

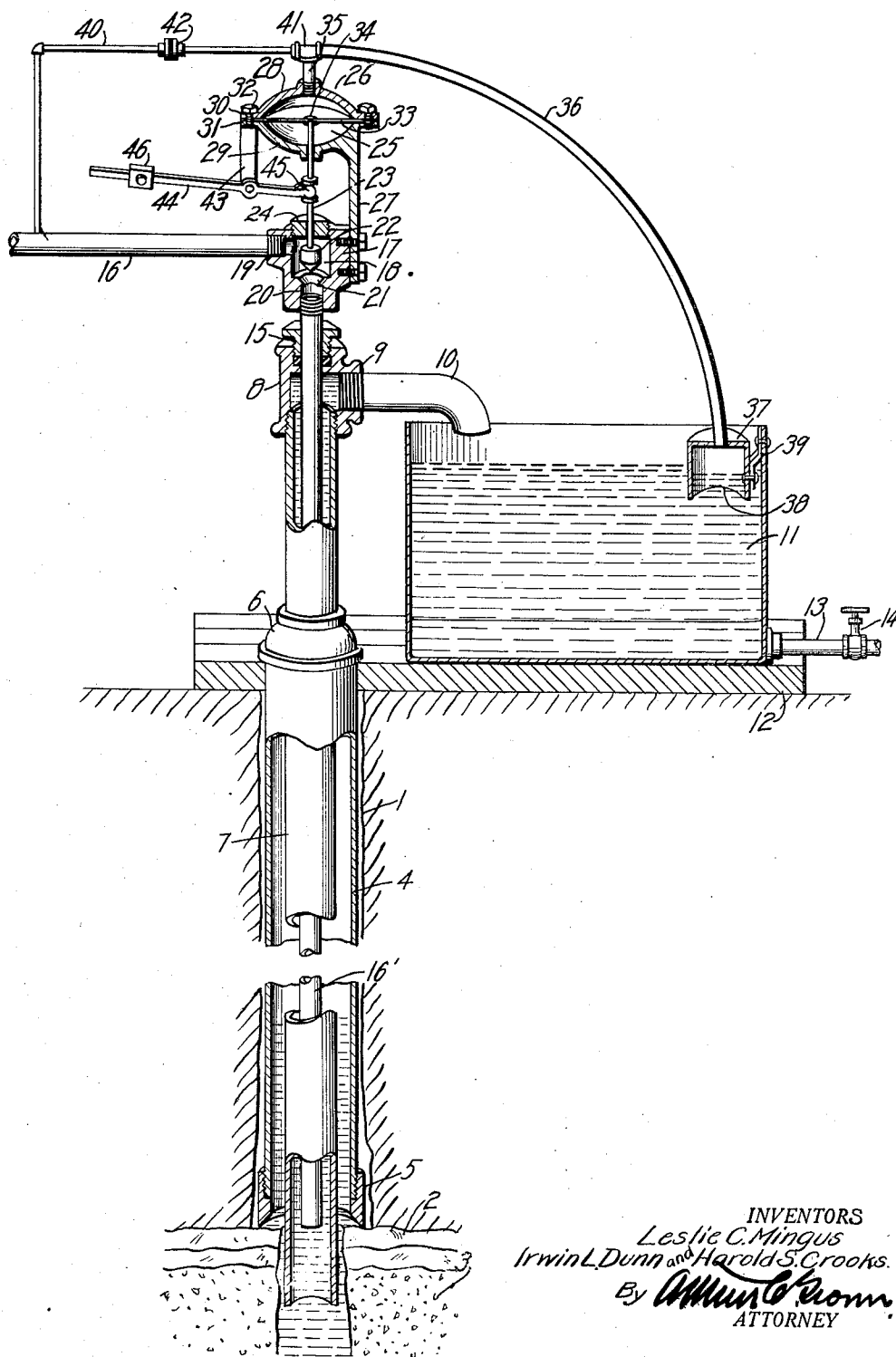
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AIR LIFT CONTROL

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AIR-LIFT CONTROL

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Our invention relates to apparatus for controlling air lift pumps, and has for its principal object to maintain a substantially constant level of well fluid in a flow tank or storage receptacle to avoid overflow of the tank or provide a sufficient reserve for constant rate of flow of the fluid from the tank irrespective of irregularity of flow from the well and without necessity for manual adjustment except for regulating flow from the well for changes in rate of withdrawal from the tank.

In accomplishing these and other objects of the invention we have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

The single figure is a perspective view of apparatus embodying our invention, parts being in vertical section and broken away for better illustration.

Referring more in detail to the drawings:

1 designates a well hole leading through cap rock 2 into water stratum 3, and 4 the well casing supported on the cap rock 2 by a shoe 5, and having a head 6 above the surface of the ground. Extending through the head 6 and casing 4 into the part of the well hole within the water stratum is a tube 7, open at its lower end and provided at its upper end with a T-fitting 8, having a lateral port 9 provided with a nozzle 10, through which water delivered through the tube may empty into a flow tank or storage receptacle 11, supported on a platform 12 adjacent the well, and having a flow line 13 leading from its bottom and provided with a hand valve 14 for manual control of offtake flow. 15 designates a stuffing box in the top of the fitting. Extending through the stuffing box and tube to near the bottom of the tube is the well section 16' of an air line 16. 17 designates a valve housing, including a chamber 18 having ports 19 and 20 into which the outer and inner sections of the air line are respectively threaded, the port 20 having a valve seat 21 at its upper end for a valve 22, whereby flow through the air line may be regulated and controlled.

The stem 23 of valve 22 extends through

a stuffing box 24 in the top of the housing 17 and into the chamber 25 of a diaphragm housing 26 preferably supported from the valve housing 17 by a riser bracket 27. The diaphragm housing comprises the upper and lower concaved members 28 and 29 having the usual rim flanges 30 and 31 connected by bolts 32. Located within the chamber 25 with its rim clamped between the housing flanges 30 and 31 is a flexible diaphragm 33 separating the chamber 25 into upper and lower portions, and to which the valve stem 23 is connected by riveting or the like 34. Opening to the portion of the chamber 25 above the diaphragm 33 is the nipple 35 of a conduit 36, leading to the flow tank 11 and terminating therein in an inverted cup 37, having its open lower end 38 spaced downwardly from the top of the tank.

The cup and conduit may be rigidly anchored to the tank by a bracket 39 having its ends riveted or otherwise permanently secured to the tank and cup respectively.

Leading from the outer section 16 of the air line is a feed line 40 communicating with the conduit 36, preferably through a T-fitting 41 forming a connection for the conduit, the nipple 35 and the feed line, and interposed in the feed line is a pressure reducing member 42 which may preferably consist of an orifice plate of ordinary construction, and of a type commonly employed for reducing flow through a fluid line.

Suspended from the housing 26 is a bracket 43, and pivotally mounted on the bracket is an arm 44 having swivel connection 45 at one end with the valve stem 23, and provided at its other end with an adjustable weight 46 for counterbalancing the valve 22 and rendering the diaphragm sensitive to pressure induced through the line 36 for operating the valve.

Assuming that the apparatus is employed in connection with a water well for a purpose requiring a substantially constant flow of water, as for an engine cooling system, the operation is as follows:

Assuming that the counterbalance 46 is adjusted to retain the valve 22 open under atmospheric pressure on the diaphragm 33 and

that the tank 11 is empty, the cup 37 is open and atmospheric pressure only exerted on the diaphragm 33.

Air admitted to the line 16 escapes through the lower end of the line into the water in tube 7 lifting the water through the tube and discharging same through the nozzle 10 into the flow tank, which fills and finally submerges and liquid seals the cup 37, trapping air in the conduit 36. The orifice in plate 42 is so mounted that only an occasional bubble of air passes through the line 40 from line 16 to the fitting 41 and until the cup 37 is submerged, air escaping through the orifice plate 42 vents through the line 36 and cup 37 to atmosphere. When the cup 37 is liquid sealed pressure induced in the line 36 by rising head of water in the cup builds up in the upper portion of the diaphragm chamber 25, until, when the level of water in the flow tank has risen to near the top of the tank, pressure in the diaphragm chamber becomes sufficient to overcome the counterbalancing weight on stem 23, and the valve 22 is moved toward its seat 21, reducing flow of air through the line 16 to reduce the water supply to the flow tank; the valve seating completely under pressure on the diaphragm if necessary.

Air passed through the orifice plate 42 may compensate for leakage in the line 36 to insure operation of the diaphragm and valve.

Outflow of the tank continuing, level of the water in the tank is lowered and the conduit 36 finally opens to atmosphere, relieving pressure on the diaphragm so that the counterbalance may open the valve to permit renewal of flow of the water lifting air.

It is apparent that with this arrangement the level of water in the flow tank may fluctuate within relatively narrow limits maintained by automatic control of the valve 22 responsive to varying pressures in the conduit 36, in turn responsive to varying levels of water in the tank.

What we claim and desire to secure by Letters Patent is:

Apparatus of the character described including in combination with a well and a discharge line leading from the well a receptacle for fluid delivered through the discharge line, an air line leading into the well, a valve controlling said air line, a conduit adapted to be sealed by fluid rising in said receptacle, an air chamber, a member in said chamber connected with said valve and responsive to pressure in said conduit, a feed line leading from the air line to said chamber, and a pressure reducing member in said feed line.

In testimony whereof we affix our signatures.

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