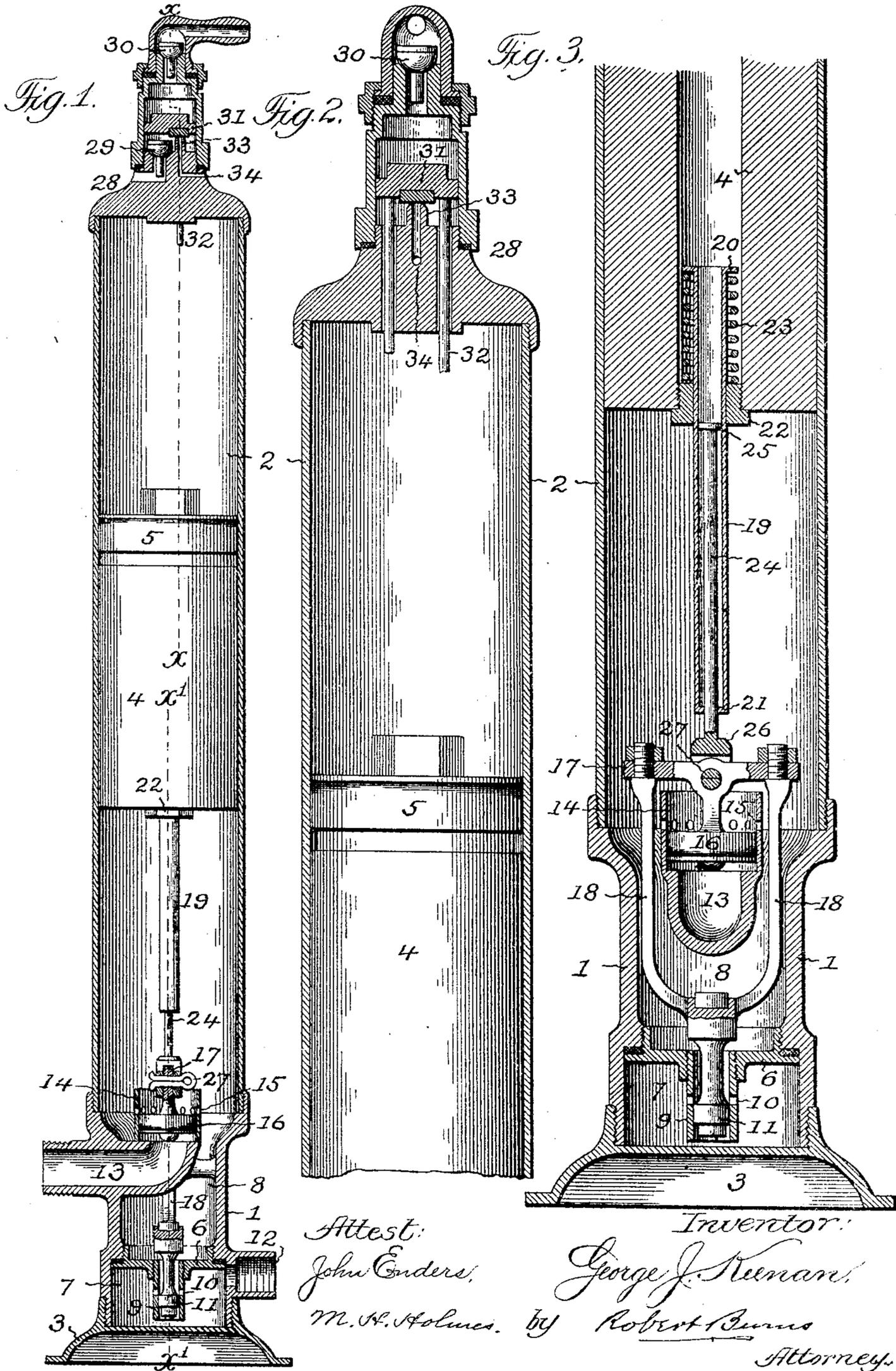


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HYDRAULIC AIR PUMP.  
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# UNITED STATES PATENT OFFICE.

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## HYDRAULIC AIR-PUMP.

No. 805,860.

Specification of Letters Patent.

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*To all whom it may concern:*

Be it known that I, GEORGE J. KEENAN, a citizen of the United States of America, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Hydraulic Air-Pumps, of which the following is a specification.

This invention relates to that type of automatic air-pumps in which the pressure from city water-mains is employed as a motive power for actuating the pump; and the present improvement has for its object to provide a simple and efficient structural arrangement and combination of parts in a hydraulic air-pump whereby certainty of operation of the automatically-actuated reversing-valve is attained, all as will hereinafter more fully appear.

In the accompanying drawings, Figure 1 is a sectional elevation of an air-pump illustrating the general arrangement of parts in the present invention. Fig. 2 is an enlarged vertical section at line  $x x$ , Fig. 1, of the upper portion of the pump. Fig. 3 is a similar view at line  $x' x'$ , Fig. 1, of the lower part of the pump.

Similar numerals of reference indicate like parts in the several views.

Referring to the drawings, 1 represents the main housing which incloses the vertically-arranged fluid-pressure inlet and the outlet valves of the present construction. Such housing is open at top and bottom, with its upper end connected directly to the lower end of the pump-cylinder 2 and its lower end closed by the supporting-base 3, as usual in the present type of hydraulic pumps.

4 is a weighted piston moving vertically in the pump-cylinder 2. Such piston is provided with the usual cup-packing 5, which in the present improvement is arranged at the extreme upper end of said piston with a view to greater efficiency and durability in operation, as extended practical experiment has shown that with such special construction the liability to canting over and binding of the piston in the cylinder, and consequent rapid wear of the parts is in a large measure avoided, and a corresponding increase in the efficiency and certainty of operation of the pump attained.

6 is a horizontal partition in the housing 1 aforesaid. Such partition is preferably made removable, as shown, and divides the interior of said housing into a lower water-pressure-

supply chamber 7 and an open-ended upper chamber 8, having direct connection with the lower and open end of the pump-cylinder, as shown. 60

9 is a vertical tubular casing arranged centrally in the partition aforesaid. Such casing is open at both ends and is provided midway of its height with one or more lateral ports or passages 10, that open into the lower pressure-supply chamber 7 aforesaid. 55

11 is a piston-valve moving vertically in the casing 9 and so located therein that in its lower position it will admit fluid-pressure through the ports 10 into the upper chamber 8, and when in its upper position will shut off such communication. 70

12 is a lateral inlet-neck in communication with the lower chamber 7 aforesaid and adapted for connection with the source of fluid-pressure supply. 75

13 is the lateral outlet-neck, having communication with the upper chamber 8 aforesaid, and in the present improvement such outlet-neck will comprise a lower horizontal portion which extends out laterally through the side of the housing 1 and a vertical portion connected by a bend or curve with the aforesaid horizontal portion. 80

14 is a vertical tubular casing forming an upward extension of the aforesaid vertical portion of the outlet-neck 13 and having an axial alinement with the before-described valve-casing 9. Such tubular casing is open at top and provided midway its height with one or more lateral ports or passages 15. 85 90

16 is a piston-valve having a cross-head 17 at its upper end and adapted to move vertically in the casing 14 and so arranged that in its upper position it will permit the fluid in the upper chamber 8 to pass through the lateral ports 15 into the outlet-neck 13, while in its lower position it will shut off such communication. 95

18 is a yoke attached to the upper end of the inlet-valve 11 and to the cross-head 17 of the outlet-valve 16 and adapted to impose simultaneous and uniform movement upon the two valves in the respective reversals of the same and as the pump-piston nears its upper and lower positions, such reversals being automatically effected by operative connections between the piston and the valves, as follows: 100 105

19 is a tubular member moving in a central vertical cavity of the pump-piston and provided with an outturned flange 20 at its up- 110

per end and an inturned flange 21 at its lower end.

22 is a bushing screwing into the lower end of the piston-cavity aforesaid and adapted to  
5 confine the member 19 in place within such cavity.

23 is a spring interposed between the bushing 22 and the upper flange 20 of the tubular member 19. Such spring is adapted to be  
10 compressed, as the pump-piston in its final upward movement initially draws the valves upward to a reversed position, after which the stress imposed upon the spring will insure a complete upward and reversal movement of  
15 the valves.

24 is a cylindrical member telescoping in the bore of the tubular member aforesaid and provided at its upper end with a head or enlargement 25, which in a continued upward  
20 movement of the pump-piston is adapted to contact with the inturned flange 21 of the tubular member to cause both of said members to continue their upward movement in unison.

26 is a connecting head or fork at the lower end of the member 24, adapted for operative engagement with the cross-head 17 of the upper valve by a cross key or pin 27, and such connecting-head is so located that as the pump-piston  
30 nears its final downward travel the bushing 22 will contact with said head to impart a downward reversal to the valves in a direct manner.

28 is a head closing the upper end of the  
35 pump-cylinder 2. Such head carries the casing for the air inlet and outlet valves 29 and 30, as usual in the present type of hydraulic air-pumps, in which the lower portion of the pump-cylinder constitutes a member of the  
40 single-acting water-engine, as above described, and its upper end the piston-chamber of air-pump, with the single piston 4 acting in common for both functions. Said valves may be of any ordinary and usual construction and arrangement, and no novelty is  
45 claimed therefor in the present case.

31 is a relief-valve arranged in the air-valve casing, above referred to, and guided vertically in its movements by depending stems 32,  
50 passing down through guide-orifices in the lower part of the closure-head 28. In the construction shown in Fig. 2 one of said stems is made longer than the other and will be engaged singly by the pump-piston as the same  
55 nears the end of its upstroke to raise the relief-valve aforesaid from its seat. The purpose of such construction is to save time in the proper assemblage of the pump parts, in that the single long stem can be more readily  
60 filed down to the proper length in effecting a regulation of the time in which the relief-valve is held open.

33 is a tubular projection arranged upon the head 28 beneath the valve 31 to form a  
65 seat therefor.

34 is a duct or passage formed in the head 28 and connecting the bore of the projection 33 with the outer air, as illustrated in Figs. 1 and 2.

With the above construction the relief-valve  
70 31 normally remains closed and is only moved to its open position as the pump-piston nears the end of its upstroke, and when so opened is adapted to release the compressed air above said piston and permit the final upward move-  
75 ment of the piston to take place without hindrance, and in consequence insure the proper reversal of the fluid-pressure inlet and outlet valves in the manner heretofore described.

Having thus fully described my said inven-  
80 tion, what I claim as new, and desire to secure by Letters Patent, is—

1. In a hydraulic air-pump of the character herein described, the combination of a vertical cylinder, a weighted piston arranged there-  
85 in, a valve-housing at the lower end of said cylinder, a partition in said housing dividing the same into upper and lower chambers, a vertical valve-casing in said partition connecting said chambers together, a vertically-  
90 moving piston-valve in said casing controlling such connection, a vertical valve-casing in the upper chamber aforesaid, a lateral horizontal neck connected to the lower end of said valve-casing, a vertically-moving piston-valve in  
95 said casing controlling communication between the upper chamber and the horizontal neck aforesaid, the said valves having a vertical alinement one with the other, a connection between the upper ends of said valves  
100 arranged in the upper chamber of the housing outside the upper valve-chamber and lateral neck and adapted to impose simultaneous movement on both valves, and operative connections between said valves and the pump-  
105 piston, substantially as set forth.

2. In a hydraulic air-pump of the character herein described, the combination of a vertical cylinder, a weighted piston arranged there-  
110 in, a valve-housing at the lower end of said cylinder, a partition in said housing dividing the same into upper and lower chambers, a vertical valve-casing in said partition connecting said chambers together, a vertically-moving piston-valve in said casing controlling such  
115 connection, a vertical valve-casing in the upper chamber aforesaid, a lateral horizontal neck connected to the lower end of said valve-casing, a vertically-moving piston-valve in said casing controlling communication be-  
120 tween the upper chamber and the horizontal neck aforesaid, the said valves having a vertical alinement one with the other, a yoke connection between the upper ends of said valves arranged in the upper chamber of the  
125 housing outside the upper valve-chamber and lateral neck and adapted to impose simultaneous movement on said valves, and operative connections between said valves and the pump-  
130 piston, substantially as set forth.

3. In a hydraulic pump of the character here-  
 in described, the combination of a vertical cyl-  
 5 nder, a weighted piston arranged therein, a  
 valve-housing at the lower end of said cylin-  
 der, a partition in said housing dividing the  
 same into an upper chamber having direct  
 communication with the under side of the  
 pump-piston, and into a lower fluid-pressure-  
 10 supply chamber, a vertical valve-casing in  
 said partition connecting both chambers to-  
 15 gether, a vertically-moving piston-valve in  
 said casing controlling the admission of fluid-  
 pressure into said upper chamber, a vertical  
 valve-casing in the upper chamber aforesaid,  
 a lateral horizontal outlet-neck connected to  
 20 the lower end of said valve-casing, a verti-  
 cally-moving piston-valve in said casing con-  
 trolling communication between the chamber  
 beneath the pump-piston and the outlet-neck  
 aforesaid, the said valves having a vertical  
 25 alinement one with the other, a connection be-  
 tween the upper ends of said valves arranged  
 in the upper chamber of the housing outside  
 the upper valve-chamber and lateral neck and  
 adapted to impose simultaneous movement on  
 both valves, and operative connections be-  
 30 tween the said valves and the pump-piston,  
 substantially as set forth.

4. In a hydraulic air-pump of the character  
 30 herein described, the combination of a ver-  
 tical cylinder, a weighted piston arranged  
 therein, a valve-housing at the lower end of  
 said cylinder, a partition in said housing divid-  
 35 ing the same into an upper chamber having di-  
 rect communication with the under side of the  
 pump-piston, and into a lower fluid-pres-  
 sure-supply chamber, a vertical valve-casing  
 in said partition connecting both chambers to-  
 40 gether, a vertically-moving piston-valve in  
 said casing controlling the admission of fluid-  
 pressure into said upper chamber, a vertical  
 valve-casing in the upper chamber aforesaid,  
 a lateral horizontal outlet-neck connected to  
 45 the lower end of said valve-casing, a verti-  
 cally-moving piston-valve in said valve-casing  
 controlling communication between the cham-  
 ber beneath the pump-piston and the outlet-  
 neck aforesaid, the said valves having a ver-  
 50 tical alinement one with the other, a yoke con-  
 nection between the upper ends of said valves  
 arranged in the upper chamber of the hous-  
 ing outside the upper valve-chamber and lat-  
 eral neck and adapted to impose simultaneous  
 55 movement on said valves, and operative con-  
 nections between said valves and the pump-  
 piston, substantially as set forth.

5. In a hydraulic air-pump of the character  
 herein described, the combination of a ver-  
 60 tical cylinder, a weighted piston arranged  
 therein, a valve-housing at the lower end of  
 said cylinder, a partition in said housing di-  
 viding the same into upper and lower cham-  
 bers, a vertical valve-casing in said partition  
 connecting said chambers together, a verti-  
 65 cally-moving inlet piston-valve in said casing

controlling such connection, a vertical valve-  
 casing in the upper chamber aforesaid, a lat-  
 eral horizontal neck connected to the lower  
 end of said valve-casing, a vertically-moving  
 outlet piston-valve in said casing controlling 70  
 communication between the upper chamber  
 and the horizontal neck aforesaid, the said  
 valves having a vertical alinement one with  
 the other, a connection between the upper  
 ends of said valves arranged in the upper 75  
 chamber of the housing outside the upper  
 valve-chamber and lateral neck and adapted  
 to impose simultaneous movement on both  
 valves, and operative connections between  
 said valves and the pump-piston, the same 80  
 comprising a tubular member moving in a  
 vertical cavity of the pump-piston, and a cy-  
 lindrical member telescoping in said tubular  
 member and having engagement with the out-  
 let-valve aforesaid, substantially as set forth. 85

6. In a hydraulic air-pump of the character  
 herein described, the combination of a ver-  
 tical cylinder, a weighted piston arranged  
 therein, a valve-housing at the lower end of  
 said cylinder, a partition in said housing di- 90  
 viding the same into upper and lower cham-  
 bers, a vertical valve-casing in said partition  
 connecting said chambers together, a verti-  
 cally-moving inlet piston-valve in said casing  
 controlling such connection, a vertical valve- 95  
 casing in the upper chamber aforesaid, a lat-  
 eral horizontal neck connected to the lower  
 end of said valve-casing, a vertically-moving  
 outlet piston-valve in said casing controlling  
 communication between the upper chamber 100  
 and the horizontal neck aforesaid, the said  
 valves having a vertical alinement one with  
 the other, a connection between the upper  
 ends of said valves arranged in the upper 105  
 chamber of the housing outside the upper  
 valve-chamber and lateral neck and adapted  
 to impose simultaneous movement on both  
 valves, and operative connections between  
 said valves and the pump-piston, the same 110  
 comprising a tubular member moving in a  
 vertical cavity of the pump-piston, a spring  
 interposed between the upper end of said  
 member and the lower end of said cavity, and  
 a cylindrical member telescoping in said tubu- 115  
 lar member, and having engagement with the  
 outlet-valve aforesaid, substantially as set  
 forth.

7. In a hydraulic air-pump of the character  
 herein described, the combination of a ver- 120  
 tical cylinder, a weighted piston arranged  
 therein, a valve-housing at the lower end of  
 said cylinder, a partition in said housing di-  
 viding the same into upper and lower cham-  
 bers, a vertical valve-casing in said partition  
 connecting said chambers together, a verti- 125  
 cally-moving inlet piston-valve in said casing  
 controlling such connection, a vertical valve-  
 casing in the upper chamber aforesaid, a lat-  
 eral horizontal neck connected to the lower  
 end of said valve-casing, a vertically-moving 130

outlet piston-valve in said casing controlling communication between the upper chamber and the horizontal neck aforesaid, the said valves having a vertical alinement one with the other, a yoke connection between the upper ends of said valves arranged in the upper chamber of the housing outside the upper valve-chamber and lateral neck and adapted to impose simultaneous movement on said valves, and operative connections between said valves and the pump-piston, the same comprising a tubular member moving in a vertical cavity in the pump-piston, and a cylindrical member telescoping in said tubular member, and having engagement with the outlet-valve aforesaid, substantially as set forth.

8. In a hydraulic air-pump of the character herein described, the combination of a vertical cylinder, a weighted piston arranged therein, a valve-housing at the lower end of said cylinder, a partition in said housing dividing the same into upper and lower chambers, a vertical valve-casing in said partition connecting said chambers together, a vertically-moving inlet piston-valve in said casing controlling such connection, a vertical valve-

casing in the upper chamber aforesaid, a lateral horizontal neck connected to the lower end of said valve-casing, a vertically-moving outlet piston-valve in said casing controlling communication between the upper chamber and the horizontal neck aforesaid, the said valves having a vertical alinement one with the other, a yoke connection between the upper ends of said valves arranged in the upper chamber of the housing outside the upper valve-chamber and lateral neck and adapted to impose simultaneous movement thereon, and operative connections between said valves and the pump-piston, the same comprising a tubular member moving in a vertical cavity of the pump-piston, a spring interposed between the upper end of said member and the lower end of said cavity, and a cylindrical member telescoping in said tubular member and having engagement with the valves aforesaid, substantially as set forth.

Signed at Chicago, Illinois, this 6th day of October, 1904.

GEORGE J. KEENAN.

Witnesses:

ROBERT BURNS,  
M. H. HOLMES.