No. 701,163. Patented May 27, 1902.

E. D. DEETER.

COMBINED AIR AND WATER PUMP.

(Application filed Feb. 28, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig 1

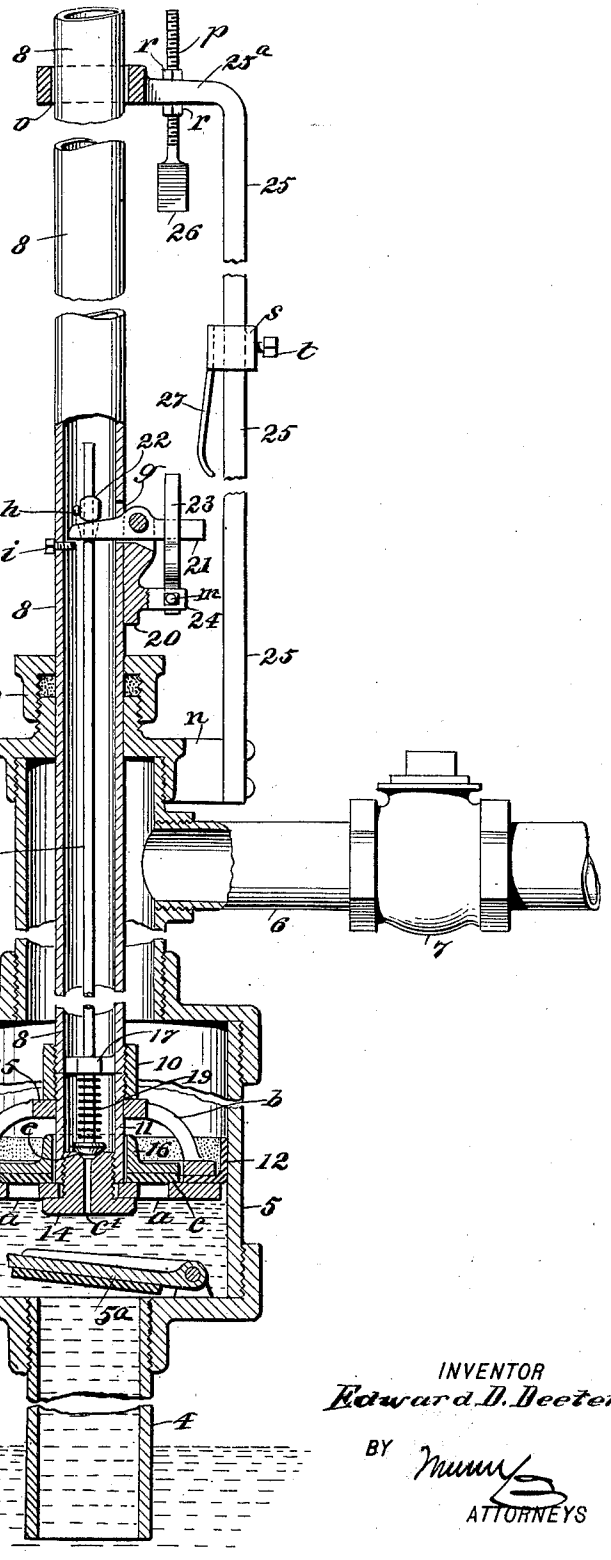


Fig 2

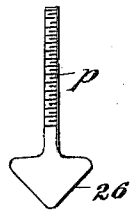
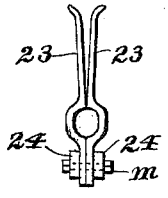


Fig 3



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No. 701,163. Patented May 27, 1902.

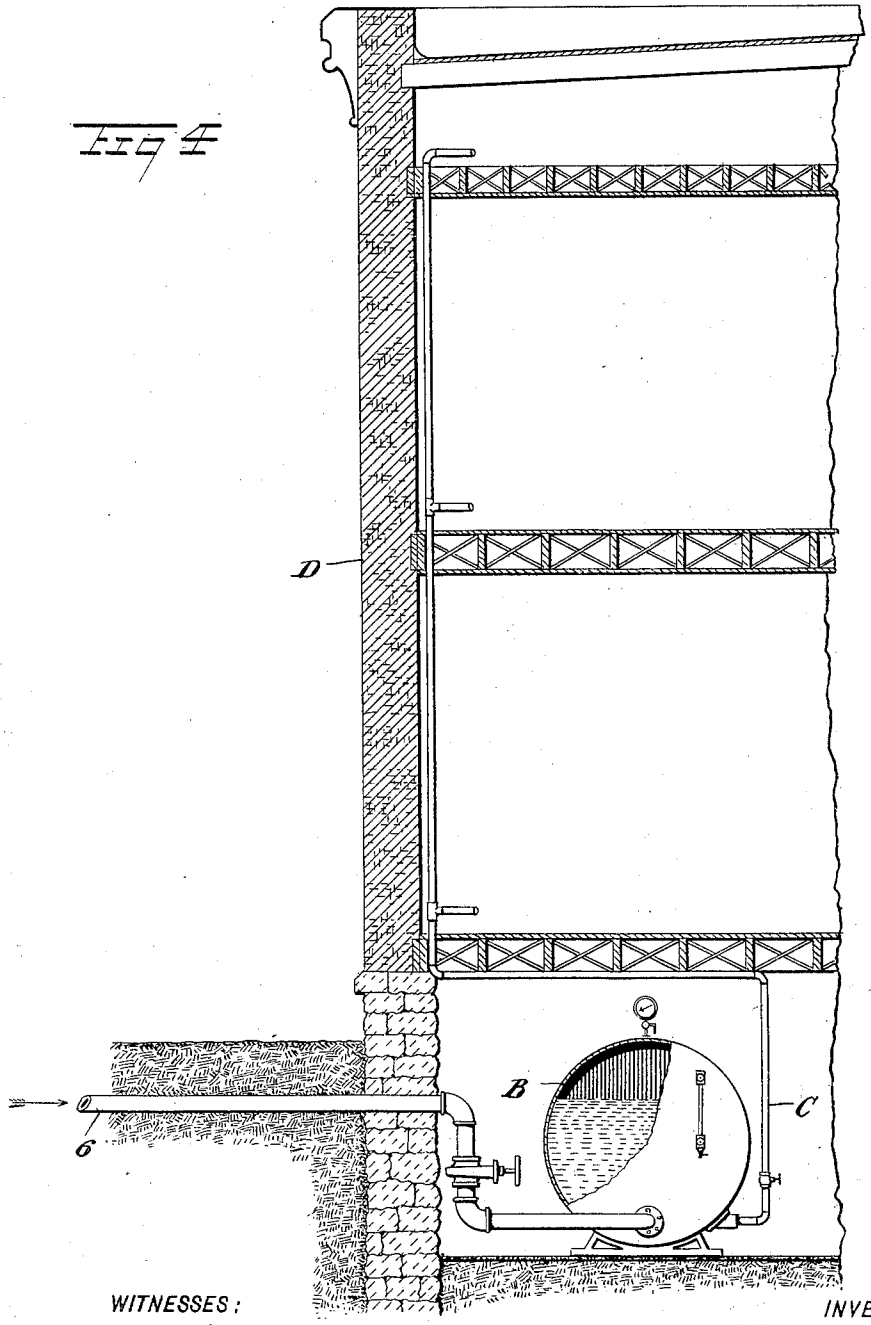
E. D. DEETER.

COMBINED AIR AND WATER PUMP.

(Application filed Feb. 23, 1901.)

(No Model.) 2 Sheets—Sheet 2.

Fig 4



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UNITED STATES PATENT OFFICE.

EDWARD D. DEETER, OF MILFORD, INDIANA.

COMBINED AIR AND WATER PUMP.

SPECIFICATION forming part of Letters Patent No. 701,163, dated May 27, 1902.

Application filed February 23, 1901. Serial No. 48,466. (No model.)

To all whom it may concern:

Be it known that I, EDWARD D. DEETER, a citizen of the United States, and a resident of Milford, in the county of Kosciusko and State of Indiana, have invented a new and Improved Combined Air and Water Pump, of which the following is a full, clear, and exact description.

This invention relates to means for affording a water-supply for buildings not connected with a general water-distributing system such as is provided for a town or city, and usually consisting of a water tank and pump, the tank being attached to the water-distributing service pipe or pipes in the building.

One object of my invention is to provide a pump of novel simple construction adapted for elevating water from a deep or shallow well and forcing the liquid as it is pumped into a sealed tank against the air confined therein, so that pressure of the air will force the water from the tank into a system of water-distributing pipes extending into one or more buildings.

Another object is to so construct the improved pump that it is adapted to pump air with the water into the receiving-tank, and thus maintain a suitable pressure on the water therein for the adequate supply of water to and through a system of service-pipes, which may extend throughout a building or block of buildings above the tank; and a further object is to provide novel details of construction for the air-pumping mechanism, which permit adjustment of the same for exact graduation of the amount of air pumped or an arrest of the air-pumping operation, as may be found necessary for efficient service of the improved pneumatic enforced water-supplying apparatus.

The invention consists in the novel construction and combination of parts, as is hereinafter described, and defined in the appended claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a broken and partly-sectional side elevation of the improved air and water pump. Fig. 2 is a detached side view of a presser-block that is a novel detail of construction employed. Fig. 3 is a detached side view of duplicate spring clamping-arms, which receive pressure of the block shown in Fig. 2; and Fig. 4 is a broken front elevation of a building, a water-holding tank at the base of the building, a supply-pipe for air and water leading from the improved air and water pump into said tank, and a system of water-distributing pipes leading upwardly in the building.

The improvements may be applied to pump water from a deep tubular well, a shallow walled well of greater diameter than a tubular well, or from any other sufficient water-supply.

In the drawings, which show the construction and application of the invention, 4 indicates the lift-pipe of the pump, that is shown broken away intermediately of its ends, but which in completed condition may have such a length as will permit the lower end thereof to be submerged in the water-supply A, as indicated in Fig. 1. Upon the upper end of the lift-pipe 4 the lower head or end wall of the pump-cylinder 5 is secured either by a screwed engagement therewith or by other means, and, as shown, there is an outlet formed in the side wall of the cylinder for an attachment of one end of the pipe 6, through which air and water passing from the pump is transferred to a water-receiving tank B through the ordinary check-valve 7. A clack-valve 5^a is hinged within the cylinder 5 upon its lower end wall, so as to rock above the open upper end of the lift-pipe 4 and serve as a foot-valve to prevent regurgitation of waert lifted through the pipe into the cylinder.

A hollow plunger-rod 8 extends vertically of a suitable length, a truly cylindrical portion of its body passing through a packing-box 9, that is positioned on the upper end wall or bonnet of the cylinder 5. Upon the lower end of the hollow plunger-rod 8 an interiorly-threaded socket-piece 10 is screwed, and into a projection of said socket the upper end of a cylindrical valve-chamber 11 is screwed, whereby the short valve-chamber is held alined with the plunger-rod.

A circular and cupped packing-ring 12, formed, preferably, of leather, is held upon

the exterior of the cylindrical valve-chamber 11, so as to have a slidable engagement at its periphery with the true bore of the cylinder 5, as follows: A flat base-plate 13, having a circular edge, a central perforation, and a plurality of orifices *a*, formed in the base-plate between its edge and the central perforation, is held upon the lower end of the valve-chamber 11 by the flanged head of the short screw-bolt 14, which engages a thread formed to receive it in the valve-chamber. The diameter of the base-plate 13 nearly equals that of the bore of the cylinder 5, and upon it the cupped packing-ring 12 is seated, having its peripheral flange extended upwardly.

A preferably dished cap-piece 15 is seated within the cupped packing-ring 12 and pressed down upon it by adjustment of the socket-piece 10, the concaved wall of the cap-piece having a suitable number of apertures formed therein, producing the arms *b*.

A disk valve 16 of suitable weight is slidably mounted upon the chamber 11 and may have a slightly-yielding facing *c* secured upon its level lower surface, which is adapted to seat upon the base-plate 13 over the orifices *a* therein, a sufficient space being afforded between the uppermost point in the dished cap-piece 15 and the base-plate 13 to permit the disk valve 16 to rise a proper distance from said base-plate, and thus allow the free passage of water through the orifices *a* and thence through the spaces between the arms *b*, as will be further explained.

A central passage *c'* is longitudinally formed in the clamping bolt or plug 14, and at the upper termination of said passage a preferably coniform valve-seat is produced by the cupped counterboring of said passage.

Within the bore of the plunger-rod 8, at or near its lower end, a centrally-apertured guide 17 is secured, comprising a plurality of spaced arms forming a spider, which is adapted to permit the free passage of water between its arms. Through the central perforation of the spider 17 the lower portion of the valve-stem 18 is downwardly extended, and at the lower extremity of said valve-stem a coniform valve *e* is secured, which may rest upon the coniform seat formed at the upper end of the passage *c'*. A coiled spring 19 is introduced between the spider 17 and the valve *e*, encircling the valve-stem 18, said spring being compressed slightly when the valve *e* is on its seat, and is thus adapted to insure the proper engagement of said valve therewith if from any cause the valve-stem fails to drop by its gravity alone.

On a bracket-block 20, which is secured by any preferred means upon the exterior of the hollow plunger-rod 8 at a suitable distance above the packing-box 9, a horizontal tappet-lever 21 is pivoted between its ends, and one portion of said lever, which passes through a slot *g* in the plunger-rod, is perforated vertically to receive the loosely-fitted upper portion of the valve-stem 18.

The upper side of the portion of the tappet-lever 21, which extends into the hollow plunger-rod 8, may with advantage be slightly convexed for a suitable engagement with a ball-shaped fulcrum-block 22, that is adjustably held above the tappet-lever on the valve-stem 18 by a set-screw 8, and it will be seen that the depression of the inner end of the tappet-arm below a normal position is prevented by the abutment-screw *i*, that is inserted through a tappet-hole formed in the side wall of the hollow plunger-rod at a suitable point.

The twin clamping-arms 23 (shown in Figs. 1 and 3) are clamped at their lower ends, so as to stand erect, by the slotted member 24, that projects outwardly from the bracket-block, 20 these springs being held in position by the transverse bolt *m*, that engages alined perforations in the slotted member and the spring-arms, as shown best in Fig. 3. The outer member of the tappet-lever 21 is located between the divergent spring clamping-arms 23, which spreads them somewhat more than is represented in Fig. 3.

Upon one side of the cylinder 5 or the upper head thereof the lower end of the upright post 25 is secured and may with advantage be held spaced therefrom a proper distance by a suitable projection *n*. On the upper portion of the post 25 a laterally-extended arm 25^a is formed or secured, having an opening *o* formed vertically in its free end, through which the hollow plunger-rod 8 loosely passes near its open upper end.

In a perforation formed in the arm 25^a the screw-threaded cylindrical body *p* of a presser-block 26 is held adjustably by the nuts *r*, that are screwed upon the body *p* at each side of the arm 25^a. The depending head portion of the presser-block 26 is preferably given a blunt arrow shape and from its relative position is adapted to pass between the twin clamping-springs 23 when they are elevated a proper degree by the upward travel of the hollow plunger-rod 8, as will presently be described.

A slightly-resilient pusher-limb 27 is adjustably held on the post 25 by the clamping-box *s*, which is slidable on the post and carries the limb on its inner side, a set-screw *t* serving to secure the box at a desired point on the post. The depending pusher-limb 27 has its free lower end curved slightly toward the post, and is thus adapted to impinge upon the outer end of the rockable lever 21 and press it downwardly without objectionable shock, finally sliding therefrom when the tappet-lever is rocked down a proper degree.

The operation of the pump mechanism for lifting and forcing water and air is as follows: Assuming that the hollow plunger-rod 8 has been connected by means (not shown) with a suitable source of power adapted to give it

proper reciprocating motion, it will be seen that the reciprocatory travel of this rod, if working parts of the pump are in the relative positions shown in Fig. 1 will cause the main plunger-head having the cupped packing-ring 12 to draw air and then water up from and through the lift-pipe 4 into the cylinder 5 below said plunger-head, as indicated in Fig. 1. Each downstroke of the main plunger-head will pass first the air from the lift-pipe 4 and then water into the portion of the cylinder 5 above the main plunger-head, as the pressure of water that has entered the lower portion of the cylinder through the clack-valve 5^a will on a downstroke of the rod 8 close said valve and lift the disk valve 16, so that water will pass through the orifices in the base-plate 13 of the plunger-head past the raised disk valve to be expelled on the next upstroke of the main plunger-head by closure of said disk valve, the water above the plunger-head then passing into the pipe 6, lifting the check-valve 7 and passing therethrough to the receiving-tank B, previously mentioned.

As it is designed to provide for the elevation of water through the service-pipes C to the upper story of a high building, such as D, there must be a sufficient amount of air-pressure produced in the tank B to effect such a result, and to this end the air-pumping mechanism, that is an essential feature of my invention, is caused to coact with the water-pumping details, as follows: When the hollow plunger-rod 8 is moving upward, at a predetermined point in its stroke the depending spring-limb 27 will contact with the outer end of the tappet-lever 21, pressing it down, and consequently rocking upward the inner end thereof.

The enforced contact of the inner end of the tappet-lever with the fulcrum-block 22 effects the limited elevation of the valve-stem 18 and valve *e* thereon, which will open an air-passage through the plug 14 from the open hollow plunger-rod 8 into the cylinder 5 below the main plunger-head.

It will be obvious that as long as the tappet-lever 21 is held in an inclined position by the spring clamping-arms 23 the valve on the stem 18 will remain unseated and air will pass below the upwardly-moving main plunger-head to mingle with the water that is at the same time entering the lower portion of the cylinder 5 from the lift-pipe 4.

The elevation of the plunger-rod 8 eventually causes the presser-block 26 to have engagement with the clamping-arms 23, spreading them apart and permitting the gravity of the valve-stem 18, supplemented by the tension of the compressed spring 19, to close the valve *e* upon its seat and arrest the passage of air down through the duct *c'* into the lower portion of the cylinder 5.

Obviously the continuation of the pumping operation will at every reciprocatory movement of the plunger-rod 8 and main plunger-head thereon pump a quantity of air along with the water into the tank B, and thus produce a proper compression of air over the water therein for the expulsion of the water into and through the system of service-pipes in one or more buildings required to be supplied with a full amount of water in all stories of the building.

As the spring-limb 27 may be adjusted to occupy any desired position on the post 25, it will be seen that the length of time during each stroke of the pump-plunger in which the valve *e* is to remain unseated may be exactly determined by the relative position given to said spring-limb, it being apparent that the lower said limb is placed on the post the longer will the valve remain open for induction of air.

If it is at any time desired to discontinue the use of the air-pump, this can be readily effected if the spring-limb 27 is raised to the upper end of the post 25, as then the presser-block 26 will spread apart the clamping-arms 23 for the release of the tappet-lever 21 immediately after the depending limb 27 has depressed the outer end of said lever, so that the valve-stem 18 and valve *e* thereon will practically remain in lowered condition.

It has been stated that the invention is of a class employed to furnish a water-supply for buildings not connected to a general water-supply. I do not, however, desire to limit the use of the improvement, but may employ it in some situations in connection with a general water-supply for the elevation of water to a greater height than the general supply will effect.

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

1. In a pneumatic system for water elevation, a sealed tank, a water-service leading therefrom, a pump comprising a cylinder having an outlet connected with the tank, a water-pumping device consisting of a plunger-rod, and a head thereon having means for the upward passage of water and air, an air-induction device coacting with the water-pumping device and having a valve for controlling the amount of air pumped, and adjustable devices for controlling the movement of said valve.

2. In a pneumatic system for water elevation, a sealed tank, a water-service leading therefrom, a pump combining water lifting and forcing mechanism, and an air-induction device adapted to control the introduction of air below the plunger-head during a part of the upward stroke of the plunger-rod, the said device comprising a valve controlling an air-passage leading below the plunger-head, means for opening said valve at a predetermined point in the upward movement of said plunger-rod, and an outlet for the water and air leading from the cylinder above the plunger-head and connected with the tank.

3. A pump, comprising a cylinder, a hollow plunger-rod, a plunger-head on the rod having a valve-controlled water-passage and an air-passage, a valve-stem in the hollow plunger-rod, a valve on the valve-stem and controlling the said air-passage in the plunger-head, and means for opening said valve at a predetermined point in an upward movement of the plunger-rod.

4. A pump, comprising a cylinder, a water-supply pipe thereon, a hollow plunger-rod, a plunger-head on said rod through which water passes after it enters the cylinder, a valve-stem movable in the hollow plunger-rod, a valve on said stem and controlling an air-passage through the plunger-head, means for opening said valve during the upward movement of the plunger-rod, and means for holding it in the open position.

5. A pump, comprising a cylinder, a water-supply pipe connected therewith, a hollow plunger-rod, a plunger-head on said rod through which water passes after it enters the cylinder, a valve-stem movable in the hollow plunger-rod, a valve on said stem and controlling an air-passage through the plunger-head, the said valve being normally closed, a device for adjusting said valve to the open position during the upward movement of the plunger-rod, and means for releasing said valve to allow it to return to closed position.

6. A pump comprising a cylinder, a depending water-supply pipe thereon, a clack-valve controlling the opening of the supply-pipe into the cylinder, a hollow plunger-rod, a head thereon slidably engaging the bore of the cylinder and having a water-passage therethrough, a vertically-reciprocal disk valve controlling said water-passage, an outlet-pipe on the cylinder above the plunger-head, and an air induction and controlling device adapted to pass air down through the plunger-head during each upward movement of the plunger-head, the said device comprising a valve controlling a passage through the plunger-head, a valve-stem extending upward from said valve, means for moving said valve-stem, to open the valve at a predetermined point in the upward movement of the plunger-rod, means for holding said valve in the open position, and means for releasing said valve.

7. A pump, comprising a cylinder, a depending water-supply pipe thereon, an outlet-pipe connected with the cylinder, a hollow plunger-rod, a threaded socket screwing on the lower end of the plunger-rod, a cylindrical valve-chamber screwing into a projection of said socket, and a plunger-head consisting of a perforate base-plate, a headed clamping-bolt screwing in the lower end of the cylindrical chamber to hold the base-plate in position, the said clamping-bolt having a central passage formed therein, a cupped pliable packing resting on the base-plate, a dished cap-plate seated within the packing-ring and engaged by the threaded socket to press the cap-plate upon said packing-ring, a disk valve slidably held between the cap-plate and the base-plate and which normally seats over the perforations in the base-plate, a valve-stem arranged to reciprocate in the hollow plunger-rod and a valve on said stem and adapted to be seated over the passage in the clamping-bolt.

8. An air and water pump, comprising a cylinder, a water-supply pipe depending therefrom, an outlet-pipe laterally extended from the cylinder near its upper end, a hollow plunger-rod, a cylindric valve-chamber secured on the lower end of said hollow rod, a plunger-head having a water-passage therethrough, a disk valve slidable on the valve-chamber and controlling the passage through the plunger-head, a headed bolt having a passage therethrough and holding the plunger-head on the valve-chamber and plunger-rod, a valve-stem reciprocal in the hollow plunger-rod, a valve on the lower end of the valve-stem and seating over the passage in the headed bolt, and means held on the cylinder and adapted to control adjustment of said valve to hold it open or permit its closure.

9. An air and water pump, comprising a cylinder, a water-supply pipe thereon, an outlet-pipe, a hollow plunger-rod, an apertured plunger-head, a disk valve adapted to control the passage in the plunger-head, a headed bolt holding the plunger-head on the rod and having a longitudinal passage therethrough, a valve-stem in the plunger-rod, a valve thereon seating over the passage in the headed bolt, a rockably-supported tappet-lever held loosely engaged at one end with the valve-stem, the other end thereof being free, an upright post at one side of the cylinder, having a lateral arm at the upper end, an adjustable spring-limb depending from one side of the post and adapted to rock the free end of the tappet-lever downwardly, spring-arms embracing the free end of the tappet-lever so as to hold it rocked, and a presser-block depending from the arm on the post, and adapted to spread apart the spring-arms for the release of the tappet-lever when said lever and arms are fully elevated by the upward movement of the hollow plunger-rod.

10. In a pneumatic system for water elevation, a sealed tank, a water-service leading therefrom, a pump-cylinder, a hollow plunger-rod, a plunger-head on said rod and provided with openings through which water passes after it enters the cylinder, an air-induction device comprising a valve-stem movable in the hollow plunger-rod, a valve carried thereby and controlling the passage of air below the plunger-head and adjustable devices controlling the movement of said valve-stem to regulate the opening-and-closing movement of said valve.

11. A pump, comprising a cylinder, a hollow plunger-rod, a plunger-head on the rod having a valve-controlled water-passage and

an air-passage communicating with the interior of the hollow plunger-rod, a valve-stem movable in the hollow plunger-rod, a valve on the valve-stem and controlling the air-passage in the plunger-head, and means for controlling the movement of said valve-stem to hold the valve open or permit its closure.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

EDWARD D. DEETER.

Witnesses:
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FREDERICK FELKNER.