July 7, 1925. 1,545,208

S. S. SMITH

PUMP

Original Filed Aug. 25, 1920

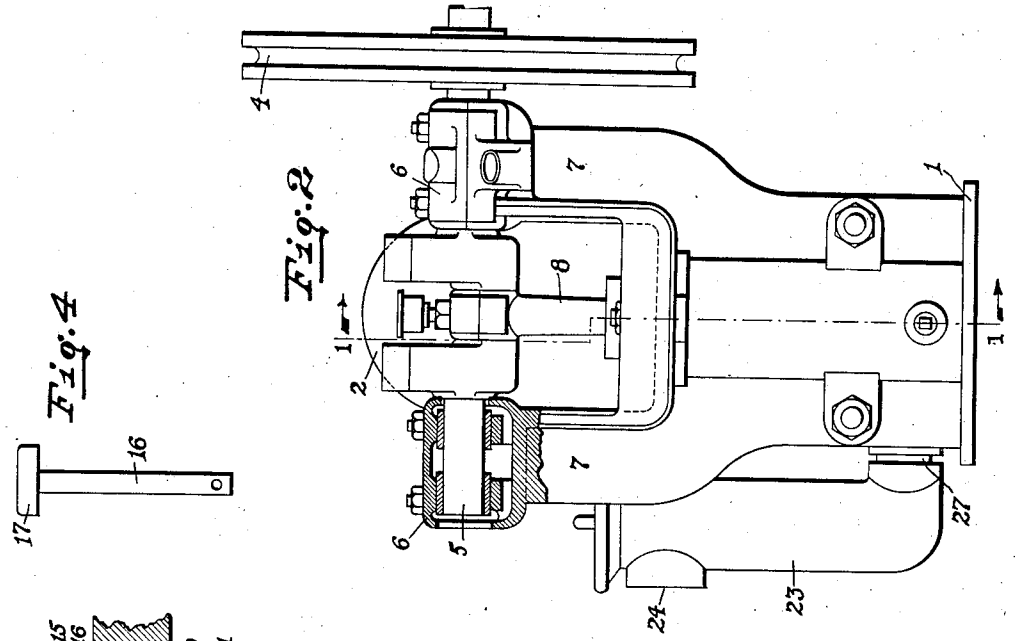


Fig. 2

Fig. 4

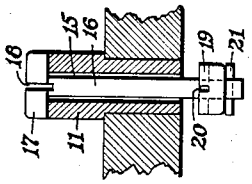


Fig. 3

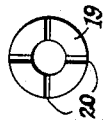


Fig. 5

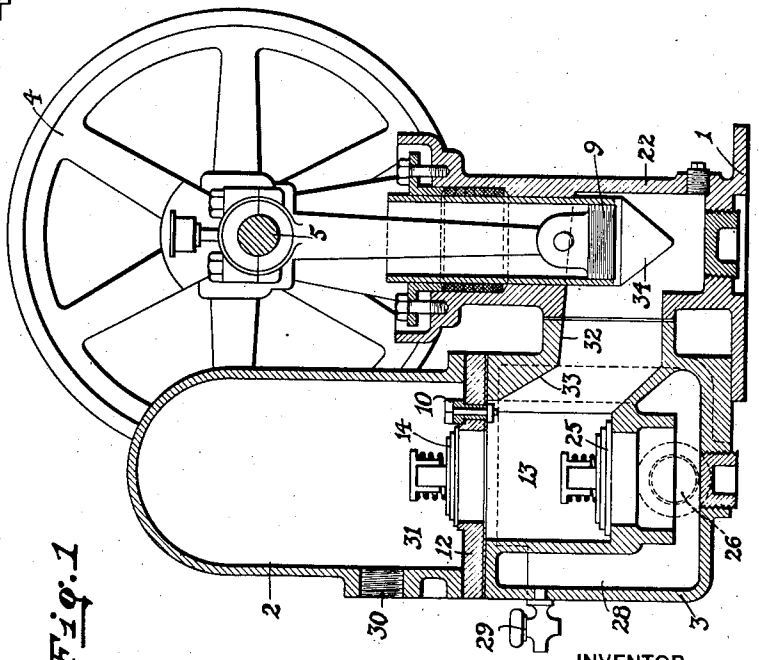


Fig. 1

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UNITED STATES PATENT OFFICE.

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PUMP.

Original application filed August 25, 1920, Serial No. 405,781. Divided and this application filed November 25, 1921. Serial No. 517,425.

To all whom it may concern:

Be it known that I, SIDNEY S. SMITH, a citizen of the United States, residing at Seneca Falls, in the county of Seneca and State of New York, have invented certain new and useful Improvements in Pumps, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to pumps, and in some of its details more particularly to high speed pumps adapted for pumping water for use in automatic water supply systems.

The subject matter embodied in this invention is divided from co-pending application Serial No. 405,781, filed Aug. 25, 1920, for water systems.

It is an object of the invention to provide a pump of improved construction which is particularly adapted to pick up its suction promptly when started, and to avoid becoming air-bound under all conditions of operation.

A further object is to provide an improved self-cleaning priming valve adapted particularly for use in connection with pumps.

Still another object is to provide a pump particularly adapted for use in automatic water supply systems which is simple in construction, functioning advantageously in use, and being comparatively inexpensive in manufacturing costs.

Other objects will be pointed out in connection with the following detailed description, and still further objects not specifically mentioned will suggest themselves to those skilled in the art as the description proceeds.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereinafter set forth, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawings wherein an illustrative but preferred embodiment of the invention is disclosed,

Figure 1 is a vertical section taken through a high-speed pump constructed in accordance with this invention, the section being taken approximately on the line 1—1 of Fig. 2 looking in the direction of the arrow;

Fig. 2 is a side elevation of the pump, certain parts being shown in section;

Fig. 3 is a detailed sectional view of the priming valve; and

Figs. 4 and 5 are detailed view of parts of the priming valve.

Referring to the drawing for a detailed description of the illustrated embodiment of the invention, a high-speed pump having a reciprocating plunger is shown. The pump is supplied with a casting or base 1 properly formed for providing the various elements of the pump assembly and for attachment to any desired supporting surface. The casing 2 provides an air chamber, and casing 3 forms a vacuum chamber and suction valve housing. A driving pulley 4 is carried on a crank shaft 5 mounted in spaced bearings 6 formed in the upper terminals of standards 7 comprised in the upper portion of the base casting. The shaft is provided with a crank connected by a crank arm 8 with the reciprocating plunger 9 for driving the same.

In pumps of the general nature herein disclosed it has heretofore been the practice to drill a small hole in the discharge valve deck to allow a small amount of water to pass therethrough from the air chamber to the valve box and cylinder for the purpose of preventing the pump from becoming air-bound, and facilitating suction and starting the flow of water promptly as the pump is started. This opening has been necessarily made quite small so as not to interfere with the capacity of the pump, and the result has been that it has often been found to clog with scale and foreign matter so as to defeat the purpose for which it was designed. To obviate this difficulty an improved priming valve has been designed. As shown in Figs. 1, 3, 4 and 5 this valve 10 comprises a cylindrical valve seat 11 fitted into the valve deck 12 between the air chamber 2 and the valve box and suction chamber 13, being disposed adjacent the spring-pressed discharge valve 14. This valve seat has a central opening 15 extending therethrough through which extends a valve stem 16 of a diameter slightly less than that of the central opening providing an annular passageway so that water may pass therethrough. Formed at the upper end of the stem 16 is a head 17 having a slot 18 cut therein, as shown in Fig. 3. The lower end

of the stem is fitted with a washer 19 having slots 20 in the surface thereof, and held in position on the stem by means of a pin 21 extending through an opening in the stem. The distance between the head 17 and washer 19 is slightly greater than the length of the valve seat 11 so that a slight longitudinal movement of the valve stem is permitted.

When the pump is at rest it will be seen that water is allowed to trickle from the air chamber through the slot 18 in the head of the valve stem and through the passageway 15 in the valve seat to the suction chamber and cylinder of the pump, providing priming when the pump is started. As the plunger of the pump reciprocates the valve stem is caused to move a short distance limited by the head 17 and washer 19 so that any scale or foreign material which may be present in the interior of the priming valve is dislodged and washed away by the flow in both directions. When water is forced from the pump cylinder 22 to the air chamber the valve stem 16 is caused to rise, the washer 19 contacting with the under-surface of the valve deck, water then flowing through the slots 20 and the passageway in the valve seat.

By reference to Figs. 1 and 3, it is to be noted that the valve seat 11 extends a short distance above the valve deck, terminating in a plane approximately at the level of the discharge area of the discharge valve 14. It will therefore be seen that water flowing from the discharge valve washes over the top of the opening of the priming valve in such a way as to tend to wash away any scale or other impurities tending to clog the priming passageway.

In order to further facilitate establishment of flow of water through the system when the pump is started, and to prevent the pump from becoming air-bound, a novel pump construction is provided. As shown in Figs. 1 and 2 this construction comprises a U-shaped passageway or conduit formed in the pump through which flow takes place. One arm of this conduit is provided by an upwardly extending conduit 23 leading to the suction opening 24, and the other arm is provided by the passageway or valve box 13 containing the discharge valve 14 and the suction valve 25, the two arms communicating by passageway 26 in the base 27 of the U. A vacuum chamber 28 is disposed adjacent the valve box and is provided with an air-cock 29 near the upper portion thereof. As shown in Fig. 1 the discharge opening 30 from the air-chamber 2 is spaced some distance above the valve deck to provide a priming reservoir 31, the purpose of which will more fully hereinafter appear.

The upper surfaces 32 and 33 of the passageway leading from the cylinder of the pump to the valve box are inclined upwardly toward the latter, and the lower end 34 of the plunger 9 is tapered in preferably conical form as shown.

In operation it is desirable that all the air which may find its way into the passageway of the pump be ejected as soon as possible when the pump is started, or when the same is in operation. Any air entrapped in the passageway will tend to contract and expand with the oscillations of the plunger and the effectiveness of the pump will thus be impaired and the establishment of flow will be retarded. In some cases experience in the past has shown that where the amount of entrapped air was excessive it was impossible for the pump to establish flow; in such a case the pump is said to be "air bound". The inclined surfaces 32 and 33 are therefore provided so that any air in the region of the passageway between the cylinder and valve box will move upwardly over such surfaces and be quickly expelled through the discharge valve 14. The plunger is constructed with a conical lower surface so as to prevent violent slapping or impact with the water when descending. The U-shaped passageway or conduit prevents water from being entirely drained from the same in case the suction valve 25 leaks. In such a case water will pass from the U-shaped conduit through the suction opening 24 into the suction pipe leading downwardly therefrom, but all the water is prevented from flowing from the conduit as air will enter at the lowest portion thereof when the water level in the valve box falls to the bottom of the conduit. After all the water has run from the suction pipe, the water remaining in the arm 23 will flow back into the valve box leaving enough water in the passageway to establish flow when the pump is started up. The arm 23 may be of sufficient diameter to provide sufficient water for this purpose.

The reservoir 31 above described is provided for the purpose of holding priming water, which is a particularly advantageous feature in case the feed pipe extends downwardly from the opening 30. If the pump is started up when the water has run out of the suction pipe, air will be pumped into the valve box, but as above pointed out, there will be a certain amount of water in the U-shaped conduit. This water, mingled with air which is pumped from the suction pipe, will be forced through the discharge valve 14, the air passing through the opening 30, and into the air chamber 2, and the water passing into the priming reservoir 31 and subsequently passing backwardly into the valve box through the priming valve 10. The air is thus quickly expelled and flow established. By means of this arrangement the pump is enabled to establish flow promptly under all conditions, and the system is effectually prevented from becoming

air-bound. The vacuum chamber 28 provides a cushioning means to prevent water-hammer when the flow through the suction passage is checked as the plunger 9 descends.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described, and all statement of the scope of the invention which, as a matter of language, might be said to fall therebetween.

1. In a pump, in combination, a plunger, a suction chamber, a passageway extending between said plunger and said suction chamber, said passageway having the inner surface of its upper enclosing wall upwardly inclined without interruption from said plunger toward said suction chamber, said inclined surface extending from the plunger to the suction chamber and being free from pockets and arranged so as to prevent trapping of air in said passageway, said plunger having a pyramidal face for avoiding slapping when removed into contact with the water and being adapted to force any air into said passageway.

2. In a pump, in combination, a plunger, an air chamber, a U-shaped conduit having valves and a suction chamber in one of the arms thereof, one of said valves communicating with said air chamber, a discharge opening spaced above said last mentioned valve, a priming reservoir between said valve and opening, a priming valve adjacent said last mentioned valve, and a passageway between said plunger and suction chamber and having an upper wall with an upwardly inclined inner face extending from said plunger to said suction chamber whereby trapping of air is avoided.

3. In a pump, in combination, a plunger, a suction chamber, a passageway extending between said plunger and said suction chamber, said passageway being arranged to minimize accumulation of air therein, an air chamber, a U-shaped conduit having a valve therein communicating with said air chamber, a discharge opening spaced above said valve so as to provide a priming reservoir, and a cushioning chamber opening into said conduit for avoiding water-hammer.

4. In a pump, in combination, a suction chamber, means for preventing water from draining therefrom as when there is a leak from said suction chamber, a plunger, a passageway between said plunger and said suction chamber having an upper wall with a smooth interior surface extending the entire distance between said plunger and suction chamber and being upwardly inclined from the former toward the latter, whereby trapping of air is avoided, and a cushioning chamber communicating with said suction chamber for avoiding water-hammer.

5. In a pump, in combination, a plunger, an air chamber, a U-shaped conduit having valves and a suction chamber disposed in one of the arms thereof, one of said valves communicating with said air chamber, a discharge opening spaced above said last mentioned valve, a priming reservoir between said valve and opening, a priming valve adjacent said last mentioned valve having an automatically reciprocable stem extending into the port thereof and adapted to operate when the pump is running to avoid accumulations of foreign matter in said priming valve, and a passageway extending between said plunger and suction chamber and having an upper wall with a smooth inner surface upwardly inclined toward the suction chamber, whereby trapping of air is avoided.

6. In a pump, in combination, a suction chamber, means for preventing water draining therefrom, a priming reservoir for preventing the escape of the water in said chamber during the time the pump is establishing flow and prior to the time said water reaches the discharge opening from the pump, a plunger, a passageway between said plunger and said suction chamber having an upper wall with a smooth upwardly inclined surface whereby trapping of air is avoided, and a cushioning chamber opening into said conduit for avoiding water-hammer.

7. In a pump, in combination, a base and a reciprocable plunger mounted therein, a U-shaped conduit with one of the arms thereof included in said base, a suction chamber and valves positioned in said arm, the other arm of said conduit being secured to said base and upstanding at the side thereof and adapted for the attachment of a suction pipe to the upper part thereof, a passageway between said plunger and suction chamber having an upper wall with a smooth inner face inclining upwardly from said plunger to said suction chamber, an air chamber communicating with said suction chamber through one of said valves, a discharge opening leading from said air chamber and disposed above said last mentioned valve, a priming reservoir between said last mentioned valve and said discharge opening.

8. In a pump, in combination, a suction chamber, means for holding priming water

in the pump in case of a leak from said chamber, a priming reservoir for receiving said priming water when the pump is started and a priming valve having a reciprocable stem and positioned between said reservoir and said chamber.

9. In a pump, in combination, a valve deck, a discharge valve in said deck and a priming device having an opening, one end of said opening being opposite the discharge area of said discharge valve.

10. In a pump, in combination, a valve deck, a discharge valve in said deck, and a priming device extending from said deck and terminating approximately in the plane of discharge flow of said valve and having a priming opening therethrough.

11. In a pump, in combination, a cylinder, a priming reservoir located in said pump, a discharge valve positioned between said cylinder and said reservoir, a priming valve disposed between said reservoir and said cylinder and having a member automatically operable independently of said discharge valve to prevent accumulations of foreign matter in said priming valve.

12. In a pump, in combination, a cylinder, a priming reservoir located in said pump, a priming valve disposed between said reservoir and said cylinder and having an automatically operable reciprocating stem extending into the port of the priming valve and adapted to operate when the pump is running to prevent accumulations of foreign matter in said priming valve.

13. In a pump, in combination, a cylinder, an air chamber, and a movable priming valve between said cylinder and said chamber, said valve being provided with a slotted washer.

14. In a pump, in combination, a cylinder, an air chamber, and a priming valve between said cylinder and said air chamber, said valve being provided with a slotted washer and with a head having a slot therein.

15. In a pump, in combination, a cylinder, a priming reservoir located in said pump, a priming port disposed between said reservoir and said cylinder, an automatically reciprocating stem extending into said port and operating when the pump is running to prevent accumulations of foreign matter in said priming valve, a head for said stem to limit movement thereof away from said priming reservoir, and a passage-way in communication with said port to permit flow from said reservoir when said stem is in position limited by said head.

16. A priming valve for pumps having a port and a stem fitting loosely therein to provide a liquid passageway thereabout, said stem being automatically movable to prevent lodgment of foreign matter in said port.

17. A priming valve for pumps having a seat and a stem fitting loosely therein, a head on said stem and a slot in said head communicating with the interior of the valve seat.

18. A priming valve for pumps having a seat and a stem fitting loosely therein, a head on said stem and a slot in said head communicating with the interior of the valve seat, and a slotted washer on said stem.

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

SIDNEY S. SMITH.

Witnesses:

HENRY G. MEACHAM,

ROBERT M. HOLCOMB.