No. 674,819. Patented May 21, 1901.

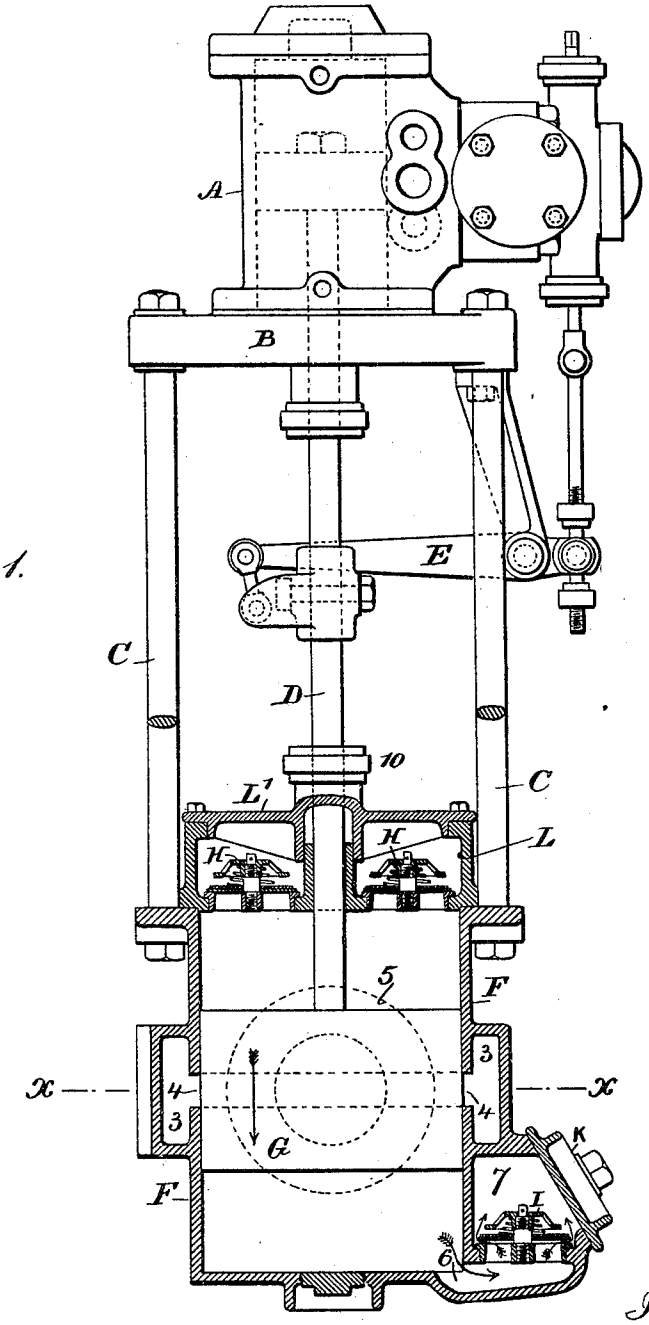
F. M. WHEELER.

DIRECT ACTING AIR PUMP.

(Application filed Sept. 9, 1899.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



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Fig. 3.

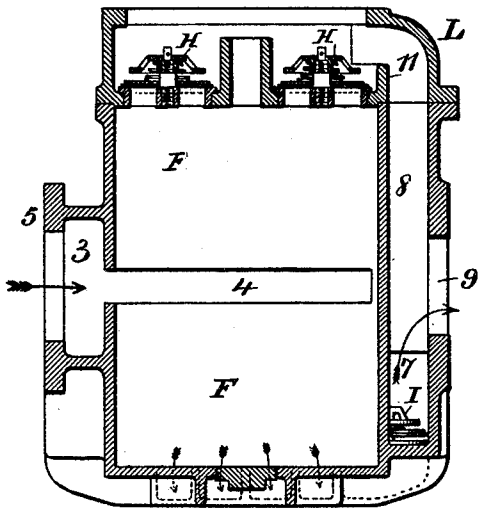
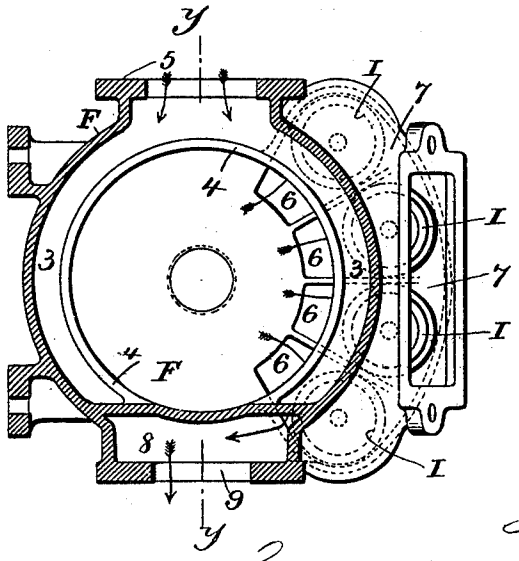


Fig. 2.



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UNITED STATES PATENT OFFICE.

FREDERICK MERIAM WHEELER, OF MONTCLAIR, NEW JERSEY, ASSIGNOR TO THE GEO. F. BLAKE MANUFACTURING COMPANY, OF NEW YORK, N. Y.

DIRECT-ACTING AIR-PUMP.

SPECIFICATION forming part of Letters Patent No. 674,819, dated May 21, 1901.

Application filed September 9, 1899. Serial No. 729,920. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MERIAM WHEELER, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented an Improvement in Direct-Acting Air-Pumps, of which the following is a specification.

Direct-acting pumps have heretofore been placed both horizontal and vertical. Where they have been placed horizontal there was uneven wear upon the parts composing the valves and it has been difficult to keep the valves tight. Where they have been placed vertical the valves have been quite inaccessible and some of the valves have been reversed and it was necessary to almost dismantle the pump to obtain access to the valves.

The object of my invention is to place the pump vertical and to place all the valves vertical and so as to lift upward from their seats and arranged so that they are all accessible by the simple removal of cover-plates without changing or disturbing any of the other working parts thereof.

In my present invention I make use of a pump-cylinder with a vertically-acting piston and rod leading to the steam-cylinder placed over the pump-cylinder, and the pump-cylinder is made with an inlet-chamber nearly around the middle portion and a narrow port that extends almost entirely around the cylinder for freely admitting the water and vapors or air. The piston passes down below this inlet-port, allowing the fluid to flow into the cylinder and upon the piston, and the fluid is forced out at the upper end of the cylinder through vertically-acting valves, and when the piston is in the upper part of its stroke the inlet from the chamber into the cylinder allows the fluid to flow in below the piston into the bottom part of the cylinder and it is discharged upon the downstroke of the piston through one or more ports in the bottom of the cylinder and upwardly through discharge-valves that work vertically and are grouped in a chamber extending partially around the lower part of the cylinder, having an elongated opening provided with a removable cap or cover, so that access is freely given to the lower valves, and there is a cap around the piston-rod and above the cylinder that is capable of being raised to give access to the valves at the top of the cylinder. The discharge-ports meet together at a discharge-pipe that is central, or nearly so, of the cylinder, and there is a dam for retaining the liquid above the valve-seats at the top of the cylinder, so that the valves are always kept sealed.

In the drawings, Figure 1 is a vertical section of the pump and an elevation of the engine. Fig. 2 is a sectional plan view of the pump at the line $x\,x$ of Fig 1; and Fig. 3 is a detached vertical section at $y\,y$ of Fig. 2, showing the dam adjacent to the upper discharge-valve. The section Fig. 3 is at right angles to the section Fig. 1.

The engine-cylinder A is mounted upon the plate B at the upper end of the columns C, and upon the piston-rod D is a link-and-coupling connection to the pivoted lever E, that is employed to actuate the valves of the engine. These parts, however, may be of any desired character.

The pump-cylinder F is connected at the lower end to the columns C, and nearly around the middle of this cylinder is an inlet-chamber 3, with a port 4, which is substantially annular and extends partially around and opens into the middle of the cylinder from the inlet-chamber 3, and at one side of this inlet-chamber is a flange 5, to which the pipe from the condenser is connected, and it is to be understood that there are no inlet-valves, but that the fluid from the condenser runs through the pipe and inlet-chamber and port 4 into the pump-cylinder F.

The piston G, that is connected to the lower end of the rod D, is sufficiently wide to correspond nearly to half the length of the pump-cylinder. Hence this piston covers the inlet-port 4 except when the piston is near one head or the other of the pump-cylinder, at which time the fluid runs through the port 4 into the cylinder, either above the piston or below it, and as the piston rises the fluid is forced upwardly through the valves H, and when the piston is descending the fluid is discharged downwardly through the passage-ways or ports 6 and upwardly through the discharge-valves I.

The discharge-valves I are in a chamber 7,

having an elongated opening and a movable cover K, and this chamber 7 passes partially around the base of the cylinder F and connects with a vertical passage 8, from which there is an opening at 9, and the flange of the discharge-pipe is to be connected at this opening. It is advantageous to cast the cylinder F with the ports 6 and 4 and the inlet-chamber 3 and the discharge-chamber with the vertical passage 8 at one side of the pump-cylinder all in one, as the valves are provided for as hereinafter described.

The removable cover K gives access to all the discharge-valves I, so that they can be fitted into the openings provided for them in the casting. These valves I are to be of any desired character; but in consequence of the seats that are provided for the discharge-valves being horizontal the valve-stems can be vertical, and thereby the valves rise and fall without perceptible friction and the unnecessary wear resulting from the weight of the valve or such wear as would result from the valve-stems being horizontal or at an inclination. I find it advantageous to make use of valves, such as represented, with a spiral spring around the valve-stem and pressing upon the valve-disk and a conical guard screwed upon each valve-stem for limiting the lifting action of each valve.

It is advantageous to cast the bottom of the cylinder F in one with the cylinder; but the cylinder-head L of the cylinder, which also forms the chamber for the upper discharge-valves, is removable from the cylinder similar to an ordinary cylinder-head, and this head is made as a valve-chest or to contain suitable valve-seats with a cover L′, and the piston-rod passes centrally through this cylinder-head and the cover, and there is a packing-gland 10 for the piston-rod, as represented. The cylinder-head L extends out over the upper end of the vertical passage 8, and there is an opening therein into the same, with a dam at 11 for retaining water sufficient to cover the discharge-valves H, which valves H are advantageously made similar to the valves I.

It will now be understood that by unbolting the cover L′ the same can be slipped up upon the piston-rod D to give access to the discharge-valves H for cleaning or repairing, and that this pump can be made very light and strong, because there are but few separate parts, and the devices that are cast with the pump-cylinder serve to strengthen the same and all the valves are easily accessible, and that in consequence of the central port to the cylinder the pump becomes a so-called "suction valveless pump," and the piston effectually displaces the fluid passing into the cylinder and any air or gases are expelled from the pump-cylinder, because the piston comes into close proximity with the under side of the valve-seat, and on the downward stroke any air or gases are forced through the ports 6 and escape through the discharge-valves I above the fluid which remains in the port 8, and in practice I find that this pump is adapted to take away the water of condensation from a condenser and to maintain a vacuum by the expenditure of much less power than heretofore usual, and the pump itself occupies very little floor-space, the weight is reduced to a minimum, and the parts all acting substantially vertically there is very little wear on either the piston, the piston-rod, the valves, or the valve-stems, thus making the pump very desirable for marine installation and especially adapted for use upon torpedo-boats and similar vessels.

I claim as my invention—

1. The combination in a steam-pump with the piston and piston-rod, of an integral cast cylinder having a central substantially annular inlet-chamber around the cylinder and a central port connecting the same with the cylinder and forming a valveless suction, a valve-chamber at one side of the cylinder and near the lower end and formed by walls and a bottom cast integral with and extending out from the cylinder, valve-seats and valves in said chamber and a removable cover above the valves and providing access thereto, substantially as specified.

2. The combination in a steam-pump with the piston and piston-rod, of an integral cast cylinder having a central substantially annular inlet-chamber around the cylinder, and a central port connecting the same with the cylinder and forming a valveless suction, a valve-chamber at one side of the cylinder and near the lower end and formed by walls and a bottom cast integral with and extending out from the cylinder, valve-seats and valves in said chamber and a removable cover above the valves and providing access thereto, and a removable cylinder-head, valves placed horizontally therein, a cover to said head and a passage-way leading from the cylinder-head to the discharge-pipe, substantially as set forth.

3. The combination in a steam-pump with the piston and piston-rod, of an integral cast cylinder having a central substantially annular inlet-chamber around the cylinder and a central port connecting the same with the cylinder and forming a valveless suction, a valve-chamber at one side of the cylinder and near the lower end and formed by walls and a bottom cast integral with and extending out from the cylinder, valve-seats and valves in said chamber and a removable cover above the valves and providing access thereto, a removable cylinder-head extended at one side with a discharge-way and a dam adjacent thereto, valves placed horizontally in the lower part thereof, a cover to said head and a passage-way leading from the discharge-way of the cylinder-head to the discharge-pipe, substantially as set forth.

4. The combination in a steam-pump, with the piston and piston-rod, of an integral cast cylinder having a central inlet and port, a

removable cylinder-head and valves therein, and a removable cover and a valve-chamber at one side of and outside at the lower part of the cylinder, valves therein and a removable cover thereto, substantially as specified.

5. The combination in a steam-pump with the piston and piston-rod, of an integral cast cylinder with the bottom of the cylinder depressed below and extending beyond one edge of the cylinder at one side with port 6 at the depression and with integral walls adjacent to the said bottom and side, and a removable cover therefor and forming an outside valve-chamber at the lower portion of the cylinder and valves therein, substantially as specified.

6. The combination in a pump with a power mechanism, the piston and piston-rod, of an integral cast cylinder having a central substantially annular inlet around the cylinder, valves in the cylinder-head and a removable cover to give access thereto, a valve-chamber at one side of and outside the cylinder and near the lower end having walls integral with the cylinder, valve-seats and valves in said chamber and a removable cover above the valves providing access thereto, substantially as specified.

7. The combination in a pump with a power mechanism, the piston and piston-rod, of an integral cast cylinder having a central substantially annular inlet around the cylinder, valves in the cylinder-head and a removable cover to give access thereto, a valve-chamber at one side of and outside the cylinder and near the lower end having walls integral with the cylinder, valve-seats and valves in said chamber, and a removable cover above the valves providing access thereto, a chamber below the valves and a port connecting the same with the cylinder, substantially as specified.

8. The combination in a vertical pump with the piston-rod, piston and cylinder, of a removable head with openings and surrounding valve-seats and valves, a passage-way formed by an integral extension of the removable head and leading from the valve-chamber of the removable head to the discharge-pipe and a dam at the said passage-way formed integral with the said removable head and acting to retain liquid above and covering the valve and valve-seats, substantially as specified.

9. The combination in a vertical pump with the piston-rod, piston and cylinder, of a removable head with openings and surrounding valve-seats and valves, a passage-way formed by an integral extension of the removable head and leading from the valve-chamber of the removable head to the discharge-pipe, and a dam at the said passage-way formed integral with the said removable head and acting to retain liquid above and covering the valve and valve-seats, and a removable cover to the valve-chamber of the removable head and a packing-gland for the piston-rod upon such removable cover, substantially as set forth.

Signed by me this 6th day of September, 1899.

FK. MERIAM WHEELER.

Witnesses:
GEO. T. PINCKNEY,
S. T. HAVILAND.