

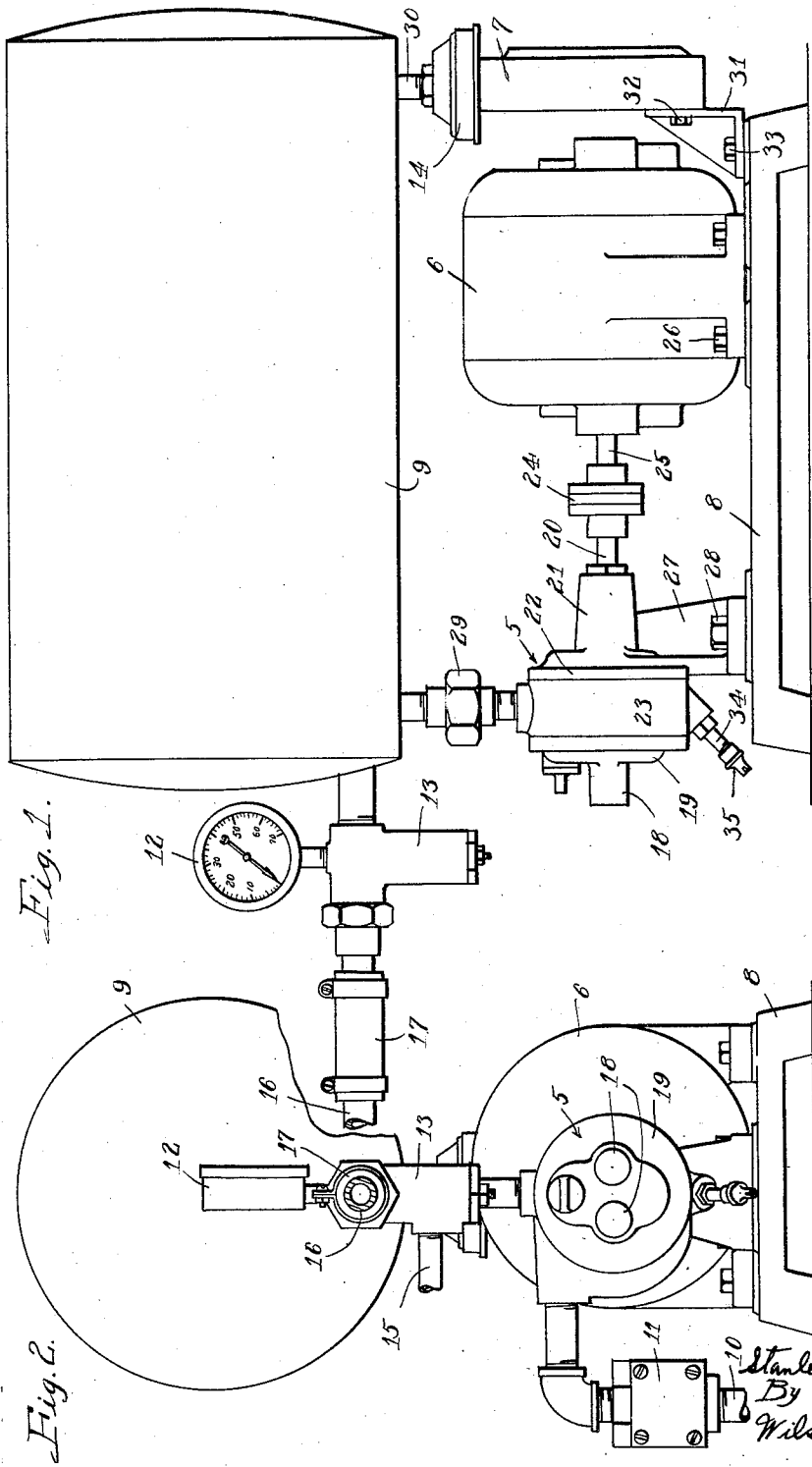
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S. H. HOBSON

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WATER SYSTEM PUMPING APPARATUS

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Inventor:
Stanley H. Hobson
By
Wilson + McCanna
Attys.

UNITED STATES PATENT OFFICE

STANLEY H. HOBSON, OF ROCKFORD, ILLINOIS, ASSIGNOR TO GEO. D. ROPER CORPORATION, OF ROCKFORD, ILLINOIS, A CORPORATION OF ILLINOIS

WATER-SYSTEM PUMPING APPARATUS

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This invention relates to a pumping apparatus primarily designed for domestic water system installations, and still more particularly those having shallow driven walls, or dug wells, cisterns, etc.

Water systems as heretofore installed had a greatly diversified arrangement of the pump, storage tank, check valves, etc., and correspondingly different spaced relationships of said elements, and it was accordingly extremely difficult, if not impossible, for the manufacturer's engineering department or dealer to diagnose and remedy troubles arising in service; every installation had its own peculiarities. Furthermore, certain arrangements gave rise to complaints from the customer on account of the excessive water hammer action for which the pump or other accessories could not be held responsible, not to mention such other difficulties as air trapping or the failure of the pump to keep primed, all of which meant a great deal of vexation and expense to the manufacturer or dealer. It is, therefore, the principal object of my invention to avoid these difficulties by providing a self-contained pumping apparatus, namely, a unit wherein the pump, motor for driving the same, storage tank, automatic pressure regulator, and such other accessories as a safety relief valve, pressure gauge, and combination strainer and check valve, are all assembled together as a compact whole, to the end that all that is necessary in the installation of the apparatus is to connect the supply and service pipes therewith. This standardizes water systems and eliminates all of the otherwise mysterious service troubles so that the manufacturer or dealer can give intelligent advice to remedy any trouble that might arise and is not put to a needless and endless amount of trouble and expense.

Another important object of my invention is to mount the storage tank directly on top of the pump without a check valve such as is otherwise ordinarily provided therebetween, and provide a check valve, or more specifically, a combination strainer and check valve, on the suction side of the pump. This arrangement has the advantages of keeping the pump primed and also eliminating water

hammer action and preventing air trapping, as will hereinafter appear.

Other objects are:

1. To utilize the pump as a support for the storage tank on the base whereon the rest of the apparatus is mounted, thus simplifying assembling and cheapening the construction.

2. To utilize the casing of the automatic pressure regulator as another support for the storage tank on the base, thus further simplifying assembling and lowering cost.

3. The provision of an air supply valve on the suction side of the pump and directly below and between the pumping gears for the purpose of introducing air with the water drawn whenever the air in the storage tank is found to need replenishing.

4. Mounting the electric motor for driving the pump on the base between the pump and the pressure regulator beneath the storage tank with an ordinary flexible coupling connection to the pump, thus further simplifying assembling, making for greater compactness, as well as eliminating the troubles incident to belt drives.

5. To provide a flexible hose connection between the apparatus and the service pipe so that very little noise is apt to be transmitted to the piping system and it is much easier to complete the connection between the service pipe and the apparatus at the time of installation.

The foregoing and other objects of my invention will appear in the course of the following detailed description wherein reference is made to the accompanying drawing in which—

Figure 1 is a side view of a water system pumping apparatus made in accordance with my invention; and

Fig. 2 is an end view.

The same reference numerals are applied to corresponding parts in the two views.

The present apparatus, as may be gathered from the foregoing, is complete in itself, being arranged to be electrically driven and automatically controlled, and arranged to start and stop of itself. It is primarily designed and intended for domestic use to furnish water under pressure to all faucets to cor-

respond to city water service, running water being supplied to the kitchen sink, bathroom, and laundry as well as to places outside the house as, for example, stock tanks, etc., in farm installations. The particular pump utilized in this apparatus adapts the same to use for shallow driven well installations where the depth does not exceed say, twenty feet, or dug wells, cisterns, etc. The apparatus, briefly stated, comprises a pump 5, electric motor 6 for driving the same, and an automatic pressure regulator 7, all mounted on a base 8 together with a storage tank 9. Water from the well or cistern is drawn by the pump through a supply pipe 10 and combination strainer and check valve 11 and stored in the tank 9 under a pressure of from say, twenty pounds to thirty five pounds per square inch, the pressure being indicated by a gauge 12 mounted preferably directly on a safety relief valve 13. The pressure regulator 7 is of a standard well known type having a diaphragm in the casing 14 thereon arranged to complete the circuit for the motor 6 when the pressure in the tank, by reason of water having been drawn therefrom, has dropped to, say, twenty pounds per square inch, and also arranged to break the circuit when, by reason of operation of the pump and replacement of the water supply in the storage tank, the pressure therein has been raised to, say, 35 pounds per square inch, it being understood that a head space for trapped air is left in the tank to permit pressure to be built up therein in the manner described. The relief valve 13 has a waste pipe 15 leading to any suitable waste receptacle to allow water to be exhausted from the tank if, for any reason, the pressure therein builds up beyond a certain predetermined point for which the valve 13 is set, that happening, for example, in case the pressure regulator 7 fails, for any reason, to function properly. The valve 13 will, of course, be set to open at a pressure appreciably higher than that at which the regulator 7 is arranged to break the circuit for the motor. The reason for this is thought to be self evident. Water is supplied to the service pipe 16 from the storage tank 9 through a rubber hose connection 17. This much description will suffice to give a general understanding of the pumping apparatus and to make it evident that the same is entirely self-contained, it being a very simple matter to install the same in a domestic water system inasmuch as it is only necessary to connect therewith the supply and service pipes 10 and 16, respectively. The flexible rubber hose connection 17, it should also be evident, prevents vibration and humming incident to the operation of the pump and motor from being transmitted to the service pipe 16 and thence to the piping system. It is also of considerable advantage to use a hose connection since it might other-

wise be hard to make a threaded connection, as, for example, by means of a union, due to slight misalignment of the service pipe. I shall now proceed to a description of the various novel features of construction and arrangement incorporated in the apparatus and call particular attention to the advantages in the matters of simplicity in operation, low initial cost, low operating cost and freedom from break-downs and the incidental expenses and annoyances.

The pump 5 forms the subject matter of another application, Serial No. 300,666, filed August 20, 1928, and it will, therefore suffice for the present purposes merely to state that it is of the rotary gear type having preferably a pair of spiral cut bronze gears pressed onto hardened and ground steel shafts received in the bearings 18 on the face plate 19, the driven shaft 20 of the pair being extended through a bearing 21 on the other face plate 22. The two face plates 19 and 22 are bolted rigidly to a cast iron housing 23 in which the spiral pumping gears are disposed. The shaft 20 has a flexible coupling 24 for connection with the armature shaft 25 of the motor 6. The latter is bolted onto the base 8, as indicated at 26. The pump 5 has a supporting bracket 27 formed preferably integral with the face plate 22 and bolted to the base 8, as at 28. It is believed to be evident that the coupling 24, aside from providing a direct connection between the pump 5 and motor 6, thereby avoiding use of a belt and the troubles going with that kind of operation, takes care of any slight misalignment of the pump with respect to the motor and makes for smooth and quiet operation. The pump 5, it will now be observed, has the storage tank 9 directly connected therewith as by a union 29, the tank being thereby supported at one end on the pump and directly above the same. The check valve ordinarily provided in the discharge line between the pump and the storage tank is eliminated and the combination strainer and check valve 11 takes the place of a strainer and foot valve otherwise provided. Considering for a moment just the combination strainer and check valve 11, pump 5, and storage tank 9, it will be evident that the tank 9 being disposed directly above the pump serves as an air chamber for the pump to take the shock in the discharge line going with the operation of the pump; the water hammer action so common to many systems, especially where the tank is located at an appreciable distance away from the pump, is avoided. A saving is realized, furthermore, by using the pressure tank as an air chamber inasmuch as it was formerly necessary to provide a separate air chamber for the pump. The location of the tank directly above the pump produces still other savings by reason of the elimination of piping, elbows, etc., not to men-

tion the fact that the check valve on the discharge line otherwise necessitated is dispensed with. The location of the tank directly above the pump also positively prevents air trapping since any air accumulating in the pump casing around the pumping gears has easy escape into the storage tank and, of course, tends naturally to rise from the pump into the tank. In water systems provided in the past, where a foot valve was used on the suction side of the pump located at a considerable depth below the pump, there was always more or less likelihood of the pump going dry. For example, a very slight leak in the suction line would frequently result in a drainage of the water from above the foot valve and the pump would not remain primed. In the present apparatus, the use of the combination strainer and check valve 11 right next to the pump and connected with a high point of its casing avoids any possibility of the pump going dry. Briefly stated, then, my novel arrangement of the storage tank directly above the pump and using a check valve on the suction side of the pump has the advantages of eliminating a check valve and separate air chamber in the discharge line, keeps the pump primed, prevents air trapping and also eliminates water hammer action.

The one end of the storage tank 9, as just described, is supported by the pump 5 through the medium of the bracket 27. I have also seen fit to utilize another element 35 of the pumping apparatus to support the other end of the tank on the base, this being the automatic pressure regulator 7 which has a pipe connection with the tank 9, as at 30, the pipe 30 communicating with the diaphragm casing 14 of the regulator. It will be observed that a bracket 31 bolted to the side of the casing of the regulator 7, as at 32, bolts to the base 8, as shown at 33. Thus, a separate post or other medium of support for the tank on the base is eliminated and the assembling of the apparatus is simplified and an all-around saving in cost realized.

There should normally be the equivalent of approximately one third of the capacity of the tank occupied by air, it being contemplated that the tank will be two-thirds full of water under the normal pressure of thirty five pounds per square inch and that when one half of this amount of water is drawn the pressure will drop to approximately twenty pounds per square inch, whereupon the pump will be set into operation to replenish the water supply as above described. If the air runs low, as would be evidenced, for example, by noting that whenever water is drawn the pump, by reason of the immediate drop in pressure, is set into operation, I have made provision whereby the air supply may be brought up to the normal amount.

A pipe 34 is tapped into the pump casing 23 in the suction side thereof directly below and between the pumping gears, as should be evident from its position in Fig. 2, and has a pneumatic valve, such as the well known Schrader tire valve, mounted therein and a cap 35 normally closing the outer end thereof. When more air is needed in the storage tank it is only necessary to remove the cap 35 to allow air to be drawn in with the water and forced into the tank. The air taken in rises naturally to the gears and after passing the gears rises naturally to the tank 9, so that no danger of air trapping is involved, as might otherwise be the case with an air intake on some other part of the pump casing or suction line. This insures the pump staying primed at all times. As soon as the proper amount of air has been taken in, the cap 35 is replaced and the otherwise fully automatic operation previously described is resumed.

It is believed the foregoing description conveys a clear understanding of my invention and of its various objects and advantages. The appended claims have been drawn to cover this as well as any other slightly modified construction, having in mind that various changes in details of construction and arrangement might be made without seriously affecting the efficient operation.

I claim:

1. In a pumping apparatus of the character described, the combination in a self-contained unit, of a supporting base, a pump mounted on said base, a motor connected therewith for driving the same, the motor also being mounted on said base, a storage tank disposed above the pump having one end thereof directly connected with the outlet side of the pump in close coupled relation therewith, the connection serving to support the one end of the tank on the pump, and means for supporting the other end of said tank on the base, comprising a pressure regulator for automatically controlling the circuit for the motor, the same being disposed vertically with the upper end thereof provided with a diaphragm casing in fluid communication with the tank, and the lower end thereof fastened to the supporting base.

2. The combination with a water system comprising a supply pipe and a service pipe, of a self-contained pumping apparatus comprising a supporting base, a pump mounted on one end of said base and extending upwardly therefrom, an automatic pressure regulator mounted on the other end of said base and extending upwardly therefrom, an electric motor mounted on the base between the pump and regulator and having a direct mechanical driving connection with the pump on the one hand and an electrical connection with the regulator on the other hand, and a storage tank mounted on top of the afore-

said elements supported at one end by a pipe connection with the discharge side of the pump and supported at the other end by a pipe connection with the regulator, there being a connection between the pump and the supply pipe and between the storage tank and the service pipe to complete the installation of said apparatus in the system.

3. In a water system, the combination with a supply pipe and a service pipe, of a pumping apparatus comprising, in a unitary assembly, a base, and a storage tank supported in elevated position thereon and having a head space therein for air under pressure, said tank being in communication with the service pipe, a gear pump disposed below the tank on the base and having the discharge side thereof substantially directly connected with the bottom of the tank, the suction side thereof being connected with the supply pipe, said pump having means for driving the same, and an outwardly seating pneumatic valve on the suction side of the pump and directly below and between the pumping gears for introducing air with the water drawn substantially as and for the purposes described, said valve being kept normally closed to render the valve inoperative and being opened only when it is desired to replenish the air supply in the tank.

4. A pumping apparatus of the character described comprising in combination, in a self-contained unit, a supporting base, an automatic pressure regulator mounted on one end of said base and extending upwardly therefrom, a pump mounted on another portion of the base, an electric motor also mounted on the base having a direct mechanical driving connection with the pump on the one hand and an electrical connection with the regulator on the other hand, and a storage tank mounted above the aforesaid elements and having a pipe connection with the discharge side of the pump, said tank being supported at one end from the base by a pipe connection with the regulator and having the other end thereof also supported from the base.

5. In a pumping apparatus of the character described, the combination, in a unitary assembly, of a supporting base, a rotary gear pump mounted on one end thereof, said pump having a top outlet and having an inlet arranged to have communication with a supply pipe, means for driving the pump, a storage tank disposed above the pump in a substantially horizontal position and having one end thereof directly connected with the outlet of the pump in close coupled relation therewith and arranged to be thereby supported, means for supporting the other end of said tank from said base, said tank being arranged to have communication with a service pipe, and an outwardly seating pneumatic valve communicating with the pump inlet

directly below and between the pumping gears for introducing air with the water drawn substantially as and for the purposes described, said valve having a cap normally closed to render the valve inoperative.

In witness of the foregoing I affix my signature.

STANLEY H. HOBSON.

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