

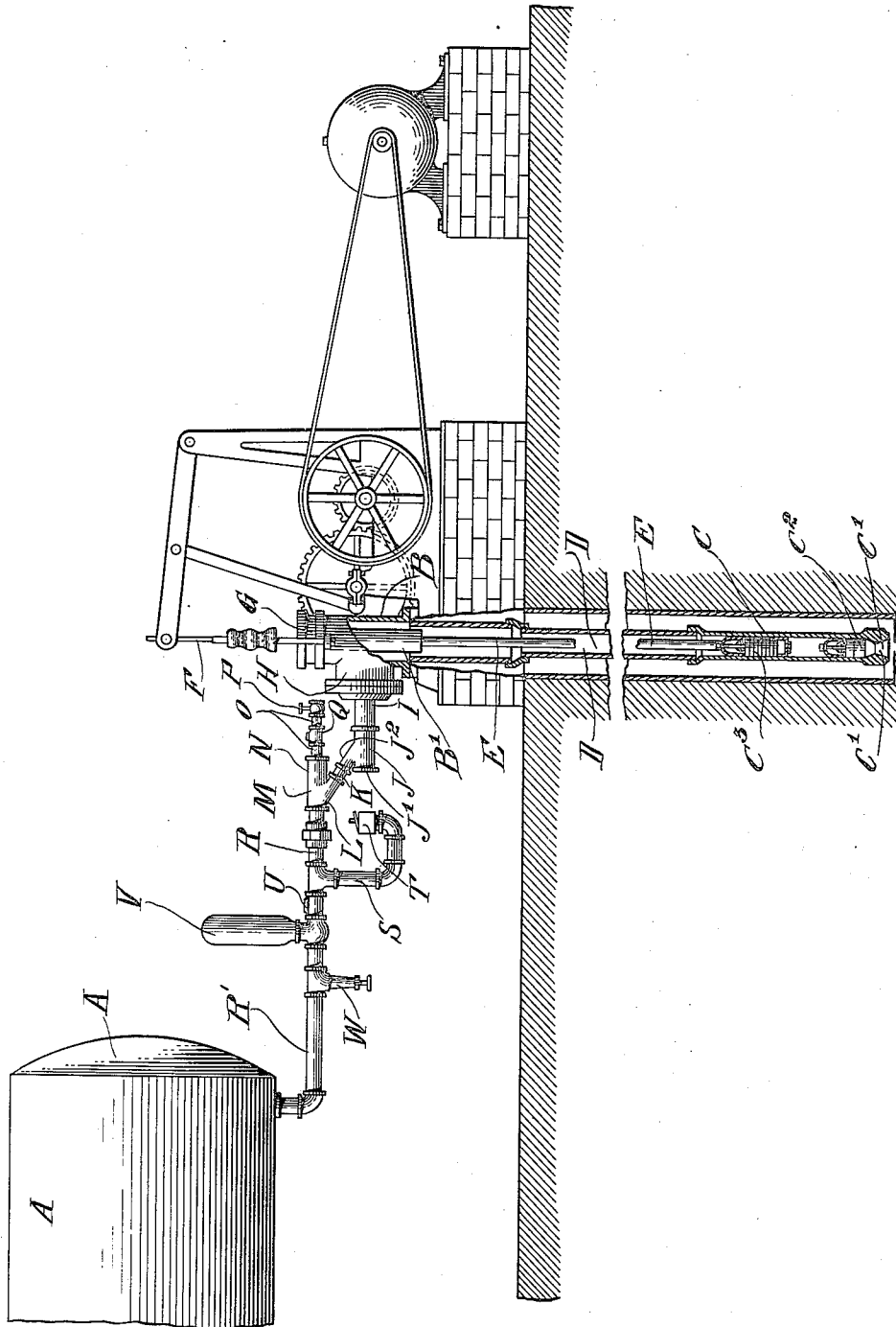
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PUMP.

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1,060,815.

Patented May 6, 1913.



WITNESSES:

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1,060,815.

Specification of Letters Patent.

Patented May 6, 1913.

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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 the upper cylinder; the air and water being then forced on the downward stroke of the upper piston through an outlet in the upper cylinder to the storage tank. A serious disadvantage 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.

The purpose of my present invention, which is designed as an improvement on the apparatus covered by United States Letters Patent, granted to Carter & Maull May 10th, 1910, No. 957,304, is to avoid the difficulties heretofore existing, due to the air in the upper cylinder being forced through the stuffing box, and also to provide a very simple and economical arrangement of the parts whereby the air pumped, in company with the water, into the storage tank will be kept out of the pumping cylinder and away from the stuffing box.

A further object of my invention is to provide means whereby there is obviated the possibility of an accumulation of air in, and leakage through, the check valve which is necessarily employed between the upper pump cylinder and storage tank to prevent the return flow of fluids from the tank.

In the accompanying drawings—A represents a water storage tank, B represents the upper cylinder of the pump, C the lower cylinder and D a pipe connecting the upper and lower cylinders. The end of the lower cylinder C, which is to be inserted in the

well, cistern or other source of water supply has an opening C', within which is secured a ball valve C².

The lower cylinder C is provided with a valved piston C³, and the upper cylinder B is provided with a piston B', of larger transverse area than the piston C³. The two pistons are connected by a rod E, so that they will be reciprocated together, the piston B' being suitably coupled to a connecting rod F, operated from any suitable source of power.

The upper cylinder B and the piston B' being of larger transverse areas than the lower cylinder C and the piston C³, will have the ability to receive and displace a larger amount of fluid than the lower piston can furnish thereto.

The upper cylinder B is provided with the usual stuffing box G and a discharge nozzle or outlet H.

Suitably connected to the nozzle H of the upper cylinder is a short pipe connection I, to the other end of which is secured a Y-joint J, one end J' of which is closed, and the arm J² of which is connected by the short pipe K with the short arm L of the Y-joint M, the other and larger fork N of which is connected to a smaller pipe O, at the free end of which is mounted an ordinary globe valve P, which may be opened to the atmosphere. Also mounted on the pipe O, and between the globe valve P and the Y-joint M is a check valve Q. The Y-joint M is connected to the tank A by a main one portion of which, extending to the check valve hereinafter referred to I designate R, and the extension thereof beyond said valve I designate R'. Near the ends of said main R is suitably mounted a branch pipe S, provided at its free end with a suitable relief valve T, normally kept closed by spring pressure or otherwise. Adjacent the connection of the branch pipe S with the main R is a check valve U. The pipe extension R is provided with an air chamber V and a gate valve W.

The Y-joint branches J and M with the short connecting pipe K form substantially a reversed Z, constituting a waterfall and air chamber, the diagonal member of which may be properly characterized as a drop connection to the outlet H of the upper cylinder, and through which that portion of water remaining unexpelled on the displacement stroke of the pump may fall back to-

ward the upper cylinder B, which water, with that raised on the suction or lifting stroke acts as a seal against the admission of air into the upper cylinder.

5 It will be observed that the main R, the extension R' the check valve U, the upper part M of the waterfall and air chamber, and the air inlet Q, are all on substantially the same horizontal plane and on a plane
10 above the upper cylinder outlet H. This arrangement is not merely a simplification of piping, but has for its object the prevention of air which is not forced into the storage tank accumulating in the check valve
15 U, or on the tank side thereof, in such position that it can leak through said valve into the waterfall and air chamber, for if it did so being under compression, it would, on expansion in said chamber, be apt to interrupt the admission of air at atmospheric
20 pressure through the air inlet Q. With the object of avoiding the difficulties that would thereby result, I have not only so arranged the pipe extension R' between the check
25 valve U and the storage tank that the water will be constantly present therein in such position relative to the valve U as to act as a seal against the leakage of air through said valve, but have also so placed said
30 valve that should, by any chance, there be any air therein, the pressure thereof will be exerted not in the direction of the valve opening but at the upper portion thereof, where there is no possibility of leakage into
35 the waterfall and air chamber. In addition to these provisions, and to further effectuate the object aimed at, I have placed adjacent said check valve U, in such position as to form substantially a part thereof, and on
40 the tank side of the valve opening, the air chamber V, wherein will be accumulated any air not forced into the tank at the displacement stroke of the pump.

The operation of the apparatus is as follows: Assuming that the respective cylinders of the pump have been charged with water, on the downward stroke of the piston B' the water in the cylinder B is displaced and forced through the nozzle H and connecting main R to the storage tank, in which
50 operation a portion of water will be left in parts M and J, and on the upward stroke of the piston B', the tendency to create a vacuum by the piston B' will draw toward
55 it the water in the parts M and J, and due to this fall of water and resulting partial vacuum in those parts, air will be drawn through the globe valve P and through the check valve Q, and on the next downward
60 stroke of the piston B' the air thus admitted will be forced by the outward and upward passage of the water, through the main R and into the storage tank A. The globe valve P may be hand manipulated in order
65 to increase or decrease the amount of air

which may be admitted through the check valve Q. The air chamber V besides having the function before referred to prevents the excessive pounding which ordinarily results where water is forced under great pressure against or into another body or head of water. The gate valve W will ordinarily
70 be opened when the pump is put into operation, but to guard against the operator working the pump with the valve closed I have provided the above referred to branch
75 pipe S and relief valve T, through which the water may be permitted to escape should the pump be accidentally operated with the referred to gate valve closed. The check
80 valve U is provided to permit the passage of fluid toward the tank and prevent its passage in a contrary direction.

Thus it will be seen that I have provided an operative and simple construction and arrangement of parts whereby air and water
85 may be forced into the storage tank at one time without the necessity of bringing such air directly into the upper cylinder, thus avoiding the difficulties heretofore experienced when this had been done, due to the air
90 being forced through the stuffing box.

What I claim is:—

1. The combination with a tank of a pump comprising an upper cylinder provided with
95 a slideway opening, a lower cylinder of lesser capacity communicating with the first named cylinder, a water lifting piston in the smaller one of said cylinders, a water displacing plunger in the larger cylinder, said piston and plunger being of different
100 transverse areas and reciprocating in unison, a water outlet from said pump, a water and air main connected to said tank having means for admitting air thereto and located
105 above said water outlet, a valve in said main to prevent back flow of fluids from said tank, a drop connection from said main to said pump adapted to permit, on the suction
110 stroke thereof, a fall of water from said main to said pump to seal the latter against the admission of air thereto, said main being so disposed and arranged relative to the tank and check valve as to enable the
115 water in said main to seal said valve against back leakage of air through the latter.

2. The combination with a tank of a pump comprising an upper cylinder provided with a slideway opening, and a lower cylinder of lesser capacity communicating with the first
120 named cylinder, a water lifting piston in the smaller one of said cylinders, a water displacing plunger in the larger cylinder, said piston and plunger being of different transverse areas and reciprocating in unison, a
125 water outlet from said pump, a water and air main connected to said tank located above said water outlet and provided with means for admitting air thereto, a trap valve in said main to prevent back flow of fluids from
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said tank, a drop connection from said main to said water outlet and communicating and forming with a portion of said main, a waterfall and air chamber, said waterfall acting, with the water in the pump to seal the latter against the admission of air thereto, and means interposed between the storage tank and said trap valve whereby an accumulation of air in said valve and back leakage of same therethrough is avoided.

3. The combination with a tank of a pump comprising an upper cylinder provided with a slideway opening, and a lower cylinder of lesser capacity communicating with the first named cylinder, a water lifting piston in the smaller one of said cylinders and a water displacing plunger in the larger cylinder, said piston and plunger being of different transverse areas and reciprocating in unison, a water outlet from said pump, a water connection to said outlet provided with an air inlet, a trap valve in said connection, said trap valve and a portion of said water connection being located above the pump outlet, said portion being adapted to form an air chamber on the suction stroke of the pump, and a pipe extension of said connection from said trap valve to said tank level with or higher than said trap valve.

4. The combination with a tank of a pump comprising an upper cylinder provided with a slideway opening, and a lower cylinder of lesser capacity communicating with the first named cylinder, a water lifting piston in the smaller one of said cylinders and a water displacing plunger in the larger cylinder, said piston and plunger being of different transverse areas and reciprocating in unison, a water outlet from said pump, a water connection to said outlet provided with an air inlet, a trap valve in said connection, said trap valve and a portion of said water connection being located above the pump outlet, said portion being adapted to form an air chamber on the suction stroke of the pump, a pipe extension of said connection from said trap valve to said tank, level with or higher than said trap valve and a member communicating with said connection, trap valve and pipe extension adapted to receive accumulations of air not discharged into the tank on the displacement stroke of the pump.

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Witnesses:

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