

Patented Jan. 31, 1911.

2 SHEETS—SHEET 1.

983,253.

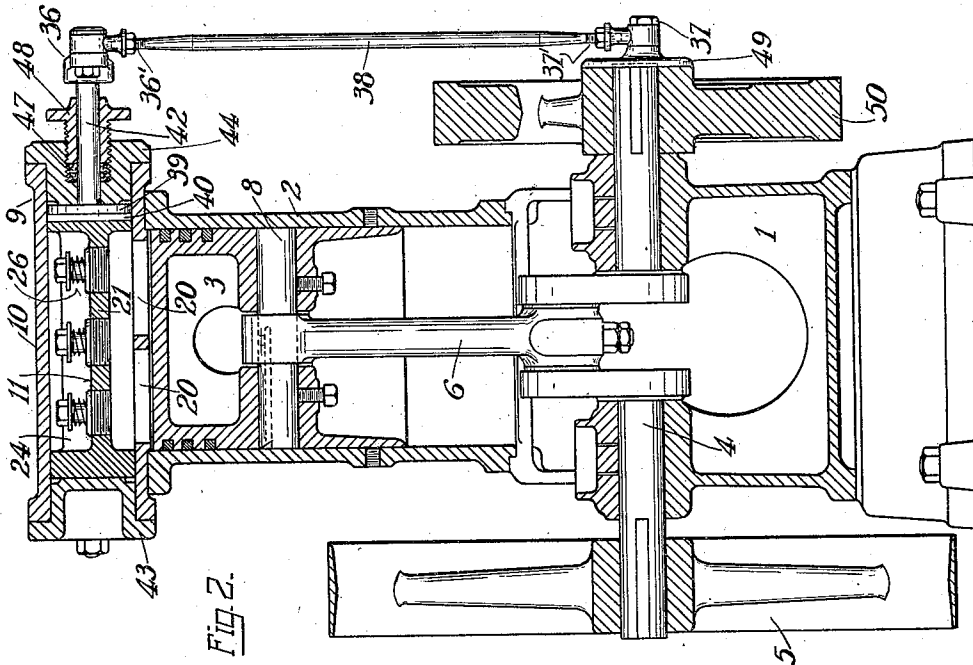


Fig. 2.

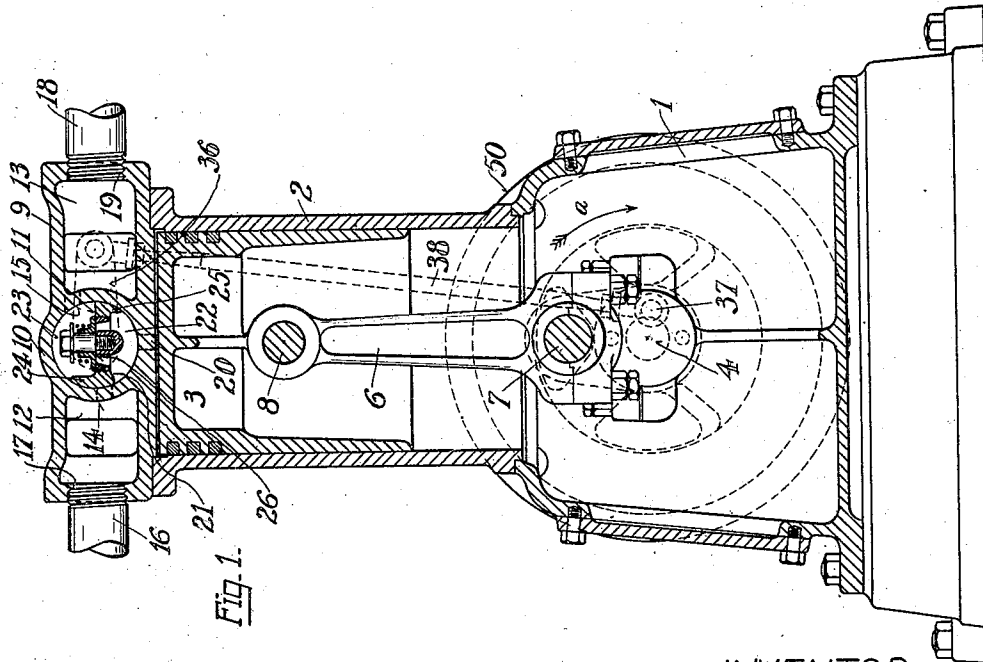


Fig. 1.

WITNESSES

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2 SHEETS-SHEET 2.

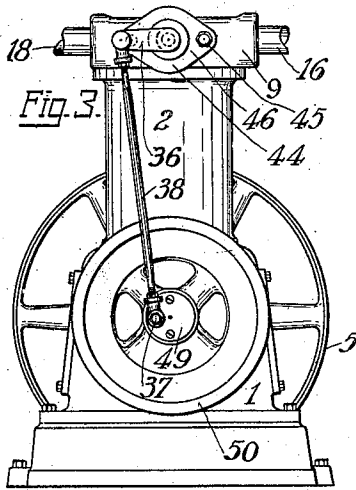


Fig. 3.

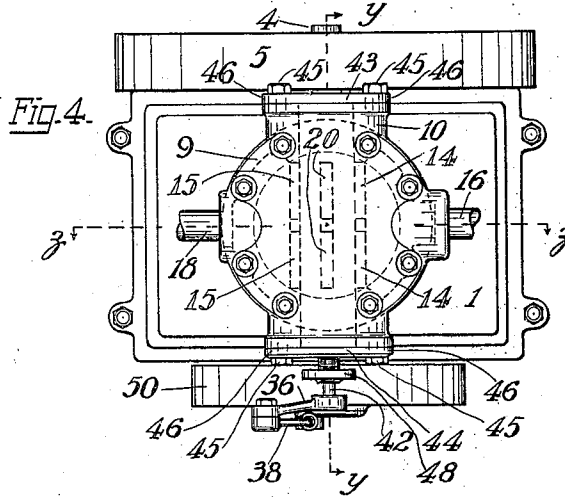


Fig. 4.

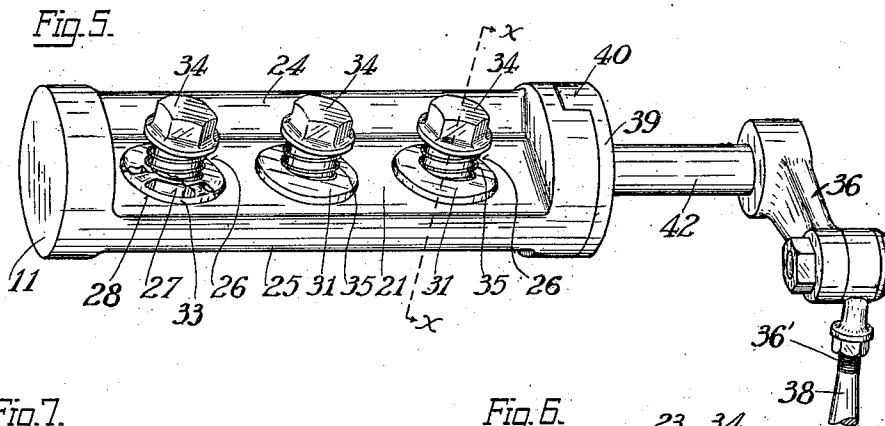


Fig. 5.

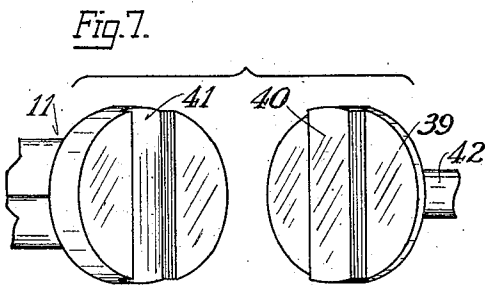


Fig. 7.

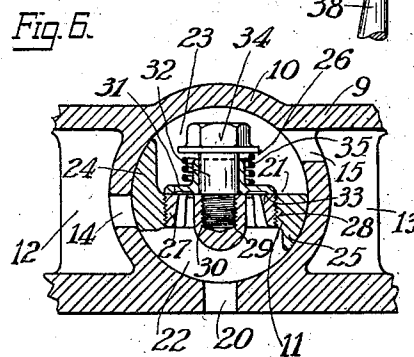


Fig. 6.

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UNITED STATES PATENT OFFICE.

CLAUDE R. SMITH, OF DAYTON, OHIO, ASSIGNOR TO ANTHONY L. HERKENHOFF, OF MINSTER, OHIO.

SUCTION-PUMP.

983,253.

Specification of Letters Patent.

Patented Jan. 31, 1911.

Application filed May 10, 1909. Serial No. 494,977.

To all whom it may concern:

Be it known that I, CLAUDE R. SMITH, a citizen of the United States, residing at Dayton, in the county of Montgomery and State of Ohio, have invented certain new and useful Improvements in Suction-Pumps, of which the following is a specification.

My invention relates to pumps, and particularly to the character of pumps known as suction pumps, and is primarily applicable for use in connection with so-called vacuum cleaning apparatus, in which the dust and dirt is drawn through a nozzle and flexible connection, and preferably through a separator, into a cylinder of the pump at a given stroke thereof, and then discharged from the cylinder.

The invention will be readily understood from the following description and claims, and from the drawings, in which latter:

Figure 1 is a central vertical section of my improved device taken on the line $z-z$ of Fig. 4. Fig. 2 is a central vertical section of the same taken on the line $y-y$ of Fig. 4. Fig. 3 is a side elevation of my improved device. Fig. 4 is a plan view of the same. Fig. 5 is a perspective view of the combined oscillating and supplemental valve. Fig. 6 is a cross-section of the same taken on the axial plane of one of the supplemental valves, corresponding to the section line $x-x$ of Fig. 5; and, Fig. 7 is a detail showing the connection between the oscillating valve and its operating plate.

1 represents the frame of the pump which comprises a cylinder 2 in which a piston 3 reciprocates. 4 is a crank-shaft operated by any suitable mechanism, as by a pulley 5. A connecting-rod 6 is journaled on the crank 7 of the crank-shaft at one end thereof and pivoted to the shaft 8 secured to the piston at the other end thereof.

9 is a head of the pump and in the form shown constitutes a valve-box comprising a valve-casing 10 in which an oscillating valve 11 rocks, there being a suction-chamber 12 at one side of said casing and a discharge chamber 13 at the other side of said casing.

14 is a suction-port for the valve-casing, and 15 is a discharge-port for said casing. A suitable connection, for instance, a suction-pipe 16, connects with the suction-chamber through an opening 17 therein, and a suitable discharge-pipe 18 connects with

the discharge-chamber through an opening 19 therein.

The valve-casing for the oscillating valve is preferably an elongated casing so that a plurality of suction or inlet-ports 14, and a plurality of discharge or outlet-ports 15 may be accommodated lengthwise of the oscillating valve, so that suction and discharge openings of large area may be provided with a minimum of rocking motion of the oscillating valve.

20 represents cylinder-ports between the interior of the valve-casing and the piston-cylinder. The oscillating valve has bearing in the valve-casing and is provided with a web 21 which divides the valve-casing into what may be termed a suction-compartment 22 and a discharge-compartment 23, the valve being provided with a wing 24 adapted to obstruct the suction-port at certain of the positions of the oscillating valve and a wing 25 which contacts the inner annular face of the valve-casing. These wings and the web as shown divide said valve-casing into two compartments. The oscillating valve has one or more supplemental valves 26 mounted thereon. These valves are so constructed as to be automatically opened by compression in the cylinder when the piston therein moves inwardly, and are shown as puppet valves. The mounting of these valves is preferably accomplished by providing a spider 27 shown threaded into an opening 28 in said web, a bolt 29 being threaded into a threaded socket 30 on said spider, a valve-disk 31 having movement lengthwise of the shank 32 of the said bolt toward and from the valve-seat 33 on said spider, the head 34 of the bolt limiting the outward movement of the valve-disk 31, and a spring 35 between the valve-disk 31 and said head 34 normally yieldably urging said valve-disk 31 upon its seat.

For oscillating the oscillating valve, I prefer to provide an arm 36 secured in suitable manner to the oscillating valve, the arm 36 having connection with a crank-pin 37 by means of a link 38, preferably adjustable, as by threaded connections 36' 37', the said crank-pin having a path of movement around the axis of the crank-shaft 4. The connection of the arm 36 with the oscillating valve is preferably accomplished by providing a plate 39 having a rib 40 received in a transverse slot 41 in the end of

the oscillating valve, and having a shaft 42 connected to said plate and arm. The plate 39 and oscillating valve are limited in end-wise movement and positioned by means of blocks 43 44 secured to the valve-casing by means of bolts 45 passing into said valve-casing through ears 46 on said block. The block 44 forms a bearing for the shaft 42, and a packing 47 may be received about said shaft in said block 44 and compressed therein by means of a gasket 48. The movement of the oscillating valve is so timed with relation to the stroke of the piston that said oscillating valve will be open when the piston moves inwardly and closed when the piston moves outwardly. Thus the crank-pin 37 may be located on a plate 49 suitably secured to the hub of a fly-wheel 50, or other suitable connection may be made for causing the same to describe a path about the axis of the crank-shaft, the crank-pin 37 being so located with relation to the crank 7 as to time the oscillation of the oscillating valve in such relation to the movement of the piston that the suction port will be open upon outward movement of the piston and closed upon inward movement of said piston. For accomplishing this the relative positions of the crank-pin 37 and crank 7 may be such that a straight line drawn through the axes of the crank-shaft and crank 7 will be at an angle of substantially ninety degrees to a straight line drawn through the axes of the crank-shaft and crank-pin 37.

In operation, when the piston moves outwardly, the crank-shaft rotating in the direction of the arrow *a*, the oscillating valve will turn for causing the wing 24 to move away from said inlet-port 14 for permitting the suction medium, for instance air received through a cleaning nozzle or a separating chamber, to be drawn into the cylinder. During the outward movement of the piston, the wing 24 will pass out of obstructing position with relation to the inlet-port 14 and at the end of the limit of movement of said wing will again return to obstructing position for closing said port. When, now, the piston begins its inward movement, the suction-compartment 22 in the valve-casing being closed, the compression within the cylinder and said suction-compartment will cause the raising of the supplemental valves 26 for forcing the contents of the cylinder through said valves 26 through the discharge-port 15.

My improved device is very simple, the parts are conveniently arranged, and there are but few parts, and they are not liable to get out of order.

My improved device provides a construction of large capacity, providing inlet and discharge openings of large area with a minimum amount of oscillation of the valve,

the oscillating valve being capable of being made of comparatively small diameter.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a suction pump, the combination with a piston and cylinder, of a cylindrical valve casing having an inlet port, a permanently open outlet port, and a permanently open cylinder port, an oscillating valve in said casing controlling communication between said inlet port and cylinder port, and a spring-pressed check valve carried by said oscillating valve and controlling communication between said cylinder port and outlet port.

2. In a suction pump, the combination with a piston and a cylinder, of a valve-casing for said cylinder having an inlet-port, an outlet-port and a permanently open cylinder-port, of an oscillating valve arranged to alternately open and close said inlet-port, and a second valve mounted on and movable with said oscillating valve arranged to be opened by compression in said cylinder and having continuous connection with said cylinder-port and said outlet-port.

3. In a suction pump, the combination with a piston and cylinder, of a cylindrical valve casing, an oscillating valve mounted in said casing and dividing the same longitudinally into two compartments, one of said compartments having a continuously open port connecting it with said cylinder, and the other of said compartments having a continuously open outlet port, said casing also having an inlet port controlled by said valve, and a spring pressed valve carried by said oscillating valve and controlling communication between said compartments.

4. In a suction pump, the combination of a cylinder, a piston therein, a valve-casing for said cylinder, an oscillating valve in said valve-casing dividing said valve-casing into two compartments, said valve-casing having an inlet-port in alternate connection and disconnection with one of said compartments, a cylinder-port in continuous connection with the same compartment, and an outlet-port in continuous connection with the other of said compartments, said oscillating valve arranged to open and close said inlet-port, a valve mounted on said oscillating valve and moving therewith and arranged to be opened by compression in said cylinder passing through said cylinder-port when said inlet-port is closed for causing said compression to pass through said oscillating valve and outlet-port, a crank-shaft having a crank, a fly wheel on the end of said crank shaft, a connecting-rod between said crank and piston, an arm for said oscillating valve, a second crank for said crank-shaft outside of said fly wheel, said cranks being in such location that a right line drawn be-

tween the axes of said crank-shaft and first-named crank is at substantially an angle of ninety degrees to a right line drawn between the axes of said crank-shaft and second-named crank, and a link connecting said second-named crank and arm, substantially as described.

5. In a suction pump, the combination with a cylinder, a piston therefor, of an elongated valve-chamber provided with an elongated inlet-port, an elongated outlet-port and an elongated permanently open cylinder-port, an elongated oscillating valve in said valve-chamber dividing said valve-chamber into two compartments, said inlet-port having alternate connection and disconnection and said cylinder-port having continuous communication with one of said compartments and said outlet-port having continuous communication with the other of said compartments, a plurality of valves arranged side by side longitudinally on said oscillating valve and spring-pressed toward said cylinder-port, and arranged to remain closed during connection of said inlet-port with said one of said compartments and to be opened by pressure thereagainst through said cylinder-port which is in continuous communication therewith through said one of said compartments for discharging said compression through the other of said compartments and said outlet-port in continuous communication therewith, substantially as described.

6. In a suction pump, the combination of a valve-casing, an oscillating valve in said

valve-casing dividing said valve-casing into two compartments, said valve-casing having an inlet-port which said oscillating valve is arranged to alternately open and close, said inlet-port when open being in communication with one of said compartments, a cylinder-port in continuous communication with the same compartment, and an outlet-port in continuous communication with the other of said compartments, and a supplemental valve mounted on said oscillating valve between said compartments and comprising a spider having a valve-seat thereon and secured to said oscillating valve, a bolt secured in said spider, a valve encompassing said bolt and arranged to seat upon said valve-seat, said valve having a sleeve portion adapted to slide on said bolt a spring between said bolt and valve and surrounding said sleeve for pressing said valve upon said valve-seat, said valve and valve-seat being located in the said other of said compartments and arranged to be opened by compression passing through said cylinder-port when said inlet-port is closed by said oscillating-valve for conducting said compression through said oscillating valve and outlet-port, substantially as described.

In testimony whereof, I have signed my name hereto in the presence of two subscribing witnesses.

CLAUDE R. SMITH.

Witnesses:

ETHEL Z. LEWIS,
GEORGE B. LEWIS.