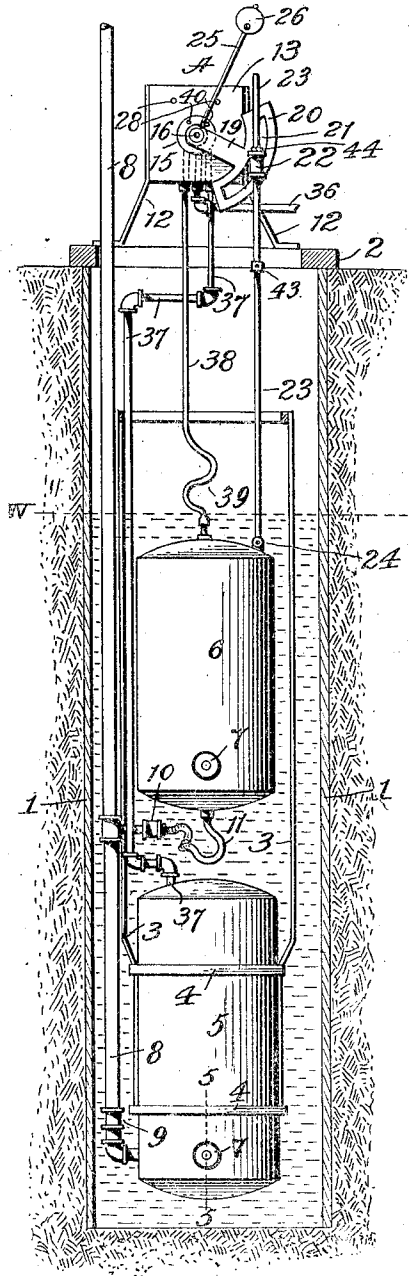
May 18, 1926. 1,585,534

T. E. CROCKETT

WATER ELEVATING APPARATUS

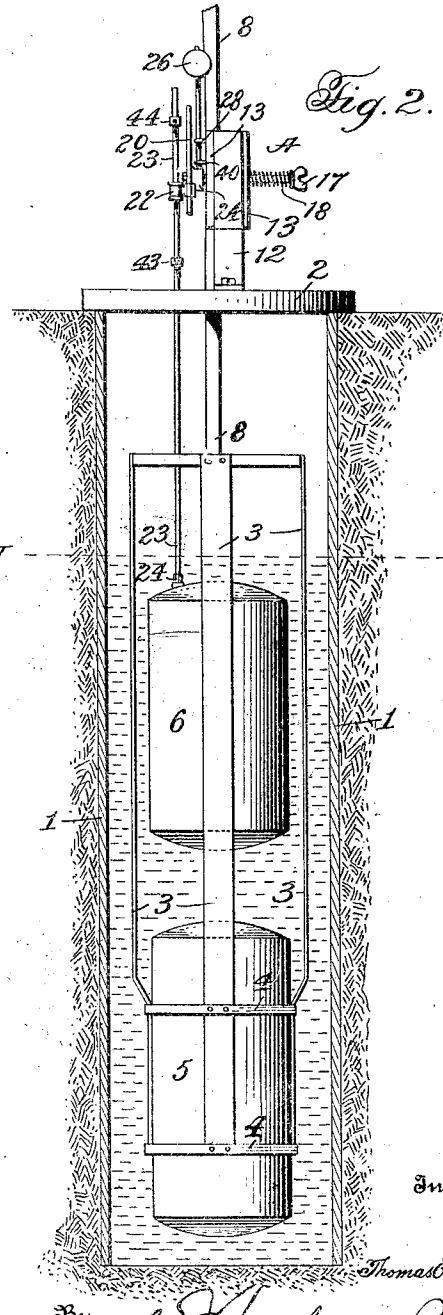
Filed Nov. 24, 1923 2 Sheets-Sheet 1

Fig. 1.



Witness:
Jas. E. Hutchinson.

Fig. 2.



Inventor.
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WATER ELEVATING APPARATUS

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Fig. 5.

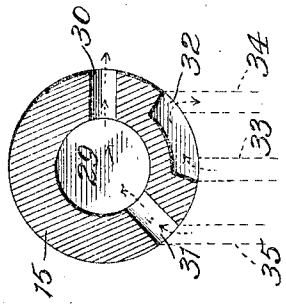


Fig. 6.

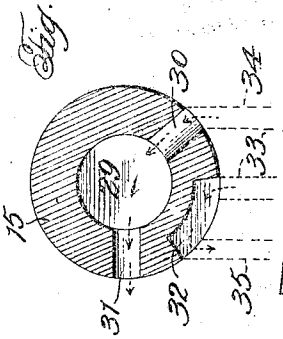


Fig. 7.

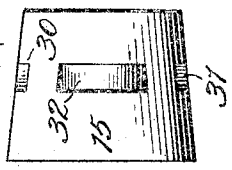


Fig. 4.

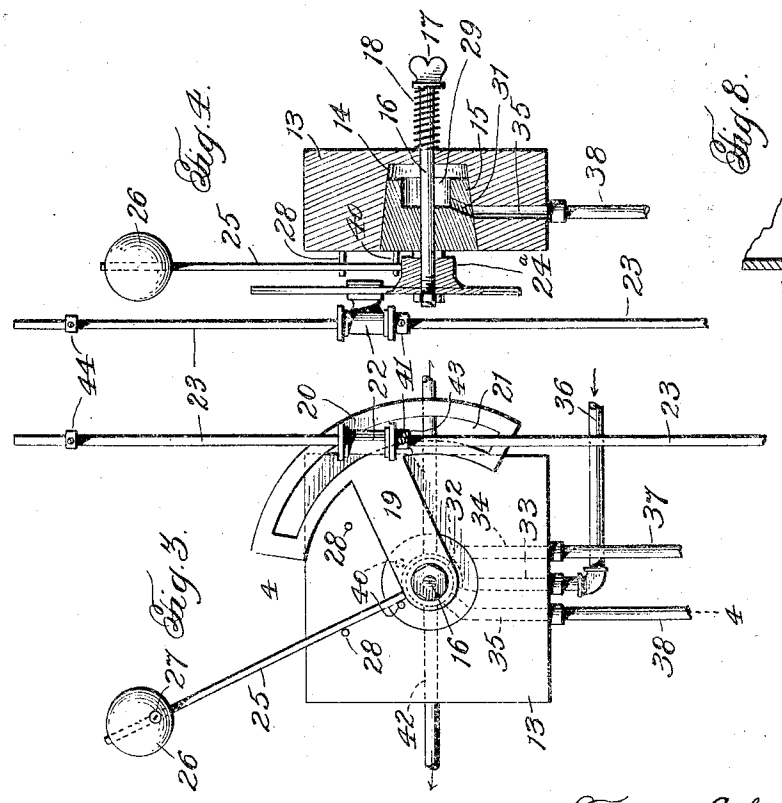


Fig. 8.

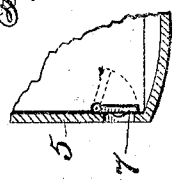


Fig. 3.

Inventor:

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Patented May 18, 1926. 1,585,534

UNITED STATES PATENT OFFICE.

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WATER-ELEVATING APPARATUS.

Application filed November 24, 1923. Serial No. 676,819.

This invention relates to water elevating apparatus and more particularly to that type of devices adapted for use in connection with wells, cisterns or other bulk sources of supply such as lakes, etc.

One of the principal objects of the invention is to provide simple and efficient apparatus which may be installed at relatively low cost and which will operate to provide a continuous supply of water as long as the same is needed.

Another object of the invention is the provision of novel mechanism wherein a plurality of independent supply tanks are employed, together with novel valve mechanism actuated by the movement of one of the tanks, as it is automatically raised or lowered, to control the supply of fluid pressure to the respective tanks, whereby a continuous supply of water may be maintained in the system which the apparatus is designed to feed.

Still another object of the invention is the provision, in a water elevating apparatus, of improved mechanism wherein one of a plurality of storage or supply tanks is utilized as a float to control the supply of fluid pressure, which acts to displace the water within the tanks, and further, whereby the fluid pressure acts directly upon the water to be displaced, as distinguished from where such fluid pressure is directed against one side of a piston which displaces the water.

Further objects of the invention will appear as the following specific description is read in connection with the accompanying drawings, which form a part of this application, and in which:

Figure 1 is a section taken through a well showing the mechanism in elevation therein.

Figure 2 is a similar view looking at the apparatus from a point at right angles to that of Figure 1.

Figure 3 is an enlarged detail front elevation of the valve actuating mechanism.

Figure 4 is a detail sectional view taken on the line 4—4 of Figure 3.

Figures 5 and 6 are sectional views through the valve plug showing its different positions.

Figure 7 is a side elevation of the valve plug removed from its casing, and,

Figure 8 is a detail sectional view through one of the check valves carried by the supply or storage tanks.

Referring to the drawings and more particularly to Figures 1 and 2, 1 represents a well casing upon the upper end of which is mounted a suitable platform 2 adapted to support the valve mechanism generally indicated at A.

Within the well and preferably mounted in such manner that it is stationary with respect to the casing 1, is a cage or open housing 3, which at its lower end is provided with clamping bands 4 surrounding and holding the lower supply tank 5 in position. The upper supply tank, indicated at 6, is slidably mounted in the cage or open housing 3, and these supply or storage tanks are provided adjacent their lower ends with inwardly opening check valves 7, adapted to permit ingress of water, but to prevent egress when the source of pressure is connected to that particular tank. The lower tank 5 is connected to the pipe 8, which leads to the point of use of the water, through a check valve 9, and the tank 6 is connected to the pipe 8 through a check valve 10 and a flexible conduit or pipe 11, this flexible connection being provided in order that the tank 6 may rise and fall in the body of water in accordance with conditions of the apparatus, i. e. whether the tank 6 is filled with compressed air which has previously discharged the water therein, or whether it is filled with water as will be hereinafter described.

Mounted upon the platform 2 are supports 12 which carry a valve casing 13 having therein a tapered valve plug socket 14 in which is seated the correspondingly tapered valve plug 15 to be hereinafter more particularly described. This plug has secured thereto and passing through the center thereof an operating stem or shaft 16 which projects from the plug a considerable distance at either end. Upon one end of the stem or shaft 16 there is provided screw threads to receive an adjusting nut 17 which confines a spring 18, and is adapted to place suitable tension thereon so as to maintain the plug tight against its seat within the socket 14.

The opposite end of the shaft 16 has loosely journalled thereon an arm 19 which carries at its outer end a segment 20 having an arcuate slot 21 formed therein into which is adjustably fitted a guide collar 22, centrally apertured to receive the actuating rod 23 carried by and projecting above the tank 6. As shown the connection of the rod 23 with the tank is a pivotal one as indicated at 24, so as to accommodate the swinging movement of the arm 19.

The arm 19 is formed with a head 24 loosely journalled upon the stem or shaft 16 and this head carries a radially projecting rod 25 having a control weight 26 adjustably secured thereon by means of the set screw 27. The rod 25 is limited in its movement in either direction beyond center by stop pins 28 which are positioned upon the casing at such points as will insure the proper registration of the ports in the plug 15 with the inlet and exhaust ports in the casing to be now described.

The plug 15 as is clearly shown in Figure 4 is provided with an axially arranged chamber 29 from which extend two exhaust ports 30 and 31 and in the periphery of the plug there is provided a vein 32 arranged as shown in Figures 3 and 5 to connect the casing ports 33 and 34 and in its opposite position, as indicated in Figure 6, to connect the ports 33 and 35. The port 33 in the casing is connected by means of pipe 36 to a suitable source of fluid pressure such as compressed air, while the port 34 is connected by means of a pipe 37 as shown in Figure 1 to the upper portion of the stationary tank 5. The port 35 is connected by means of a pipe 38 and a flexible pipe 39 to the upper end of the slidably arranged tank 6.

In order to actuate the valve plug 15 I provide spaced studs 40 projecting outwardly from the valve, which are engaged by the arm or rod 25 as it is moved with the arm 19 so that when said arm 25, which as above stated is loose upon the shaft 16, is moved beyond center, the weight 26 will actuate the arm, turning the same freely about the shaft 16 and bringing the rod into engagement with one of the studs 40 to turn the valve until the arm 25 contacts with one of the limiting pins 28. In the position of the valve as indicated in Figure 3, the rod 25 has contacted with the left hand pin and has turned the valve plug until the ports 33 and 34 in the casing are connected by the vein 32.

It will be noted that the casing 13 is provided with diametrically opposite exhaust passages 41 and 42, which are adapted to be respectively connected with the exhaust ports 30 and 31 in the plug 15 according to the position of this part.

The rod 23, connected to the tank 6 as before described, and slidably mounted through the guide collar 22, carries a pair of spaced collars 43 and 44 adapted to contact respectively with the lower and upper ends of the guide collar so as to move the segment 20 and the arm 19 and thereby throw the weighted lever or rod 25 to actuate the valve.

Having thus described the structural features of this invention I shall now proceed with a description of the operation.

We will assume that the parts are in the position illustrated in Figure 1 with the tank 6 in its lowermost position and submerged below the water line *w—w*, and with the valve plug 15 in the position shown in Figure 6. In this position of the parts, both tanks 5 and 6 are filled with water and the compressed air entering through the pipe 35 and port 33 of the valve casing is conducted via the vein 32 and port 35 to pipes 38 and 39 to the upper end of the tank 6, thus placing a constant pressure upon the surface of the water contained in this tank so that immediately a faucet in the system, which the pipe 8 feeds, is open, water will flow out of the bottom of the tank 6 through the pipe 11 and pass the check valve 10 to the faucet through the pipe 8. As the water is used from the tank 6 its buoyancy is increased and as a consequence rises in the water in the well or other source of supply and carries with it the rod 23. It is, of course, understood that the movement of the tank 6 in rising and falling is guided by the cage 3 which preferably is constructed of four or more spaced rods connected at their lower ends by the bands 4 and at their upper end by a band 4^a.

As the tank 6 rises the collar 43 is brought into engagement with the guide collar 22 and the arm 19 is elevated carrying with it the weighted lever or rod 25 until this latter part passes center, at which time the weight 26 actuates the lever 25, which, contacting with the left hand pin 40 on the valve plug 15, moves this latter element so as to bring the vein 32 into the position shown in Figure 3 whereby it connects the ports 33 and 34. At this point the arm 25 has been stopped by reason of its engagement with the left hand limiting pin or stud 28 and the exhaust port 31 is connected with the port 35 and the exhaust port 30 with the passage 41.

In this position of the parts the air previously fed into the tank 6 is now exhausted as follows:—Through the pipes 39, 38, port 35 in the valve casing, port 31 in the plug valve 15, chamber 29 and port 30 to the outlet passage 41.

At the same time air from the source of supply through the pipe 36 is fed directly to the lower tank 5 as follows:—Pipe 36, port 33, vein 32, port 34 and pipe 37, to the top of tank 5. The water in tank 5 will

thereby be placed under pressure and discharged through the check valve 9 and pipe 8 to the point of use.

As the air exhausts from the tank 6 as just described, water from the well will enter through the check valve 7 and thereby fill the tank causing the same to again sink to the position shown in Figure 1, and in doing so causing the collar 44 to engage the upper end of the guide collar 22 and move the valve back to its original position as before described. It is to be understood, of course, that this second actuation of the valve to the position shown in Figures 1 and 5 does not occur until the tank 6 has been completely or practically completely filled with water. When the tank 6 has sunk to its lowermost position and the valve parts arranged as in Figures 1 and 5, air will be exhausted from the tank 5 through the pipe 37 to the port 34 which is then connected to the exhaust passage 42 via port 30, chamber 29 and port 31.

It is also to be understood that the refilling of the tank 6 will always occur prior to a complete discharge of the water in the tank 5, but the tank 6 may be refilled when only a very small quantity has been discharged from the tank 5 or before any water has been discharged from the tank 5 depending entirely upon the quantity used in the system which the pipe 8 supplies. For instance, if after all the water had been used from tank 6 and the valve shifted to the position shown in Figure 3, no water was used from the system, the tank 6 would continue to fill with water and exhaust the air therefrom until the valve parts had been reversed or brought to the position shown in Figures 1 and 6, so that the compressed air would be upon the water in the tank 6 and the water would be discharged again from this tank.

Again if a great quantity of water were used while the tank 5 was connected to the source of pressure most of the water might be discharged therefrom while the tank 6 was refilling. However, the parts are so arranged and the collars 43 and 44 adjusted so that the water in tank 5 cannot be completely discharged before the tank 6 is again ready to have its contents discharged.

The adjustment of the collars 43 and 44 upon the operating rod 23 and the adjustment of the collar 22 within the slot 21 of the segment 20 makes it possible to control the operation of the valve as desired. For instance, if the collar 43 were raised upon the rod 23, the valve would be shifted from the position shown in Figure 1 to the position shown in Figure 3 at an earlier period and when the tank 6 was at a lower level. Again, if the collar 44 were shifted downwardly upon the rod 23 the valve would be actuated from the position shown in Figure 3 to the position shown in Figure 1 at an earlier period and when a smaller quantity of water had been discharged from the tank 5.

The adjustment of the collar 22 in the slot 21 in either direction beyond the center of the arm 19 will produce substantially similar results as the adjustment of the collars 43 and 44, and also a quick throw of the lever rod 25.

By constructing the valve with the spaced pins 40 actuated by the weight lever 25, a quick snapping action of the valve in either direction is assured.

While I have shown one embodiment of the invention it is to be understood that many changes in form and proportion may be made without in any way departing from the spirit or scope of the invention as defined in the appended claims, and I also wish it understood that while the mechanism has been illustrated as operating within a well, that I contemplate constructing the same for use in cisterns, lakes, dug and driven or bored wells, and in fact in any place where it is desired to elevate water from a source of supply to a point of use.

I claim:—

1. In a water elevating apparatus, in combination with movable and stationary storage tanks and a source of pressure, of a valve actuated by the movable tank for controlling the pressure to said tanks and the discharge of water therefrom.

2. In a water elevating apparatus, in combination with movable and stationary storage tanks and a source of pressure, of a valve actuated by said movable tank for alternately admitting pressure to the respective tanks and discharging the water therefrom.

3. In a water elevating apparatus a source of water supply, a stationary submerged storage tank, a second tank adapted to be raised or lowered in the source of supply according to its condition, and a valve actuated upon a relative movement between said tanks for alternately directing the source of fluid supply to the respective tanks and exhausting pressure therefrom whereby the water is alternately discharged from the respective tanks, and means for admitting water to either tank when the other of said tanks is connected with the source of pressure.

4. In a water elevating apparatus, the combination with a well, a stationary tank submerged beneath the water in the well, a second tank whose buoyancy is controlled by its contents, a source of fluid pressure, a valve controlled by the buoyant tank for alternately admitting said pressure to the respective tanks, and means for admitting water to either of said tanks when the other of said tanks is connected with the source of pressure.

5. In a water elevating apparatus, the combination with a well having a source of water supply therein, of a storage tank submerged in the water, a second storage tank whose position in the water is controlled by its contents, a source of fluid pressure, a single valve connected to the source of pressure and to said tanks, said valve having exhaust ports, and means for actuating the valve whereby the pressure is alternately admitted to the respective tanks and the exhaust ports alternately connected with said tanks.

6. In a water elevating apparatus, the combination with a source of water supply, a pair of storage tanks having inlets and outlets, one of said tanks being movable, a source of fluid pressure, and a valve actuated by the movable tank for controlling the source of fluid pressure alternately to the respective tanks.

7. In water elevating apparatus, a pair of relatively movable tanks having inlet and outlet openings controlled by check valves, a source of pressure, a valve connected to said source of pressure and to said tanks, and having exhaust ports, and means actuated upon relative movement between said tanks for operating the valve whereby the tanks are alternately connected to the source of pressure and to the exhaust.

8. In water elevating apparatus, the combination with a body of water, of a stationary tank submerged within said body of water and having check valve controlled inlet and outlet ports, a movable supply tank having check valve controlled inlet and outlet ports. said movable tank being positioned within the body of water according to the character of its contents, a source of pressure, and a valve controlling the source of pressure to the respective tanks, together with operating means connecting the valve and movable tank.

9. In a water elevating apparatus, a pair of storage tanks, a source of fluid pressure, a valve controlling the source of fluid pressure to said tanks, means connecting the valve to one of the tanks for operation thereby, and means for further actuating the valve after an initial actuation by the last mentioned means.

10. A valve for controlling fluid pressure to storage tanks of water elevating apparatus, comprising a casing, a valve rotatably mounted therein, means actuated by one of the tanks for moving the valve partially in one direction, and means for completing the movement of the valve in that direction independent of the last named means.

11. A valve for controlling fluid pressure to storage tanks of water elevating apparatus, comprising a casing, a valve rotatably mounted therein, means actuated by one of the tanks for moving the valve partially in one direction, and gravity actuated means for completing the movement of the valve in the same direction which is independent of the last named means.

12. In a water elevating apparatus the combination with a well, a frame mounted within the well, a tank submerged beneath the water in the well, and secured immovably in the frame, a second tank slidably guided in the frame whose buoyancy is controlled by its contents, a source of fluid pressure, a valve controlled by the slidably mounted tank for alternately admitting said pressure to the respective tanks and means for admitting water to either of said tanks when the other of said tanks is connected with the source of pressure.

13. In a water elevating apparatus the combination with a well, a frame mounted within the well, a tank submerged beneath the water in the well, and secured immovably in the frame, a second tank slidably guided in the frame whose buoyancy is controlled by its contents, a source of fluid pressure, a valve controlled by the slidably mounted tank for alternately admitting said pressure to the respective tanks and means for admitting water to either of said tanks when the other of said tanks is connected with the source of pressure, together with a common discharge pipe connected to said tanks.

In testimony whereof I affix my signature.

THOMAS E. CROCKETT.