

(No Model.)

M. J. CUSHMAN.
COW MILKING MACHINE.

No. 579,339.

Patented Mar. 23, 1897.

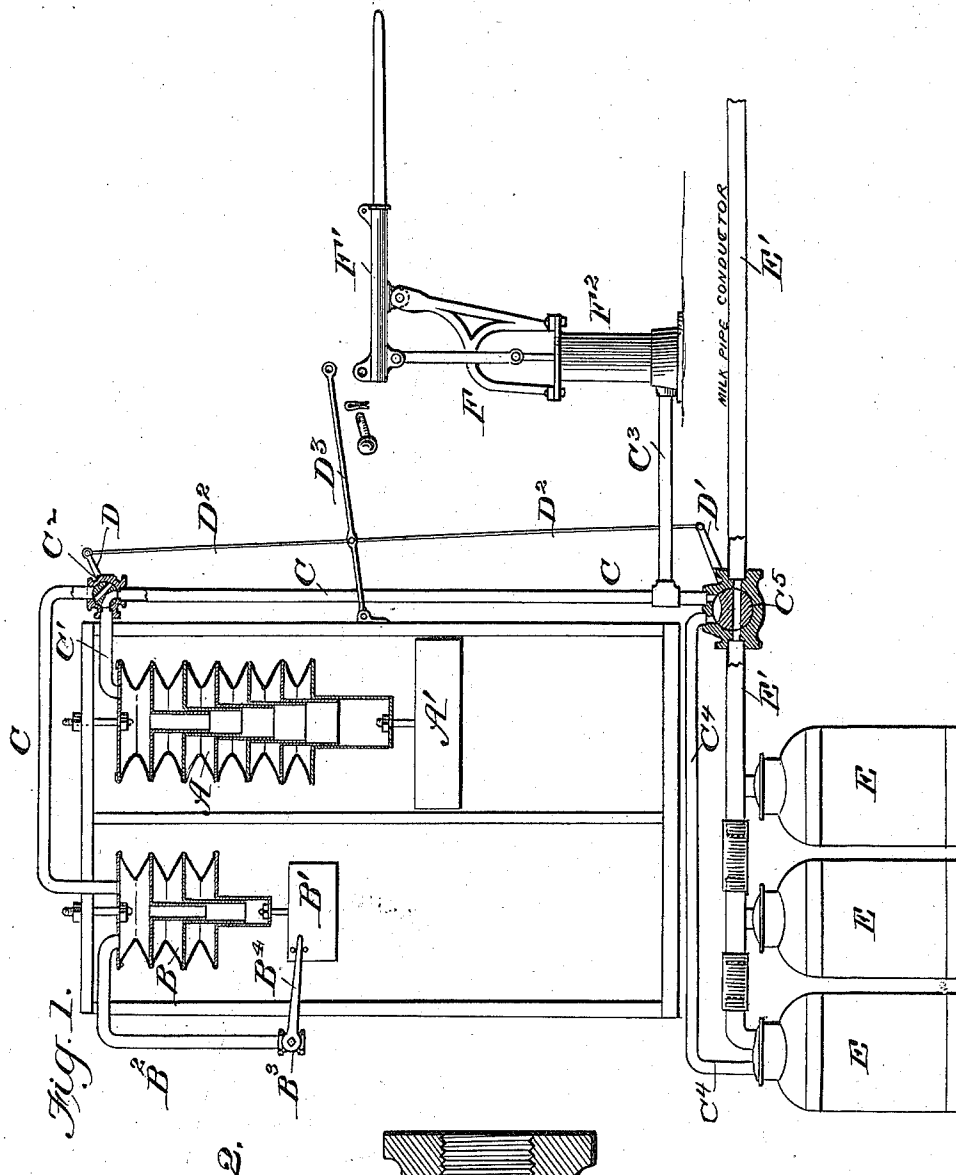
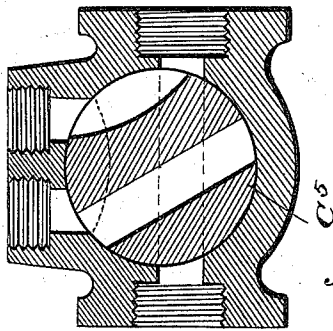


Fig. 1.

Fig. 2.



WITNESSES:
Jas. A. Ryan
Amos W. Hall

INVENTOR
Modestus J. Cushman
BY *Munn & Co.*

ATTORNEYS.

UNITED STATES PATENT OFFICE.

MODESTUS J. CUSHMAN, OF WATERLOO, IOWA.

COW-MILKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 579,339, dated March 23, 1897.

Application filed December 24, 1895. Serial No. 573,219. (No model.)

To all whom it may concern:

Be it known that I, MODESTUS J. CUSHMAN, of Waterloo, in the county of Black Hawk and State of Iowa, have invented a new and useful Improvement in Cow-Milking Machines, of which the following is a specification.

In the class of "pulsating" milking-machines, that is to say, machines in which the air-vacuum in the teat-cups is made to alternately increase and decrease, say, for example, from a maximum of twelve degrees to a minimum of four degrees of air-pressure, it is essential such vacuum shall not fall below the minimum; otherwise the cups will fall off from the teats. It is further desirable, if not practically necessary, the alternating pulsations shall be regular and decided.

I have devised an improved milking-machine, or, rather, an improved air-exhausting and valve attachment for one, as hereinafter described.

In the accompanying drawings, Figure 1 is a combined side and sectional elevation of my improved apparatus. Fig. 2 is an enlarged section of one of the valves.

A, Fig. 1, indicates a flexible and collapsible air-chamber, and B one of like construction, which are suspended in a suitable stationary frame and provided with air-inlets, also with the respective weights A' B' of correspondingly-different size. These air-chambers and their attachments will be found more fully described in the patent of Messrs. Harvey and Hoover, No. 541,458.

It will be understood that the weight A' is of sufficient size to maintain by its gravity or downward traction a vacuum of twelve degrees air-pressure in the larger chamber A, while the weight B' will correspondingly maintain a vacuum of four degrees in the smaller chamber B. An air-inlet pipe B² is connected with the rigid head of chamber B and provided at its lower pendent end with a valve B³. The latter is operated by a lever B⁴, loosely connected with the weight B', for a purpose hereinafter stated. An air-exhaust pipe C is also attached to air-chamber B and extends down to a junction with the main milk-conducting pipe E', which is connected with the milk-receptacles E, and in practice extends along the cow-stable, where it is provided with a series of flexible branch

tubes and attached terminal teat-cups. (Not shown.) In brief, the construction, arrangement, and connection of the milk-receptacles E, milk-pipe E', and teat attachments are the same as described in my application, Serial No. 562,701, filed September 16, 1895.

The air-exhaust pipe C' connects the head of the larger air-chamber A with pipe C, and a rotatable two-way valve C² is located at the junction of said pipes. When adjusted in one position, said valve closes the pipe C' and opens communication between the horizontal and vertical sections of pipe C, and in the alternating position it connects, as shown, the pipe C' with the vertical section of pipe C and closes the horizontal part that connects with air-chamber B. It is apparent that two or more valves could be used instead of one of the special valves with same results.

A branch pipe C⁴ leads from one of the milk-receptacles E to the milk-pipe E'. At the junction of the three pipes C, C⁴, and E' is located a four-way rotary valve C⁵, and it serves to alternately close and open them, as hereinafter described. These two valves are respectively provided with lateral lever-arms D and D', which are connected by a vertical rod D², so that they are caused to operate in unison through the medium of a horizontal lever D³, fulcrumed on the frame in which the air-chambers A and B are hung and having a pivot connection with the rod D², as shown. The free end of such lever is adapted for detachable connection with the oscillating lever-head F' of an air-exhaust pump F. The pump-cylinder F² is connected by a branch pipe C³ with the air-pipe C, as shown.

The operation of the machine is as follows: The lever D³ is raised and thereby the rod D² operates both valves C² and C⁵ simultaneously, so that these results follow: first, the valve C² closes that portion of pipe C that connects with the air-chamber B, while it opens the passage through pipe C' to air-chamber A, and, second, the valve C⁵ opens passage from pipe C to C⁴ and shuts off the passage between pipe C and milk-pipe E', and opens passage in E' from milk-receptacles to teat-cups and tubes. The pump F is now worked and draws air out of chamber A and its connections, thereby causing it to contract or

collapse and lift the weight A', with the result that a vacuum of about twelve degrees is produced in said chamber, the pipes C and C', the milk-receptacles E, and in milk-pipe E' and branches. When the chamber A has been collapsed as far as possible, the operator depresses the lever D³, so that the valves C² and C⁵ are reversed, with the following results: first, the pipe C' is closed and the portion of pipe C that connects with the smaller chamber B is put in connection with the vertical section of pipe C, and, second, the valve C⁵ closes the pipe C' and also the passage from milk-pipe E' to receptacles E, while opening passage from C to E'. There being a vacuum of about twelve degrees in pipe C, it is evident air will be instantly drawn from chamber B into pipes C and E'. The said vacuum in C thus ordinarily suffices to collapse the chamber B and raise its weight B', so as to create a vacuum of about four degrees in C and E'. If not, then the pump is operated to effect it. Thus the machine is put in condition for beginning the milking operation. The lever D³ being detached from the pump, it is first vibrated by hand at a speed of about thirty strokes a minute while the teat-cups are being applied to one or more cows. It is apparent that in consequence of the alternate opening and closing of the valves C² and C⁵ and the opening and closing of passages to air-chambers A and B upon each upstroke of the lever D³ there will be a vacuum of about twelve degrees in the entire apparatus save the chamber B, and that at each downstroke of said lever D³ there will be a vacuum of about four degrees in all parts save chambers A and the milk-receptacles E. It is further apparent that after each upstroke of the lever D³ the air in pipes C and E', which had previously been reduced to a vacuum of about four degrees, will be drawn into the larger chamber A until there is a vacuum of about twelve degrees, the said chamber being correspondingly expanded. As the operation continues it becomes nearly fully expanded and must be again exhausted and collapsed in order to permit the milking operation to continue. To effect this, which is done without interruption of milking, the operator reattaches the lever D³ to the pump-head, and then works the pump at the rate of, say, thirty strokes a minute to draw air out of the air-chambers and connections, thus collapsing the chamber A. It is apparent the drawing of air from the smaller chamber B, caused by each downstroke of the lever D³, causes its partial collapse, so that it finally collapses completely. When this occurs, the weight B' being automatically raised it will open the valve B³ in pipe B², and thus admit air to chamber B, so that it again expands until the weight B' again descends far enough to close the valve B³, which obviously arrests the expansion of chamber B. Thus the said lever and valve serve as an automatic air-inlet or safety attachment for the chamber B.

The general operation of the machine is such that pulsations relatively of about twelve to fourteen degrees are produced alternately in rapid succession, and thus the teat-cups are held in place by a vacuum of about four degrees while the milk is drawn by a vacuum of about twelve degrees and the milking continues without interruption by reason of the collapse of either chamber A or B.

To summarize and in part recapitulate the operation, when lever D³ is raised valve C² closes C and B and opens A, while valve C⁵ opens milk-receptacles E and pipes E', but closes passage between pipe C and E', so that a vacuum of twelve degrees is in A, C, E, and E'. When lever D³ is down, A and E are closed and B, C, and E' open with an air-tension of four degrees. Thus A and E are shut off whenever B is open, and vice versa.

It is to be understood that I do not restrict my invention in its range of use or application, but propose to apply it to any milk-yielding animal of any species with such modification in size or details of form of parts of the apparatus as the case may require.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a milking-machine, of the character specified, the combination of the differentiated air-chambers, air and milk pipes, and suitable valve mechanism, substantially as shown and described, whereby the said air-chambers are alternately put in connection with and cut off from communication with the milk-pipe and connections.

2. In a milking-machine of the character specified the combination with differentiated vacuum-chambers, a milk-receptacle and air and milk pipes, of a valve mechanism applied to said pipes and means for operating it substantially as shown and described, whereby the said chambers are alternately put in connection with and cut off from communication with the milk pipe and receptacle, as specified.

3. In a milking-machine of the character specified, the combination with the differentiated vacuum-chambers a milk pipe and receptacle, and air-exhaust pipes connecting them with said chambers, of valves located at the junction of the several pipes, and means for connecting and operating the valves, which are constructed and arranged substantially as described, and thereby adapted to establish and cut off communication of the chambers with the milk pipe and receptacle.

4. In a pulsating milking-machine the combination with differentiated expansible vacuum-chambers, a milk pipe and receptacle and air-pipes communicating with said chambers, milk pipe and receptacle, of a rotary valve, applied at the bifurcation of the air-pipe, which connects with the chambers, and a similar valve arranged at the junction of the air and milk pipe, a rod connecting the said valves, and a lever pivoted to the rod, substantially as shown and described, where-

by said valves are simultaneously operated for alternately opening and closing communication between the vacuum-chambers, air-pipe, and milk pipe and receptacle, as specified.

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5. In a pulsating milking-machine, the combination with weighted differentiated vacuum-chambers which are automatically expansible, a milk pipe and receptacle, and pump, of the air-exhaust pipes C, C', C³ and C⁴ which connect the chambers, pump and milk pipe and receptacle, as specified, rotary or oscillating valves arranged respectively at the junction of pipes C, C' and C, C⁴ and E' as specified; a rod connecting the valve-arms,

a lever pivoted to the rod and having a detachable connection with the movable pump as shown and described.

6. The combination with the vacuum-chamber B, its weight and an air-exhaust pipe and connection of an air-inlet pipe, a valve located in the open end of the same, and a lever-arm attached to said valve and having a loose connection with the weight, whereby the valve is operated by the contraction and expansion of the chamber, as specified.

MODESTUS J. CUSHMAN.

Witnesses:

AMOS W. HART,
M. D. BLONDEL.