(No Model.) 2 Sheets—Sheet 1.

A. G. NOACK.

HYDRAULIC AIR COMPRESSOR.

No. 550,352. Patented Nov. 26, 1895.

Fig. 1.

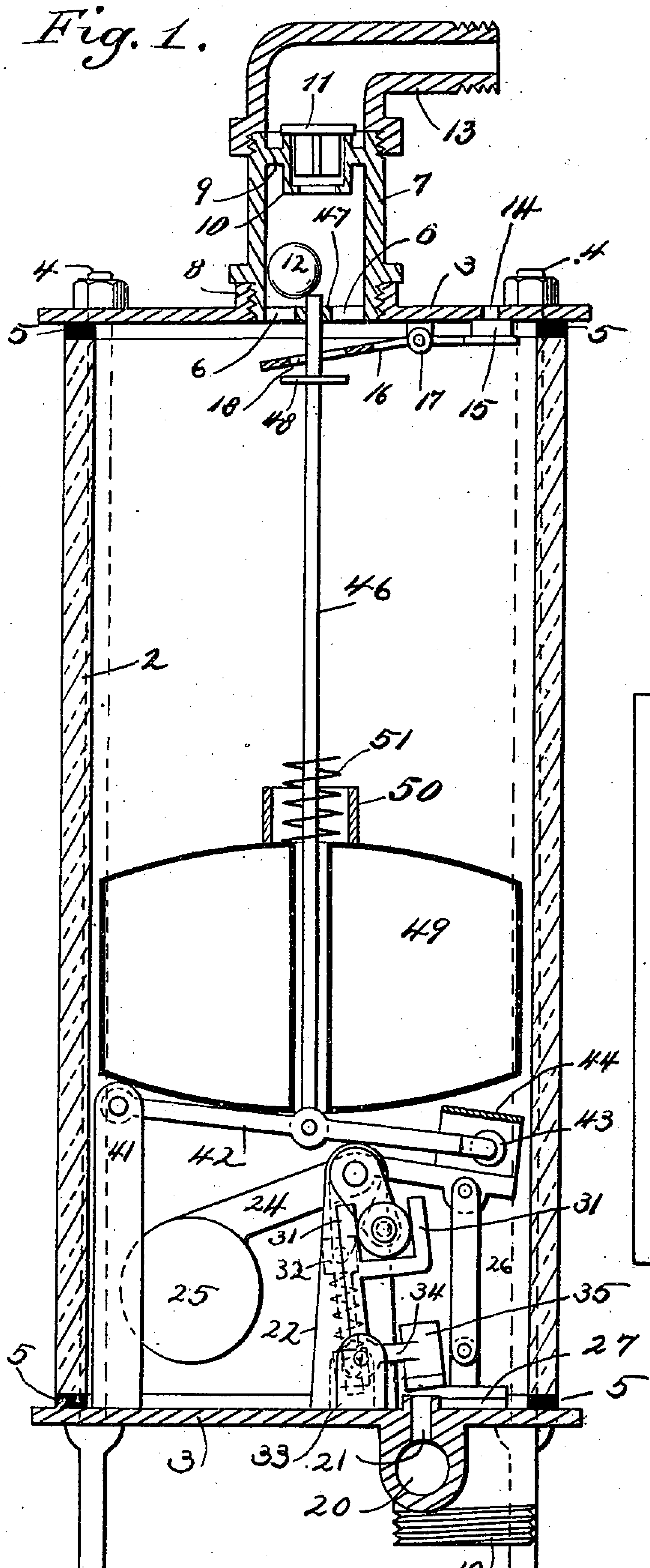
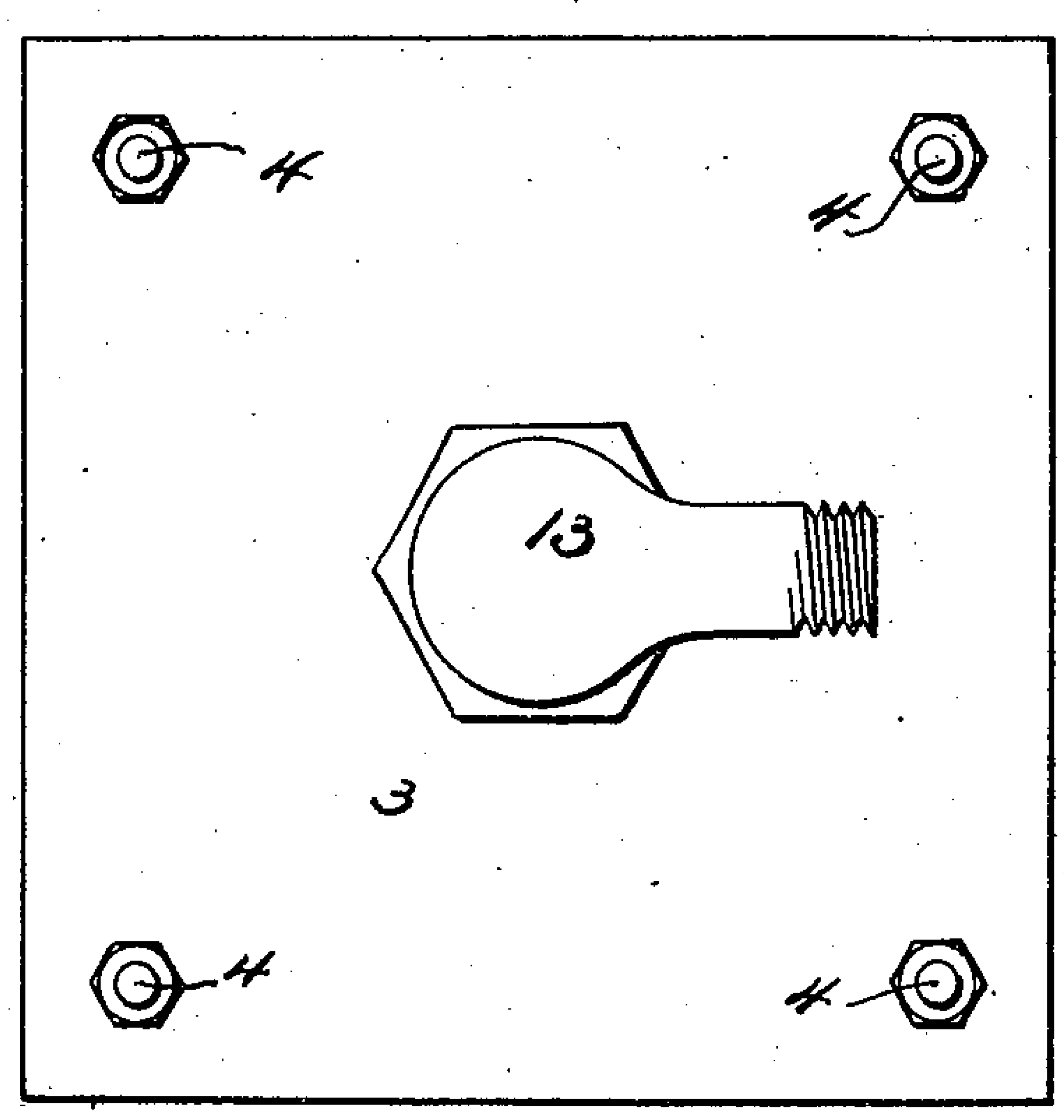


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

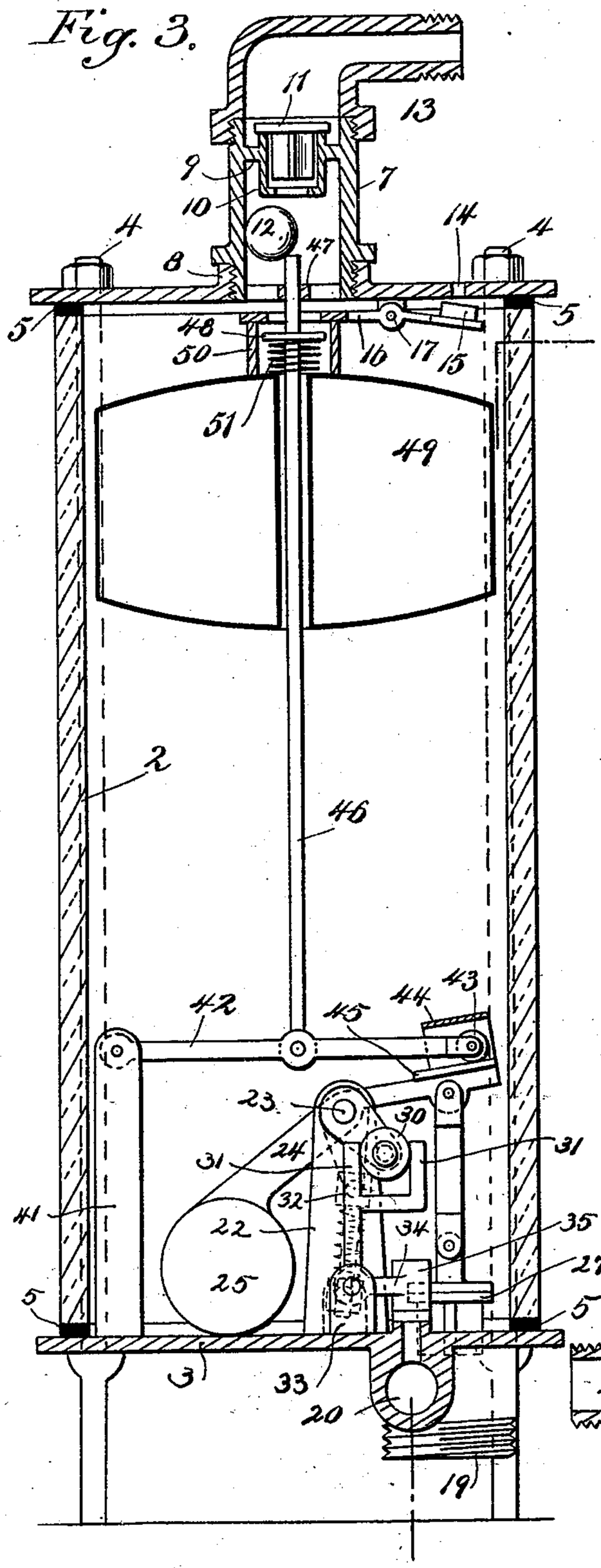
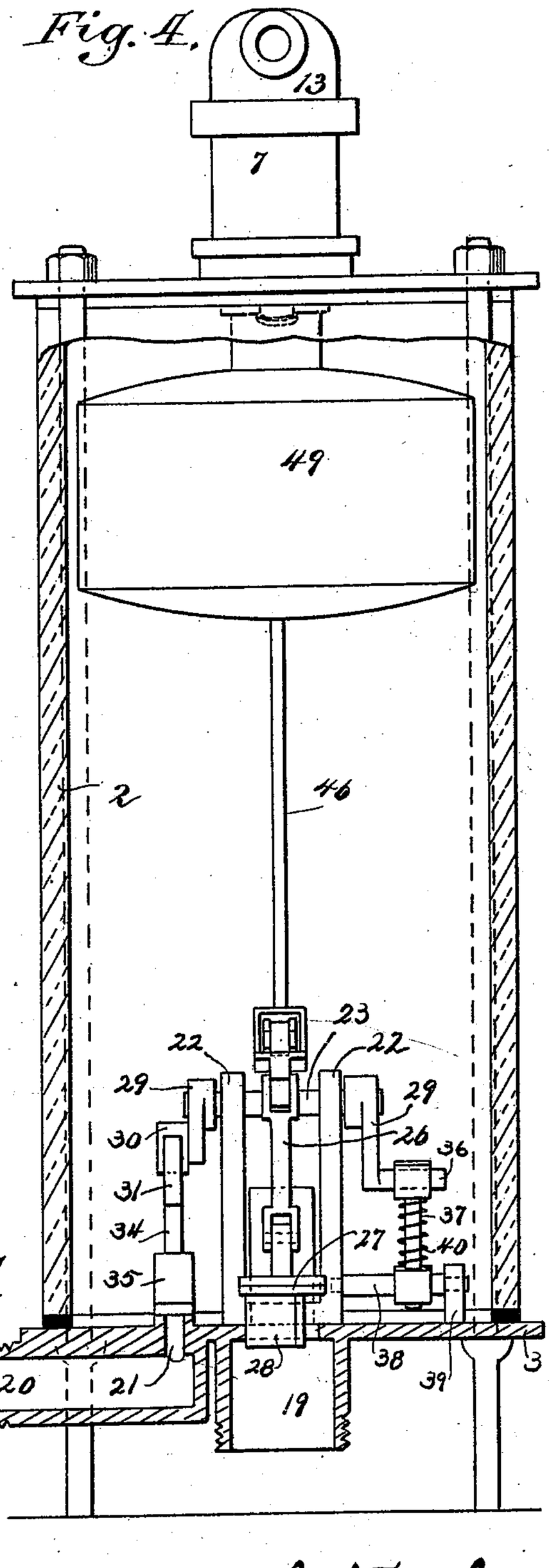


Fig. 4.



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UNITED STATES PATENT OFFICE.

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HYDRAULIC AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 550,352, dated November 26, 1895.

Application filed March 29, 1895. Serial No. 543,646. (No model.)

To all whom it may concern:

Be it known that I, ADOLPH G. NOACK, a citizen of the United States, and a resident of Brooklyn, county of Kings, and State of New York, have invented certain new and useful Improvements in Hydraulic Air-Compressors, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof, in which similar figures of reference indicate corresponding parts in all the views.

This invention relates to air-compressors; and the object thereof is to produce a hydraulic apparatus of this character which shall be simple in construction and operation and occupy comparatively small space and which possesses many advantageous features not heretofore known in apparatus of this character.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which—

Figure 1 is a central vertical section of my improved air-compressor; Fig. 2, a top plan thereof; Fig. 3, a section similar to that shown in Fig. 1, but showing the operating devices in different positions; and Fig. 4, a vertical section at right angles to that of Fig. 1.

In the practice of my invention I employ a cylindrical casing 2, preferably of glass and provided with top and bottom plates 3, secured thereto by means of bolts or rods 4, the connection between said parts being made perfectly air and water tight by means of annular packing 5.

The upper head or end plate of the casing is provided centrally thereof with perforations 6, which are inclosed by a tube 7, secured to a tubular upwardly-extending projection 8 and provided at its upper end with a partition 9, which supports a short tube 10, the open upper end of which is controlled by an automatic valve 11 and the lower end of which is provided with an opening adapted to be closed by a ball or float valve 12, and to the upper end of the tube 7 is secured a tube 13, which communicates with an air-receptacle, (not shown,) in which it is desired to store air under pressure.

In the upper end plate 3, near one side thereof, is also a port or aperture 14, which is controlled by a valve 15 on one end of a lever 16, which is pivotally connected with the head 3 at 17, and the opposite end of which is provided with a slot 18, said lever being designed to operate in the manner hereinafter described.

The bottom plate of the cylinder is provided with a discharge-tube 19 and ingress-tube 20 provided with a port 21, which communicates with the interior of the cylinder, and within the cylinder and connected with the bottom thereof are automatic valves which control said discharge-tube and ingress port and tube, constructed and operating in the following manner:

Secured to the bottom 3 of the cylinder are vertical standards 22, in the upper ends of which is mounted a shaft 23, to which is rigidly secured a lever 24, one end of which is provided with a weight 25 and the opposite end of which is pivotally connected with a depending arm or rod 26, to which is pivoted at its lower end a valve 27, provided with a projection 28, which enters the discharge-port in the upper end of the tube 19, which port is controlled by said valves.

The opposite ends of the shaft 23 are each provided with a crank-lever 29, one of which is provided with a roller 30, mounted on the free arm thereof, which rests within jaws 31, formed on the upper end of a crank-lever 32, pivoted at its lower end to an upwardly-extending shoulder or projection 33, and the arm 34 of which carries a valve 35, adapted to control the port 21, which communicates with the ingress-tube 20.

The opposite crank-lever 29 has loosely mounted on its outer or free arm 36 the head of a rod or arm 37, the lower end of which is secured to a shaft 38, pivotally supported at each end near the bottom of the cylinder, the support shown consisting of one of the standards 22 and a short standard 39, secured to the bottom 3 of the cylinder, and mounted on the rod or arm 37 is a retracting-spring 40, designed to operate as hereinafter described.

Secured within the cylinder and at one side thereof is a standard 41, the lower end of which is secured to the bottom 3, and to the upper end of which is pivotally connected one end of an auxiliary lever 42, the opposite

end of which is provided with a roller 43, which moves within a housing 44, connected with the end of the weighted lever 24, which is provided with a flat top piece 45, on which said roller rests.

Pivotally connected at its lower end with the auxiliary lever 42 and centrally thereof is a vertical rod 46, which extends upward and passes through the slot 18 in the lever 16 and through a guide 47 within the lower end of the tube 7, and secured upon this rod 46 below the lever 16 is a plate or shoulder 48. Mounted upon the rod 46 is a float 49, constructed of any desired material and hollow or otherwise, and to the upper side thereof is secured a short tube 50, which also surrounds the rod 46, and within this tube is a spring 51, which may, if desired, be secured to the plate or shoulder 48.

The operation is as follows: The cylinder 2 being normally filled with air and the operative parts in the position shown in Fig. 1, water is turned on through the pipe 20, and, gradually rising within the cylinder, the float 49 is lifted thereby and moves upwardly on the rod 46. It will be observed that the float serves to keep the valve 27 of the water-discharge port closed as long as it is resting on the lever 42. When there is a sufficient amount of water within the casing to lift the float, the back-pressure of the water will be sufficient to keep the valve 27 closed, as will be readily understood, and the float then gradually rises as water flows in until the spring 51 thereon comes in contact with the shoulder or projection 48 on the rod 46, and the back-pressure will be sufficient to hold the rod 46 and the lever 42 in the position shown in Fig. 1, in which the discharge-valve 27 is closed, until the upper end of the tube 50 strikes the inner end of the lever 16, the spring 51 being depressed by the plate or shoulder 48 within the tube 50, and at this time the float 49 will be almost submerged. As the float 49 is forced upward, as above described, the air within the cylinder is compressed and forced outward through the pipe 7, the valve 11 being automatically lifted by the pressure to admit of the passage of the air therethrough and through the pipe 13 into the receiver prepared therefor, as will be readily understood. When the tube 50, however, on the float 49 strikes against the inner end of the lever 16, the air in the cylinder will be practically exhausted, the inner end of said lever will be pressed upward, and the valve 15 forced from its seat, when the air will rush in through the port 14 and at the same time the lever 42 will be lifted by the float and through it the end of the weighted lever 24, which will operate to raise the valve 27 and open the discharge-port, when the water will immediately flow out, and the air, entering through the port 14, will again fill the casing. The strength of the spring 51 is so calculated as to insure the opening of the valve 27 at about the same time that the upper end of the tube 50 strikes the lever 16, and the object of the valve 12 in the tube 7 is to close the lower end of the tube 10 if by any reason or for any cause the discharge-valve 27 should not be opened and the water should continue to rise in the chamber and the tube 7, and thus prevent the water from passing into the air-receptacle. As soon as the water in the chamber has been discharged, or practically so, the float 49 will be again seated on the lever 42 in the position shown in Fig. 1, when the operation above described may be repeated, and this operation will continue as long as desired.

In Fig. 3 I have shown the position of the parts at the moment when the discharge-port in the bottom and the air-ingress port in the top are opened by means of the float 49, and Fig. 4 is a view taken at right angles to that of Fig. 3 at the same time. The operation of the spring 40 on the rod or arm 37 is to assist in holding the valve 27 seated when the water is turned on and begins to elevate the float, and also to return said valve to its seat when the water has been discharged, and it will be observed that the valve 35, which controls the water ingress-port, is operated against the pressure of the water, and that the operation of the weighted end of the lever 24 at the time the air-port in the top of the casing is opened is to lift the valve 27 from its seat, thus opening the discharge and to cause the valve 35 to be seated, thus closing the ingress-port, as will be readily understood.

I do not limit myself to the exact form and construction shown and described, as it is evident that many changes therein and modifications thereof may be made without departing from the scope of my invention; but,

Having fully described said invention, its construction and operation, what I claim, and desire to secure by Letters Patent, is—

1. In a hydraulic air compressor, the combination, with a cylindrical casing having a top and bottom, of water ingress and discharge ports in the bottom thereof, a weighted lever pivotally supported on standards and connected with and operating valves which control the water ingress and discharge ports, an auxiliary lever pivotally supported at one end within the casing and being connected at the other end with the free end of the weighted lever, a rod pivotally connected with said auxiliary lever and extending upward through said casing, and a float mounted on said rod and adapted to operate an air ingress valve in the top of said casing and the levers which control the water ingress and discharge ports, substantially as shown and described.

2. In a hydraulic air compressor, the combination, with a casing having a top and bottom, the top thereof being provided with an air ingress port controlled by an automatic valve and an air discharge tube communicating with a chamber within the casing and with an air receiver and provided with an automatic valve, of a water ingress port in

the bottom of the casing, a pivoted crank lever provided at one end with a valve controlling said port and at the other with jaws or arms, a water discharge port, a weighted lever mounted on a shaft pivotally supported on standards secured to the bottom of the casing, and a crank arm or lever connected with one end of said shaft and having mounted on one end thereof a roller adapted to rest and operate within the jaws or arms connected with the lever which carries the valve of the water ingress port, and an arm or rod pivotally connected at one end with the free end of the weighted lever and at the other with a valve adapted to close the water discharge port, and means for operating said weighted lever to open and close said valves and also to operate the air ingress valve in the top of the casing, substantially as shown and described.

3. In a hydraulic air compressor, the combination, with a hollow cylinder having water ingress and discharge ports in the bottom thereof, an air ingress port in the top, controlled by an automatic valve, and also a pipe communicating with an air receiver, of valves controlling the water egress and discharge ports, operated by a weighted lever, one of said valves being controlled by a crank lever pivotally connected with the weighted lever near the center thereof and the other by an arm or rod pivotally connected with the free end of said weighted lever, and a float also connected with the free end of said weighted lever and adapted to operate the valve controlling the air ingress port at the top of the cylinder and also the valves controlling the water ingress and discharge ports through the weighted lever, substantially as shown and described.

4. In a hydraulic air compressor, the combination, with a cylindrical casing having a top and bottom, of an air tube communicating therewith at the top thereof and also with an air receiver, said tube being provided with an automatic air egress valve, and an air ingress port also in the top of said casing provided with an automatic valve connected with one end of a lever pivoted within the casing, water egress and discharge ports in the bottom of said casing, and a pivoted weighted lever secured to a shaft mounted in standards secured to the bottom of said casing, said lever shaft being also provided with a crank arm connected with and operating a pivotally supported crank lever, with one arm of which is connected a valve adapted to close the water ingress port, and a rod or arm pivotally connected with the free end of said weighted lever and also adapted to close the discharge port, and an auxiliary lever pivotally supported at one end within the casing and being loosely connected at the other end with the said weighted lever, and a vertical rod pivotally connected with said auxiliary lever and passing upward through the casing and through a slot in the lever which controls the air ingress valve, and a float mounted on said rod and adapted to operate each of said valves and levers, substantially as shown and described.

5. In a hydraulic air compressor, the combination, with a cylindrical casing having a top and bottom and an air discharge tube and automatic air ingress valves communicating with said casing through the top thereof, said air discharge tube being provided with an automatic valve and said air ingress port being controlled by a valve mounted on a lever pivotally supported within the casing, of water ingress and discharge ports in the bottom of said casing, and a weighted lever mounted on a shaft pivotally supported on standards secured to the bottom of said casing, a crank arm connected with one end of said shaft and also connected with and operating a crank lever pivotally supported and carrying on one arm a valve adapted to close the ingress port, and a rod or arm pivotally connected with the free end of a weighted lever and with a valve adapted to close the discharge port, the other end of said weighted-lever shaft being provided with a crank arm, on the free end of which is mounted one end of a rod the other end of which is connected with a shaft pivotally supported near the bottom of the cylinder, a spring mounted on said arm, and an auxiliary lever pivotally supported at one end within the casing and being connected at the other end with the free end of the weighted lever, a vertical rod pivotally connected with the auxiliary lever near the center thereof and extending upward through the casing and through a slot in the lever which controls the air ingress port, and a float mounted on said rod and adapted to operate the air ingress valve and the levers which operate the valves which control the water ingress and discharge ports, substantially as shown and described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 27th day of March, 1895.

ADOLPH G. NOACK.

Witnesses:
PERCY T. GRIFFITH,
A. M. CUSACK.