

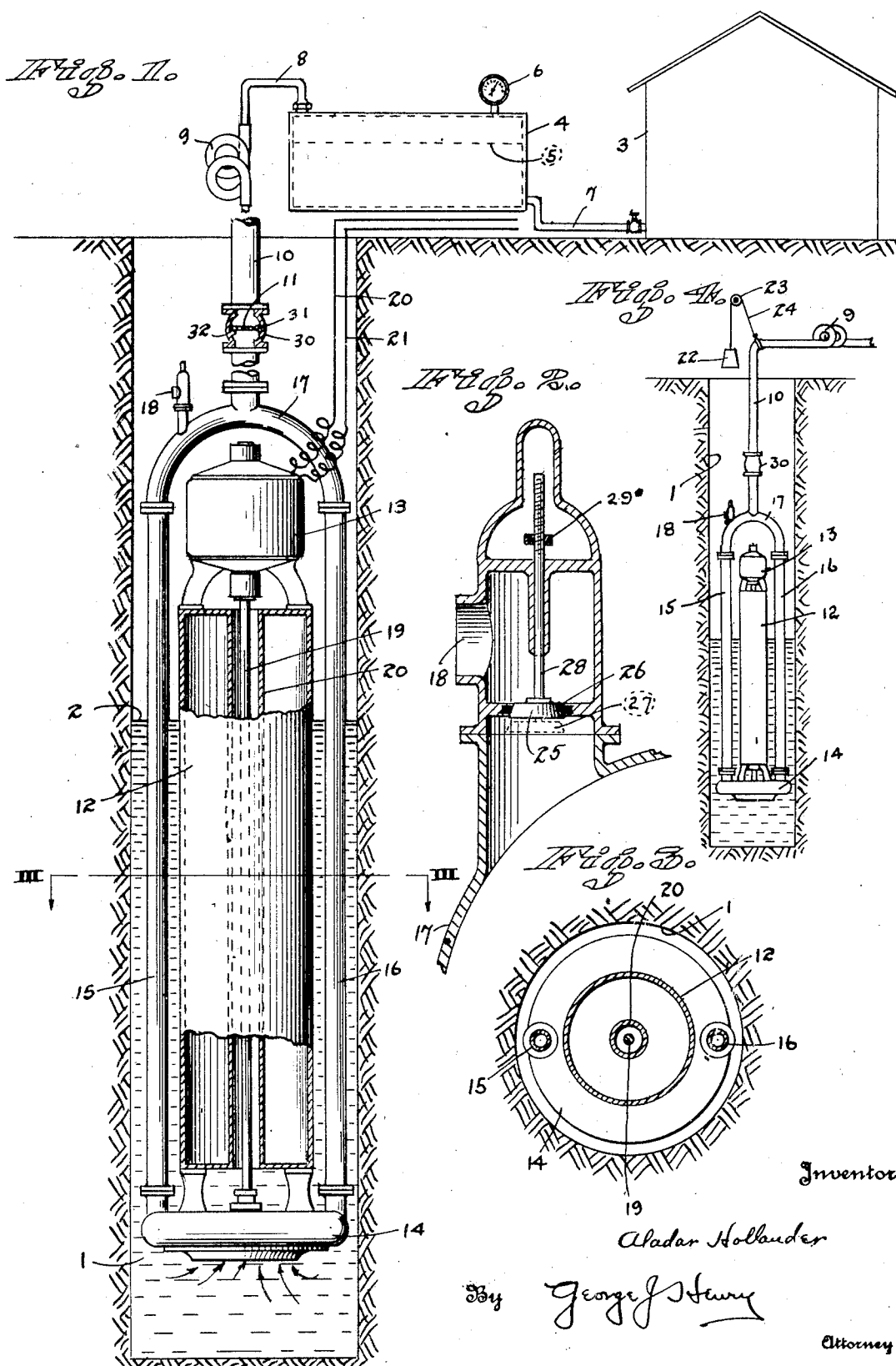
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### VERTICAL SHAFT FLOATING PUMP

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## UNITED STATES PATENT OFFICE.

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## VERTICAL-SHAFT FLOATING PUMP.

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My invention has for its object a simplified and efficient combination of motor and pump assembled together to drive through a vertical shaft and provided with a float between the motor and the pump whereby the pump is at all times retained submerged, and the motor at all times retained above the water level regardless of the variations of the water level in a well.

A further object is a device of the character described, with a one way valve in a delivery column from the pump and an air valve movable in one direction to admit air to the pump column, when the pump is not operating.

A further object is a device of the character described, constructed and adapted to introduce an air charge from time to time with the pumped water.

Another object is a pump for automatically retaining a compressed air body in a water service tank.

Other objects will appear from the drawings and specifications which follow:

These objects I attain by providing a float preferably of cylindrical form having a central hollow tube through which an operating shaft communicates from a motor mounted on the upper part of the float to drive the centrifugal pump which is positioned under and suspended from the said float.

From the pump a suitable delivery pipe or pipes extends substantially parallel with the said axial tube and above the motor and through conventional flexible connections communicates with a suitable storage service tank.

In the delivery column I mount a one way foot valve so as to hold water above the foot valve when the pump is not operating and to prevent the return of pressure air or water from the service tank through the pump discharge column.

On the discharge column and between the foot valve and the pump and above the float I mount an air inlet valve having a spring actuating closure adapted to admit air when the pressure in the pump column

is below atmospheric pressure but to close whenever the pressure in the pump column exceeds the atmospheric pressure.

By referring to the accompanying drawing my invention will be made clear.

In the drawing:

Fig. 1 is a vertical section through a conventional well showing the apparatus of my invention in position therein with a float and foot valve shown partly in section and with a service tank and a flexible section of the delivery column, on a reduced scale.

Fig. 2 is an enlarged cross section through the air inlet valve of Fig. 1.

Fig. 3 is a cross section of Fig. 1 on the line III—III.

Fig. 4 is a diagrammatic showing of my apparatus with a float of reduced size and with the apparatus suspended from a pulley and provided with a counter-balancing weight thereabove.

The weight in this case partially counter-balances the apparatus suspended in the well, the remainder of the counter-balancing being effected by the displacement of the reduced sized float.

Throughout the figures similar numerals refer to identical parts.

Numeral 1 indicates a conventional well in which the water level is shown at 2.

A farm house is shown at 3 and a water service tank at 4 in which the water level is shown at 5.

A pressure gauge at 6 indicates the pressure in the service tank at all times, and water service connections are shown at 7 to the house 3.

The inlet connection to the tank 4 is shown at 8 and any conventional flexible connection is shown at 9 which is connected with a pump delivery column 10, and with the tank through the pipe 8.

At 11 is a foot valve allowing water to rise through the column 10 but closing upon its seat as shown in Fig. 1 when the pump stops and it therefore holds the fluid and the pressure in the column 10, pipes 9, 8 and tank 4.

At 12 is a float on which is fixed the mo-

tor 13 and below which is suspended the pump 14, the latter adapted to deliver pressure water from the well through the column members 15, 16 which discharge through the branch pipe 17 and foot valve into the discharge column 10.

At 18 is an air inlet valve, while at 19 is the shaft connecting the motor and operating the pump and which passes through the tube 20 sealed in the float 12.

At 20, 21 are conventional electric operating connections to the motor 13 and it is understood that these are to be supplied with a suitable source of energy, well known but not shown, through automatic or hand operated switches to energize the motor 13 as may be required.

Referring particularly to Fig. 4, where a float of smaller dimensions is employed, the apparatus is partially counter-balanced by the weight 22 operating over the pulley 23 through the cable 24, which partially counter-balances the suspended weight of the apparatus in the well.

In Fig. 2, showing the detailed structure of one form of air valve 18, the valve member 25 normally seats upon the valve seat 26 when water is being pumped and falls to the dotted position 27 when the pump is stopped.

The foot valve 11 is hinged in the body 30 at 31 and when the pump is operating, the valve 11 pivots at 31 rising off of its seat 32 whereas when the pump stops the valve 11 closes on the seat 32.

I prefer to arrange the column members 15, 16 symmetrically about the central shaft 19 and therefore prefer to use two such members. In this way the center of gravity of the entire suspended structure is always retained in the axial line of the shaft 19 and central in the well.

The float 12 is shown of hollow cylindrical form preferably of sheet steel with welded or riveted seams and is of such dimensions as will adequately support the entire suspended weight, without sinking below the water surface 2.

This float may be made of reduced dimensions and its deficiency in sustaining power, may be compensated for by the weight 22 shown in Fig. 4, if desired.

The operation is as follows:

The motor 13 is energized through the connections 20, 21 rotating the shaft 19 and actuating the pump 14 whereby water is forced from the well 1, through the members 15, 16, branch pipe 17 raising the valve 11 and forcing the water up through the column 10, pipes 9 and 8 and into the storage tank 4.

When the pump first starts to operate, a body of air is forced up above the water surfaces in the members 15, 16 and will now be compressed in the tank 4 establish-

ing an elastic fluid pressure above the water surface 5.

When the pressure gauge indicates the desired pressure having been attained, the house 3 may be served as required by water being withdrawn through the pipe 7. This will effect a reduction in pressure in the tank 4 and when this has reduced to a sufficient degree, the motor will again be energized and the pump operated to deliver more water into the tank 4.

Under the increased pressure in the tank 4, the water body therein contained will gradually absorb the compressed air or the compressed air may leak or be otherwise lost from the tank 4 and its replenishment from time to time is essential to retain a proper elastic pressure to force water through the connection 7 as demanded.

By my apparatus this compressed air body is automatically replenished as follows:

Whenever the pump is stopped the foot valve 11 closes under the pressure in pipe 10 and the body of water below the valve 11 falls substantially to the level 2.

This is made possible by the external air pressure acting upon the valve 25, forcing it from its seat, thus allowing the water to fall to the level 2 in the members 15 and 16 and thus filling the space above the water levels in the said members 15, 16 and branch 17 and up to the foot valve 11 with air.

When the pump is again started this air in the members 15, 16 and branch 17 is forced up with the water now being forced from the pump 14 and is passed into the storage tank 4. The tank will therefore be recharged with compressed air.

This increment of re-charging of compressed air will occur every time the pump is started and stopped.

I claim:

1. In combination with a vertical shaft centrifugal pump, a float below which said pump is suspended said float having a tubular opening therethrough, a motor fixed on top of said float, a driving shaft connecting said motor and said pump in operative relation and passing through said opening.

2. In combination with a vertical shaft centrifugal pump, a float below which said pump is suspended said float having a tubular opening therethrough, a motor fixed on top of said float, a driving shaft connecting said motor and said pump in operative relation and passing through said opening, a tank, a discharge column from said pump and connecting said pump with said tank, a flexible portion in said column permitting the assembled float, motor and pump to rise and fall with the water in a well.

3. In combination with a vertical shaft centrifugal pump, a float below which said pump is suspended said float having a tubu-

lar opening therethrough, a motor fixed on top of said float, a driving shaft connecting said motor and said pump in operative relation and passing through said opening, a tank, a discharge column from said pump and connecting said pump with said tank, a flexible portion in said column permitting the assembled float, motor and pump to rise and fall with the water in a well, said discharge column comprising a plurality 10 of delivery pipes symmetrically spaced around said float and merging into a single discharge pipe above the motor.

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