

No. 834,704.

PATENTED OCT. 30, 1906.

W. J. BELL.

ELECTRIC FLUID PRESSURE SWITCHING AND SIGNAL APPLIANCE.

APPLICATION FILED JUNE 3, 1905.

3 SHEETS--SHEET 1.

Fig. 1.

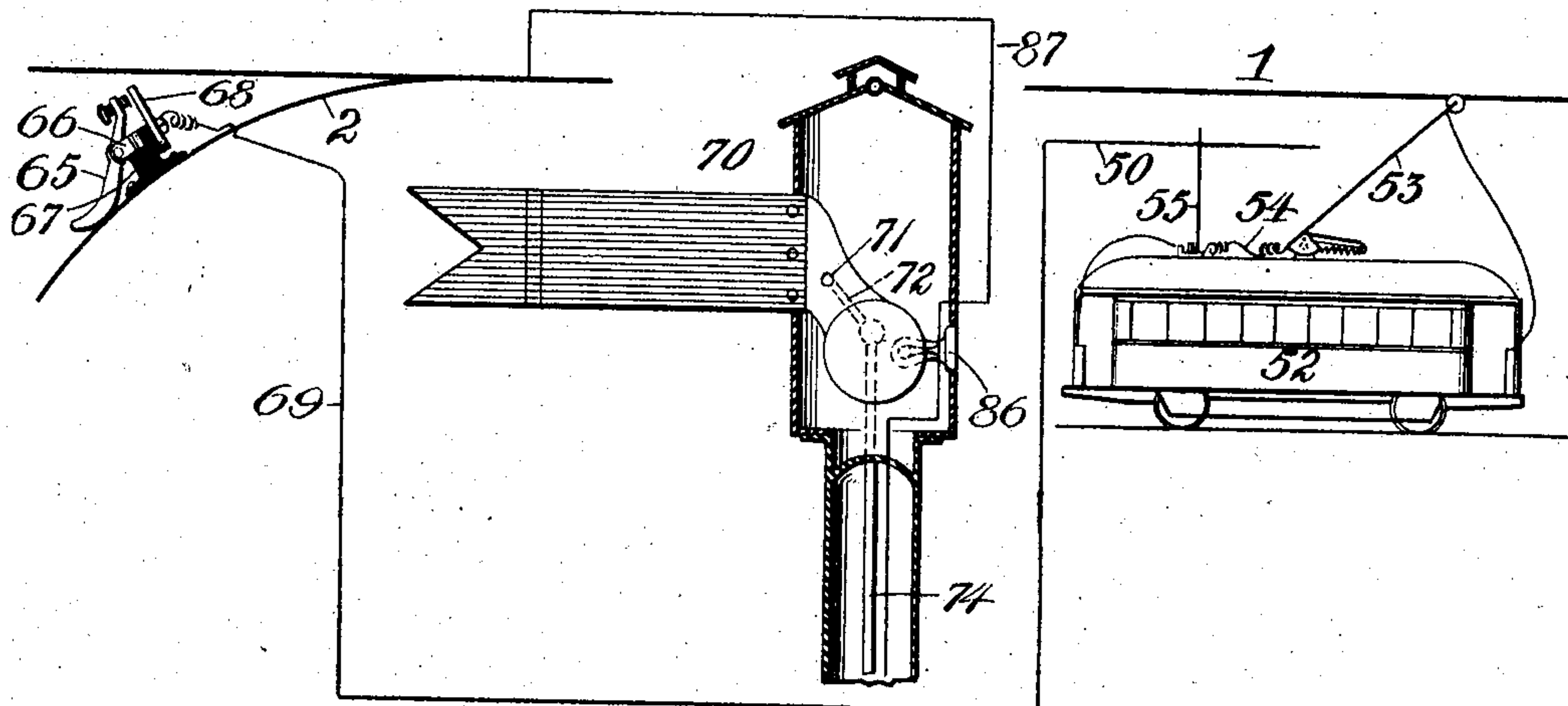
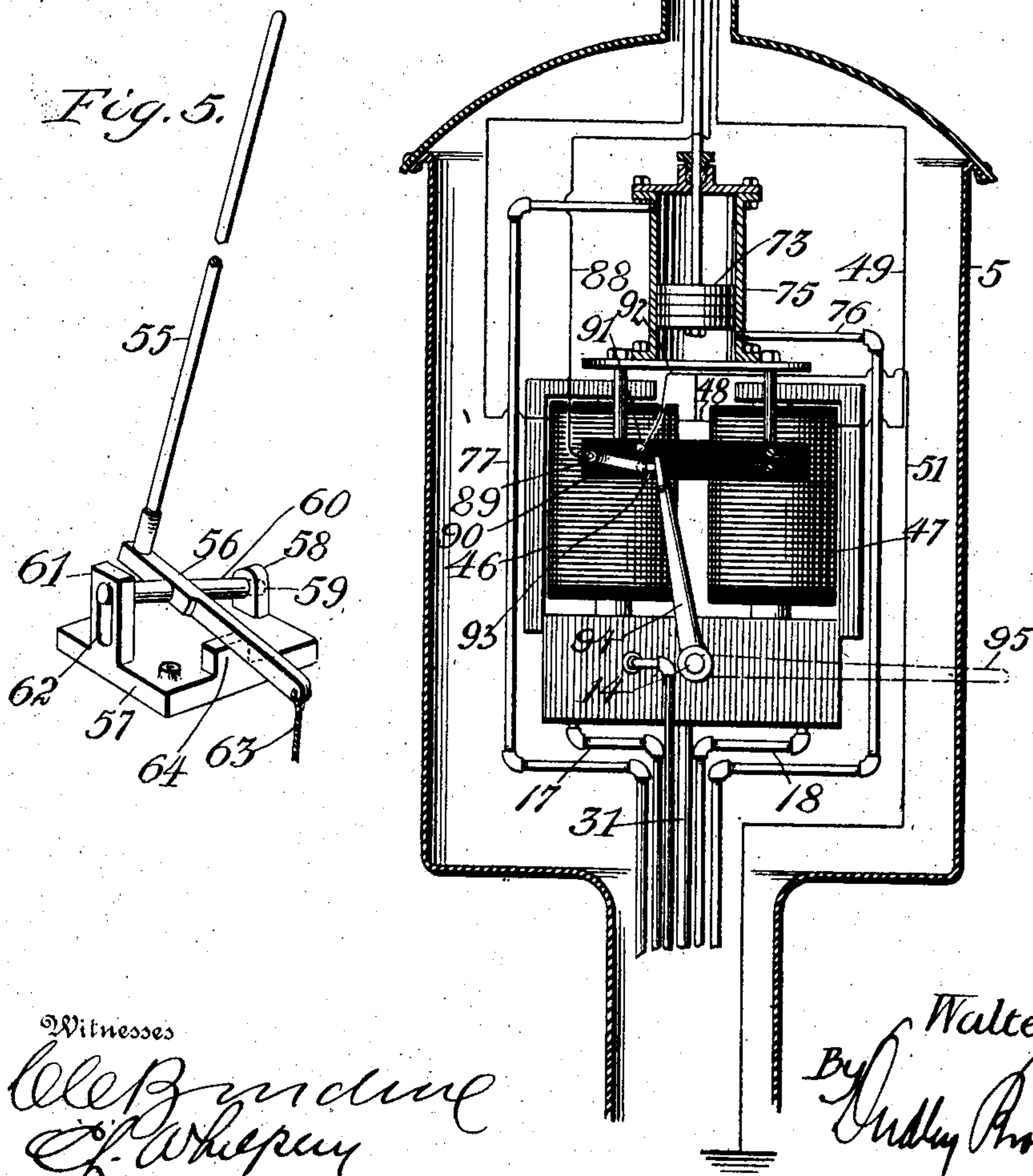


Fig. 5.



Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

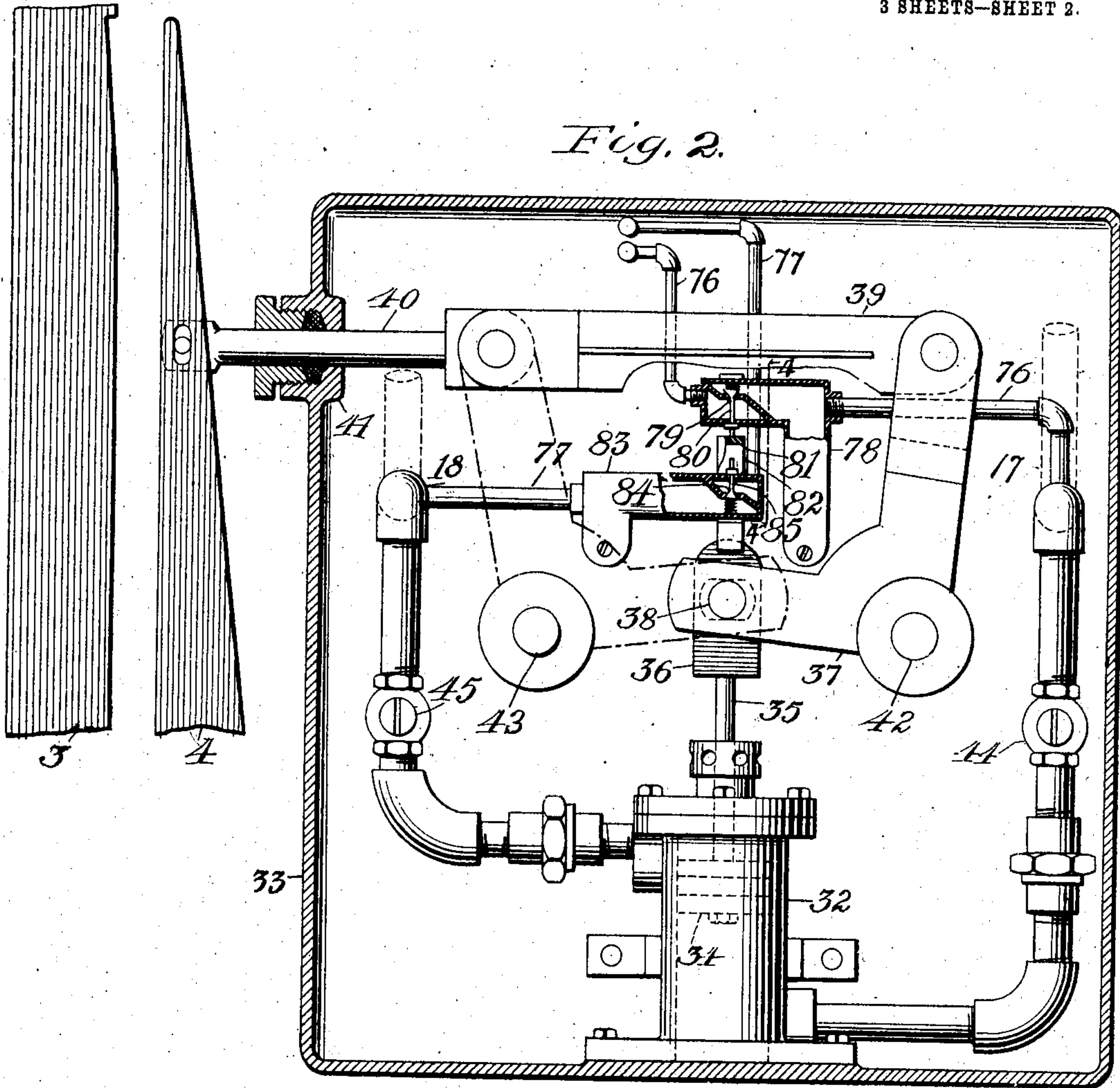
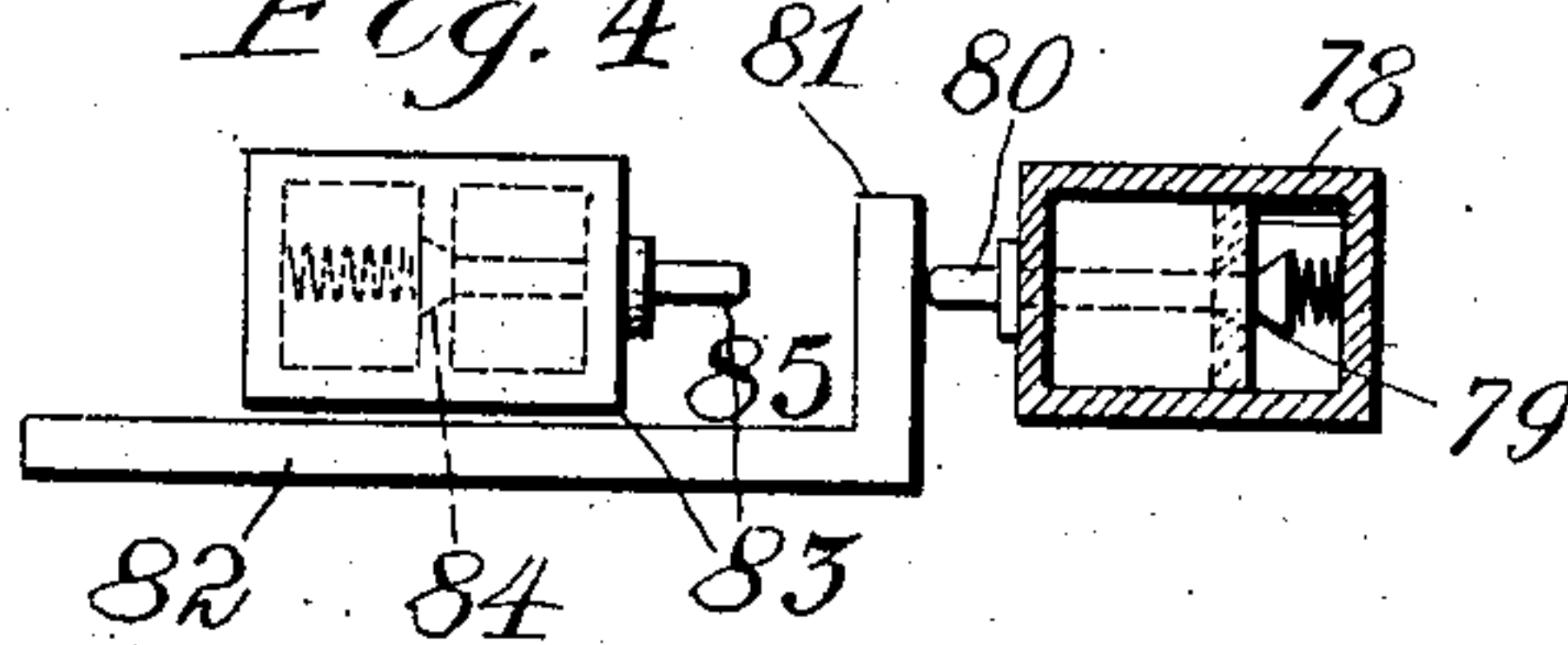


Fig. 4



Witnesses

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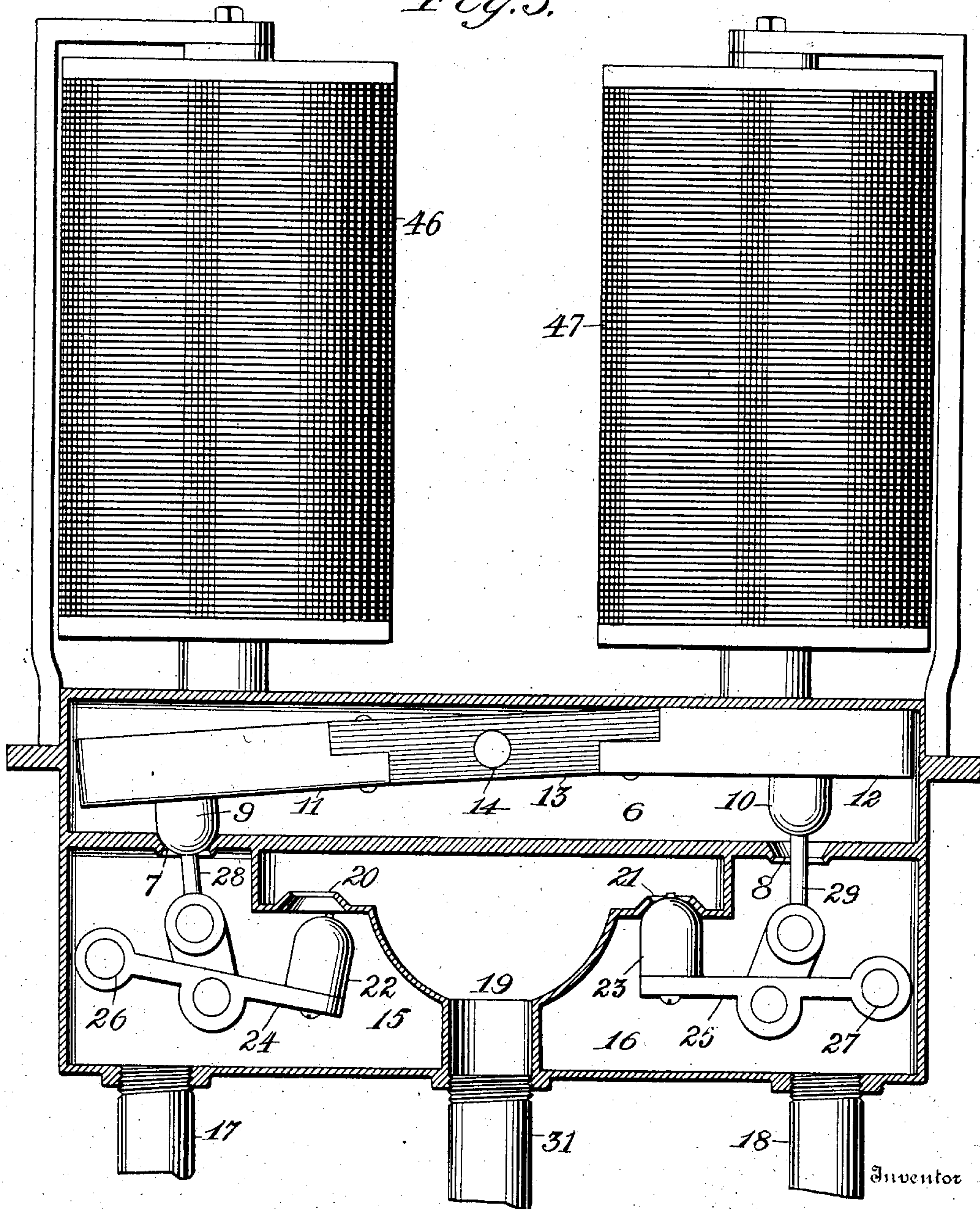
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3 SHEETS—SHEET 3.

Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC FLUID-PRESSURE SWITCHING AND SIGNAL APPLIANCE.

No. 834,704.

Specification of Letters Patent.

Patented Oct. 30, 1906.

Application filed June 3, 1905. Serial No. 263,640.

To all whom it may concern:

Be it known that I, WALTER J. BELL, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented certain new and useful Improvements in Electric Fluid-Pressure Switching and Signal Appliances; 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 electrofluid-pressure switching and signaling mechanisms, and contemplates the production of an improved appliance of this character which, while capable of use in conjunction with any suitable fluid and pressure-creating agent, is more especially designed for employment in connection with the water-supply of towns and cities, the approximately constant pressure of which is obtained by gravity or by the action of pumps.

An object of the invention is the simplification of the construction and operation of appliances of this character whereby durability is obtained and reliability of action assured, and the throw of the switching element is more easily and quickly accomplished regardless of the location of said element relative to the switching means.

A further object of the invention is to preclude displays of false signals in connection with the positions of the switching element, the signaling means, which forms a part of the invention, being brought into action to change the signal when the element has reached its limit of movement, whereby all dangers due to "split switches" may be easily avoided.

Other objects and advantages are set forth in the following detailed description of the invention, and in connection with said description reference is to be had to the accompanying drawings, illustrating the mechanism in its preferred form of embodiment, it being understood that various changes and modifications may be made therein without exceeding the scope of the invention defined by the claims.

In the drawings, Figure 1 is a front elevation of a signal and switch controlling mechanism embodying the invention. Fig. 2 is an enlarged plan view, partly in section, of the switch-throwing means. Fig. 3 is a fur-

ther enlarged sectional view of the main valves and their controlling means. Fig. 4 is a sectional view on line 4 4 of Fig. 2. Fig. 5 is a perspective view of the car-contact and the means for moving it.

Referring to the drawings by numerals, 1 designates the main-line trolley-wire, and 2 is the trolley-wire for the divergent track.

3 is one of the main rails, and 4 is the switch element or tongue. For the purpose of this description it will be assumed that the switch-tongue is moved by water supplied at a more or less constant pressure from city-mains, although the use of this element with its stated source of supply is not to be regarded as a limitation.

The switch-controlling mechanism is contained in a casing 5, suitably supported, and disposed, preferably, above the same is a semaphore and light-signal presently to be described. In the casing is a water-chamber 6, having in its bottom openings 7 8, formed to provide seats for valves 9 10, respectively, carried by armatures 11 12. The armatures are fastened at their inner ends to a non-magnetic bar 13, centrally pivoted on a shaft 14. The chamber 6 communicates, through the openings 7 and 8, with chambers 15 16, from which lead pipes 17 18, and between said chambers is an exhaust-passage 19, having in its walls openings 20 21, formed to provide seats for valves 22 23, carried by arms 24 25, pivoted, respectively, at 26 27. Extending from the valves 9 10 through the openings 7 8 are rods 28 29, respectively, connected by links with the arms 24 25. Water under pressure is supplied to the chamber 6 by a pipe connected with a water-main, and a waste-pipe 31 leads from the exhaust-passage 19.

The pipe 18 leads into one end of a cylinder 32, located in a casing 33 below the surface of the ground, and in which cylinder is a piston 34, having a stem 35 terminating in a slotted head 36. A bell-crank lever 37 carries at one of its arms a pin 38, entering the slot in the head 36, and its other arm is connected by a link 39 with the switch-tongue rod 40, movable in a guide 41. The lever 37 is pivotally mounted on a pin 42 at one side of the cylinder, and a like pin 43 is provided at the other side to allow of the shifting of the lever, as indicated in dotted lines in Fig. 2, to reverse the direction of throw of the switch, as will

be understood. The pipe 17 leads into the opposite end of the cylinder for the retraction of the piston and tongue, and in the pipes 17 and 18 are valves 44 45 to be closed when the cylinder is to be removed for repairs.

Above the chamber 6 are two magnets 46 47 for the alternate attraction and movement of the armatures 11 and 10. The coils of these magnets are connected together by a wire 48, and a wire 49 leads from magnet 47 to a contact 50, supported adjacent to the trolley-wire 1. A ground-wire 51 leads from the wire 48. The car 52 carries the usual trolley pole and wheel 53, and a constantly-charged wire 54 leads from the latter to a contact-arm 55, also carried by the car. The arm 55 extends upwardly from a lever 56, pivoted in a bracket 57, to which the wire 54 may be fastened. This bracket is provided with two ears, one of which, 58, has an approximately circular opening 59 for the pivot-pin 60 of the lever, and in the other ear 61 is a vertical slot 62, confining the other end of said pin. A cord or the like 63 is fastened at one end to the long arm of the lever 56 and its other end is within easy reach of the motorman. If an approaching car is to switch to the divergent track, the motorman of said car draws down the cord 63, thereby rocking the lever 56 and elevating the arm 55, the lever in its movement engaging a stop 64 on the bracket 57. In the further movement of the lever the stop becomes the fulcrum, and by reason of the allowed range of vertical movement of one end of the pin 60, due to the slot 62, the arm 55 is tilted into engagement with the contact 50, whereupon current flows from the trolley-wire 54 and contacts 55 50, thence by the wire 49 to and through the coils of magnet 47, and thence through the wires 48 and 51 to ground. The magnet being thus energized, the armature is moved to raise the valve 10 from its seat and to seat the valve 23. In this movement also the valve 9 is seated to close the chamber 6 at this point, and the exhaust-valve 22 is unseated. The opening 8 being uncovered, water flows under pressure into the chamber 16 and from thence through the pipe 18 into the forward end of the cylinder 32. The piston is by the incoming water moved rearwardly, and through the described connections the switch-tongue is thrown in the direction to cause the car to enter the divergent track.

Supported by the divergent trolley-wire at the proper distance from the switch is a normally open circuit-closer, consisting, preferably, of a contact-arm 65, pivoted immediately in a bracket 66, fixed to the hanger 67. A fixed contact 68 on the bracket is connected by a wire 69 with the coils of magnet 46, said coils being connected to ground by

the aforesaid wires 48 and 51. As the car passes beneath the circuit-closer the wheel thereof rocks the arm 65 into engagement with the contact 68, whereupon current flows from the trolley-wire 2 through the wheel, through contacts 65 68, through the wire 69 and coils of magnet 46, and thence through wires 48 and 51 to ground. The magnet 46 being thus energized, the armature 11 is elevated and the armature 12 depressed, resulting in the seating of valves 10 and 22 and the unseating of valves 9 and 23. In this position of the parts the water in front of the piston finds outlet through the pipe 18, chamber 16, opening 21, exhaust-chamber 19, and exhaust-pipe 31, and the piston is retracted by water under pressure flowing into the rear end of the cylinder through the now uncovered opening 7, chamber 15, and pipe 17.

In conjunction with the switching mechanism there is employed, as before stated, a signal device in the form of a semaphore 70 for indicating the positions of the switch-tongue. The semaphore may have the usual board and bull's-eye pivoted on a shaft 71, from which extends an arm 72, connected with a piston 73 by a rod 74. The piston is slidably confined in a cylinder 75, into the ends of which lead pipes 76 77, communicating, respectively, with the pipes 17 and 18. In the pipe 76 is a chamber or casing 78, containing a spring-pressed valve 79, the stem 80 of which extends through the bottom of the casing into the path of a shoulder 81 on an arm 82, fixed to and movable vertically with the head 36. A similar chamber or casing 83 in the pipe 77 contains a spring-pressed valve 84, seating in a direction opposite to that of the valve 79 and having its stem 85 extending through the top of the casing into the path of movement of the shoulder 81. The stems of the valves 79 and 84 are disposed, preferably, in vertical alinement, as shown. With the parts in position to effect the throw of the switch, that portion of the pipe 77 between the pipe 18 and the seated valve 84 is in communication with said pipe 18, and therefore pressure exists in the casing 83. As the piston 34 reaches its limit of rearward movement the shoulder 81 engages the stem of valve 84 and unseats the latter, whereupon water under pressure flows through the pipe 77 and into the upper end of cylinder 73, forcing piston 73 downwardly and moving the semaphore-board and bull's-eye into danger position. With the parts positioned to effect the resetting of the switch, pressure is present in the pipe 76 and casing 78, the valve 80 being closed. As the piston 34 reaches its limit of forward stroke the shoulder 81 engages the stem of valve 79 to unseat the latter, and pressure flows through the pipe 76 to beneath the piston 73, whereupon the semaphore-board and bull's-eye are moved into position to indicate a clear

track. Thus the danger and safe positions of the semaphore are obtained only when the switch-tongue is fully thrown, and false signaling is prevented and danger from split switches completely avoided. The pressures in pipes 76 and 77 exhaust with the exhaust of the pressures in the pipes 17 and 18, with which they respectively communicate, as before stated, the valves 79 and 84 being unseated by the returning pressure.

It will be understood that the usual red lens is provided in connection with the bull's-eye to indicate danger, and there is also employed an electric light 86, one wire 87 of which is connected with the trolley-wire or other source of current, the other wire 88 being connected to a hand switch-lever 89, mounted on an insulating-board 90, supported in front of the magnets. One fixed contact 91 of the switch is connected by a wire 92 with the ground-wire 51, and when it is desired to have a constant light the lever 89 is moved over the contact 91. If it is desired to show a light during the switching operation only, the lever is moved over a contact 93 on the board 90, which contact is engaged by a swinging contact-arm 94, fixed to the armature-shaft 14 and movable therefore with the armatures.

95 is a hand-lever fixed to the shaft 14 to be moved by the motorman to throw the switch in the event of the failure of the controlling means.

I claim as my invention—

1. In an appliance of the character described, the combination of a switching element, a fluid-pressure-actuated element, and a connection between said elements including a bell-crank lever adapted to be reversed to reverse the throw of the switching element.

2. In an appliance of the character described, the combination of a switching element, a piston, and a connection between the element and piston including a bell-crank lever capable of being reversed in position to reverse the throw of the switching element.

3. In an appliance of the character described, the combination with an electrically-operated switching element of a fixed contact, and a contact carried by the car, said contact being supported to be moved vertically and laterally to engage the fixed contact to close an electric circuit and actuate the switch.

4. In an appliance of the character described, the combination with an electrically-operated switching element of a fixed contact located adjacent to the path of a car, and a contact carried by the car and adapted to be moved vertically and laterally into engagement with the fixed contact to close an electric circuit and actuate the switch.

5. In an appliance of the character de-

scribed, the combination with an electrically-operated switching element of a fixed contact located adjacent to the path of movement of a car, a contact carried by the car and adapted to be moved vertically and laterally into engagement with the fixed contact, and hand means for moving the car-contact to close an electric circuit and actuate the switch.

6. In an appliance of the character described, the combination of a fixed contact located in proximity to path of movement of a car, an arm-contact carried by the car mounted to be raised vertically, and means for laterally tilting the car-contact at the end of its vertical movement into engagement with the fixed contact.

7. In an appliance of the character described, the combination of a switching element, a piston operatively connected with said element, a cylinder for said piston, a fluid-pressure chamber having pipe connection with opposite ends of said cylinder, connected valves controlling the supply to and exhaust from said cylinder, a pair of electromagnets, and connected armatures at said magnets operatively connected with said valves.

8. In an appliance of the character described, the combination of a switching element, a piston operatively connected with said element, a cylinder for said piston, a fluid-pressure chamber having pipe connection with opposite ends of said cylinder, an exhaust-pipe, connected pairs of valves for controlling the supply and exhaust pipes, a connected pair of armatures for moving said pairs of valves, and a pair of magnets alternately energized to move said armatures.

9. In an appliance of the character described, the combination of a pair of magnets alternately energizable, armatures for said magnets connected together to move in unison in opposite directions, fluid-supply pipes, a fluid-exhaust passage, a pair of valves for each supply-pipe and the exhaust-passage, the supply-valve and exhaust-valve of each pair seating alternately, and a connection between each armature and each pair of valves.

10. In an appliance of the character described, the combination of fluid-supply passages each having an opening, a fluid-exhaust passage having openings, connected alternately-seating valves for controlling each supply-opening and the companion exhaust-opening, and an armature connected with each pair of supply and exhaust valves the armatures being connected together to move in unison in opposite directions.

11. In an appliance of the character described, the combination of a switching element, fluid-pressure means for moving said element, a signal, and fluid-pressure means controlled at the ends of the movements of

said element for operating said signal the
controlling means for each of said fluid-pres-
sure means including a pair of connected
valves and means for alternately moving
5 said valves.

12. In an appliance of the character de-
scribed, the combination of a switching ele-
ment, fluid-pressure means for moving said
element, a signal, fluid-pressure means for
10 moving said signal and connections between
the two means, the signal-moving means be-
ing operated coincidently with the ends of
movements of the switching element and
controlling means for each of said fluid-pres-
15 sure means including a pair of connected

valves and means for alternately moving
said valves.

13. In an appliance of the character de-
scribed, the combination of a switching ele-
ment, a piston for moving said element, a 20
signal, fluid-pressure means for operating
said signal including two valves connected to
each other, and means connected with said
piston for alternately moving said valves.

In testimony whereof I affix my signature 25
in presence of two witnesses.

WALTER J. BELL.

Witnesses:

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CHARLOTTE DEE.