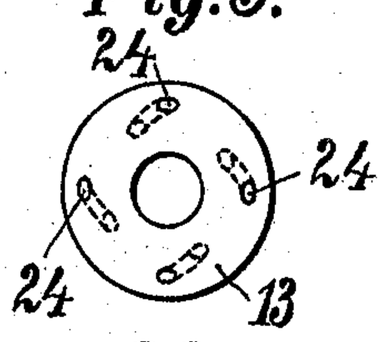
No. 854,954. PATENTED MAY 28, 1907.

M. KOHL.

AIR PUMP.

APPLICATION FILED SEPT. 20, 1905.

Fig. 3.



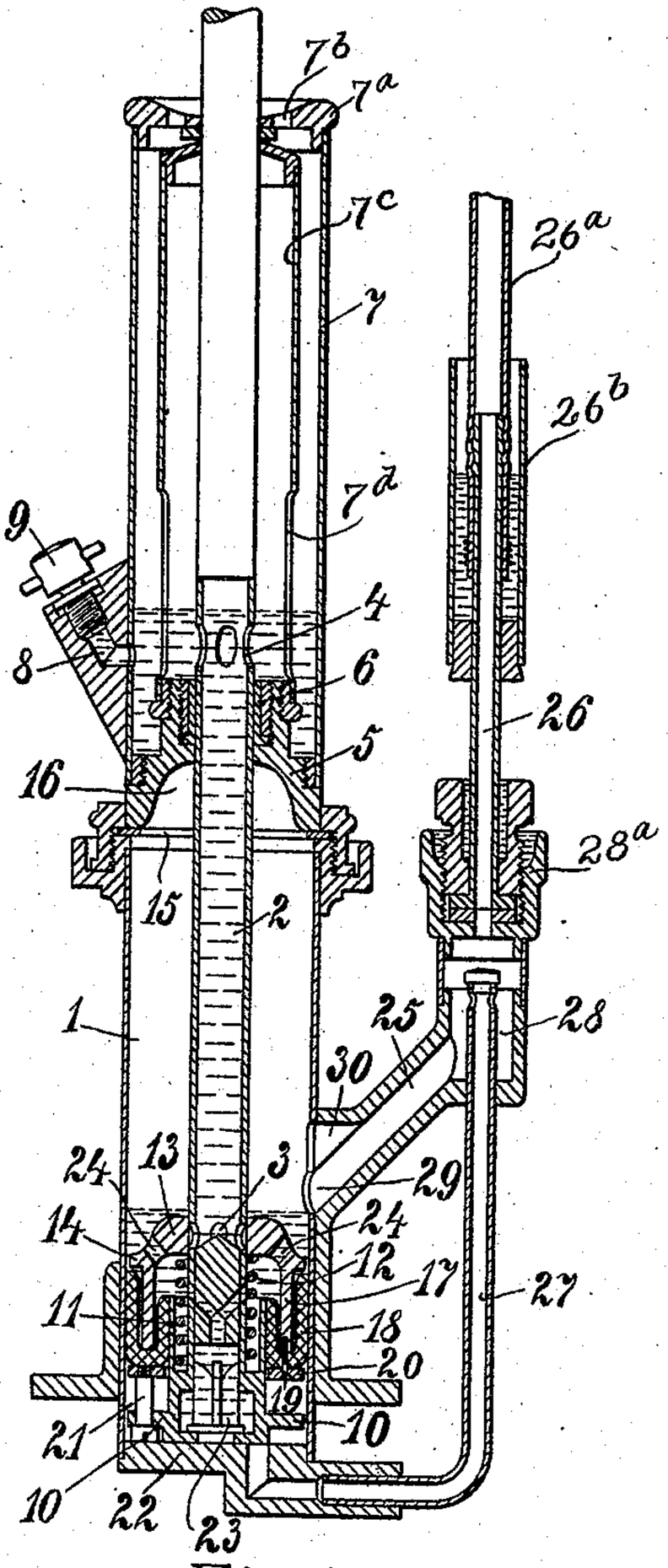


Fig. 1.

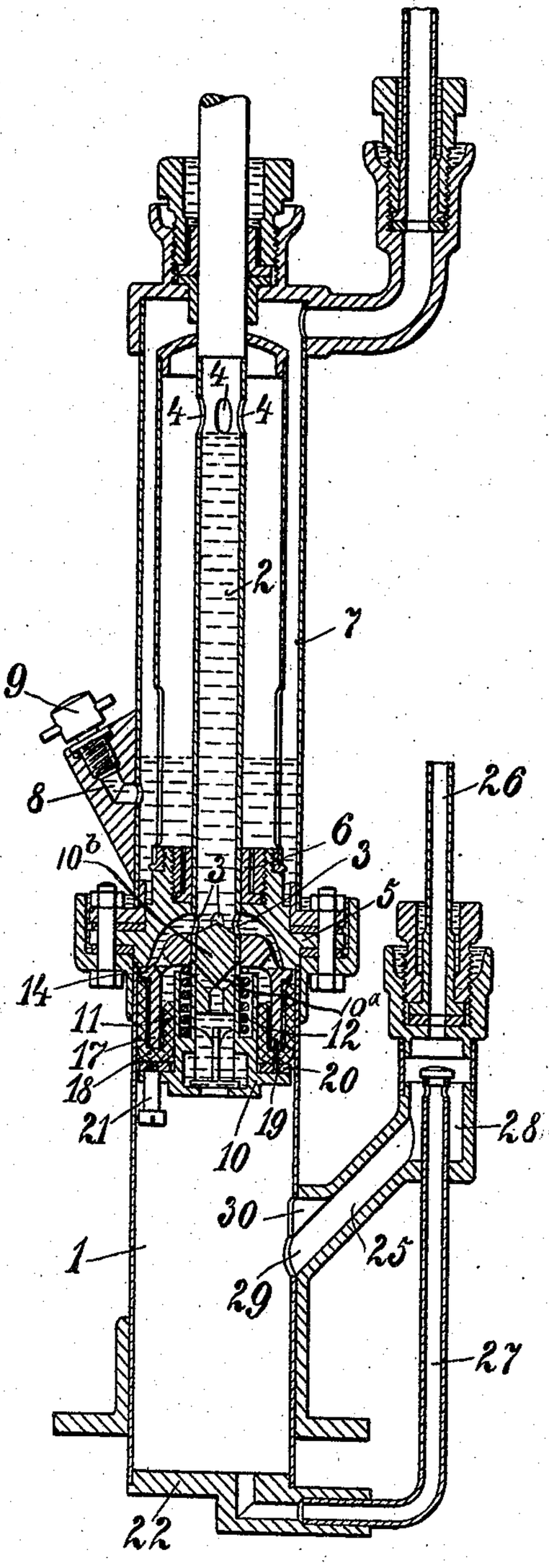


Fig. 2.

Witnesses:-

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AIR-PUMP.

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To all whom it may concern:

Be it known that I, MAX KOHL, a subject of the German Emperor, residing at Chemnitz, in the Kingdom of Saxony and Empire of Germany, have invented certain new and useful Improvements in Air-Pumps, of which the following is a specification.

This invention relates to improvement in air pumps and will be fully described in connection with the accompanying drawings and particularly pointed out in and by the appended claims.

In the drawings: Figure 1 is a vertical section of a single cylinder air pump embodying the main features of my invention. Fig. 2 is a similar view showing the parts in a different position and illustrating a connection whereby a double pump may be employed. Fig. 3 is a detail plan view of one part of the pump.

Like numerals of reference designate similar parts throughout the different figures of the drawing.

As shown the pump comprises a cylinder 1, provided with an air inlet 25 communicating with a fitting 28. A pipe 26 communicating with the receptacle from which air is to be drawn, is connected with the fitting 28 by means of a liquid tight gland 28^a. Said pipe 26 is desirably provided with a flexible connection 26^a adapted to be secured to the receptacle and an air tight joint is effected between the flexible connection 26^a and the pipe 26 by means of a liquid tight fitting 26^b. A by pass or equalizer 27 communicates with the lower end of the cylinder 1 and the fitting 28 for a purpose to be hereinafter more fully described. The upper end of the cylinder 1 is closed by a cap 5 in which is formed an air discharge chamber 16. An oil receiver 7, provided with an inlet 8 closed by a plug 9, is mounted on said cap 5 preferably in alinement with cylinder 1. The upper end of said receptacle 7 is closed by a cap 7^a having openings 7^b affording communication with the outer air. Located within the receptacle 7 and preferably mounted on the cap 5 is an air dome 7^c provided with elongated openings 7^d. A piston tube 2 extends through the cap 7^a and the air dome into the cylinder 1, there being provided in the cap 5 a gland 6 to insure an air tight operation of said tube. The tube 2 is apertured at 4 and the apertures are located in such a position with respect to the stroke of the tube as to always remain within the air dome 7^c. The said tube 2 carries at its lower end a piston which as shown comprises an integral base 10 which is provided with an annular flange 11 adapted to receive an expansively acting spring 12. A piston valve 13 is slidably mounted upon the piston tube 2 and is adapted to be displaced by the spring 12 as shown in Fig. 1. Said valve 13 is provided with an annular shoulder 14 adapted, when the piston is in its upper position as shown in Fig. 2, to engage a flange 15. The upper wall of said valve 13 is provided with tangentially disposed ports 24 communicating at all times with the cylinder space above the piston and the interior of the same. The upper wall of said valve 13 is relatively thick with respect to the remainder of the valve and serves as a closure for openings 3 formed in the piston tube 2. Said openings 3 are so disposed with respect to the stroke of the piston tube 2 as to be at all times within the cylinder 1.

The spring 12 serves normally to displace the valve 13 in a manner to close said openings 3 except when the valve is displaced from its normal position as shown in Fig. 2. Said valve 13 is provided with an annular extension 17 surrounding the upper portion of the piston and carries a packing ring 18 which projects upwardly on both sides of the extension 17 and affords an air tight engagement with the cylinder 1. The packing ring 18 is secured to the extension 17 by means of a ring 20 and screws 19 as clearly shown in Figs. 1 and 2. In order to prevent the spring 12 from displacing the valve 13 beyond a predetermined point or in other words beyond a point at which the upper wall of the valve 13 would serve to close the openings 3, I provide a bolt 21 which as shown is secured to the ring 20 by threaded engagement and projects through the flange of the base 10. When the piston is in the position as shown in Fig. 2 or in other words collapsed, the bolt 21 projects below the base 10, but when the piston is in a lowermost or in an intermediate position wherein the spring 12 has displaced the valve 13 the head of the bolt 20 will engage the base 10 as clearly shown in Fig. 1. The base 10 is provided with a non-return valve 23 which closes communication between the lower end of the cylinder and the upper end thereof through the piston when

the latter travels upwardly and which opens communication when the piston travels downwardly. Ports 10^a formed in a block 10^b secured in the piston tube 2 provide communication through ports 24 with the upper part of the cylinder when the piston descends, said block serving to cut off direct communication with the lower part of the cylinder and the tube 2.

In starting the pump the plug 9 is removed and oil or other liquid is introduced through the inlet 8 into the receptacle. Assuming that the piston is in the position shown in Fig. 1, the oil passes through openings 4 into tube 2 filling the same to the level indicated in Fig. 1. The piston tube 2 is then raised to the position shown in Fig. 2 forcing the valve 13 downwardly and permitting the oil to pass through openings 3 into and around the piston. The piston 2 is then reciprocated a sufficient number of times to effect thorough lubrication of the pump whereupon an additional amount of oil will be introduced through the inlet 8 to compensate for the oil which has passed from the tube 2 into the piston and for the oil which has been required for lubrication of the parts, bringing the oil level in the receptacle 7 to the point shown in Fig. 1.

The operation is as follows: Upon raising the piston from the position shown in Fig. 1 the air above the latter will be compressed after the piston has passed the inlet 29 in the upper part of the cylinder until the piston has reached the position shown in Fig. 2 whereupon the valve 13 will be displaced permitting the air to pass through openings 3 upwardly through the piston tube 2 through openings 4 and 7^d outwardly through openings 7^b. The tangential disposition of the ports 24 serves to agitate or more strictly speaking imparts a rotary motion to the oil which, due to pressure, seeks an outlet through openings 3 thereby serving to remove any air bubbles which may tend to lodge in the upper wall of the chamber 16. By providing the by-pass 27 and locating the inlet 25 approximately at the center of the cylinder, the vacuum which would normally be created below the piston before the latter had passed the inlet 25 is dissipated. This improved construction thereby relieves the working of the pump of the resistance which this unnecessary vacuum would create and permits the piston to work freely from the lower wall of the cylinder to a point adjacent the inlet 25. Preferably the inlet 25 is provided with a portion 29 having an extension 30 whereby the inlet 25 is maintained in communication with the cylinder 1 for an increased period of time. If for any reason the valve 13 is jammed in its closed position so that the spring 12 fails to effect displacement during descent of the piston, the bolt 21 engaging the lower wall 22 of the cylinder will force the valve 13 into a closed position.

I claim:—

1. An air pump comprising a cylinder provided with an air-inlet, a tubular piston rod provided with openings for communicating with said cylinder and normally containing a supply of liquid, said openings forming an air outlet through said liquid, and means associated with said piston and normally closing said openings and coöperating with said cylinder to open the same, said means preventing the escape of liquid into said cylinder.

2. An air pump comprising in combination a cylinder provided with an air inlet, a tubular piston rod provided with openings adapted to communicate with said cylinder and normally containing a supply of liquid, said openings forming an air outlet through said liquid, a piston for said rod, and a piston valve normally closing said openings and adapted to coöperate with said cylinder to close the same, said valve preventing the escape of liquid into said cylinder.

3. An air pump comprising in combination a cylinder provided with an air inlet, a tubular piston rod provided with openings adapted to communicate with said cylinder and normally containing a supply of liquid, said openings forming an air outlet, means for supplying oil or the like to said cylinder through said openings, and means associated with said piston and normally closing said openings and coöperating with said cylinder to open the same, said means preventing the escape of liquid into said cylinder.

4. An air pump comprising a cylinder provided with an air inlet, a tubular piston rod provided with openings adapted to communicate with said cylinder and forming an air outlet therefor, means for supplying oil to the cylinder through said openings, a piston for said rod adapted to receive a portion of the oil, a valve associated with said piston and normally closing said openings and itself provided with openings communicating with the piston, said openings being arranged to impart a rotary flow of oil outwardly discharged therethrough.

5. An air pump comprising in combination a cylinder provided with an air inlet, a tubular piston rod provided with openings adapted to communicate with said cylinder and forming an air outlet therefor, means for supplying oil to said cylinder through said openings, a piston for said rod, a valve associated with said piston, a spring displacing said valve to close said openings, a bolt limiting displacement of said valve, and a non-return valve for said piston.

6. An air pump comprising in combination a cylinder provided with an air-inlet, a tubular piston rod provided with openings adapted to communicate with said cylinder and

forming an air outlet therefor, means for supplying oil to said cylinder through said openings, a piston for said rod, a valve associated with said piston, a spring displacing said valve to close said openings, a bolt limiting displacement of said valve, a non-return valve for said piston, and a by-pass communicating with said cylinder and said air inlet.

7. An air pump comprising a cylinder provided with an air outlet, a piston for said cylinder adapted to perform its function of expelling air in connection with a quantity of liquid, and means associated with said piston serving to agitate the liquid to expel minute air bubbles adjacent said outlet.

8. An air pump comprising a cylinder provided with an air outlet, a piston for said cylinder adapted to perform its function of expelling air in connection with a quantity of liquid, and means associated with said piston serving to impart a radial rotary flow of the liquid to expel minute air bubbles adjacent said outlet.

9. An air pump comprising a cylinder provided with an air outlet, a piston for said cylinder adapted to perform its function of expelling air in connection with a quantity of liquid, and a movable member provided with tangentially disposed openings serving to impart a radial rotary flow of the liquid to expel minute air bubbles.

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

MAX KOHL.

Witnesses:
BERNHARD BLANK,
FREDERICK J. SILTZMAN.