

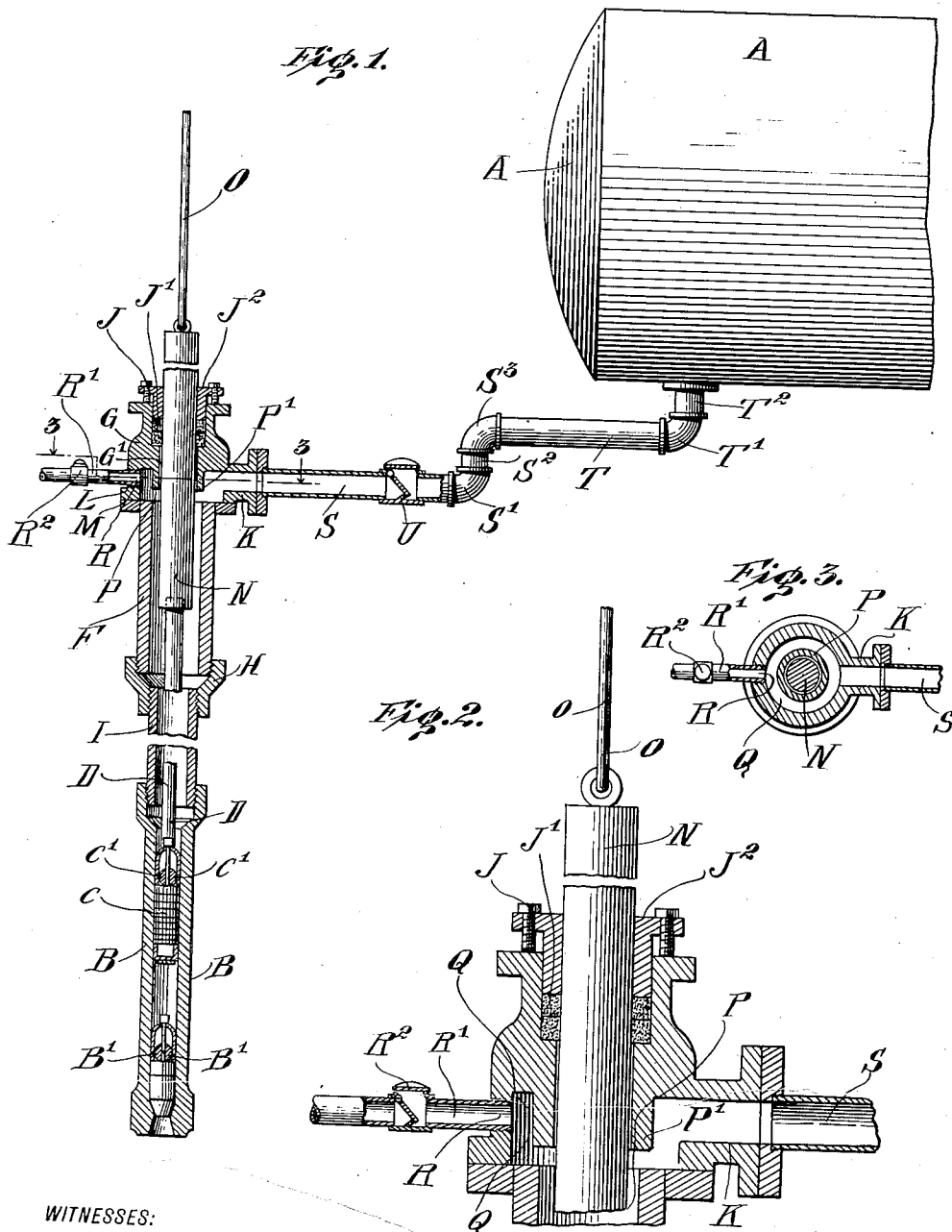
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PUMP.

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1,060,816.

Patented May 6, 1913.



WITNESSES:

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, RALPH B. CARTER, a citizen of the United States, and a resident of Haworth, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Pumps, of which the following is a specification.

My invention relates to that class of pumps designed more particularly for pumping air and water to a storage tank, the water being distributed from the storage tank under pressure of the air. The pump usually employed for this purpose is what is commonly known as a differential cylinder pump, it having an upper cylinder and a lower cylinder of different capacities, connected together. The difference in capacity between the upper cylinder and the lower cylinder, is utilized to draw air into the upper cylinder on the upward stroke of the upper piston through a valve in or connected to the upper cylinder, the air and water being then forced, on the downward stroke of the piston through an outlet in the upper cylinder, to the storage tank. A serious disadvantage connected with the use of this type of pump is that the air thus pumped into the upper cylinder, finds a leakage through the stuffing box, for air will find a means of escape where water will not.

My present invention has for its principal object the provision of means to overcome this difficulty.

In the accompanying drawing,—Figure 1 is a view partly in elevation and partly in section showing a portion of a tank and a partial view of a pump with the air and water connection located therebetween; Fig. 2 is an enlarged detail sectional view of the head of the pump, showing the application of my improvement thereto, and Fig. 3 is a cross section on line 3—3 of Fig. 1.

Referring now in detail to the construction illustrated, A indicates the storage tank, B indicates the lower cylinder of the pump, the lower end of which will be inserted into the well, cistern or other source of water supply (not shown). Suitably mounted within the lower end of the cylinder B is a ball-valve B', through which the water is admitted to said cylinder. The lower cylinder B is provided with a piston C, having a ball-valve C', the piston C being connected to the lower end of the upwardly extending rod D. The upper cylinder of the pump comprises the cylindrical casing F and the head G.

Threaded to the lower end of the casing F of the upper cylinder is a coupling H, to which is secured the threaded end of a pipe I, the other end of said pipe being threaded to the upper end of the lower cylinder B. The head G of the upper cylinder is provided with a central piston opening G', and the usual stuffing box J, packing J' and gland J². The head G has a discharge portion K, preferably formed integral with an annularly disposed shoulder L, seating on the shoulder M of the casing F. Vertically disposed through the stuffing box J and the opening G' of the head G, and through the upper cylinder or casing F is a piston N, one end of which is connected to a rod O, which is reciprocated from any suitable source of power, and the other end of which is connected to the upper end of the rod D, whereby, when motion is imparted by means of the rod O to the piston N, motion is also imparted in the same direction to the piston C, through the rod D.

It will be observed that the upper cylinder or casing F is of greater transverse area than the lower cylinder B; likewise, the transverse diameter of the piston or plunger N is greater than the transverse diameter of the piston C.

The parts, as thus far described, are of well known construction, and I will now describe my improvements as applied thereto.

The inner central portion of the head G is formed with an annular extension or flange P', which encircles the piston N, and extends downwardly to a point somewhat short of the upper end of the casing F, being spaced therefrom and from the inner wall of the lower portion of the casing of the head G, to form an annular air trap Q, which communicates at one side with the opening in the discharge portion K, as shown in Fig. 3, and at its lower portion with the interior of the cylindrical casing F.

Projecting through the casing of the head G at the side opposite the outlet K is an air inlet port R, within which is threaded one end of a pipe R', the other end of which is open to the atmosphere. The pipe R' is provided with a check valve R², through which pipe, when said check valve is open, air is admitted to the air trap Q.

Connected to the outlet K of the head G is a pipe S, which in turn is connected by the elbow S', the short pipe S² and the elbow S³, with the pipe T, the latter being

connected by the elbow T', and the short pipe T² with the storage tank A. Within the pipe S is provided a check valve U, which is designed to permit a flow of fluid toward the tank A and to prevent its flow in the opposite direction.

The operation of the apparatus is as follows: Assuming that in the ordinary pumping operation the lower cylinder and connecting pipe have been charged with water, on the upward stroke the withdrawal of the piston N draws air through the pipe R', past the check valve R², which opens to permit thereof, and into the air chamber Q, and at the same time sufficient water has been lifted by the piston C to nearly fill the casing F, said casing being completely filled in the manner hereafter described. On the downward stroke the piston N acts on the perpendicular column of water, displacing the water in the casing F and forcing the same, as well as the air which has been admitted through the air inlet port R, into the trap Q and the outlet K, the pipe S, check valve U and pipe T, into the storage tank A. On this downward or compression stroke there will be a considerable quantity of water which does not make its escape through the outlet K and check valve U, which water will fall back into the casing F, and this, together with the water lifted on the next upward or suction stroke, will be sufficient in amount to completely fill the casing F and the lower portion of the head G up to the bottom of the air trap Q. It is important that the operating parts for lifting, displacing and discharging the water shall be so proportioned as to relative size that the space in the cylinder F and head G for the column of water lifted on the suction stroke, and the water remaining unexpelled through the outlet K and check valve U on the downward or compression stroke shall be so completely filled as to confine the air at the beginning of, and during the compression or displacement stroke to the air trap Q, and the passage leading therefrom in the outlet K. Thus the air is kept away from the piston opening G' and cannot possibly pass therethrough.

It will thus be seen that within the upper cylinder of the pump, I have provided an air trap, into which the air will naturally make its way, being the path of least resistance, and wherein it may be subjected to all required pressure by the upwardly discharging water, without causing it to pass into the stuffing box.

What I claim is:

1. The combination with a storage tank of a pump comprising an upper cylinder and a lower cylinder of different capacities, pistons in said cylinders working in unison, an air inlet in the upper cylinder, a connection from the upper cylinder to the tank,

and means connected with said air inlet for trapping the air against escape through the top of said cylinder.

2. The combination with a storage tank of a pump comprising an upper cylinder and a lower cylinder of different capacities, pistons of different transverse areas in said cylinders working in unison, an air inlet in the upper cylinder, a pipe connecting the upper cylinder to the tank, and a trap connected with the air inlet for preventing the escape of the air through the top of said cylinder.

3. The combination with a storage tank of a pump comprising an upper cylinder and a lower cylinder of different capacities, pistons of different transverse areas in said cylinders working in unison, a valved air inlet to the upper cylinder, a valved connection from the upper cylinder to the tank, and a trap connected with the air inlet for preventing the escape of the air through the top of said cylinder.

4. The combination with a storage tank of a pump comprising an upper cylinder and a lower cylinder, the upper cylinder being of larger capacity than the lower cylinder, a valved inlet to said lower cylinder, a pipe connecting the two cylinders, a piston in the lower cylinder, a piston in the upper cylinder of greater transverse area than the piston in the lower cylinder, a rod connecting the two pistons, means for operating said pistons, a valved air inlet to said upper cylinder, an annular trap in the upper cylinder connected to said air inlet and a valved connection from said upper cylinder to the storage tank.

5. The combination with a storage tank of a pump comprising an upper cylinder and a lower cylinder, the upper cylinder being of larger capacity than the lower cylinder, a valved inlet to said lower cylinder, a pipe connecting the two cylinders, a piston in the lower cylinder and a piston in the upper cylinder of greater transverse area than the piston in the lower cylinder, a rod connecting the two pistons, means for operating said pistons in unison, a valved air inlet to said upper cylinder, an annular trap in the upper cylinder connected to said air inlet to prevent the escape of the air through the top of said cylinder, an air and water outlet connected to said annular trap, a pipe connected to said outlet and to said tank and a valve in said pipe.

6. The combination with a storage tank of a pump comprising an upper and a lower cylinder of different capacities, a pipe connecting said cylinders, a valved inlet to said lower cylinder, pistons moving in unison in said cylinders, the upper piston being of larger transverse area than the lower piston, a head on said upper cylinder, a central annular flange encircling the upper piston and

spaced from the inner side wall of the casing to form an air trap, a valved inlet to said trap, an outlet from said trap and a valved connection leading therefrom to the storage tank.

7. In a pump of the class described, the combination of a headed upper cylinder provided with an opening for a reciprocating member and provided with a valved air inlet and a water and air outlet, a lower cylinder of different capacity than the first named cylinder, pistons in said cylinders working in unison in the same directions and means at the headed end of the upper cylinder connected with said air inlet for trapping the air against escape through said first named opening.

8. In a pump of the class described, the combination of an upper cylinder and a lower cylinder, of different capacities, pistons in said cylinders of different transverse areas, reciprocating in unison, a head for said upper cylinder provided with a slideway opening and also provided with an air inlet and a water and air outlet, said inlet and outlet communicating with each other and with the interior of said upper cylinder, and means adapted to trap the air admitted through said air inlet and prevent its passing through said slideway opening.

9. In a pump of the class described, the

combination of an upper cylinder and a lower cylinder of different capacities, a water displacement piston in said upper cylinder, and a water lifting piston in said lower cylinder of lesser transverse area than the displacement piston, both reciprocating in unison in the same directions a head for said upper cylinder provided with a slideway opening, and also provided with an air inlet and a water and air outlet, said inlet and outlet communicating with each other and with the interior of said upper cylinder, a valve in said inlet for admitting air there-through on the suction stroke of the pump and for excluding the same on the displacement stroke thereof, a valve permitting the outflow of water and air through said water and air outlet on the displacement stroke of the pump and preventing back flow on the suction stroke thereof, and means in said head cooperating with the water in the upper cylinder and head, to trap the air so admitted on a horizontal plane above the lower end of said slideway opening and prevent the same passing through the latter on the displacement stroke of the pump.

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Witnesses:

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