Sept. 23, 1930. M. CORNELL 1,776,416

PUMP

Filed June 18, 1929

Fig.2.

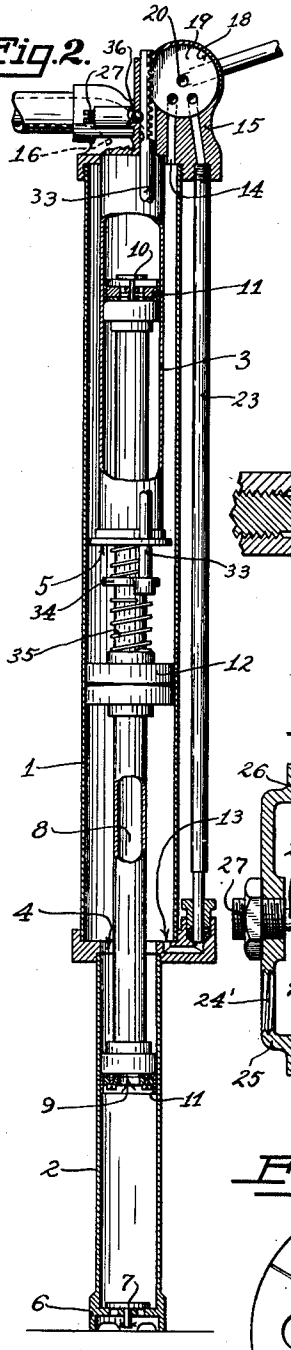


Fig.3.

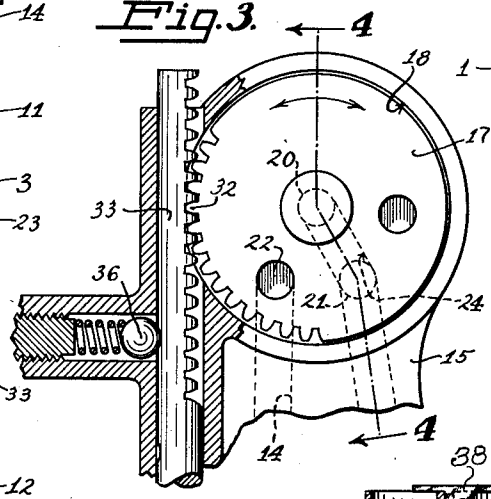


Fig.1.

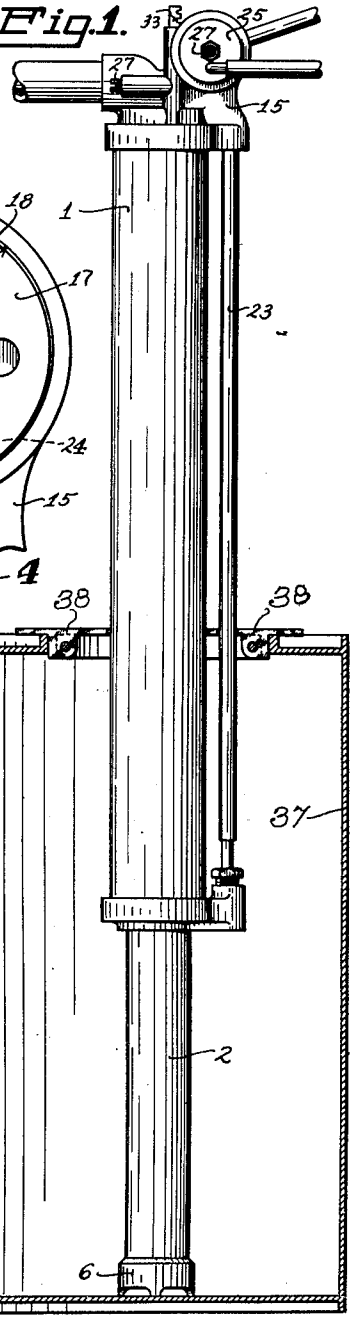


Fig.4.

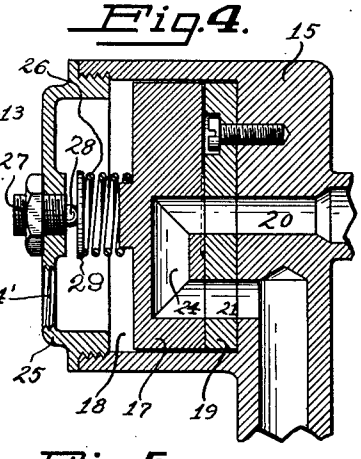
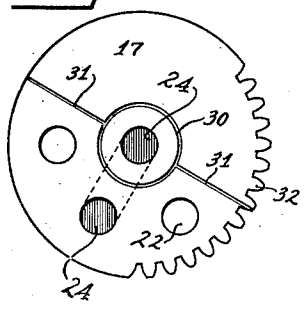


Fig.5.



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UNITED STATES PATENT OFFICE

MEAD CORNELL, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO LUBREQUIPMENT COMPANY, A CORPORATION OF CALIFORNIA

PUMP

Application filed June 18, 1929. Serial No. 371,770.

This invention relates to pneumatic pumping apparatus and particularly to one designed for the lifting or pumping of relatively heavy liquids.

One of the objects of the invention is to provide a two stage pump having but a single operating piston and which is of simple construction and positive in its operation. A further object is to provide a novel form of tubular piston structure which carries both the pumping and operating pistons and which is removable from the apparatus as a unit. Another object is the novel form of mechanism for controlling the movement of the air valve for admitting the air stream to actuate the piston. A further object is to provide a novel form of air valve which is capable of operation under heavy pressures.

With the above mentioned and other objects in view, the invention consists in the novel construction and combination of parts hereinafter described, illustrated in the accompanying drawings and pointed out in the claims hereto appended; it being understood that various changes in the form, proportion, size and minor details of construction within the scope of the claims may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

To more fully comprehend the invention reference is directed to the accompanying drawings, wherein—

Fig. 1 is a view in elevation of my invention, in pumping position, within a container.

Fig. 2 is a view in vertical section.

Fig. 3 is a view in section of the air valve and its operating means.

Fig. 4 is a sectional view on line 4—4, Fig. 3.

Fig. 5 is a view in plan of the air valve, showing one face.

In the drawings, wherein like characters of reference designate corresponding parts, —1 indicates the main cylinder having a pumping chamber 2 extending from the lower end thereof and a second pumping chamber 3 disposed concentrically therein, at its upper end. The chambers 2 and 3 open at their adjacent ends, as at 4 and 5, into the main cylinder 1. At its lower end the chamber 2 is provided with a supporting foot 6 having a valve controlled inlet 7.

Mounted for reciprocation within the main cylinder 1 and chambers 2 and 3 is a tubular piston 8 having an inwardly opening check valve 9 at its lower or inlet end and an outwardly opening check valve 10 at its upper or discharge end. Each end of the piston 8 is provided with a packing or cup 11 for frictional engagement with the wall of the chamber within which it reciprocates. Midway of its length, the piston carries the oppositely disposed cup leathers 12 having frictional engagement with the inner wall of the main cylinder. The upper reciprocation of piston 8 will displace the material in chamber 3 above the piston and will draw material into the lower chamber 2 through the inlet 7. The piston is pressure operated, air under pressure being alternately admitted into the cylinder 1 at opposite sides of the leathers 12, through ports 13 and 14.

To the top of cylinder 1 is secured a head 15 supporting the upper end of pumping cylinder 3 and provided with an orifice 16 through which the grease expelled from the cylinder 3 discharges. This fluid flow to opposite sides of the leathers 12 is controlled by the oscillation of a disk valve 17 mounted within a valve seat chamber 18 in the head 15. A valve plate 19 is held within the rear of the seat chamber 18 and the same is provided centrally with an air inlet port 20 connected with an air supply under pressure. Near its periphery, and positioned one on either side of the inlet port 20, are the ports 21 and 22, one connecting with the port 13 through pipe 23 and the other connecting with port 14 with the upper end of cylinder 1. The valve is provided with an elbow passage 24, one end of which is at all times in communication with port 20 and the opposite end of which communicates alternately, on the oscillation of the valve, with ports 21 and 22 to admit air under pressure into the cylinder 1 to reciprocate the piston 8 therein.

Valve 17 has pressure relief ports 23 and

24 therein which register alternately with ports 21 and 22 to relieve pressure from one side of the leathers 12, while it is being admitted to the other side to reciprocate the piston 8.

The released pressure escapes through a port 24′ in the valve chamber cap 25, which has screw connection with head 15. The valve 17 is held to its seat by a coiled spring 26 interposed between the outer face of the valve and the cap 25. The adjustment of a screw 27 in cap 25 regulates the frictional tension between the valve and its seat, and a bearing ball 28 between the screw and plate 29 affords a single pressure point on the spring.

The inner face of the valve 17 is channeled at 30 circumferentially of the port 24, and from said channel extend the radial channels 31, the channels reducing the area of the valve face on which the high pressure air is active, prior to escaping to the atmosphere. This channel structure enables the use of air under high pressure without raising the valve from its seat.

The valve is oscillated by the following mechanism. Engaging with the toothed periphery 32 of the valve is a toothed rack 33 reciprocating in the cylinder 1. The rack terminates in a ring 34, embracing piston 8 above packings 12. On each side of ring 34 are coiled compression springs 35 adapted, on the full stroke of the piston in either direction, to trip the rack 33 against the yielding holding tension of the spring pressed ball 36. Thus a quick throw is imparted to the valve 17 through rack 33 on the movement of the piston its full stroke in either direction. The pumping apparatus is illustrated as being operatively positioned in a container 37 through the hinged closure members 38, Fig. 1.

I claim:—

1. A pump structure comprising a pair of pumping cylinders, a tubular valve controlled piston common to both for reciprocation to lift material from one to the other and to discharge it from the latter, a source of air under pressure, a disk valve for oscillation on its seat to control the flow of air to reciprocate said piston alternately in opposite directions and provided with an air inlet port, the face of said valve around the air inlet port being channeled to reduce the area acted on by air under pressure escaping between the valve face and seat, spring means for holding the valve to its seat, and means operated by the reciprocation of the piston to oscillate said valve.

2. In combination with a pump including a pumping chamber, a tubular piston reciprocating therein, a main cylinder in alignment with the pumping chamber and into which said piston extends, said piston provided approximately midway of its length within said cylinder with a head, and means for admitting air under pressure to reciprocate said piston comprising a valve chamber provided with an air inlet, an air escape to the atmosphere, and an air connection to said main cylinder, one on each side of said head, a disk valve mounted to oscillate within said valve chamber and provided with an elbow port, one end of which is connected, at all times, with said air inlet, and the other end alternately connects with said respective air connections to said main cylinder, vent ports in said valve for alternately connecting with said respective air connections to said main cylinder, and means for oscillating said valve on the reciprocation of the piston.

3. In combination with a pump including a pumping chamber, a tubular piston reciprocating therein, a main cylinder in alignment with the pumping chamber and into which said piston extends, said piston provided approximately midway of its length within said cylinder with a head, and means for admitting air under pressure to reciprocate said piston comprising a valve chamber provided with an air inlet, an air escape to the atmosphere, and an air connection to said main cylinder, one on each side of said head, a disk valve mounted to oscillate within said valve chamber and provided with an elbow port, one end of which is connected, at all times, with said air inlet, and the other end alternately connects with said respective air connections to said main cylinder, vent ports in said valve for alternately connecting with said respective air connections to said main cylinder, a rod provided with a rack engaging the periphery of said valve and a portion of the rod embracing the piston, and means on the piston for tripping said rod to actuate the valve on the reciprocation of the piston in either direction.

4. In combination with a pump including a pumping chamber, a tubular piston reciprocating therein, a main cylinder in alignment with the pumping chamber and into which said piston extends, said piston provided approximately midway of its length within said cylinder with a head, and means for admitting air under presure to reciprocate said piston comprising a valve chamber provided with an air inlet, an air escape to the atmosphere, and an air connection to said main cylinder, one on each side of said head, a disk valve mounted to oscillate within said valve chamber and provided with an elbow port, one end of which is connected, at all times, with said air inlet, and the other end alternately connects with said respective air connections to said main cylinder, vent ports in said valve for alternately connecting with said respective air connections to said main cylinder, an adjustable spring tension means

bearing on the axis of rotation of the valve to maintain its face in frictional contact with its seat, the face of said valve provided with a channel surrounding the inlet end of the elbow port and other channels communicating therewith and extending to the periphery of the valve, and means for alternately oscillating said valve on the reciprocation of the piston.

5. A pump structure comprising a pair of pumping cylinders, a tubular valve controlled piston common to both for reciprocation to lift material from one to the other and to discharge it from the latter, a source of air under pressure, a disk valve for oscillation on its seat to control the flow of air to reciprocate said piston alternately in opposite directions and provided with an air inlet port, the face of said valve around the air inlet port being channeled to reduce the area acted on by air under pressure escaping between the valve face and seat, means for holding the valve to its seat, and means operated by the reciprocation of the piston to oscillate said valve.

In testimony whereof I have signed my name to this specification.

MEAD CORNELL.