Feb. 8, 1927. 1,617,095

R. L. BACHER

PUMPING SYSTEM

Filed May 28, 1926 2 Sheets-Sheet 1

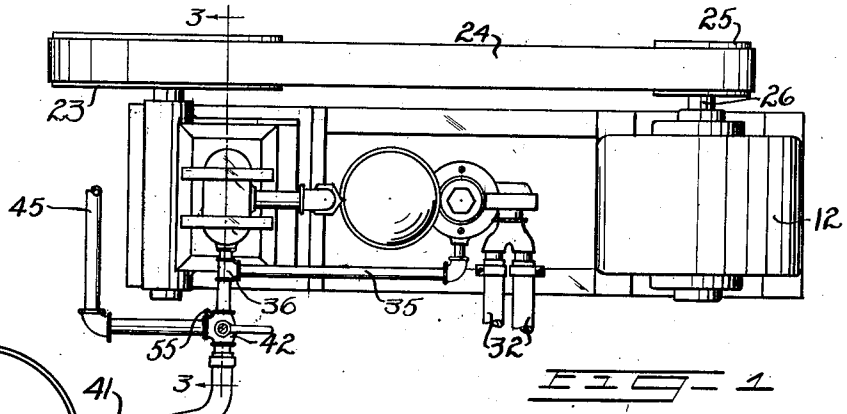


FIG. 1

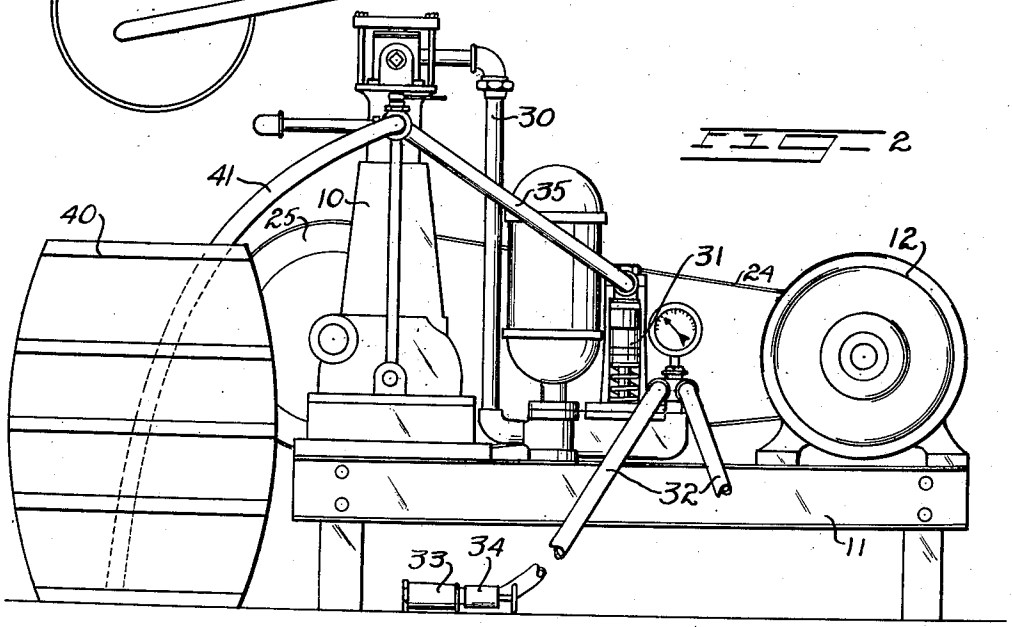


FIG. 2

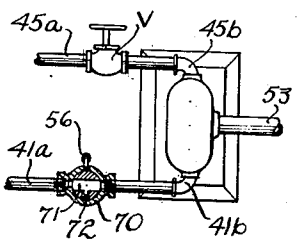


FIG. 7

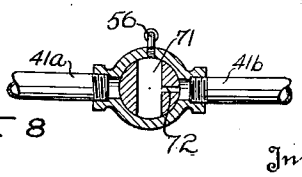


FIG. 8

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Feb. 8, 1927. 1,617,095

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PUMPING SYSTEM

Filed May 28, 1926 2 Sheets-Sheet 2

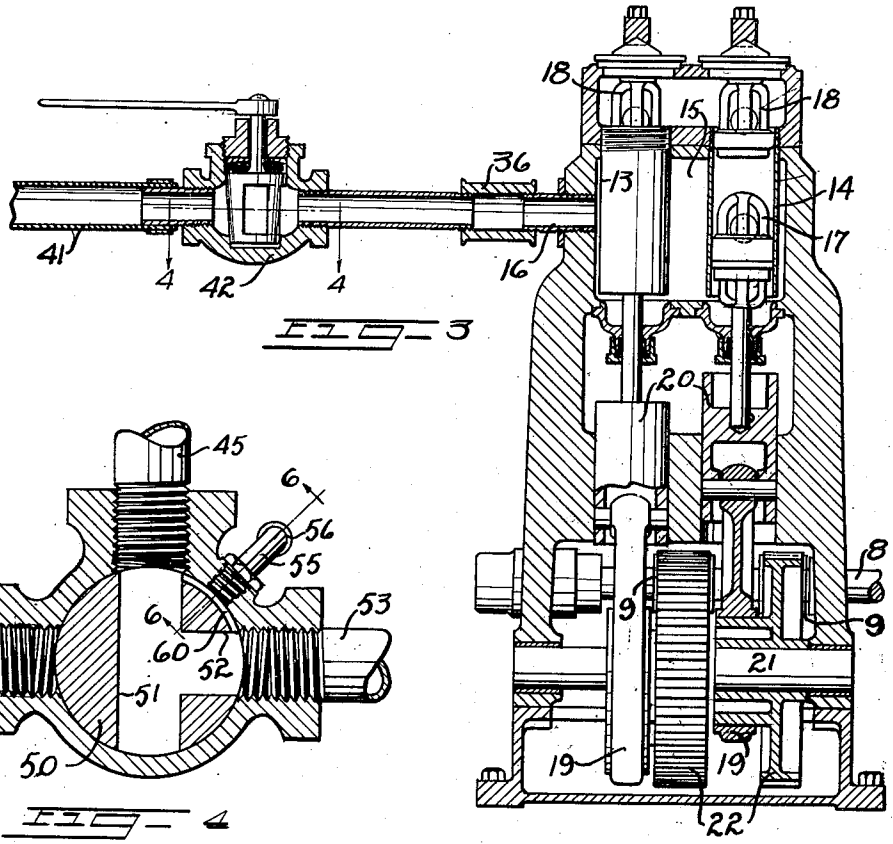


FIG. 3

FIG. 4

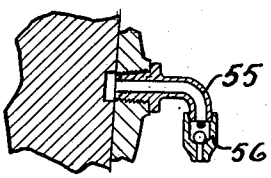


FIG. 6

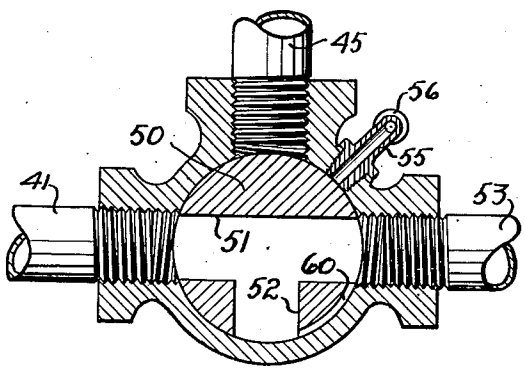


FIG. 5

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UNITED STATES PATENT OFFICE.

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PUMPING SYSTEM.

Application filed May 28, 1926. Serial No. 112 248.

One of the recent developments in connection with the washing of motor vehicles is to spray water under a pressure of 300 pounds per square inch upon the surface to be cleaned. By using water under high pressure the body of a vehicle may be cleaned without the use of a sponge or brush. In practice the part to be cleaned is first sprayed with a soap solution and is subsequently sprayed with clear water. The soap solution, as well as the clean water has heretofore been stored in a barrel, and a pump having inlets leading from the barrels has been utilized for raising the pressure to three hundred pounds per square inch. To obviate the necessity for employing a barrel to hold the clear water, it has been proposed to connect the inlet of the pump directly to the city water supply line which ordinarily operates at a pressure of about 70 pounds per square inch. The procedure then would be to use a soap solution from the barrel to remove mud and dirt, and then to close the conduit leading from the barrel and open the city water line, so that the difference in pressure between the inlet and discharge conduits of the pump may be materially decreased, and therefore the power employed to operate the pump may be diminished.

The use of clear water under city pressure in a pump which previously has been drawing water from atmospheric pressure has produced striking results. For example, the pressure on the city water line has dropped about to zero, as soon as the city water was allowed to enter the pump, and within a few seconds arose from zero to about one hundred and forty pounds per square inch. This sudden rise in pressure has not only been dangerous to the piping, but also has been so great that the pump casing has been bulged outwardly on the inlet side. An effort has been made to strengthen the casing but such efforts have not been successful in remedying the trouble. Moreover, it is impractical to replace pumps which are now in use in order to permit the use of water under city pressure with all pumps which are now being utilized for car washing purposes. Another expedient has been to place an air chamber between the city supply line and the pump, so as to provide a cushioning effect for the water hammer, which invariably follows the opening of the valve from the city water supply line, after the pump has been operated with water which is stored within a reservoir at atmospheric pressure.

The principal object of the present invention is to provide means for enabling the use of water under city pressure at the inlet side of the pump, in connection with the use of water under atmospheric pressure, and to permit the changing over from atmospheric to city water pressure without stopping the pump, and without obtaining dangerous variations in pressure. A further object is to provide a valve whereby the change over from one source of supply to another may be accomplished in an expeditious manner without changing the pump construction.

I accomplish the above objects by utilizing an air vent which opens automatically as soon as the low pressure source of supply is cut off. This vent may be disposed intermediate either source of pressure supply and the pump, and may be incorporated in the body of a three-way valve. In the preferred form the air vent has a small check valve which is normally closed by the water in the inlet line, but is adapted to be opened whenever the pump is operating and the low pressure supply is cut off. By using the vent I have been able to shut off the low pressure supply and then to turn on the high pressure supply without causing any appreciable variation in pressure supply line. A variation of five or ten pounds from the average pressure has been about the maximum variation which has occurred after the vent has been put into use.

My invention is shown in connection with a pump which is illustrated in Fig. 1 as a plan view, and in Fig. 2 as a side elevation, while Fig. 3 shows a section taken on a plane indicated by the line 3—3 in Fig. 1; Fig. 4 is a horizontal section through a three-way valve embodying my invention; Fig. 5 is a similar section showing a position of the valve different from that illustrated in Fig. 4, and Fig. 6 is a section taken on a plane indicated by the line 6—6 in Fig. 4. Fig. 7 is a detailed fragmentary view showing a different valve arrangement for controlling the admission of water from two separate lines to the pump. Fig. 8 is a transverse cross section through one of the valves.

The pump which I have illustrated in connection with my invention is indicated in general at 10 as mounted upon a table

11, and as being driven by a motor 12, which is also mounted upon the table. In Fig. 3 the pump is shown more in detail as embodying a piston type, wherein two cylinders 13 and 14 have a common inlet chamber 15. The intake to the chamber 15 is indicated at 16 as being above the bottom of the cylinder so that there is at all times a water seal above the open lower end of the cylinder. An inlet valve, such as that indicated at 17 is mounted on the top of each piston, while an outlet valve 18 is mounted adjacent the upper end of each cylinder. The pistons are arranged to be reciprocated within the respective cylinders by the motion of eccentrics 19 which are connected to the pistons through crossheads 20. The eccentrics are rigidly mounted upon a shaft 21, which carries gears 22. These gears may be rotated by pinions 9 on shaft 8, which carries a pulley wheel 23. This wheel may be driven by a belt 24 from a pulley 25 which is mounted upon the armature shaft 26 of the motor 12.

The discharge line from the pump indicated at 30 is shown as passing through a pressure regulating device 31, and then through a discharge conduit 32. Each conduit 32 is equipped with a spray nozzle 33 adjacent the end thereof and a valve 34 for controlling the operation of the nozzle. An overflow conduit 35 leads from the pressure regulating device and communicates with the inlet pipe 16 through a T connection 36.

The pump has a low pressure source of supply and a high pressure source of supply; the low pressure embodying a reservoir which is shown as a barrel 40 into which soapy water is stored after it has been prepared to the proper degree. A supply conduit 41 leads from the barrel and communicates with the intake conduit 16 through the three-way valve 42. The high pressure source of supply enters the valve 42 through a conduit 45. The valve is shown more in detail in Figs. 4 and 5, and illustrates two positions of the valve member with reference to the valve body. For example, in Fig. 4, the valve is shown in such position that the pump is in communication with the city pressure line, while in Fig. 5, it is turned to place the pump in communication with the reservoir 40. While the pump is drawing water from the reservoir, the city pressure line is shut off, and while it is drawing from the city pressure line the reservoir is shut off.

When the pump is operated, the procedure for supplying water to the pump is as follows:—The valve member 50 is turned to the position shown in Fig. 5, wherein soapy water from the reservoir 40 flows through conduit 41, then through the passageway 51, and thence through conduit 53 and connections between the valve, and the pump into the inlet chamber 15. The soapy water under pressure of about 300 pounds per square inch will satisfactorily remove the surface dirt without necessitating the use of a sponge or brush. After the surface has been cleaned, then it is sprayed with clear water. This is accomplished by turning the valve member 50 to bring one end of the passageway 51 opposite the conduit 45, and to bring the cross passageway 52 opposite the connection 53, which communicates with the inlet conduit 16. This position is shown in Fig. 4.

Heretofore, upon cutting off the reservoir connection and turning on the pressure connection there has been a serious water hammer, and dangerous variations in pressure on the inlet side of the pump. I do not know the reason for such variations, but I believe they are due to the fact that as soon as the reservoir supply line is shut off, the continuous operation of the pump creates a partial vacuum in the chamber 15 and that this partial vacuum allows the city water to gain considerable momentum by the time it reaches the inlet chamber to the pump. This phenomenon is also apparent if an air chamber is interposed between the valve 42 and the pump. The only reason which I can advance for this is that the chamber is rarefied between the time in which the reservoir is connected to the pump, and the time in which the pressure line is connected to the pump, and that as soon as the pressure line is open, the city water is allowed greater freedom to increase in momentum during the course of travel to the pump.

To overcome the objection resulting from excessive variation in pressure when the pump supply is changed from a low to a high pressure source, I provide an air vent communicable with the suction chamber of the pump and a valve for each source of supply to the pump. This vent in the preferred form is shown as an L-shaped pipe 55 which is in threaded engagement with the body of the valve 42, so that the interior of the pipe communicates with the interior of the valve body. The outer end of the pipe is turned downwardly and is provided with a check valve which is preferably a ball check indicated at 56. The check valve is normally maintained closed by the weight of liquid which may be in the pipe, but is adapted to be opened whenever partial vacuum is created in the inlet conduit 16 and whenever the source of supply from the reservoir is cut off. To accomplish this I provide a groove 60 which connects one end of the passageway 51 with the passageway 52 in the valve member 50. This groove is located in line with the interior of the pipe 55 so as to place the interior of the pipe in communication with the interior of the valve member when the member is in a

predetermined position with reference to the valve body.

By placing the vent between the high pressure source of supply and the pump and by employing the peripheral groove 60, then I am assured of sufficient air within the chamber 15 to cushion the force of a blow which may result from a sudden opening of the valve to admit the entrance of water under city pressure. As soon as water under the higher pressure enters the valve, then the check valve 56 will be automatically closed. A particular advantage of the use of my invention is the fact that water under city pressure may be directly connected to the inlet side of the pump, and thereby a material saving in the power required to operate the pump may be effected.

In Fig. 7, I have shown the intake line for water under city pressure at 45ª communicating through an ordinary globe valve V to an inlet conduit 45ᵇ leading to the suction chamber of the pump. The line 41ª is adapted to lead from the reservoir 40 and has a shut off valve 70 the outlet of which communicates with the suction chamber through a conduit 41ᵇ. The arrangement is such that the admission of air under atmospheric pressure to the suction chamber is had whenever the line 41ª is cut off. For effecting this, the plug of the valve 70 has a cross passage 71 and a small opening 72, the passage communicating between the conduit 41ª and 41ᵇ when in the position shown in Fig. 7 while the opening 72 is inactive. However when the valve 70 is operated to close the line 41ª as shown in Fig. 8 an air vent or vacuum breaker 56 is opened to communication with the suction chamber of the pump by reason of the passageway 71, aligning with such vent and the opening 72 with the conduit 41ᵇ.

The modified construction has an advantage namely that the valve 70 is cheaper than the three-way valve such as shown in Fig. 4, and since some form of valve is always present in plumbing systems, the globe valve shown need not be supplied by the manufacturer when installing the system in the form shown in Fig. 7, resulting in a saving in the installation cost.

I claim:

1. In a pumping system, a pump having a suction chamber, a conduit for leading water thereto under pressure, a valve in said conduit, and means in communication with the chamber adapted to prevent the formation of a vacuum therein when the valve is closed.

2. In a pumping system, a pump having a suction chamber, a conduit for leading water thereto under pressure, a shut-off valve in said conduit, a passageway in communication with the chamber and leading to the external atmosphere, and a check valve controlling said passageway, whereby a vacuum in the suction chamber is prevented during the time said shut-off valve is closed.

3. In a pumping system, a pump having a suction chamber, a high pressure line and a low pressure line leading thereto, valve means for closing both said lines, and means operable only when the low pressure line is shut off and capable of preventing a vacuum in such suction chamber.

4. In combination, a pump, means for operating it, two independent sources of supply for the pump, one being at a higher pressure than the other, and an air vent between the higher pressure source of supply and the pump.

5. In combination, a pump having a suction chamber, a high pressure line and a low pressure line communicating therewith, valve means for opening and closing both of said lines, and a vacuum breaker valve arranged to be placed in communication with the chamber when the valve means is operated to close the low pressure line.

6. In combination with a motor driven pump having a suction chamber, a plurality of feed lines communicating with the same under different pressures, means for opening and closing such lines, and a vacuum breaker arranged to communicate with the suction chamber when a high pressure line is opened and a low pressure line closed and to be prevented from such communication when a reverse condition obtains.

7. In combination, a pump, two independent sources of supply therefor, one being at a higher pressure than the other, an air vent between the higher pressure source of supply and the pump, and means for automatically opening the vent when the low pressure source of supply is shut off.

8. In combination with a motor driven pump having a suction chamber, a plurality of lines communicating with the same under different pressures, means for opening and closing such lines, and a vacuum breaker arranged to be automatically placed in communication with the suction chamber when a high pressure line is opened and a low pressure line closed, and to be automatically thrown out of such communication when a reverse condition obtains.

9. In combination, a pump, an inlet conduit therefor, a three-way valve connected to said conduit, two independent sources of supply connected to said valve, and an air vent associated with the valve.

10. In combination, a pump, a three-way valve connected to the supply side of the pump, two independent sources of supply connected to said valve and a common conduit leading from the valve to the pump for conducting fluid from either source of supply to said pump, and an air vent associated with the valve, the air vent being

adapted to be opened while the pump is operating and while the valve is being turned to shut off one source of supply and to turn on the other source of supply.

11. In combination, a pump, two sources of supply therefor, one being at atmospheric pressure, and the other being at a pressure higher than atmospheric pressure, a common inlet conduit for said sources of supply, means for shutting off either source of supply, and means for venting the pump when one source of supply is shut off.

12. In combination, a pump, two sources of supply therefor, one being at atmospheric pressure, and the other being at a pressure higher than atmospheric pressure, means for shutting off one source of supply when the other is turned on, a common inlet conduit for said sources of supply, and an air vent associated with the inlet, said vent being automatically opened when said means is operated to shut off one source of supply and to turn on the other.

13. In combination, a pump, two sources of supply therefor, one of said sources of supply being at atmospheric pressure and the other being at higher than atmospheric pressure, said sources of supply being joined together and having a common conduit leading to the pump, a three-way valve at the junction of said sources of supply, and an air vent associated with the common inlet conduit, said vent being adapted to be opened automatically while the pump is operating and while the valve is being actuated to cut off the atmospheric source of supply and to turn on the pressure source of supply.

14. In combination, a pump, two sources of supply therefor, one being at atmospheric and the other at a higher pressure, a three-way valve, a conduit leading from each source of supply to said valve, a third conduit leading from the valve to the pump, the valve being so arranged that only one source of supply can be connected at one time to the pump, an air vent associated with the valve, said valve being normally closed when the atmospheric pressure source of supply is in communication with the pump, but adapted to be opened automatically while the valve is being operated to shut off the atmospheric source of supply and to turn on the high pressure source of supply.

15. In a pumping system, a pump having a suction chamber, a conduit for leading water thereto under pressure, a shut off valve in said conduit, another conduit for leading water thereto under lower pressure, a valve in the latter conduit and means associated with said latter valve whereby when the lower pressure conduit is shut off the suction chamber is open to communication with the external atmosphere.

16. In a pumping system, a pump having a suction chamber, a conduit for leading water thereto under atmospheric pressure, a conduit for leading water thereto under higher than atmospheric pressure, valves for each of the conduits, and an air vent associated with the valve for the atmospheric pressure conduit, and means whereby closing this latter valve places the suction chamber into communication with said vent.

In testimony whereof, I hereunto affix my signature.

ROLLIN L. BACHER