D. KLEIN.

AIR PUMP.

APPLICATION FILED JUNE 8, 1910.

1,004,278. Patented Sept. 26, 1911.

Fig. 2.

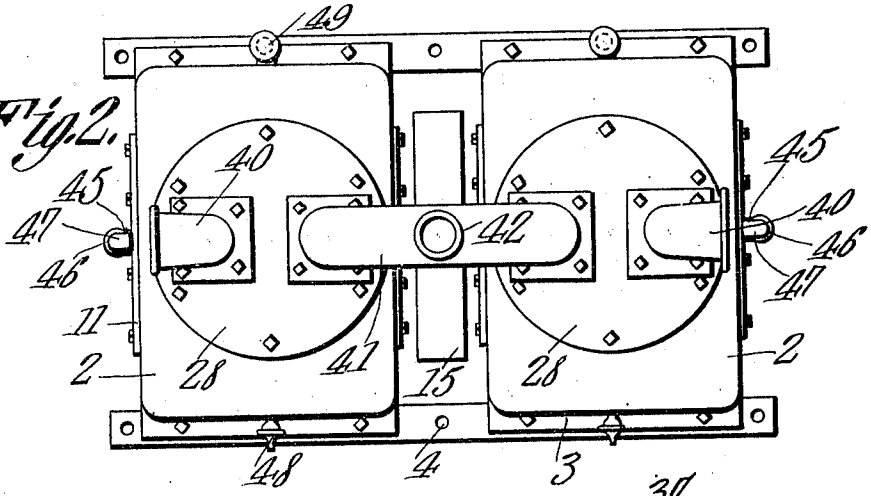
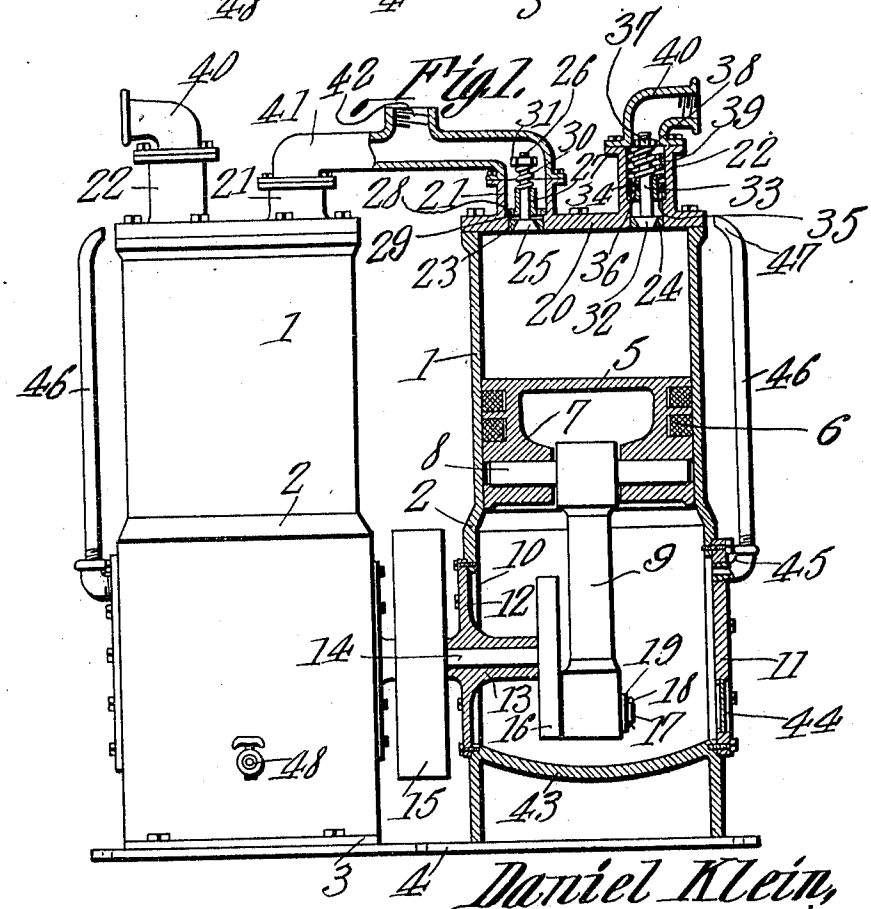


Fig. 1.



Witnesses

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UNITED STATES PATENT OFFICE.

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AIR-PUMP.

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To all whom it may concern:

Be it known that I, DANIEL KLEIN, a citizen of the United States, residing at Spokane, in the county of Spokane and State of Washington, have invented a new and useful Air-Pump, of which the following is a specification.

This invention has reference to improvements in air pumps and is designed more particularly for use in the production of sub-atmospheric pressure in a conduit connected with pulsator-type milking machines.

Air pumps, as ordinarily constructed for exhausting air from a container or conduit are not adapted to meet the conditions present where milking machines are used. The man or men usually employed to operate the pump and the milking machines are not experts in running complicated machinery and they are usually neglectful in attending to the lubrication of the pumps, especially where numerous bearings must be frequently supplied with oil or other lubricant, the result being that the machines soon run dry with resultant excessive wear.

With the present invention the construction is such that a moderate supply of lubricant will last for a long time and may be introduced into the structure at one point only, the operation of the pump causing the lubricant to be thrown to all parts needing lubrication.

The invention likewise includes means whereby the pump will automatically maintain parts liable to become heated by the compression of air in a comparatively chilled condition.

The invention will be best understood from a consideration of the following description taken in connection with the accompanying drawings forming a part of this specification, in which drawings:—

Figure 1 is an elevation with parts in section of an air exhausting pump constructed in accordance with the present invention. Fig. 2 is a top plan view of the same.

The pump structure is preferably of the twin type and consequently there are provided two pump cylinders 1 of which one is shown in elevation in Fig. 1 and the other is shown in vertical diametric section. Each cylinder 1 is merged into a laterally extended base portion 2 on the bottom of which are formed flanges 3 so that the two pump structures may be united by side strips 4 suitably perforated for the passage of screws or bolts whereby the pumps may be fastened to some stationary structure. Within each cylinder 1 there is a piston 5 which may be of the trunk type and is provided with packing rings 6 and with the usual diametrically disposed lugs 7 provided with matching passages for a pin 8 whereby one end of a pitman 9 is connected to the piston.

Opposite sides of the basic portion 2 of the two pumps are provided with suitable passages 10 covered by face plates 11, 12 respectively, the several passages 10 being in line one with the other. Each face plate 12 is formed with a central extended bearing 13 for a drive shaft 14 of sufficient length to enter both basic portions 2 of the pumps. Between the pumps the shaft 13 carries a pulley 15 for the application of power by a belt, but it will be understood that power may be applied to the shaft in any convenient manner. At each end of the shaft 14 the latter carries a crank disk 16 provided with a crank pin 17 receiving the end of the pitman 9 remote from that connected to the piston and the pitman is held to the pin 17 by a suitable cotter pin 18, the pitman at this point being flanked by suitable washers 19.

Each cylinder 1 is provided with a head 20 bolted in the usual manner to the cylinder body. On the outer face of each head are formed cylindrical extensions 21, 22 respectively, although this does not preclude the formation of these extensions of separate pieces. Coincident with the extensions 21, 22 are passages through the head 20 having respective valve seats 23, 24, which for convenience of manufacture may be made separate from the head 20 and secured in the passages formed therethrough.

Lodged normally in the valve seat 23 is a valve 25 having a stem 26 extending through a guide 27 on a plate 28 seated on a shoulder above the valve seat 23, which shoulder may be formed by counter boring the cylinder 21. The plate 28 is formed with passages 29 for the transmission of air there-through. The valve stem 26 is surrounded by a spring 30 lodged between the end of the guide 27 and a nut 31 applied to the valve stem 26 and locked thereto in any appropriate manner permitting the desired adjustment of the spring. The valve 25 is so arranged as to open toward the cylinder 1. Normally seat-

ed in the valve seat 24 is a valve 32 provided with a valve stem 33 and extending through a guide 34 on a plate 35 in turn seated on a shoulder formed in the extension 22 by counterboring the latter or otherwise. The plate 35 is provided with perforations 36 for the passage of air.

Applied to the valve stem 33 is a nut 37, while surrounding the stem between the nut and the guide 34 is a spring 38, the arrangement of these parts being like that described with reference to the valve 25. The plate 35 is held to the shoulder upon which it normally rests by a spring 39 lodged within the extension 22 between the said plate and the overhanging portion of a neck 40 made fast to the outer end of the extension 22, this neck 40 being replaceable by any suitable connection.

The extensions 21 of the two cylinders are connected by a bridge conduit 41 provided with a single inlet 42 designed to be connected to the conduit leading to the milking machine or machines of the system controlled by the pump of the present invention. The pulsator type of milking machines operating on sub-atmospheric pressure being well known, such machines need no description herein.

The bottom wall of each basic portion 2 is in the form of a curved web 43 beginning substantially coincident with the lower edges of the openings 10 and made concave to constitute a pocket or receptacle. The cap plate 11 of each basic portion 2 is provided with a window 44 by means of which the interior of the basic portion 2 may be observed from time to time. Extending through the plate 11 to the interior of the basic portion 2 is an ell 45 from which there leads a pipe 46 terminating in a nozzle 47 adjacent to the head 20 where formed with or having attached thereto the extension 22 containing the valve 32. Each basic portion 2 may be provided with a drain valve 48. It will be understood that wherever packing is needed it is provided even though not indicated in the drawings.

Because of the conditions under which milking machines are used the pump of the present invention is made of small size and driven at high speed reaching at times upward of six hundred strokes per minute. This gives the required displacement of the air for the proper operation of the pulsators of the milking machine while the weight of the machine and the power necessary to drive the same are reduced to a minimum. At the same time a very efficient lubrication is obtained by the introduction of a mass of oil or other lubricant in each subbase 20 where it is retained by the concave web 43 and the lower end of the pitman splashes the oil with great violence to all the bearings requiring lubrication, a supply of oil in the basic portion 2 lasting for a month or more. The window 44 enables an operator to ascertain the height of the oil within the basic member 2 and at long intervals more oil may be introduced, for which purpose a suitable inlet pipe 49 may be provided, such pipe of course being provided with a removable cap. To balance the pump the pistons may be so arranged as to move in opposite directions.

With such a pump in operation air is drawn into the bridging pipe 41 and alternately through the valves 25 to the interior of the cylinders 1 when the piston in the cylinder is moving downward as viewed in Fig. 1. On the return stroke of the piston the valve 25 closes and the valve 32 is opened by the pressure established by the return or upward stroke of the piston and the air is driven out through the passage unclosed by the valve 32 and may escape to the atmosphere or be otherwise conducted away. Since more or less compression of the air within the cylinder 1 is necessary to open the valve 32 there is a certain amount of heat thus generated and the air so heated in passing through the valve seat 24 and extension 22 will heat the parts therein contained. Ordinarily this heat is disposed of by a water jacket or similar means. The movement of the piston 5 toward and from the basic portion 2 tends to create alternate pressure and vacuum conditions within the basic portion 2. As the piston 5 descends the air within the basic portion 2 is compressed and finds escape through the pipe 46 and is directed by the nozzle 47 against the head of the cylinder and against the extension 22 thus chilling these parts and by conduction maintaining the valve 32 and the valve 24 and adjacent parts in an appropriately chilled condition. When the piston 5 is moving upwardly then there is created sub-atmospheric pressure within the basic portion 2 and the atmospheric air will enter through the pipe 46 and the rush of air therein will create a current about the head 20 and extension 22 also serving to chill these parts. Since there is no material compression within the basic portion 2 on the downward stroke of the piston 5 the air issuing from the pipe 46 is not heated to any material extent and is cold enough to cause extraction of heat from the head 20 and adjacent parts. Not only does a small size high speed air pump facilitate the lubrication of these parts but because of its small size and ease of running not only reduces the first cost of the pump but produces a very material saving in power and fuel, both of these items amounting to considerable in milking machine systems. By forming the basic portion 2 of each pump with lateral extensions in the direction of the plane of movement of the pitman, the capacity for

lubricant is correspondingly increased and the intervals for the renewal of such lubricant are correspondingly extended while the increased material needed for these lateral extensions is so small as to be negligible.

It will be understood, of course, that while a duplex pump is shown and described, under some circumstances the invention may be incorporated in a single cylinder pump, or the pump may have more than two cylinders.

What is claimed is:—

In an air pump, a crank case, a cylinder supported thereon, casings upon the cylinder, inlet and exhaust valves within the respective casings, said crank case having an opening, a piston mounted for reciprocation within the cylinder and constituting means for forcing warm air outwardly through and sucking cool air inwardly through the opening, and a pipe extending from the opening and terminating in a nozzle for directing currents of air across the casing of the exhaust valve during the discharge of air from and the suction of air to the crank case.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

DANIEL KLEIN.

Witnesses:
F. N. MARTIN,
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