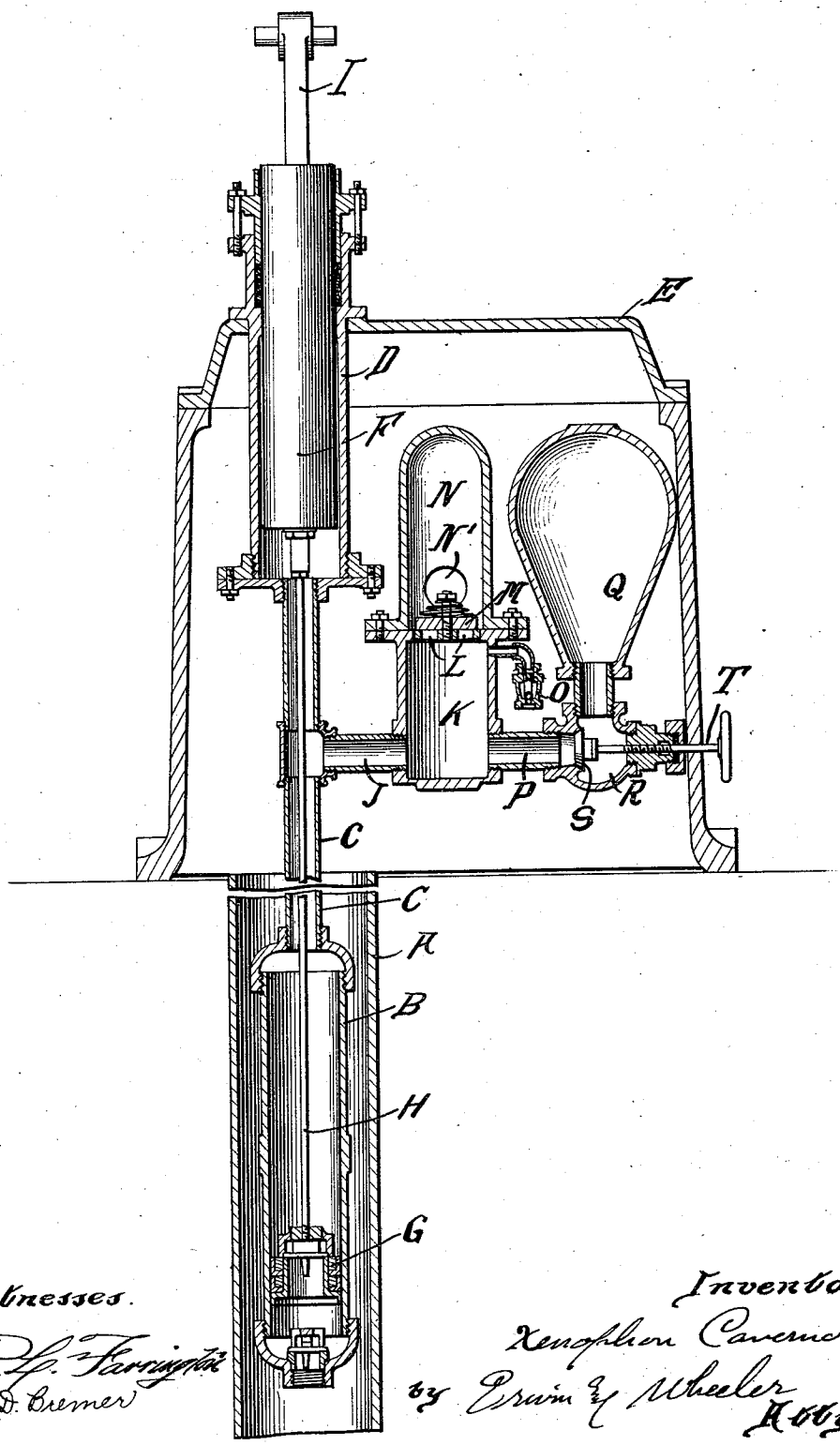
X. CAVERNO.

PUMPING APPARATUS.

APPLICATION FILED JULY 2, 1910.

1,015,782.

Patented Jan. 30, 1912.



Witnesses.

F. C. L. Farrington

L. D. Bremer

Inventor:

Xenophon Caverno

by Edwin J. Wheeler

Atty's.

UNITED STATES PATENT OFFICE.

XENOPHON CAVERNO, OF KEWANEE, ILLINOIS.

PUMPING APPARATUS.

1,015,782. Specification of Letters Patent. Patented Jan. 30, 1912.

Application filed July 2, 1910. Serial No. 570,206.

To all whom it may concern:

Be it known that I, XENOPHON CAVERNO, a citizen of the United States, residing at Kewanee, county of Henry, and State of Illinois, have invented new and useful Improvements in Pumping Apparatus, of which the following is a specification.

My invention relates to improvements in pumping apparatus, and pertains especially to that class of pumping apparatus shown and described in my former Patents, Number 795892, dated August 1st, 1905, and Number 955580, dated April 19th, 1910, and which are adapted for pumping both water and air into a tank designed to receive and store the same under pressure.

The present invention relates more particularly to those pumps of this class in which the water column is permitted to drop, or retract, and admit air at some point between the pumping devices proper, and the storage tank.

My present objects are to avoid water hammer, and also to provide special means, operative at intervals when it is desired to cut off the air supply to the tank, for relieving the vacuum which would otherwise be formed in a structure having one pumping cylinder of larger diameter than the other.

In the following description, reference is had to the accompanying drawing, in which—

The figure is a vertical sectional view of a pumping apparatus embodying my invention, drawn to a plane cutting the pumping cylinders and air chamber.

A is a well casing within which a pump cylinder B is suspended by means of a pipe C. An upper cylinder D is employed, this being preferably located above the surface of the ground and supported by a casing E. This upper cylinder is provided with a displacement plunger F and the lower cylinder B is provided with a piston G, the plunger and piston being connected by a rod H extending through the tube C. The plunger F and piston G are actuated from any suitable source of power applied through the pump rod I. The fluid delivered by the piston and plunger is conveyed through a branch pipe or duct J to a chamber K. The pipe J may be connected with the pumping apparatus proper at any suitable point above the lower cylinder B and is arranged to discharge into the lower portion of the chamber K, from which the fluid is delivered through suitable ports L past a spring actuated check valve M and into a chamber N, which chamber is provided with an outlet N′ leading to the pressure tank, (not shown), or any other suitable point of delivery. The chamber N may also serve as an auxiliary air cushion chamber to prevent water hammer. The air admission chamber K is provided with an air inlet check valve O of any suitable type. It is also connected by a valved passage P with an air cushion chamber Q, the passage P preferably communicating with the lower portion of the chamber K and being provided at an intermediate point with a valve casing R having a manually actuated valve S, which may be moved to and from its seat by means of a screw threaded valve stem T.

In the construction illustrated, the plunger F is of greater diameter than the interior diameter of the cylinder B, and is therefore adapted to deliver a greater quantity of fluid than the piston G. In the normal operation of the apparatus, with the valve S closed, water will be drawn into the lower cylinder B through an ordinary inwardly opening check valve at the lower end of said cylinder, the water above the piston G being delivered to chamber K and cylinder D. Air will simultaneously be drawn in through the check valve O to compensate for the difference in the pumping capacity of the plunger F and piston G, this air being pocketed, however, in the chamber K, so that it will not enter the pumping cylinder D. On the down stroke, the plunger F will force the water from cylinder D into chamber K, the piston G moving freely downwardly through the water in cylinder B. The water thus forced into chamber K will first drive the air in said chamber past the check valve M into chamber N, and thence through the duct N′ to the pressure tank or other point of delivery, the air being followed by an amount of water equal to the water delivering capacity of the piston G. With this construction, the air drawn in through the inwardly opening check valve O to chamber K, will form an air cushion under check valve M, which will prevent the water hammer which would otherwise result at the beginning of the down stroke of the plunger F. When the valve S is open, the same cushioning effect will be secured by allowing a portion of the water to pass through duct

P and compress the air in chamber Q. In such case, during the upstroke or suction stroke of the pistons or plungers, the air in chamber Q will reëxpand sufficiently to prevent the formation of a vacuum strong enough to open check valve O and therefore no air will be pumped until the valve S is again closed. It will of course be understood that, (unless valve O is locked), in order to avoid drawing in air past the check valve O, when the valve S is open, the air chamber Q must be of sufficient size to prevent a reduction in pressure within chamber K below atmospheric pressure to such an extent as to cause the check valve O to open. But even if the chamber Q is not of sufficient size to prevent the opening of check valve O, it will at least delay the opening of such valve and therefore materially reduce the amount of air delivered to the pressure tank through the chamber N.

While I have illustrated my invention as embodied in a type of pump having pistons or plungers of different delivery capacities, it is not essential to this invention that differential cylinders or plungers should be used, since it is obvious that means, such as are shown and described in my former Patent, Number 795892, might be employed, if desired, to lower the water in chamber K between the water forcing strokes of the plunger or piston, which drives the water through such chamber. In fact, my invention is applicable to any pumping apparatus which includes means for lowering the water level in a chamber, such as chamber K, in the interval between the water forcing strokes. It will be observed that the outlet of chamber N is illustrated as located below the upper end of said chamber. This allows a supply of air to accumulate in the upper portion of the chamber N, which also serves as an air cushion. This chamber, however, is not essential to my invention, although convenient both for the purpose of providing such an air cushion directly over the check valve M and also for the purpose of providing clearance for said check valve.

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

1. In a water pumping apparatus, the combination with a pump, of an air admission chamber having a water inlet connected with the outlet of said pump, means for permitting the water level to drop in said chamber in the intervals between the water forcing strokes of the pump, an auxiliary air chamber connected with the intermediate chamber, and a valve controlling communication between said chambers, said intermediate chamber having an outlet located above its water inlet, and an automatically opening valve controlling said outlet.

2. In a water pumping apparatus, the combination with a set of connected pumping cylinders having water actuating members of different fluid displacing capacities, means for actuating said members, an air cushion chamber, an air admission chamber connected with said air cushion chamber by a valved passage and also having an inlet connected to receive water from the pumping cylinders,—said air admission chamber having a valved outlet located above the inlet and also having an air inlet above the connection between the air admission chamber and the air cushion chamber provided with an automatic air admission valve.

3. In a water pumping apparatus, the combination with a set of pumping cylinders provided with a tubular connection, and a set of fluid actuating members in said cylinders of different displacing capacities, of an air admission chamber having a water inlet, connected to said tubular connection at a point between the cylinders, said air admission chamber having a valved air inlet, and also having an outlet located above the water inlet, in a position to first receive air and then water during the forcing stroke of the pump.

4. In a water pumping apparatus, the combination with a set of pumping cylinders arranged to deliver water from one to the other, connected fluid actuating members of different displacing capacities located in the respective cylinders, an air admission chamber, an otherwise closed air chamber, connected with said air cushion admission chamber by a valved passage, automatic air inlet and fluid outlet valves for said air admission chamber, an open discharge connection leading from the upper pumping cylinder to said air admission chamber below the fluid outlet, and means for closing and opening the air chamber valved passage in accordance with the air supply requirements.

5. In a water pumping apparatus, the combination with a set of pumping cylinders, arranged to deliver water from one to the other, connected fluid actuating members of different fluid displacing capacities, located in the respective cylinders, an air admission chamber, automatic air inlet, and fluid outlet valves for said chambers, another chamber provided with an outlet below its upper wall and having an inlet, connected with the outlet of the air admission chamber, and an open connection between the cylinder having the fluid displacing member of greatest capacity and the air admission chamber below the outlet of said chamber.

6. In a water pumping apparatus, the combination with a set of connected pumping cylinders having water actuating members of different fluid displacing capacities, means for actuating said members, an air

admission chamber connected to receive water from the pumping cylinders, and provided with an air inlet check valve, an air cushion chamber connected with the lower portion of the air admission chamber, an auxiliary air cushion chamber through which water and air are forced from the air admission chamber, said auxiliary air cushion chamber being provided with a valved inlet leading from the air admission chamber, and also having an outlet in the lower portion thereof.

In testimony whereof I affix my signature in the presence of two witnesses.

XENOPHON CAVERNO.

Witnesses:
CHAS. H. SHELDEN,
F. A. DICKINSON.