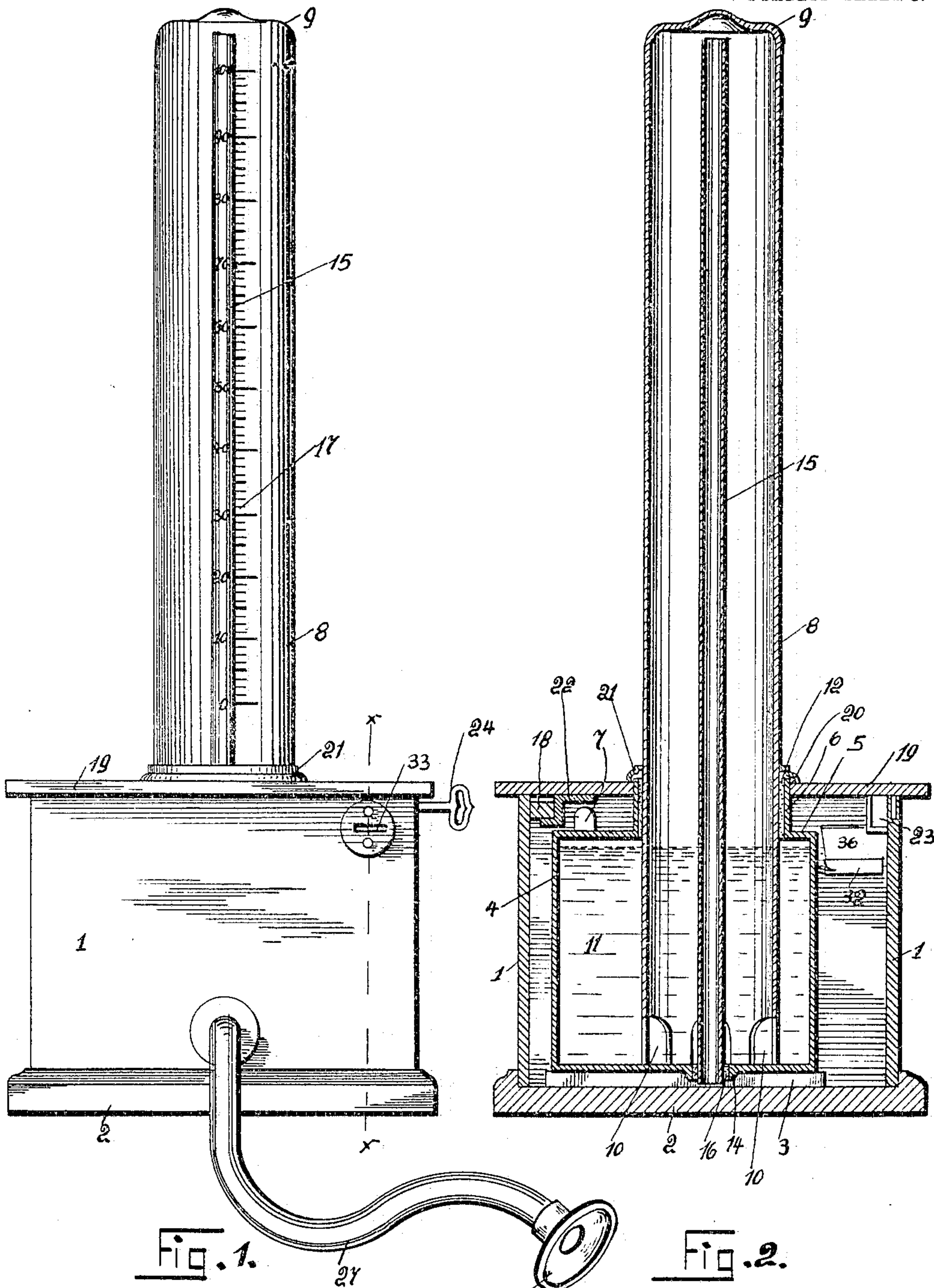


No. 781,627.

PATENTED JAN. 31, 1905.

J. D. WOLF.
LUNG TESTING MACHINE.
APPLICATION FILED NOV. 15, 1904.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

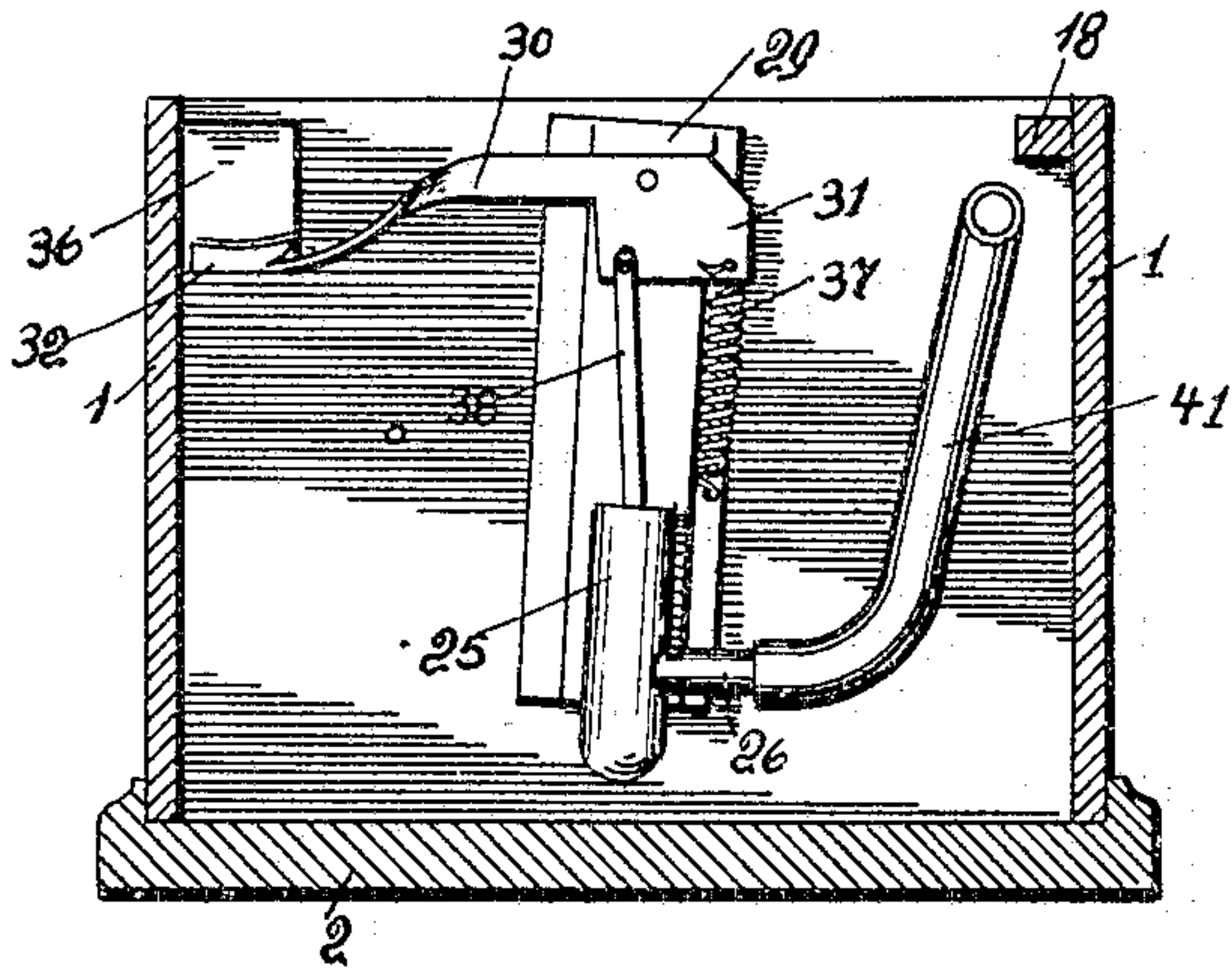


Fig. 4.

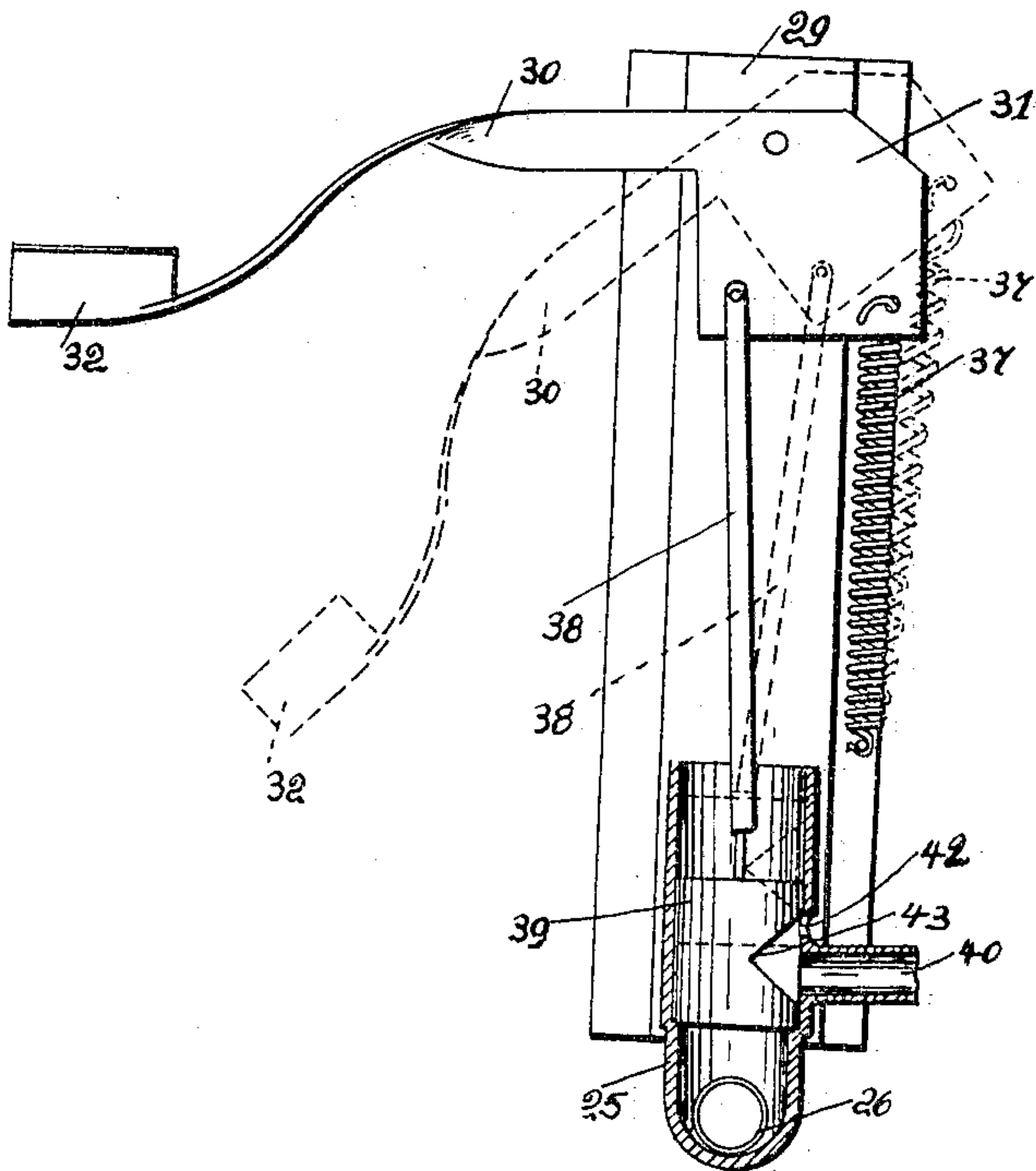
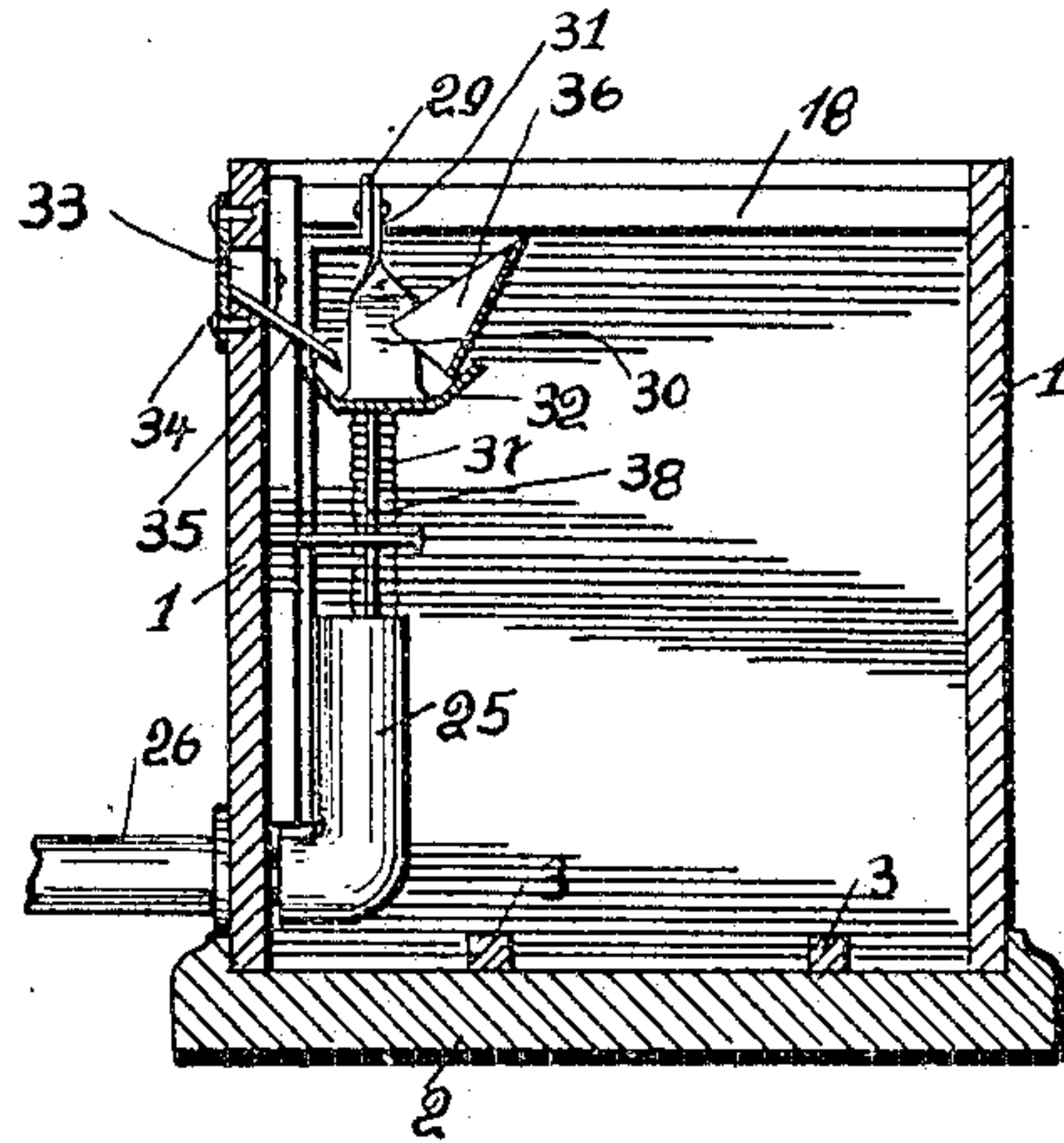


Fig. 5.

Fig. 6.

Fig. 7.

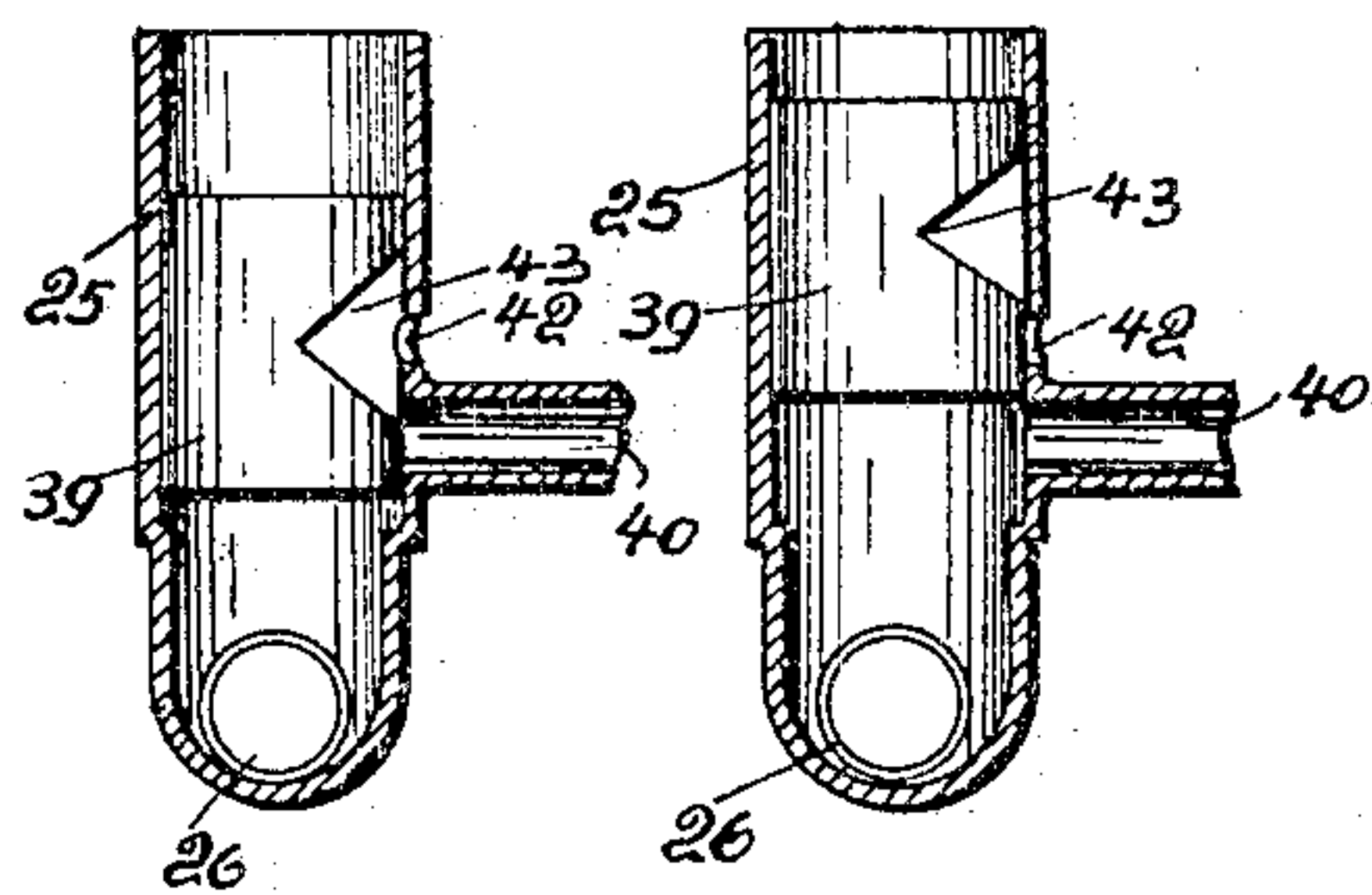


Fig. 8.

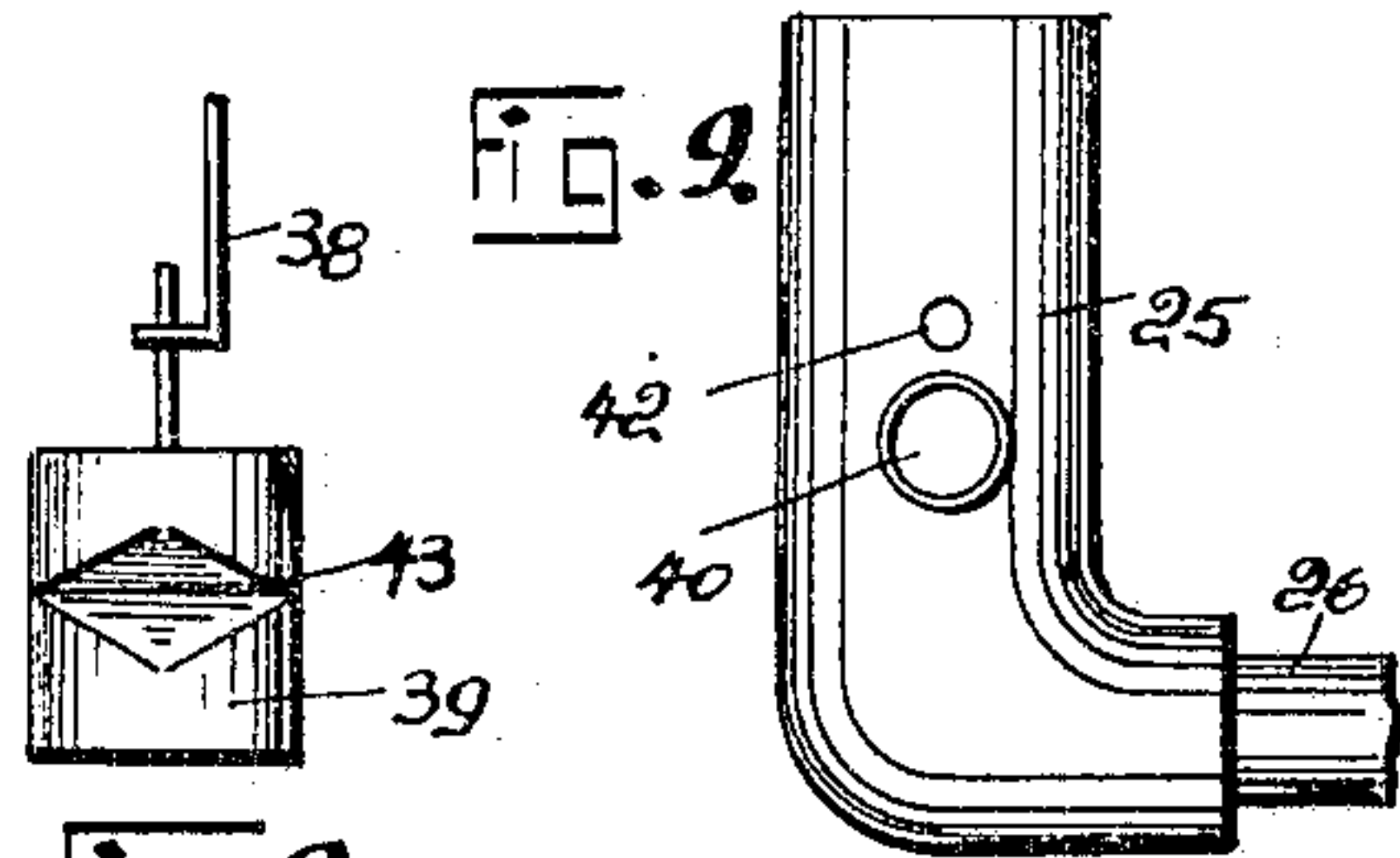


Fig. 8.

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UNITED STATES PATENT OFFICE.

JOSEPH D. WOLF, OF BEAVER, PENNSYLVANIA.

LUNG-TESTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 781,627, dated January 31, 1905.

Application filed November 15, 1904. Serial No. 232,878.

To all whom it may concern:

Be it known that I, JOSEPH D. WOLF, a citizen of the United States of America, residing at Beaver, in the county of Beaver and State of Pennsylvania, have invented certain new and useful Improvements in Lung-Testing Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in lung-testing machines; and the object of this invention is to provide a machine of this type which will be extremely simple in construction and comparatively inexpensive to manufacture.

The invention contemplates a testing-machine wherein a reservoir and graduated stand-pipe are employed, and to the reservoir air is adapted to be admitted to raise the liquid contained in the same within the stand-pipe, and I have provided a novel form of valve and coin-controlling mechanism which will automatically operate when a coin is deposited in the machine and the operator admits air to the same.

Heretofore in machines of this type the stand-pipes commonly used have been open at their upper ends, whereby when the water has been raised a sufficient distance it will be emitted from said tube. This construction permits of all kinds of refuse, such as paper and the ends of cigars, being placed in the tube by the juvenile class that generally linger around machines of this type when the same are being tested. In my improved machine I close the upper end of the stand-pipe and provide an auxiliary pipe within the stand-pipe, whereby when the water has reached a certain height or air has passed through the water after the same has reached this height may be carried off from the stand-pipe without interfering with the general operation of the machine.

I have also provided novel means in connection with the machine whereby when a person is testing his lungs it will be impossible for the operator upon once placing the machine in operation to inhale a fresh supply of air to inject into the machine, means being provided which will automatically cut off the air-con-

duit when the operator has ceased to inject air into the machine.

The invention finally consists in the novel construction, combination, and arrangement of parts, which will be hereinafter more fully described, and, referring to the drawings accompanying this application, like numerals of reference designate corresponding parts throughout the several views, in which—

Figure 1 is a front elevation of my improved machine. Fig. 2 is a vertical sectional view of the same. Fig. 3 is a vertical sectional view of the casing of my improved machine looking toward the inner front wall thereof. Fig. 4 is a transverse sectional view taken on the line *x x* of Fig. 1. Fig. 5 is a detail view of the coin-controlling mechanism, showing the valve thereof in vertical section. Figs. 6 and 7 are detail sectional views of the valve, showing the piston in the two positions it will assume when the machine is operated. Fig. 8 is a side elevation of the piston; and Fig. 9 is a side elevation of the valve-casing, showing the inlet and exhaust ports.

To put my invention into practice, I employ a rectangular casing or box, as designated by the reference-numeral 1, and upon the base 2 of the casing or box I secure the cleats 3 3, upon which is adapted to rest a reservoir 4, which is preferably rectangular in shape and has its top 5 formed with a flanged opening, as indicated at 6. The reservoir is also provided in its top with an air-inlet pipe or nipple 7. In the flanged opening 6 is mounted a stand-pipe 8, which is preferably made of a transparent material, such as glass, this stand-pipe having a closed end, as indicated at 9, while the other end of said pipe is adapted to rest upon the base of the reservoir and is formed with a plurality of openings 10, whereby the liquid 11 contained within the reservoir will be admitted to the stand-pipe and will assume a level therein equivalent to that within the reservoir 4. The stand-pipe 8 is secured within the flanged opening 6 by plaster-of-paris or any suitable cement, as designated by the reference-numeral 12. The bottom of the reservoir centrally of the stand-pipe 8 is provided with a flanged opening 14, through which extends a

pipe 15, this pipe extending upwardly into close proximity to the closed end 9 of the stand-pipe 8. The pipe 15 is secured in the flanged opening 14 by plaster-of-paris or a
 5 suitable cement, as designated at 16, this end of the pipe being withheld from engagement with the base 2 of the casing of my improved machine by the cleats 3 3. The stand-pipe 8 is graduated upon its front side, as indicated
 10 at 17, each one of the graduations representing two ounces of liquid contained within the reservoir, and the stand-pipe is made of a sufficient size to have a capacity equivalent to the reservoir.

15 One of the side walls of the casing 1 is provided with a cleat 18 near its upper edge, this cleat serving to secure a suitable cover or lid 19 upon the casing. The lid is provided with an opening 20, through which the stand-pipe
 20 8 and the flanged opening 6 of the reservoir are adapted to protrude. Surrounding this opening and the stand-pipe I provide a suitable metallic molding 21, which is in the form of a split ring and is adapted to be placed
 25 down over the stand-pipe 8 when the lid has been secured upon the casing. The inner face of the lid is provided with an angular clip 22, which is adapted to engage in the cleat 18, and the opposite edge of the lid is provided
 30 with a suitable lock 23, which is adapted to engage in the side of the casing 1, a suitable key 24 being employed to manipulate the lock 23 to secure the lid 19 upon the casing 1.

35 Reference will now be had to Figs. 3 to 9, inclusive, wherein I have illustrated the coin-controlling mechanism of my improved testing-machine. Upon the front side of the wall of the machine is mounted a substantially
 40 L-shaped valve-casing 25, the lower end of which protrudes without the casing, as indicated at 26, and upon this end of the casing is secured a flexible pipe 27, which is provided with a funnel-shaped mouthpiece 28. Secured
 45 to the inner face of the front wall of the casing adjacent to the valve-casing 25 is an angularly-disposed strip 29, and upon the upper end of said strip is pivotally mounted the coin-receiving lever 30. This lever is pro-
 50 vided with an enlarged portion 31 upon its pivoted end, while the other end of said lever extends outwardly and is bent downwardly to a position in close proximity to the side wall of the casing 1. The end of this lever has its
 55 sides bent upwardly, as indicated at 32, forming a receptacle in which a coin is adapted to be deposited, this coin being admitted to the casing through an opening 33, formed in the front wall. This opening is provided with a
 60 slotted escutcheon-plate 34 and also with an inclined plate 35, which is adapted to guide the coin into the receptacle 32. The side of the casing adjacent to the opening 33 is provided with an angularly-disposed guide-plate
 65 36, which is adapted to prevent the coin,

which may be injected into the opening 33 with considerable force, from being displaced without the receptacle 32 until the machine has been operated. The enlarged portion 31
 70 of the lever 30 is connected by a spiral spring 37 to the strip 29, this spring serving to normally hold the lever 30 in close proximity to the opening 33, as illustrated in Figs. 3 to 5, inclusive, of the drawings. The enlarged portion 31 is also pivotally connected by a link
 75 38 to a piston 39, that is slidably mounted within the valve-casing 25. This valve-casing is provided with an outlet 40, which is connected by a flexible pipe 41 to the air-inlet pipe 7 of the reservoir. The reference-num-
 80 eral 42 designates an exhaust-port formed in the valve-casing directly above the outlet-pipe 40. The piston 39 has formed in its one side a recess 43, the object of which will be presently described. 85

The operation of my improved lung-testing machine is as follows: The machine as constructed by me is adapted to test the lungs of a person by determining the amount of a liquid, such as water, that can be raised in the
 90 stand-pipe 8 by my improved machine, and to place the machine in operation a coin is deposited in the casing 1 through the opening 33, this coin being received by the receptacle 32, formed upon the end of the lever 30. The normal position of the piston 39 is shown in Fig.
 95 5 of the drawings, and upon the operator placing the funnel 28 over his mouth and blowing air into the same the combined weight of the coin and the force of air raises the piston to the
 100 position shown in Fig. 7 of the drawings, Fig. 6 illustrating this piston in one of the positions it will assume when passing the outlet-pipe 40. When the piston has been raised to the position shown in Fig. 7 of the drawings, the air
 105 passing through the pipe 26 is admitted into the valve-casing and into the outlet-pipe 40, where it passes through the flexible pipe 41 to the air-inlet pipe 7 of the reservoir, and the force of air or pressure upon the top of the liquid
 110 11 will force the same through the openings 10 of the stand-pipe 8 and raise the water to a height within the stand-pipe which will be indicated by graduations 17 of said pipe, and, as heretofore stated, these graduations deter-
 115 mine how many ounces of liquid can be lifted by the air exhaled from the lungs of the person operating the machine. When the air of the operator's lungs has been exhausted, the spiral spring 37 will return the piston to the
 120 position illustrated in Fig. 5 of the drawings, this position preventing the operator from again operating the machine until the liquid within the stand-pipe has assumed its normal position within the reservoir and until another
 125 coin has been deposited within the machine. The lowering of the piston 39 by the spiral spring 37 prevents the operator from making any false test which might be occasioned by a second inhalation of the lungs. When the
 130

piston 39 recedes within the valve-casing, the outlet-pipe 40 is shut off from the inlet-pipe 26 by said piston and the exhaust-port 42 and the outlet-pipe 40 are placed in communication by the recess 43 of the piston and the air which has been forced into the reservoir will be permitted to exhaust to permit the liquid within the stand-pipe to recede into the reservoir and assume its normal position. Should the operator inject sufficient air into the machine to force all of the liquid out of the reservoir into the stand-pipe, the air will pass up through the water into the top of the stand-pipe 8 and will then be carried downwardly through the pipe 15 to the exterior of the reservoir. This pipe, through which the excess amount of air is adapted to pass, constitutes one of the main features of my invention, and should the passage of the air through the water be of such force as to cause a violent eruption of the water, part of the water may be carried off through the pipe 15 without in any instance damaging or straining the stand-pipe 8. When the coins have been deposited in the receptacle 32 and the operator has forced air into the valve-casing, the lever 30 is lowered sufficiently to drop the coin into the casing, and upon the accumulation of coins within this casing the lid 19 may be unlocked and removed, whereby the coins may be extracted from the casing of my improved lung-testing machine.

While I have herein shown the preferred manner of constructing my improved machine, I wish it to be understood that I may employ other valves and coin-controlling mechanism than that illustrated in the accompanying drawings, and I may make various other changes in the details of construction without departing from the general spirit and scope of the invention.

Having fully described my invention, what I claim, and desire to secure by Letters Patent, is--

1. A machine of the type described comprising a casing, a reservoir mounted in said casing and adapted to contain a liquid, a transparent stand-pipe mounted in said reservoir, a pipe mounted within said stand-pipe and communicating with the exterior of said reservoir, a valve mounted adjacent to said reservoir, means for automatically operating said valves, means for locking said valve in an inoperative position, substantially as described.

2. In a machine of the type described, the combination with a suitable air-supply, of a casing having a lid, a reservoir mounted in said casing and adapted to contain a liquid, a transparent stand-pipe mounted in said res-

ervoir and adapted to protrude without said casing, a valve mounted adjacent to said reservoir, said valve adapted to be operated by said air-supply to admit air to said reservoir, a coin mechanism controlling the movement of said valve, substantially as described.

3. In a machine of the type described, the combination with a reservoir adapted to contain a liquid, of a transparent pipe mounted in said reservoir, the upper end of said transparent pipe being closed, and means to admit air to said reservoir to raise the liquid within said transparent pipe, substantially as described.

4. In a machine of the type described, the combination with a reservoir adapted to contain liquid, of a transparent pipe mounted in said reservoir, said transparent pipe having its upper end closed, a pipe mounted in said transparent pipe and communicating with the exterior of said reservoir, and means for admitting air to said reservoir to raise the liquid within said transparent pipe, substantially as described.

5. In a machine of the type described, the combination with a reservoir adapted to contain a liquid, of a transparent stand-pipe mounted upon the bottom of said reservoir and protruding through the top thereof, said pipe having its upper end closed, a pipe mounted in said transparent pipe and communicating with the exterior of said reservoir, means whereby, when air is injected into said reservoir, said liquid will be carried upwardly in said stand-pipe, substantially as described.

6. In a machine of the type set forth, the combination with a reservoir adapted to contain a liquid, of a transparent stand-pipe mounted in said reservoir and communicating with the exterior thereof, said pipe having its upper end closed, means whereby when an excess amount of air is admitted to said reservoir said air will be removed from said stand-pipe, substantially as described.

7. The combination with a casing having a suitable lid, of a reservoir mounted in said casing, a transparent graduated pipe mounted in said reservoir and protruding without said casing, means for automatically controlling the admission of air to said reservoir, means whereby when an excess amount of air is admitted to the reservoir, said air will be removed from said transparent pipe, substantially as described.

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

JOSEPH D. WOLF.

Witnesses:

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K. H. BUTLER.