 3 is an elevation of a modified form of the apparatus more particularly applicable to the closing of a stop-cock, or in other cases where a considerable movement is required. Fig. 4 is an elevation, partly in section, of an apparatus wherein the liquid is

moved bodily against a yielding side or wall of the receptacle.

In Fig. 1, B B' are two receptacles or chambers connected by tubes, as shown. These receptacles are made of glass or any other suitable material. In the chamber B is placed a coil or resistance H, capable of being traversed by an electric current, and connected with wires, which are hermetically sealed into the sides of the bulb or receptacle. The receptacles, as well as the connecting-tubes, are partly filled with a vaporizable liquid—such as ether, alcohol, and the like—and the bulb or chamber B is sealed or otherwise securely closed against the loss of liquid by vaporization. It may be sealed with an atmospheric or other gas above the liquid; but I prefer to so construct the apparatus that it will contain only the vapor of the liquid itself. The receptacle is shown as pivoted on a column P, or other suitable support, by means of a knife-edge, as indicated at T, or in any other suitable manner.

The pivoted and swinging receptacle is connected with the valve G by means of the lever G' or other suitable devices, by which the movement of the receptacle may be communicated to the valve.

The operation of the device will be readily understood from this description. Upon closing the circuit of the coil H there will be generated in the chamber B a vapor, which, as it cannot escape, will press downward upon the surface of the liquid and force it through the connecting-tubes toward the chamber B', thereby causing that end of the receptacle to tip downward and, by means of the lever G' or other suitable devices, to close the valve G. I have shown the bulb B' as higher in level than the bulb B, as this arrangement insures the emptying of the bulb B' when the current is taken off the coil H. It will be understood, of course, that it is not necessary that the coil H should be placed in the interior of the bulb B, the only condition of the invention in this respect being that it shall be in heating proximity to the volatile liquid.

The apparatus shown in Fig. 2 is the same in all essential respects, except that by this arrangement the passage of the current is caused to open the valve instead of close it,



as in Fig. 1. I have indicated in dotted lines at the left of Fig. 2 that the valve might have been closed by the downward movement of the receptacle B'. This is equally true of Fig. 1. It will be understood, of course, in connection with both of these figures that the interruption of the current followed by the return movement of the liquid will reverse the position of the valve.

In Fig. 3 the glass bulbs are replaced by metal boxes B B', of any suitable size and construction and connected by tubing, as before. In this figure the apparatus is shown as suspended considerably to one side of the center of the apparatus, thereby giving a somewhat increased movement to the distant end of the same suitable to the closing of a stop-cock, as shown at V. The coil H is shown as placed outside of the box B, and a spring Z, connecting with the bulb B', tends to hold the mechanism in the position shown in the figure. The operation is as before. Upon the passage of the current the liquid is driven from the box B to the box B', thereby disturbing the equilibrium of the apparatus and closing the valve V.

In Fig. 4 there is shown the closed bulb or receptacle B, as before partly filled with the vaporizable liquid, properly supported in position by means of any suitable devices. A heating-coil H is placed around the exterior of the vessel, which is provided with a yielding wall or diaphragm D under the surface of the liquid. I have shown it as placed at the bottom of the receptacle; but it will be understood that the position in this respect is not important, as it might be placed with equally good results in the sides of the receptacle below the surface of the liquid. The yielding side or diaphragm D impinges against a pivoted lever G, the free end of which is normally held in contact with the diaphragm by a spring Z. From the opposite side of the free end of the lever projects a valve-stem S, connected by suitable devices with a valve, switch, lever, or any similar device, as may be desired. The operation of the device is as before. Upon the closing of the circuit the heating-coil H generates a vapor within the closed chamber B, which, pressing down upon the liquid, causes it to press against the yield-

ing diaphragm D, which in its outward movement actuates the lever G' and the valve-stem S.

What I claim as my invention is—

1. The combination of a closed receptacle partly filled with a vaporizable liquid, a heating-coil adapted to give rise to a bodily movement of said liquid, a valve, and means actuated by the movement of said liquid to open or close said valve, and a spring or weight for returning the valve to original position when the current ceases to flow through the heating-coil.

2. The combination of an oscillating receptacle partly filled with a vaporizable liquid, a heating-coil adapted to give rise to a bodily movement of said liquid from one part of said receptacle to another, a valve, means actuated by said oscillating receptacle to open and close said valve, and a spring or weight constantly acting in a direction to return the valve and actuating part of the apparatus to original position, whereby on the cessation or weakening of current in the heating-coil the parts may be restored to normal condition.

3. The combination of a pivoted receptacle comprising two chambers or bulbs connected by tubes and partly filled with volatile liquid, one of said chambers or bulbs being on a higher level than the other, a heating-coil adapted to force the liquid from the lower bulb or chamber to the higher, a valve or equivalent device, and means actuated by the movement of said pivoted receptacle to open or close said valve.

4. The combination of an oscillating receptacle partly filled with volatile liquid and pivoted to one side of its center, a heating-coil adapted to force said liquid from the long to the short side of said receptacle, a stop-cock or equivalent device, and means actuated by said oscillating pivoted receptacle to open or close said stop-cock.

Signed at Lynn, in the county of Essex and State of Massachusetts, this 12th day of November, A. D. 1887.

ELIHU THOMSON.

Witnesses:

OTIS K. STUART,  
J. W. GIBBONEY.