No. 869,781. PATENTED OCT. 29, 1907.

D. L. HOLDEN.

PNEUMATIC PUMP.

APPLICATION FILED FEB. 8, 1906.

Fig. 2

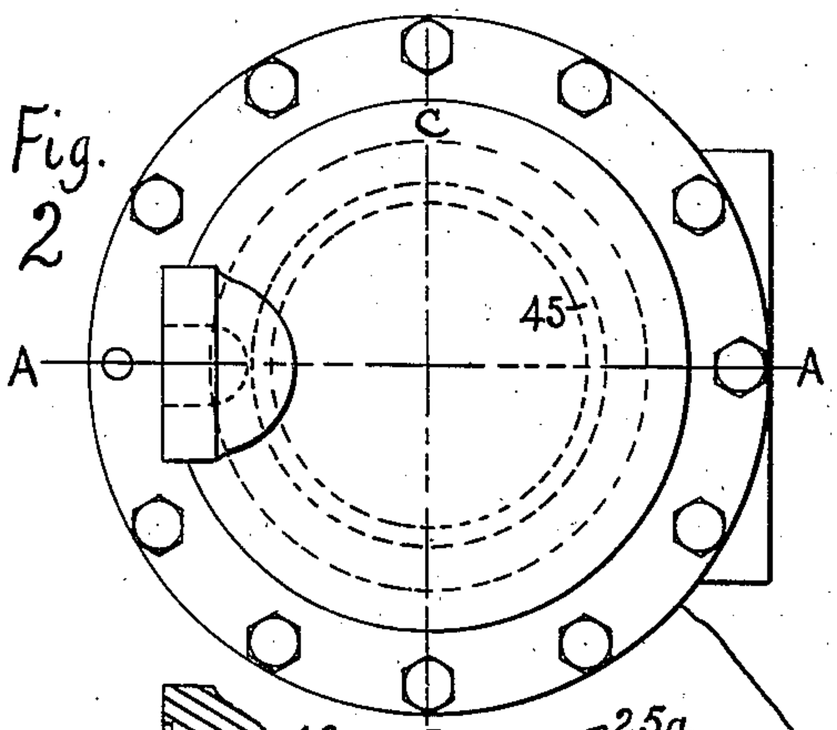

Fig. 4

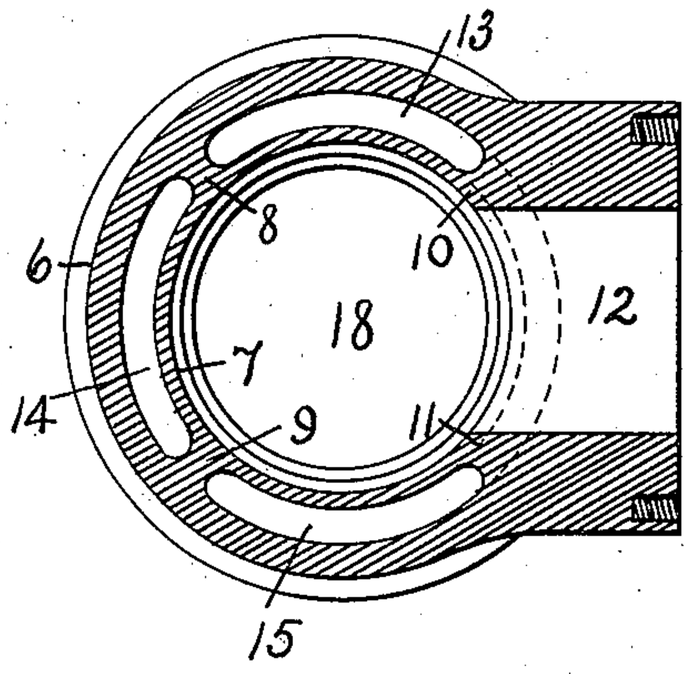

Fig. 1

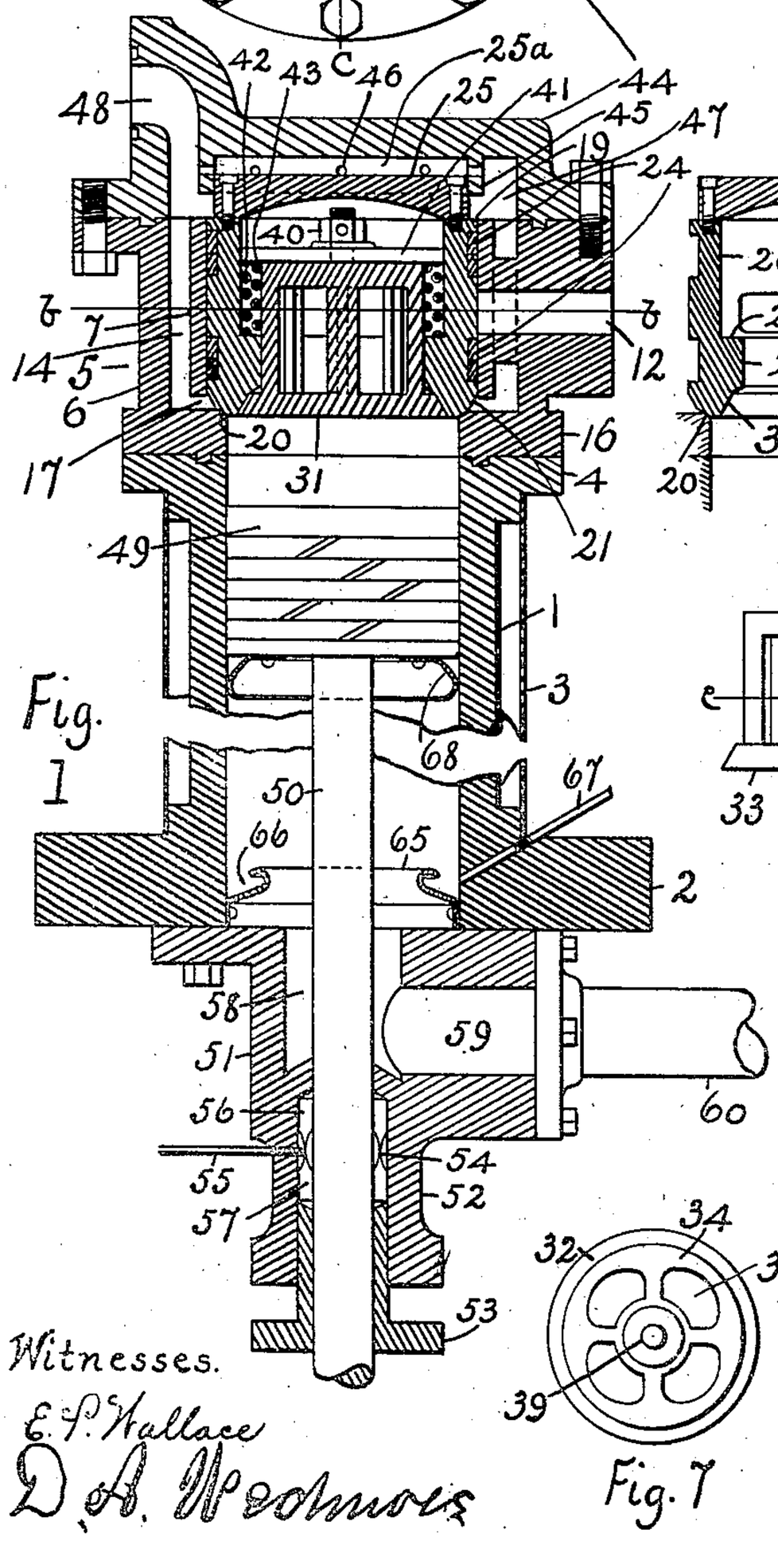

Fig. 5

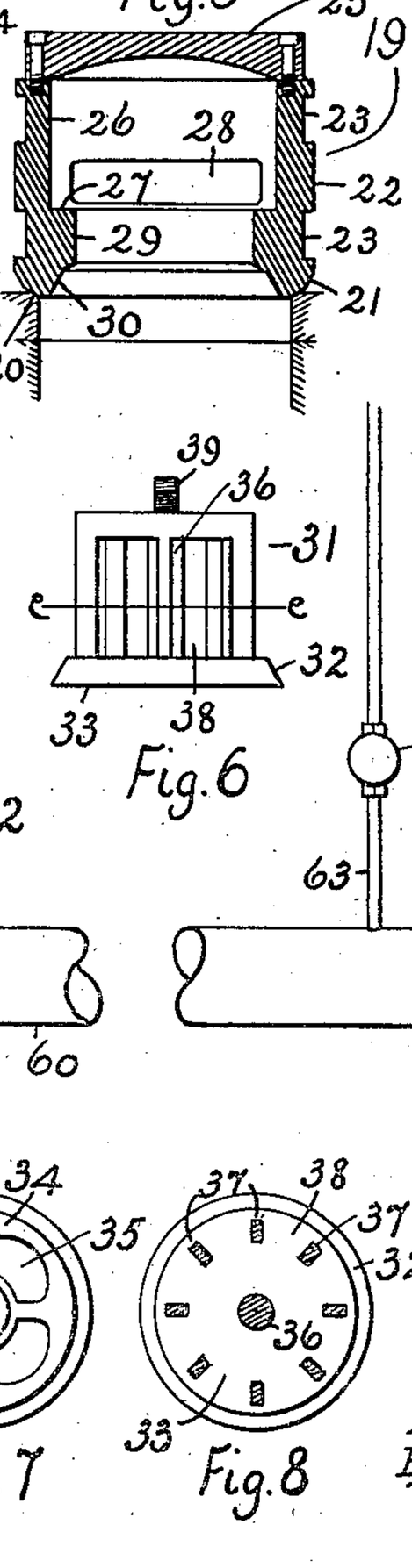

Fig. 6

Fig. 3

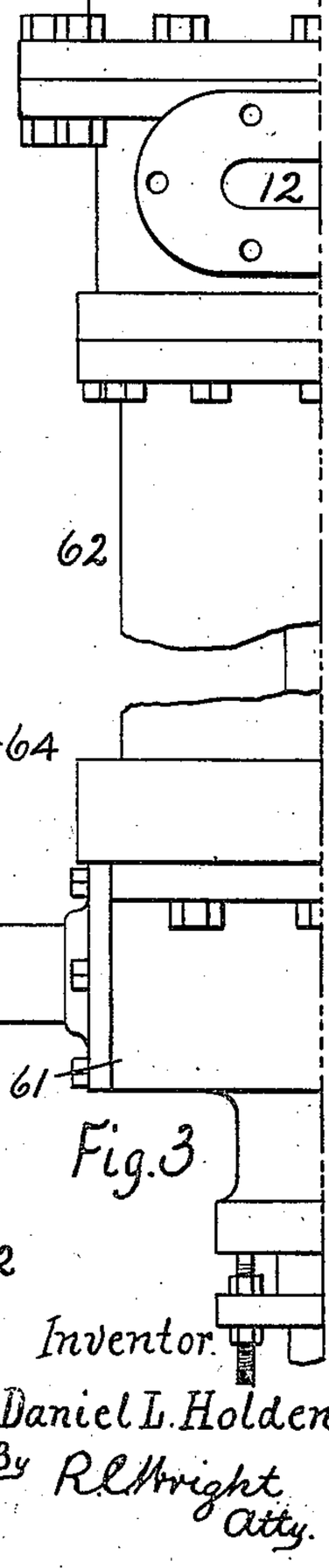

Fig. 7

Fig. 8

Witnesses.
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UNITED STATES PATENT OFFICE.

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PNEUMATIC PUMP.

No. 869,781. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed February 8, 1906. Serial No. 300,047.

To all whom it may concern:

Be it known that I, DANIEL L. HOLDEN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Pneumatic Pumps, of which the following is a specification.

This invention relates to pneumatic pumps, and in which the ingress and egress valves are located at the top of the pump, in a chamber having an inlet surmounted by a cover having an outlet; the inlet valve being within the outlet valve, with passages to and from the valves, and resilient means for the closing of the valves when free from pressure.

The object of this construction is to avoid having an inlet valve in the piston, and the introduction of the fluid or gas to the pump below its piston, and thence through the piston, for its compression. Where a valve is in the piston it is limited in capacity, and at every return of the piston, at the ends of the stroke, the valve is subjected to sudden movements which soon cause it to leak. With the valves in stationary seats, as in this construction their movement is not so sudden, and being free from jars due to a quick operation the valves and their seats are non-leakable during long service. Also, the arrangement herein set forth puts the inlet and outlet pipes above the cylinder, for easier application, and better care and inspection. At the lower end of the pump, below the piston, there is a connection from one pump to another as an equalizing means, so that any fluid or gas which may leak by the piston cannot be confined and act as a back pressure; and arrangements are introduced to automatically lubricate the piston, and other improvements, all of which are more fully set forth in the specification. With this arrangement of valves the piston speed of the pump can be greatly increased over the form having a valve in the piston.

The invention is illustrated in the accompanying drawing in which similar parts are indicated by similar reference characters, in which

Figure 1 is a central vertical section of a pump, on line A A Fig. 2. Fig. 2 is a top view of the cylinder head. Fig. 3 is a partial elevation of an adjacent pump, to show the connection to avoid back pressure. Fig. 4 is a section of the valve chamber, on line *b b* Fig. 1. Fig. 5 is a section of the outlet valve on line *c c* Fig. 2. Fig. 6 is an elevation of the inlet valve. Fig. 7 is a top view of the inlet valve. Fig. 8 is a section of the inlet valve on line *e e* Fig. 6.

The pump barrel 1 has a bottom seating flange 2, and is used with or without the water jacket 3. At the top of the barrel to a flange 4, is secured the valve chamber 5 with an exterior wall 6 and an interior wall 7, the walls being connected at 8, 9, 10, 11, between connections 10, 11 there is an inlet passage 12, and between walls 6, 7 and their connections there are spaces 13, 14, 15 for fluid passage, and as the inner wall 7 does not extend to the bottom flange 16 of chamber 5 there is an annular space 17 connecting the space 18 within wall 7 with passages 13, 14, 15. Within chamber 5 at the top of barrel 1 there is an outlet valve 19 in a conical seat 20 of about 30 degrees, from which there is another angle 21 of about 60 degrees connecting with the exterior diametral line 22 of the valve which fits freely within and is guided by wall 7. In the exterior surface of the valve are grooves 23 in which are fitted packing rings 24. The valve has a removable top 25 of less diameter than its part 22 and at its upper interior part there is a chamber 26 extending down to a seat 27. There is a fluid passage 28 leading to chamber 26 and in communication with passage 12 of chamber 5. Below chamber 26 and seat 27 the valve's interior part 29 is decreased in diameter, and its lower interior end has a coned seat 30. The inlet valve 31 has a coned seat 32 fitting seat 30, and above the seat it is of an external diameter to fit within and be guided by part 29 of the outlet valve. Valve 31 has a solid bottom 33 and a top 34 having openings 35 the top and bottom being connected by a central column 36 and circumferential columns 37 between which are open spaces 38.

Above top 34 there is a screw threaded extension 39, to receive a nut 40, which holds a follower 41 of a diameter to closely fit in chamber 26 of valve 19. Between the outer diameter of valve 31 and chamber 26 of valve 19, and seated between seat 27 and follower 41 are coil springs 42, 43. Chamber 5 has a cover 44 having an annular ring 45 forming a cushion chamber 25^a and as a guide for the removable upper part 25 of valve 19, and through the ring are vents 46 to an annular space 47 in communication with passages 13, 14, 15 and the outlet 48. Within barrel 1 there is a piston 49, of any suitable construction, with a piston rod 50 downwardly extending and passing through the lower head 51 of the pump and through a stuffing box 52 and its gland 53. The stuffing box has an oiling ring 54 with an oil pipe 55, the ring dividing the packing into an upper space 56 and a lower space 57. Head 51 has a chamber 58 with a branch passage 59 to which is attached an equalizing pipe 60 when two pumps are used, the pipe at its opposite end is attached to a head 61 of another pump 62. From pipe 60 there is a bleeder pipe 63 leading to the inlet pipe (not shown) and having a valve 64. Where a single pump is used bleeder pipe 63 will be attached direct to passage 59.

For lubricating barrel 1 and its piston 49 there is a wiper ring 65 secured to the lower inner diameter of barrel 1 with an oil reservoir 66, curved to prevent slopping, and fed by an oil pipe 67, and to the bottom of piston 49 there is a dip ring 68 adapted to enter the reservoir and carry the lubricant upwards.

In the operation of the pump the piston 49 moves to the valve 31, to expel every particle of fluid. The valves 19, 31 as seen in Fig. 1 are both closed, as they would be when the piston after completing its upward stroke is to commence its downward stroke, with the descent of the piston the inlet valve 31 is drawn down by the flow of fluid to fill the vacuum through passages 12, 28 to chamber 26 of valve 19 and through spaces 28 of valve 31 and through the valve seat 30 to the interior of the barrel 1, the follower 41 compressing springs 42, 43. Upon the return stroke of the piston valve 31 is seated and springs 42, 43 hold valve 31 to its seat, at which time valve 19 is forced up and carries valve 31 with it, when the fluid flows to annular space 17, passages 13, 14, 15 to outlet 48. The space 25ª above part 25 of valve 19 is now filled with fluid of the same pressure as is in the passages, but as the valve rises openings 46 are closed, and the inclosed fluid is compressed to a greater pressure than the surrounding fluid, this acts as a cushion for the valve, and also as a means to seat the valve 19 when the piston starts to return. If there is any leakage by piston 49 the fluid will not be confined to accumulate a back pressure, but will flow through pipe 60 to cylinder 62 in which the piston moves oppositely to piston 49, or when piston 49 moves down the piston in pump 62 moves up. When there is an accumulation of pressure in pipe 60 due to an excessive leakage past piston 49, which exceeds the initial pressure the valve 64 will be opened to allow the excess of pressure to flow to the suction side of the pump through bleeder pipe 63.

I claim.

1. In a pneumatic pump, the combination of a cylinder; a piston therein, a chamber mounted upon the pump cylinder, an outer and an inner wall for the chamber with intervening spaces, an annular space connecting said spaces with the interior of the chamber, a fluid inlet to the interior of the chamber; a cover for the chamber having an annular space in communication with the intervening spaces of the chamber, a cushioning chamber in the cover and vents therefrom to the annular space, an outlet from the space, an outlet valve within the chamber and seated by the gas cushion, and an inlet valve within the outlet valve with resilient seating means.

2. In a pneumatic pump, the combination of a cylinder; a piston therein, a chamber covering the pump cylinder and having a double wall with intervening spaces around the interior of the chamber and in communication with its interior; a cover for the chamber; a cushioning chamber in the cover, and outlet valve within the chamber, and seated upon the pump cylinder and entering the cushion chamber, a fluid passage from the interior of the valve to a corresponding passage in the chamber; packing rings for the valve, and an inlet valve within the outlet valve, having resilient means for its seating, and open spaces through its top and its diametral surface.

3. In a pneumatic pump, the combination of a cylinder; a piston therein, a double walled chamber upon the pump cylinder, with intervening spaces in communication with the interior of the chamber; a fluid passage to the chamber; a cover for the chamber with an outlet passage in communication with the intervening spaces of the chamber; an outlet valve within the chamber, seated upon the pump cylinder, and having a fluid passage to its interior; an inlet valve within the outlet valve and seated thereon, and openings therein to permit fluid flowing to its interior.

4. In a pneumatic pump, the combination of a cylinder; a piston therein, a double walled chamber upon the pump cylinder, with intervening spaces in communication with the interior of the chamber; a fluid passage to the chamber; a cover for the chamber with an outlet passage in communication with the intervening spaces of the chamber; an outlet valve within the chamber, seated upon the pump cylinder, and having a fluid passage to its interior; an inlet valve within the outlet valve and seated thereon, openings through its wall for fluid flowing to its interior, a follower on the valve, and resilient means seated under the follower at one end and upon the outlet valve at its opposite end, to retain the inlet valve on its seat in the outlet valve.

5. In a pneumatic pump, the combination of a cylinder; a piston therein; a removable oil dip ring under the piston, and having a curved exterior, a wiper ring secured at the lower end of the pump cylinder, of an outwardly curved top, and serving as an oil reservoir to supply lubricant to the dip ring, and means to feed the reservoir.

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

DANIEL L. HOLDEN.

Witnesses:
WILLIAM C. STOEVER,
RANSOM C. WRIGHT.