

Dec. 20, 1927.

1,653,167

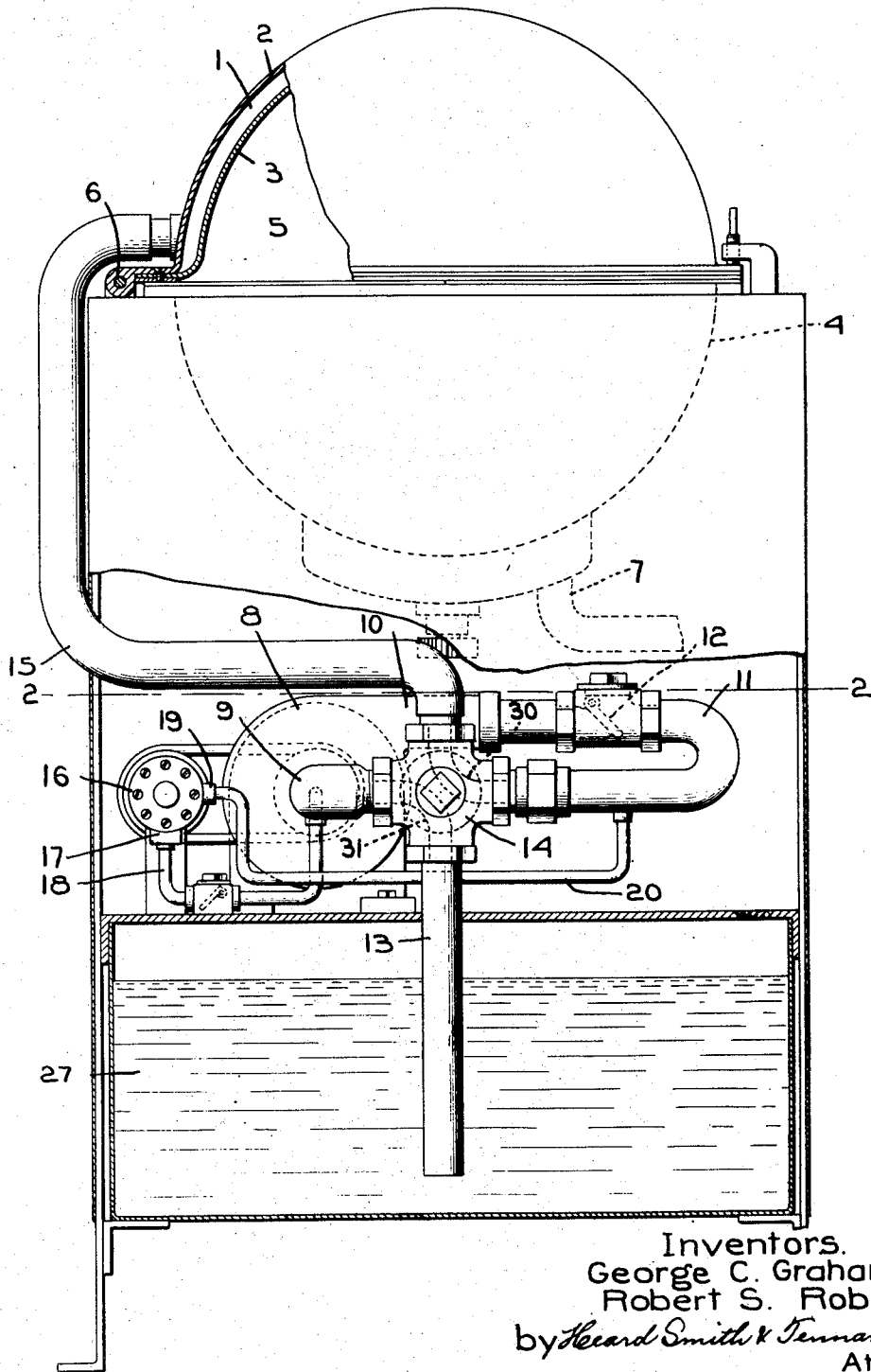
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PUMP INSTALLATION

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2 Sheets-Sheet 1

Fig. 1.



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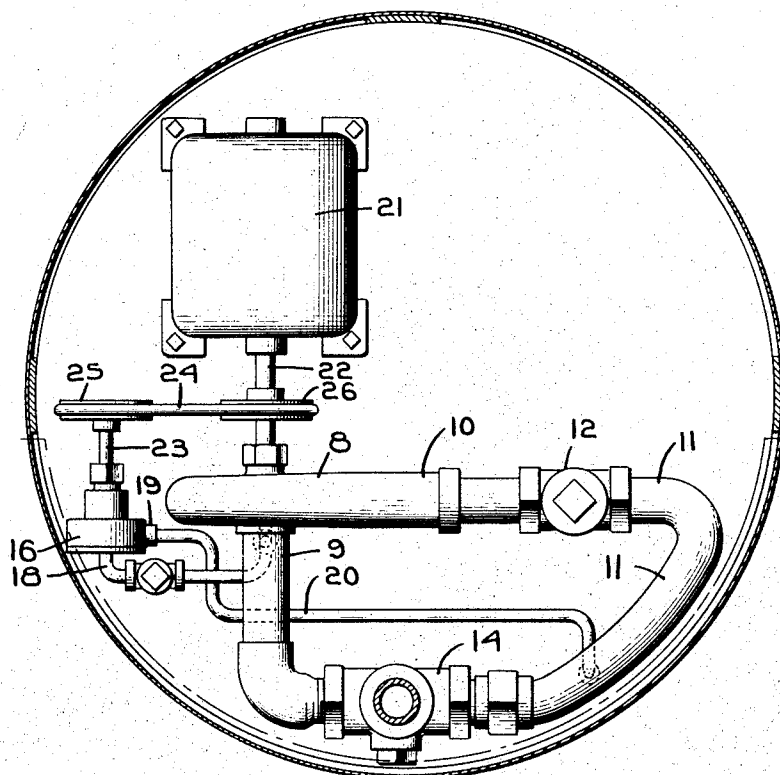
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Fig. 2.



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UNITED STATES PATENT OFFICE.

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PUMP INSTALLATION.

Application filed February 20, 1926. Serial No. 89,561.

This invention relates to a pump installation for use where it is desired to fill a chamber rapidly with a fluid and then to build up a relatively high pressure in said chamber, and the general object of the invention is to provide a pump installation capable of accomplishing this end with a minimum expenditure of energy.

In pump installations of this general type it has heretofore been proposed to employ a large-volume low-pressure pump for filling the chamber and then to employ a small-volume high-pressure pump for building up the pressure in the chamber. A pump installation embodying my invention is of this general type. The large-volume low-pressure pump which we preferably employ is of the centrifugal pump type, this pump having the advantage that it is very efficient in delivering a large volume at a low pressure. The high-pressure small-volume pump may be of any desired type. That herein shown is a gear pump.

The actuating mechanism for both pumps is constructed so that the pumps operate simultaneously. The low-pressure large-volume pump is connected to the chamber to be filled and also to a source of supply and when the pumps are operated said large-volume pump will rapidly fill the chamber. The inlet and outlet connections of the small-volume high-pressure pump are such that while the pumps are operating said high-pressure pump is also pumping water into the chamber although in small volumes. When the pressure in the chamber reaches the limit capable of being developed by the low-pressure pump then said pump will simply slip without moving any water and without forcing any water into the chamber. The high-pressure pump however, continues to deliver water into the chamber and begins to build up the desired pressure therein. A check valve is employed which is situated to prevent the water flowing back through the low-pressure pump when the high-pressure pump is operating to build up the pressure. During the continued operation of the two pumps after the low-pressure pump ceases to deliver water the high-pressure pump is the only one which is effective in forcing water into the chamber; the low-pressure pump simply slipping without doing any work.

The device is entirely automatic in that

when the limit of pressure capable of being developed by the low-pressure pump is reached the shift to the action of high-pressure pump is accomplished without requiring any attention on the part of the operator.

Another advantage of the construction herein shown is that the high-pressure pump acts as a means for priming the low-pressure pump when the pump installation is started in case said low-pressure pump requires to be primed before it will begin to operate.

This invention is capable of use for a variety of purposes wherever it is desired to fill a chamber quickly with fluid and then build up a pressure in the chamber, and merely as illustrating one practical use for the invention we have shown it herein as it might be applied in connection with a washing machine of the type shown in United States Patent No. 1,547,266, dated June 26, 1925, and granted to Robert S. Robe. We wish it distinctly understood, however, that the invention is not limited to any particular use and, therefore, may be used for other purposes than that herein illustrated.

In the drawings, Fig. 1 is a view partly broken out of a washing machine such as illustrated in said above-mentioned Patent No. 1,547,266;

Fig. 2 is a section on the line 2-2, Fig. 1. In the washing machine herein shown the chamber which is to be filled with fluid and in which pressure is to be built up is indicated at 1. This chamber is constituted by the space between the cover 2 of a washing machine and a flexible diaphragm 3 which is secured to the cover at the periphery thereof. The washing machine comprises a tub or bowl 4 having within it the chamber 5 in which the clothes are to be washed and the cover 2 is hinged to the bowl, as shown at 6. The tub or receptacle 4 is provided with a discharge pipe 7 through which the wash water is drained from the receptacle.

The diaphragm 3 and expansible chamber 1 are used partly to subject the clothes in the chamber 5 to pressure when the water has been withdrawn and thereby to squeeze the clothes to a semi-dried condition and this is done by pumping water or other fluid under pressure into the chamber 1 thereby forcing the diaphragm 3 down against the clothes under a relatively high pressure. The movement of the diaphragm 3 may also be used to introduce washing or rinsing

water into the chamber 5 and this is accomplished as described in the above-mentioned Patent No. 1,547,266, by placing the end of the discharge pipe 7 (which is a flexible pipe) into a tub or receptacle containing the washing water and after first pumping the water into the chamber 1 to force the diaphragm 3 down and contract the clothes-receiving compartment, then pumping the water or fluid out of the chamber 1 so as to raise the diaphragm 3 by suction, this operation expanding the clothes-receiving chamber 5 and sucking the water into it.

The pump installation embodying the present invention may be used for either pumping water or other fluid into the chamber 1 and for pumping the fluid out of said chamber 1.

The above reference to the use of the pump installation in filling or emptying the chamber 1, is however, merely for illustrative purposes as it will be understood that this pump installation is equally well adapted for filling other chambers than the chamber 1 of the above-described washing machine.

When the device is to be operated it is desirable to fill the chamber (which, in the drawing, is the chamber 1) as quickly as possible and when the chamber is full it is then desirable to build up the pressure in the chamber at a moderate rate. The pump herein shown for accomplishing this comprises a low-pressure large-volume pump 8 which is preferably in the nature of a centrifugal pump it having the central inlet 9 and the tangential discharge 10. This discharge has a delivery pipe 11 connected thereto.

13 indicates a supply pipe through which liquid or other fluid is delivered to the pump and said supply pipe may extend to any suitable source of supply. In the construction herein shown said supply pipe leads into a tank 27 containing fluid and which it is desired to pump into the chamber 1.

The present invention is also illustrated as having a four-way valve 14 in the piping system by which either the inlet 9 or the delivery pipe 10 of the pump may be connected to the chamber 1. As shown in Fig. 1 the valve is set so that the supply pipe 13 communicates with the inlet 9 and the delivery pipe 11 communicates with a pipe 15 leading to the chamber 1.

The four-way valve 14 is of the usual plug type arranged so that by giving it a quarter turn the direction of flow will be reversed.

The high-pressure small-volume pump is indicated at 16 and while it may be of any approved type we have herein illustrated a gear pump. The inlet 17 of the pump is connected by a pipe 18 to the pump 8 or its connections and the discharge 19 of the

high-pressure pump 16 has a pipe 20 connected thereto through which water is pumped into the chamber 1 to be filled. A check valve is employed to prevent a back or reverse flow of water through the low-pressure pump 8 while the pressure is being built up in the chamber 1. This check valve may be located at any desirable point so long as it accomplishes this purpose. In the illustrated embodiment of the invention a check valve 12 is shown situated in the delivery pipe 11 and the inlet connection 18 to the high-pressure pump is located on the inlet side of the check valve 12 while the discharge 19 of the high-pressure pump leads to a point on the discharge side of said check valve. Both pumps are connected to a motor device in such a way that they are both operating simultaneously whenever the motor is in operation. The motor is indicated at 21 and it may be an electric motor or any other type.

As herein shown the motor shaft 22 is connected directly to the runner of the centrifugal pump 8. The shaft 23 of the gear pump is belted to the motor shaft 22 by means of a suitable belt 24 and pulleys 25, 26. Therefore, when the motor 21 is operated both pumps will be in operation.

The operation of the device is as follows. Whenever it is desired to fill the chamber 1 the four-way valve will be turned into the position shown in Fig. 1 so that its port 30 will connect the pipes 11 and 15 and the port 31 will connect the inlet pipe 13 to the inlet of the low-pressure pump, and the motor will then be started thus operating both pumps.

The large-volume low-pressure pump 8 will operate to deliver water rapidly from the source of supply (which in this instance is a tank 27 in the base of the washing machine and into which the supply pipe 13 extends) to the delivery pipe 11 and from thence through the pipe 15 to the chamber 1. During this time the high-pressure pump is also operating to take water from the inlet of the low-pressure pump and deliver it into the discharge pipe 11 and thus the chamber 1 is being filled through the operation of both pumps.

The centrifugal pump 8 will operate efficiently for delivering relatively large volumes of water or other fluid under low pressure and when the chamber 1 has been filled and the pressure therein rises to the maximum which the pump 8 will deliver then the runner of said pump 8 will simply slip or turn around in the water and as soon as this occurs the power required to operate the runner is very much reduced over that which is required where the runner is delivering the water. The high-pressure small-volume pump 16, which has been operating all the time that the low-pressure

pump 8 is operating, continues to deliver water to the delivery pipe 11 after the pump 8 ceases to deliver water and as the high-pressure pump 16 delivers on the discharge side of the check valve 12 said pump 16 will be effective in building up a pressure in the pipe and in the chamber 1, the check valve 12 preventing water from flowing back through the pump 8 due to the higher pressure developed by the high-pressure pump 16. Although the runner of the low-pressure pump is rotating while the high-pressure pump is building up the pressure yet inasmuch as said runner is merely churning around in the water without delivering any water the power which is used in rotating the runner of the pump 8 is relatively small.

This pump installation is entirely automatic in its operation, both pumps operating during the filling of the chamber 1 and until a pressure has been built up therein equal to that which the pump 8 will deliver, at which time the pump 8 automatically ceases to function as a pump while the high-pressure pump 16 continues in operation to build up the desired pressure.

By reversing the valve 14 this pump may be also used for emptying the water from the chamber 1.

A centrifugal pump has the characteristic that it must be primed before it will function and the arrangement herein illustrated is such that the high-pressure pump 16 operates automatically to prime the low-pressure pump 8 in case said priming action is needed. If, for instance, when the motor is started the water has drained out of the pump 8 so that it requires to be primed then the high-pressure pump will operate to exhaust the air from the low-pressure pump and suck water into said pump, this resulting from the fact that the inlet of the high-pressure pump is connected to the low-pressure pump so that the high-pressure pump is supplied from the low-pressure pump. As soon as the pump 8 becomes properly primed then it will begin to function to move water as will be readily understood.

With the present invention, therefore, the high-pressure pump not only serves to build up the desirable high pressure in the chamber 1 but it also acts to automatically prime the low-pressure pump in case said priming action is necessary.

In some installations the low-pressure pump may be situated in a location where it will be constantly maintained in a primed condition. This would occur in case said pump is located in the tank 27 or below the level of the source of supply.

While for the purpose of illustration we have shown the invention as applied to a washing machine yet we desire it to be understood that the reference to the washing machine is simply for illustrative purposes

and that the invention is equally applicable for use in connection with other machines and wherever it is desired to pump water rapidly into the chamber and then to build up a pressure in the chamber.

Furthermore, while a four-way valve 14 is shown for convenience in connection with the washing machine yet under some circumstances this four-way valve may not be necessary.

We claim:

1. In a pump, the combination with a chamber to be filled in which it is desired to build up a relatively high pressure, of a large-volume low-pressure pump having its outlet connected to said chamber and its inlet connected to a source of water supply, a check valve between the outlet of the pump and said chamber, a small volume high-pressure pump adapted to take water from said source of supply and having its outlet leading to the discharge side of said check valve, and means connecting said pumps for simultaneous operation.

2. In a pump installation, the combination with a chamber to be filled in which it is desired to build up a relatively high pressure, of a large-volume low-pressure pump having an inlet connected to a source of supply, a delivery pipe connecting the outlet of said pump to said chamber, a check valve in said delivery pipe, a small-volume high-pressure pump having its inlet connected to the inlet of the low-pressure pump and its outlet connected to the delivery pipe on the discharge side of the check valve, and pump-operating means connected to both pumps for operating them simultaneously.

3. In a pump installation, the combination with a chamber to be filled, of a large-volume low-pressure pump, a delivery pipe connecting the outlet of said pump to said chamber, a check valve in said delivery pipe, a small-volume high-pressure pump having its outlet connected to the delivery pipe on the discharge side of the check valve, and its inlet in communication with the low-pressure pump, and means for operating said pumps simultaneously, whereby the high-pressure pump functions both to prime the low-pressure pump and to build up a pressure in the chamber beyond that capable of being produced by the low-pressure pump.

4. In a pump, the combination with a chamber to be filled in which it is desired to build up a relatively high pressure, of a large-volume low-pressure pump having its outlet connected to said chamber and its inlet connected to a source of water supply, a small-volume high-pressure pump for building up a high pressure in said chamber, means for operating said pumps simultaneously, said pumps being so connected that the high-pressure pump may be used for priming the low-pressure pump, and a check

valve to prevent water flowing back through the low-pressure pump when the relatively high pressure is being built up in said chamber.

- 5 5. In a pump, the combination with a chamber to be filled in which it is desired to build up a relatively high pressure, of a centrifugal pump having an inlet connected to a source of supply and its outlet connected to said chamber, a check valve between the
10 outlet of the pump and said chamber, a small-volume high-pressure pump having its inlet connected to the inlet of the centrifu-

gal pump and its outlet connected to the delivery pipe on the discharge side of said check valve, and pump-operating means connected to both pumps for operating them simultaneously, whereby the high-pressure pump functions both to prime the centrifugal pump and to build up a pressure in the chamber beyond that capable of being produced by the centrifugal pump. 15 20

In testimony whereof, we have signed our names to this specification.

GEORGE C. GRAHAM.
ROBERT S. ROBE.