

May 12, 1936.

S. A. DUFFAUD

2,040,433

SUCTION AND FORCE PUMP

Filed Oct. 24, 1934

Fig. 1

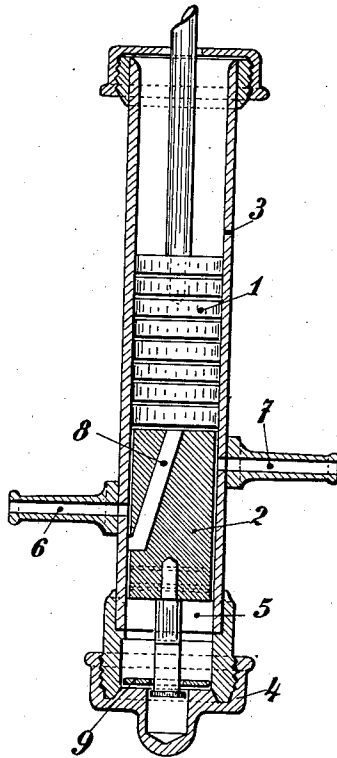


Fig. 2

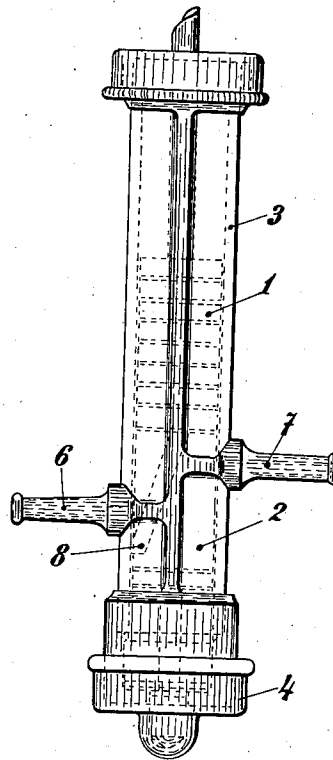
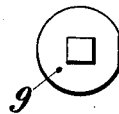


Fig. 3



INVENTOR
SUZANNE ALICE DUFFAUD
BY
Richards & Gier
ATTORNEYS

UNITED STATES PATENT OFFICE

2,040,433

SUCTION AND FORCE PUMP

Suzanne Alice Duffaud, Paris, France

Application October 24, 1934, Serial No. 749,721
In France November 10, 1933

7 Claims. (Cl. 103—227)

This invention relates to a suction and force pump which is namely characterized by the fact that it comprises no essential member except the two moving pistons one of which moves automatically under the influence of the other. The said pump also comprises between the lower piston and the cylinder head a compression chamber adapted to secure the balance of the pistons when they are in their position of rest. The absence of flap valves and valves makes it one of the simplest pumps, based upon the principle of the elasticity of gases.

The invention is shown diagrammatically and by way of example in the accompanying drawing, in which:

Fig. 1 is a longitudinal section of the pump.

Fig. 2 shows the same in elevation.

Fig. 3 is a plan view of the truncated washer acting as a stop for the lower piston.

This pump comprises two movable pistons 1, 2 located in a cylinder 3 which is of a substantial length and is closed at its lower part by a tight joint 4. Between the piston 2 and the joint 4 is provided a chamber 5 which is filled with air at the atmospheric pressure and which can be considered as a compression chamber and is intended to secure the balance of the two pistons when the same are in their position of rest. In the said position, the lower piston 2 closes the two ports 6, 7 of the cylinder 3.

The operation of this pump is as follows:

When the upper piston 1 is moving upwardly under the action of any sort of external power, it carries along in its upward motion, the lower piston 2 which is unable to resist to the action of the vacuum tending to be formed between them. The latter will therefore follow the upper piston 1 as far as a determined point at which the port 6 of the cylinder is opposite the port 8 of the piston and will be maintained in this position, it being stopped in its stroke by the abutment washer 9 which will have followed the same. The upper piston 1 continuing its stroke will then create a vacuum in the cylinder and consequently will suck the liquid or gas placed close to the port 6.

The lower piston 2, by virtue of its motion, increases the volume of the chamber 5 and, under the atmospheric difference, tends to move down again although it is maintained in its position under the power of the vacuum created by the piston 1.

Now, when the piston 1 is stopped in its ascending motion after having elevated an amount X of liquid, for instance, and having imparted

thereto a reverse motion, it will be noticed that the piston 2 at once moves down again without any effort and at the same rate until it reaches its position of rest determined by the chamber 5 and concurrently with the atmospheric pressure. At this moment, the ports 6, 7 are closed, the liquid cannot escape and in going on with this down stroke, one compresses first the liquid which, on its turn, transmits the pressure to the piston 2, thereby causing the same to move down in compressing the air contained in the chamber 5 until the point where, the port 7 of the cylinder being uncovered, the liquid is allowed to flow. When the latter has flowed and if the piston is suddenly released, then the air compressed will expand and will cause the two pistons to reassume their original position of balance. The air enclosed in the chamber 5 then replaces a spring and if the two pistons are conveniently located, the effect produced is superior to that of a coil spring.

The simplicity of this mechanism of the pump and the reduced number of its members allow to make the same entirely of glass for the chemical uses or with metal pistons and glass cylinder for therapeutical purposes.

I claim:

1. A suction and compression pump comprising a cylindrical body closed at one end and having an intake port and an outlet port, a pump piston and a valve piston reciprocally mounted in said cylindrical body, said valve piston being situated adjacent said closed end, means forming an air-tight chamber intermediate said valve piston and said closed end and means for reciprocating said pump piston whereby said valve piston is caused to be reciprocated in said cylindrical body alternately closing and opening said intake and outlet ports.

2. A suction and compression pump comprising a cylindrical body closed at one end and having an intake port and outlet port, a pump piston and a valve piston reciprocally mounted in said cylindrical body, said valve piston being situated adjacent said closed end, means forming an air-tight chamber intermediate said valve piston and said closed end, means for reciprocating said pump piston whereby said valve piston is caused to be reciprocated in said cylindrical body alternately opening and closing said intake and outlet ports, and means for limiting the up and downward stroke of said valve piston.

3. A suction and compression pump comprising a cylindrical body closed at one end and having an intake and outlet port, a pump piston and

a valve piston reciprocably mounted in said cylindrical body, said valve piston being situated adjacent said closed end, means forming an air-tight chamber intermediate said valve piston and said closed end, means for reciprocating said pump piston whereby said valve piston is caused to be reciprocated in said cylindrical body alternately opening and closing said intake and outlet ports and means comprising an abutment washer in said atmospheric chamber for limiting the up and downward stroke of said valve piston.

4. A suction and compression pump comprising a cylindrical body closed at one end and having an intake port and an outlet port, a pump piston and a valve piston reciprocably mounted in said cylindrical body, said valve piston being situated adjacent said closed end, means forming an air-tight chamber intermediate said valve piston and said closed end, means in said valve piston forming an intake duct adapted to contact said intake port and means for reciprocating said pump piston whereby a vacuum chamber and a compression chamber is alternately formed intermediate said pump piston and said valve piston and whereby said valve piston is reciprocated alternately closing and opening said intake and outlet ports.

5. A suction and compression pump comprising a cylindrical body having an intake port and an outlet port, a pump piston and a valve piston reciprocably mounted in said cylindrical body, means for reciprocating said pump piston, said valve piston being situated adjacent one end of said cylindrical body and adapted to close and open alternately said intake and outlet ports, and means for closing said end of the cylindrical body

and forming an air-tight chamber intermediate said valve piston and said end of the cylindrical body.

6. A suction and compression pump comprising a cylindrical body having an intake port and an outlet port, a pump piston and a valve piston reciprocably mounted in said cylindrical body, means for reciprocating said pump piston, said valve piston being situated adjacent one end of said cylindrical body and adapted to close and open alternately said intake and outlet ports, means for closing said end of the cylindrical body and forming an air-tight chamber intermediate said valve piston and said closed end of the cylindrical body, and abutment means mounted on said valve piston and operating in said air-tight chamber for limiting the up and downward stroke of said valve piston.

7. A suction and compression pump comprising a cylindrical body having an intake port and an outlet port, a pump piston reciprocably mounted in said cylindrical body, means associated with said valve piston for restraining the movement thereof, whereby a suction and a compression chamber is alternately produced between said pump piston and said valve piston when the latter is reciprocated, said means comprising an air-tight chamber adapted to receive at least a portion of said valve piston, whereby suction and compression is alternately produced in said chamber upon reciprocation of said valve piston, said means being so adjusted that the suction will retract said valve piston after it has reached a certain predetermined position.

SUZANNE ALICE DUFFAUD.