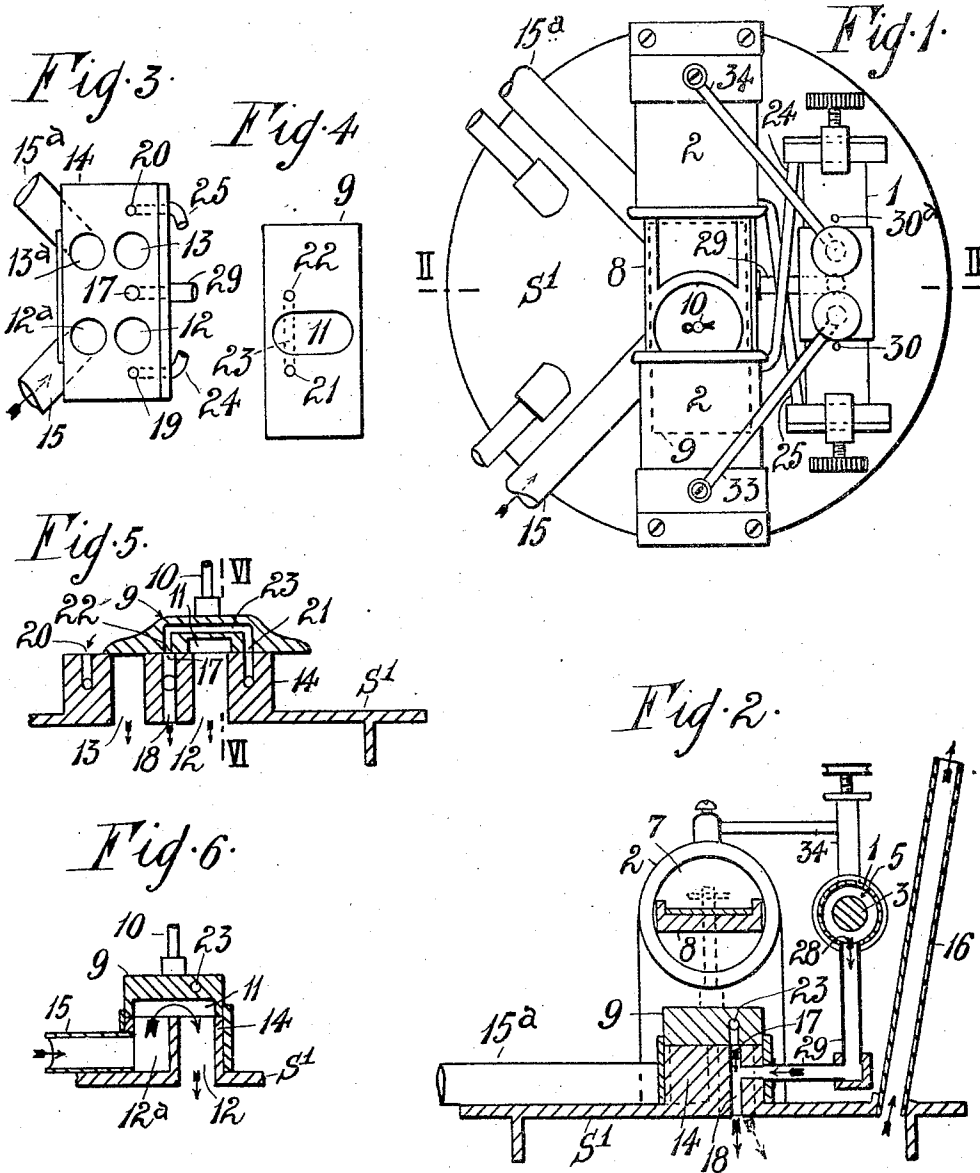


A. KILBORN.  
 SUCTION OPERATED VALVE MECHANISM.  
 APPLICATION FILED OCT. 2, 1908.

935,521.

Patented Sept. 28, 1909.  
 2 SHEETS—SHEET 1.



Witnesses

*W. B. Keeler*  
*W. B. Keeler*

By

Inventor  
*Albert Kilborn*  
*James L. Norris*  
 Attorneys

935,521.

2 SHEETS—SHEET 2.



Вн

Attorneys

Witnesses

W.B. Keeler  
J.G. Mosler

# UNITED STATES PATENT OFFICE.

ALBERT KILBORN, OF MIDDLE BRIGHTON, VICTORIA, AUSTRALIA.

## SUCTION-OPERATED VALVE MECHANISM.

935,521.

Specification of Letters Patent. Patented Sept. 28, 1909.

Application filed October 2, 1908. Serial No. 455,911.

To all whom it may concern:

Be it known that I, ALBERT KILBORN, a subject of the King of Great Britain, residing at "Bondi", New street, Middle Brighton, in the State of Victoria, Commonwealth of Australia, engineer, have invented a Suction-Operated Valve Mechanism, of which the following is a specification.

This invention consists of mechanism, operated by suction, which is designed for the purpose of oscillating or reciprocating a valve, adapted to cut off at predetermined intervals a motive fluid employed for any purpose. It is accordingly useful in milking apparatus wherein a valve is employed for connecting and disconnecting intermittently the vacuum or suction supply with or from teat cups.

Briefly stated the mechanism comprises a compound piston valve and a double ended piston each adapted to reciprocate in their cylinders by the alternate communication at either end with suction and air at atmospheric pressure, the compound piston valve operating the double ended piston and the latter causing a valve to reciprocate across suitable ports connected with the motive fluid to be controlled.

The invention is illustrated by the accompanying drawings whereof:—

Figure 1 is a plan of the apparatus as applied for milking apparatus. Fig. 2 a vertical section on line II—II of Fig. 1. Fig. 3 a plan of the valve seat. Fig. 4 an underside plan of the valve. Fig. 5 a longitudinal section through the valve and its seat. Fig. 6 a vertical section on line VI—VI Fig. 5. Fig. 7 a horizontal section through the compound piston valve. Fig. 8 a similar view through the double ended piston cylinder, and Fig. 9 a diagrammatic view illustrating one half cycle of the operation of the mechanism.

According to this invention there are two cylinders 1, 2, placed adjacent to each other, the former containing a compound piston 3, 3, 3, by which there are formed three valve chambers or recesses 4, 5, 6, in the cylinder, while the cylinder 2 contains a double ended piston 7, 7, having a common rod 8. The valve 9 to be controlled is removably attached by a stem 10 to the rod 8 and to provide for the reciprocatory motion of said stem 10 the cylinder of the double ended pis-

ton is preferably formed in two separated parts 2, 2, which however may be joined together provided there is a central slot for the passage of the stem 10 of the valve. The latter has a recess 11 on its underface adapted when open to one or more pairs of ports 12, 12<sup>a</sup>, or 13, 13<sup>a</sup>, in its seating 14 to place a pipe or pipes 15, 15<sup>a</sup>, in communication with any motive fluid delivered to the ports 12, 13. For the purpose of illustration it will be assumed that suction is the motive power to be controlled. For convenience, there is provided a vessel S having a fluid tight lid S' wherein the necessary exhaustion is maintained by an air pump or other suitable suction producing device connected to the pipe 16. The valve seating 14, has a port 17 situate between the ports 12, 13, which is also in communication with the suction by means of passage 18 and on either side of port 17 the seating has ports 19, 20, at opposite ends, one or the other of which is open to atmospheric pressure at the limit of the valve's movement.

On each side of the recess 11 in the valve and on the underface thereof are two ports 21, 22, connected together by a passage 23. The valve, by means of ports 21, 22, and passage 23, alternately places the ports 19, 20, in communication with the suction through port 17 and passage 18 in the seating, and alternately opens said ports 19 and 20 to the air. The ports 19, 20, are connected by crossed pipes 24, 25, with ports 26, 27, in the ends of the compound piston valve cylinder 1, and said cylinder has a central port 28 connected by pipe 29 for convenience of construction with the passage 18 leading to port 17 of the valve seating and consequently with the suction supply, but said pipe 29 may be connected directly with the suction supply as in Fig. 9. The cylinder is moreover provided on either side of said port 28 with one or two air inlets 30, 30<sup>a</sup>, formed in the cylinder. Furthermore said cylinder is provided between the port 28 and air inlets 30, and 30<sup>a</sup>, with two ports 31, 32, in communication respectively by means of pipes 33, 34, with ports 35, 36, in the ends of the cylinders 2 of the double ended piston 7, 7.

The central portion 37 of the compound pistons 3, 3, 3, in the cylinder 1 is reduced in diameter or formed with a groove which

with the cylinder forms an annular recess or valve chamber 5, which alternately connects the ports 31, and 32, with the suction port 28; at the same time air at atmospheric pressure is admitted alternately through the air inlets 30, 30<sup>a</sup>, to the recesses 4, or 6 in the cylinder and conducted in turn by means of pipes 33 or 34 and ports 35 or 36 behind the pistons 7, 7, in the cylinders 2, 2.

It will be apparent that the compound piston valve brings the respective ends of the double ended piston alternately into communication with suction and air and that when suction is in communication with one end, air is admitted at the other end. This movement reciprocates the valve 9 across either the ports 12, 12<sup>a</sup>, or ports 13, 13<sup>a</sup>, in its seating 14, and by means of the recess 11 in said valve connects or disconnects either pair of said ports thus connecting or disconnecting automatically starting and stopping at regular intervals the passage of the motive fluid through the pipes 15 and 15<sup>a</sup> which is the desideratum of this invention.

Referring now to the diagrammatic view Fig. 9 and assuming that it is desired to cut off suction at intervals from the pipes 15—15<sup>a</sup> by the valve 9 then suction in the vessel S is in communication with ports 17, 12, and 13, of the valve seating 14 and with port 28 of the compound piston valve cylinder 1. The double ended valve 7 is traveling in the direction indicated by arrow and is just at the limit of its stroke and the compound piston valve 3 is just starting in the opposite direction. Suction is in communication with port 28, recess 5, port 31, pipe 33, and port 35, of the cylinder 2 and is drawing the piston in the direction indicated and the movement is assisted by air entering inlets 30<sup>a</sup>, in the cylinder 1 and passing through recess 4, port 32, pipe 34, port 36, to the opposite end of the double ended piston 7. Suction is in communication with port 17 in the valve seating, port 22, passage 23, ports 21 and 19, by way of pipe 24 and port 26 of the cylinder 1, thus sucking the compound piston valve in the direction indicated, and this movement is assisted by air at atmospheric pressure entering port 20 in the seating and passing along pipe 25 to port 27 at the opposite end of the cylinder. When the pistons are in the positions indicated, the motive fluid is in communication with pipe 15 by ports 12, 12<sup>a</sup>, but the port 13<sup>a</sup> is disconnected. Upon the further travel of the compound piston valve, the ports 28 and 32 are connected by recess 5 and the port 36 of the cylinder 2 is then in communication with the suction, while at the same time the air inlet 30 connects by recess 6 with the port 31 and air is delivered to port 35 so that the motion of the piston 7 is reversed and the valve 9 also. When the latter

reaches the limit of its stroke the ports 13, 13<sup>a</sup>, are opened by recess 11, the port 17 is then connected with port 20 when the port 27 of the cylinder 1 is in communication with the suction and at the same time air enters the port 19 and is delivered by pipe 24 to port 26 so that the piston valve is again reversed.

By the foregoing it will be seen that the valve operates over twin ports 12, 12<sup>a</sup>, and 13, 13<sup>a</sup>, in the seating, cutting off communication with the suction at intervals from the pipes 15, 15<sup>a</sup>, which may for instance lead to separate sets of milking cups, each pair of ports being alternately covered and uncovered by the valve when reciprocated by the double ended piston 7, and it will be obvious that the mechanism will operate equally as well a single pair of ports 12, 12<sup>a</sup>. It will moreover be apparent that although the ports 12, 13, of the valve seating are shown in communication with suction in the vessel S they may be connected with any other motive fluid by means of pipe 40 and cylinder 41, it being only necessary that suction is used to operate both pistons.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is;—

1. Suction operated valve mechanism comprising a compound piston valve, a cylinder for said piston valve, means for placing said cylinder in communication with suction and air at atmospheric pressure, a double ended piston adapted to operate in connection with said compound piston valve, a cylinder for said double ended piston adapted to be placed in communication alternately at its respective ends with suction and air from the cylinder of the compound piston valve, a valve positively connected to said double ended piston, and a seating for said valve provided with a pair of ports, one of which is in constant communication with the source of motive fluid supply.

2. Suction operated valve mechanism comprising a compound piston valve provided with three recesses, a cylinder for said piston valve, a central port in said cylinder in communication with suction, air inlets on either side of said central port, ports between said central port and air inlets in communication by means of pipes with ports in the respective ends of another cylinder, a double ended piston in the latter, a reciprocating valve attached to said piston and formed with a central recess on its under face, ports in said valve on either side of said recess, a passage connecting said ports, a valve seating formed with air admission ports, and with a port in communication with suction situated between said air ports, two pairs of ports in said seating one of each

in communication with a motive fluid, each pair being adapted to be brought into communication by means of the recess in said reciprocating valve, crossed pipes connecting the air inlet ports in said valve seating with ports in the respective ends of the compound piston valve cylinder substantially as set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ALBERT KILBORN.

Witnesses:

EDWARD N. WATERS,  
FREDERICK B. WATERS.