Jan. 5, 1943. F. W. RYAN, JR 2,307,160

PUMP

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Fig. 1.

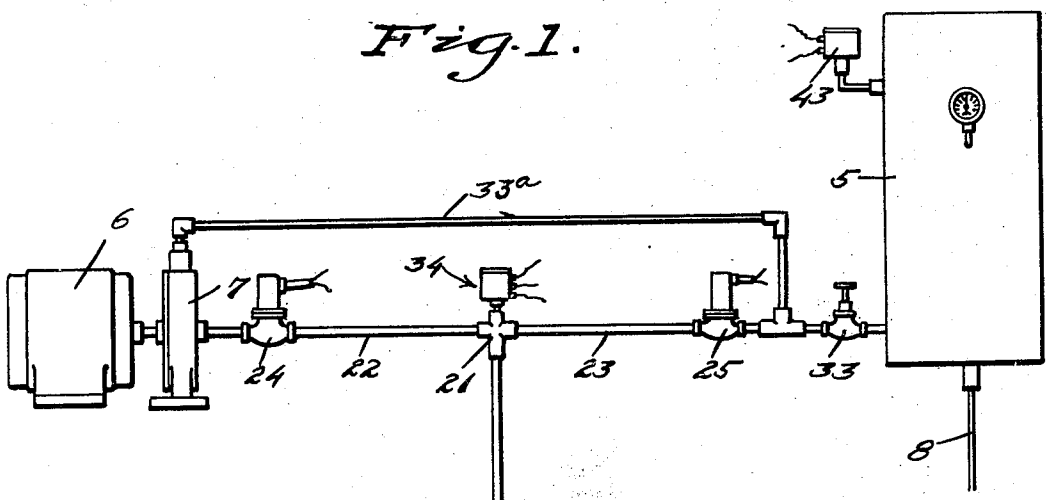


Fig. 4.

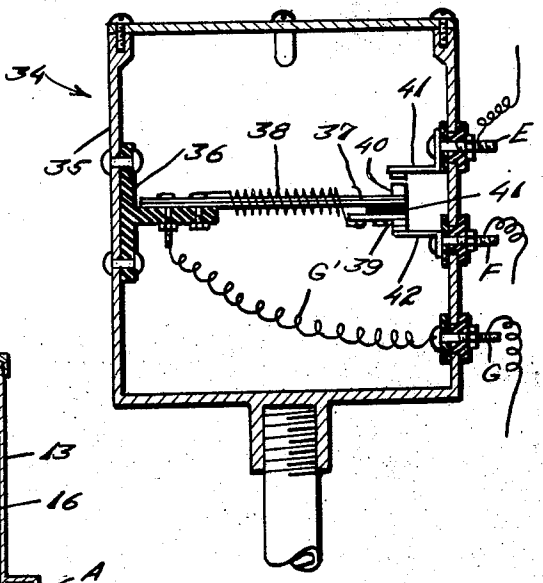
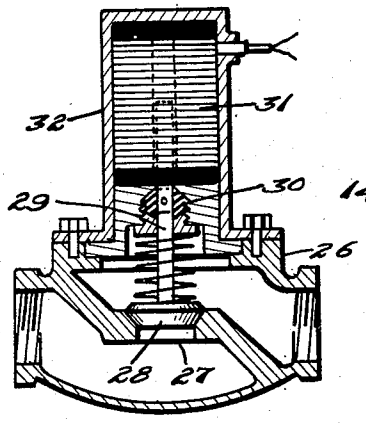


Fig. 3.



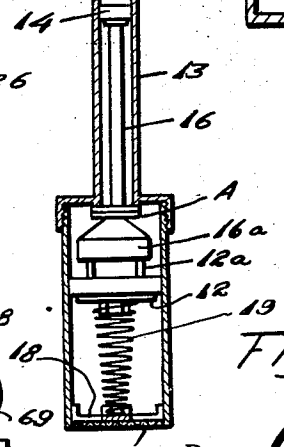
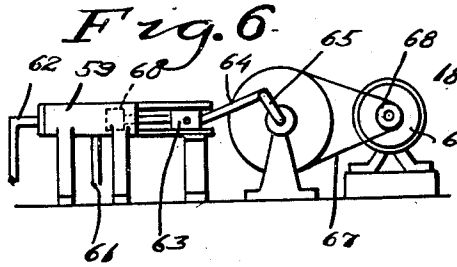


Fig. 6.



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Fig. 2.

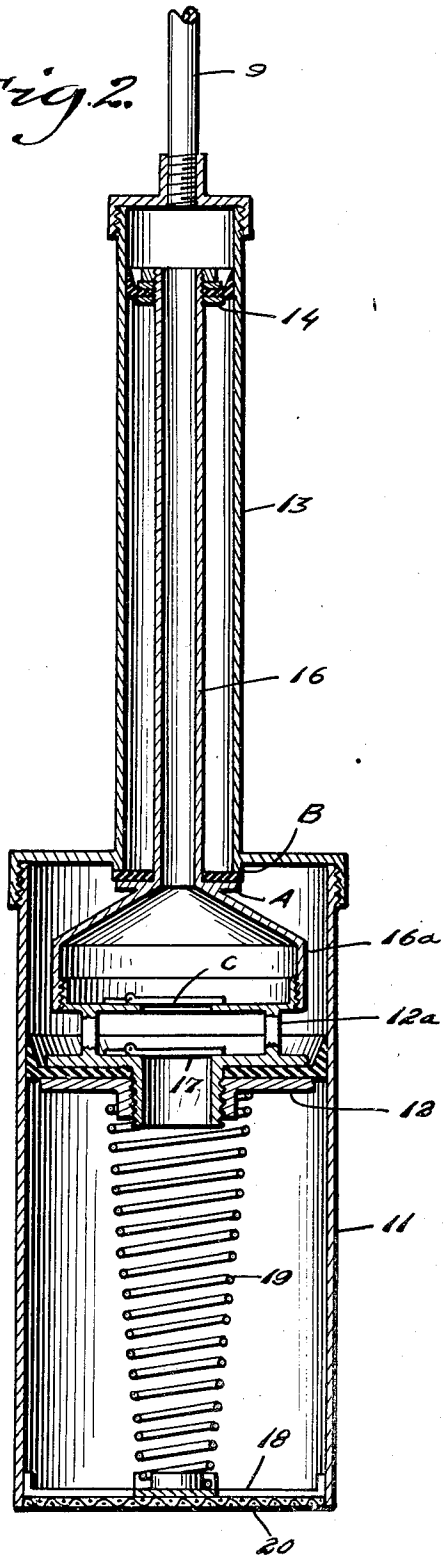
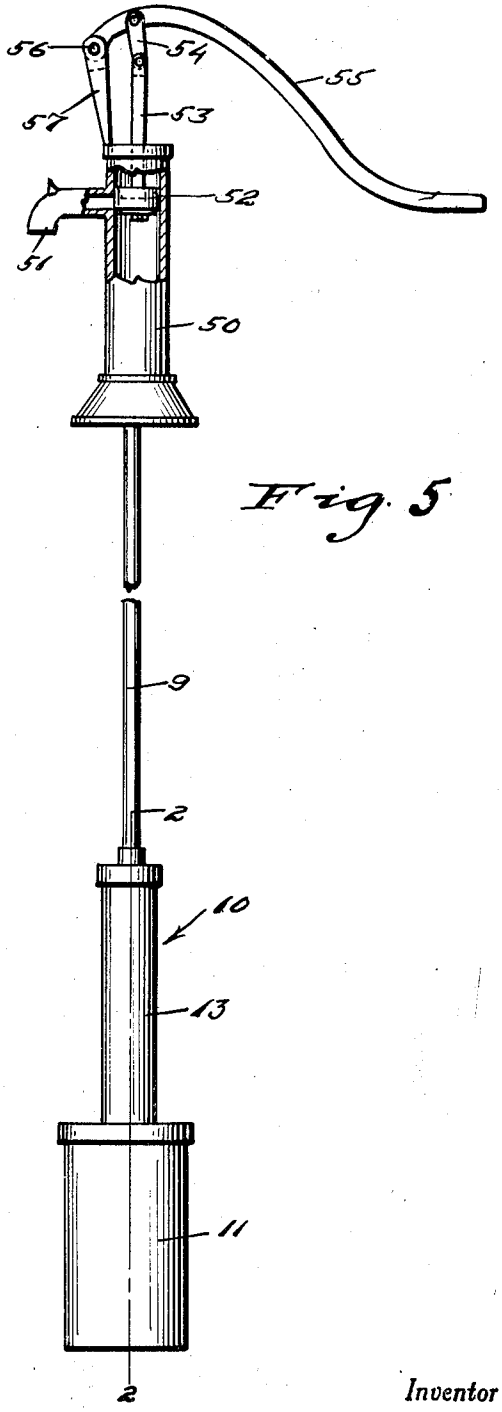


Fig. 5



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PUMP

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Application October 31, 1940, Serial No. 363,750

2 Claims. (Cl. 103—44)

This invention appertains to new and useful improvements in pumps and more particularly to a pump of the deep well type.

The principal object of the present invention is to provide a deep well pump which is substantially automatic in operation.

Another important object of the present invention is to provide a deep well water pump which is adapted for automatic and continuous operation depending upon stored water and the pressure incident thereto.

Still another important object of the invention is to provide a deep well pump which will operate offset with respect to the well and without the usual rod and the like now employed in overhead pumps.

Other objects and advantages of the invention will become apparent to the reader of the following specification.

In the drawings:

Figure 1 represents a diagrammatic view showing the various connections between the elements involved.

Figure 2 is an enlarged fragmentary vertical sectional view through the plunger assembly.

Figure 3 is a vertical sectional view through one of the magnetic valves.

Figure 4 is a vertical sectional view through the thermal switch.

Figure 5 is a side elevational view, partly in section showing a modification of the invention.

Figure 6 is a side elevational view of another type of pumping means.

Referring to the drawings wherein like numerals designate like parts, it can be seen that numeral 5 denotes a storage tank, while numeral 6 denotes an electric motor for operating a centrifugal pump 7. Numeral 8 denotes a take-off pipe for the tank 5.

A stand pipe 9 extends down into the ground and terminates in a plunger assembly 10, which consists of a lower cylinder 11 of a certain diameter and in which operates a substantially large plunger 12, and a cylinder 13 of considerably less diameter than the cylinder 11 rising from the cylinder 13 and having a small plunger 14 operative therein.

The plunger 14 is connected to the plunger 12 through means of a tube 16 and a chamber 16*a*, the latter being located adjacent the plunger 12 and connected thereto by connecting elements 12*a*.

At the top of the chamber 16*a* is a circumferential flange A on which is a packing or resilient element B, the two elements acting as a check valve in respect to the lower end of the barrel 13.

In the bottom of the chamber 16*a* is a check valve C while in the top of the plunger 12 is a check valve 17. The spider 18 is provided across the lower end of the cylinder 11 and between this and the bottom of the plunger 12 is interposed a compression spring 19. A mesh strainer 20 is provided at the bottom of the cylinder 11.

Extending laterally from the cross-shaped fitting 21 at the upper end of the stand pipe 9 are the pipes 22 and 23 which have the magnetic valves 24 and 25 therein. Each valve consists of a shell 26 having a valve seat 27 therein against which is operative a valve element 28 having a stem 29 extending therefrom and connected to the plunger 30 of a solenoid 31 mounted in a shell 32 rising from the valve body 26.

The pipe 22 extends to the inlet side of the centrifugal pump 7 while from the outlet side of the pump 7 extends a pipe 33*a*, connecting to the pipe 23 at a point between the valve 25 and the tank 5. As can be seen in Figure 1, a manually operated valve 33 is provided in the pipe 23 between the pipe 33*a* and the tank 5.

Rising from the fitting 21 is a thermal switch 34. This switch 34 consists of a case 35 having suitable supporting means at its bottom side for mounting on the fitting 21. A T-shaped bracket of insulation denoted by numeral 36 supports an outstanding bi-metal element 37 on which is located a heat coil 38. One end of this heat coil is connected to the bi-metal element 37 while the other end is connected to a contact 39. On the case 35 are binding posts E, F and G, the binding post G being connected to a source of current, while the binding posts E and F are connected to the valves 24 and 25. The binding posts E and F have stationary contacts 41 and 42, while the current supply binding post G is connected by a jumper G' to the bi-metal element 37. A fluid pressure type switch is provided on the tank 5 and generally referred to by numeral 43.

The pump, pipes and cylinders are always full of water and the plunger 12, we will assume, is at the top of the cylinder 11. The thermal switch 34 is set to switch the current from the valve 24 to the valve 25 intermittently. The pressure switch 43 is set to supply current to the motor 6. Water from the pump and tank builds up the pressure in the stand pipe 9 forcing the piston 14 downwardly and, in turn, forcing the piston valve down compressing the spring 19. On this downward stroke the valve 17 in the

large piston opens letting water fill the cylinder above the large piston.

A slightly modified form of the invention is shown in Figure 5. This is a hand operated type and consists of a barrel 50 at ground level having the discharge spout 51 adjacent the upper end thereof. Numeral 52 represents a piston operative in the barrel 50 and having a rod 53 extending therefrom and through the top of the barrel where it is connected by a link 54 to a pump handle 55 pivotally connected as at 56 to a post 57 on the top of the barrel 50. This is a conventional type of pump, but utilizing the plunger assembly generally referred to by numeral 10.

As water is withdrawn from the system, the pressure in tank 5 drops approximately 20 pounds. At this point the pressure switch 43 closes the circuit to motor 6 and to thermal switch 34. The thermal switch 34 is cold and current flows from G through bi-metal strip 37 (see Figure 4) and through contact point 41 and from there by way of terminal E to open electric valve 25. This electric valve 25 is of a magnetic type shown in Figure 3.

Pressure from the tank is released through the stand pipe 9 and through tube 16' to the chamber 16a. The pressure holds valve c in closed position. This pressure forces the entire plunger assembly down, compressing spring 19. As the plunger assembly travels downward, water flows through valve 17 and upwardly around the outside of chamber 16a.

During this period, a small amount of current (not enough to open valve 24) has been flowing through winding 38. The current in this winding 38 heats bi-metal strip 37. The heat warps the bi-metal strip 37 from a position engaging contact 41 to the contact 42. When it contacts the contact 42, (as shown in Figure 4) the current then travels through the bi-metal strip itself 37. The resistance of the bi-metal strip 37 is not as great as winding 38, consequently, heat is not generated and the strip 37 cools. As the strip cools, it regains its normal shape and moves from contact 42 to contact 41. As it leaves contact 42, the current again flows through the winding 38 only. This again heats the bi-metal strip as the cycle is repeated. While the pump is in operation the switch constantly turns this current first from one electric or solenoid valve and then to the other.

After a short interval, depending on the switch 34, current is switched from solenoid valve 25 to solenoid valve 24, opening the latter. The pressure on the tank 5 is then relieved from the stand pipe 9 and the suction from pump exerts a drawing pressure on the water in the stand pipe 9. As the pressure in stand pipe 9 is relieved, spring 19 raises the plunger assembly. The water in the space around and above chamber 16a is forced through valve c and up into stand pipe 9, where it travels through pump 7, pipe 33a into tank 5. Switch 34 then closes solenoid valve 24, and opens solenoid valve 25. The cycle is then repeated until sufficient pressure is built up in tank 5 to operate switch 43 which opens the circuit so that the pump stops.

The operation of the hand pump type shown in Figure 5 is substantially the same as that of the electric type just described. The main difference is that the pressure which operates the plunger assembly is supplied by manual force. A piston 52 travels up and down past the port to spout 51. This reciprocatory action supplies pressure to the plunger assembly which forces it down as the spring 19 raises the plunger assembly at each stroke. Pressure forces the plunger assembly down compressing spring 19 and passes water through valve 17 to the space around the chamber 16a. As the piston 52 is raised up past the port to spout 51, the pressure on the plunger assembly is relieved and the spring pushes the plunger assembly up to its stop position. As the plunger assembly travels up, water around the chamber 16a is forced through valve c into chamber 16a up through a stand pipe 9 and out through spout 51.

Figure 6 of the drawings discloses a modified form of pumping apparatus, the pump cylinder 49 of which corresponds to the centrifugal pump 7 of the system first described or the pump cylinder 50 of the hand pump type shown in Figure 5. The pump cylinder 59 has a piston 60 operative therein and actuated by a cross head 63 connected by a connecting rod 64 with a crank 65, this crank 65 being operated by a pulley over which is trained a belt 67 from a small pulley 68 driven by an electric motor 69. Numeral 62 denotes the eduction pipe which connects with the cylinder 13 in the manner the pipe 9 does in Figure 1. In Figure 6 numeral 61 represents the discharge pipe from the pump 59.

While the foregoing specification sets forth the invention in specific terms, it is to be understood that numerous changes in the shape, size and materials may be resorted to without departing from the spirit and scope of the invention as claimed hereinafter.

Having described the invention, what is claimed as new is:

1. In a pumping system, a stand pipe, a plunger unit, said plunger unit being located at the lower end of the stand pipe and consisting of a large cylinder, a small cylinder rising from the large cylinder and connected to the stand pipe, correspondingly sized plungers in the cylinders, check valves in the plungers and a connection between the plungers, a storage tank, a pump having its inlet in communication with the stand pipe and its discharge in communication with the tank consisting of a centrifugal pump and an electric motor driving the same, pressure means for controlling the said motor, a flow conduit connecting said tank to the stand pipe, a magnetic valve in the line from the stand pipe to the pump inlet, a magnetic valve in the flow line, from the tank to the stand pipe, and thermal means for controlling said magnetic valves.

2. In a pumping system, a stand pipe, a plunger unit, said plunger being located at the lower end of the stand pipe and consisting of a large cylinder, a small cylinder rising from the large cylinder and connected to the stand pipe, correspondingly sized plungers in the cylinders, check valves in the plungers and a connection between the plungers, a storage tank, a pump having its inlet in communication with the stand pipe and its discharge in communication with the tank consisting of a centrifugal pump and an electric motor driving the same and pressure means for controlling the said motor, a flow line from the tank to the stand pipe and electro-magnetic valve means for controlling the flow of water from the stand pipe to the pump and from the tank to the stand pipe.

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