Aug. 16, 1949. R. J. MATTHEWS 2,479,247

COMBINED WATER GAUGE AND AIR VOLUME CONTROL

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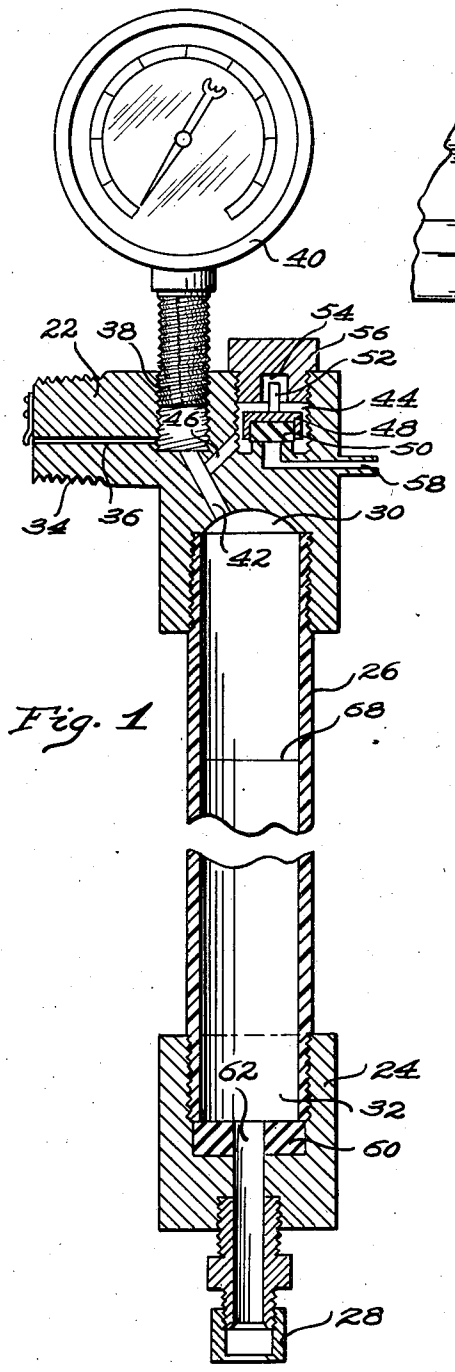


Fig. 1

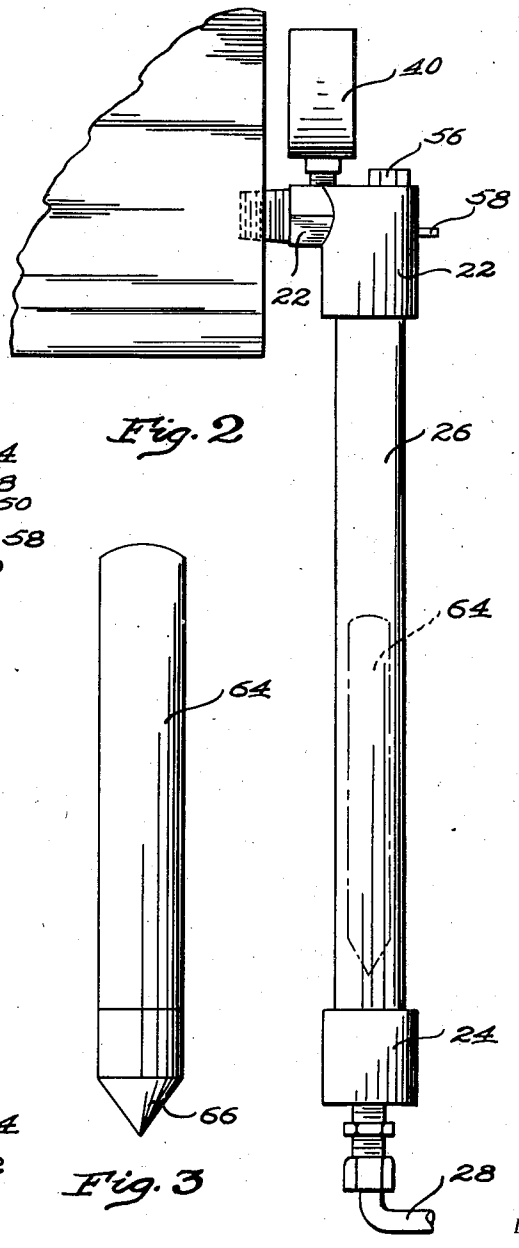


Fig. 2

Fig. 3

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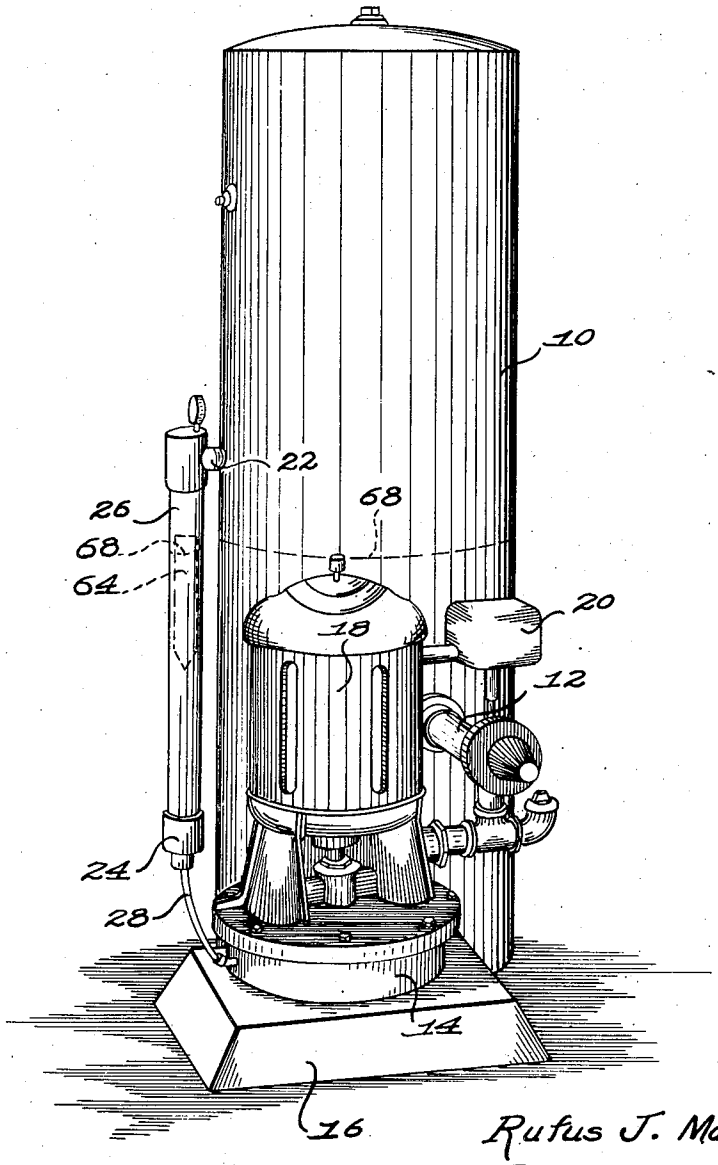
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COMBINED WATER GAUGE AND AIR VOLUME CONTROL

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Fig. 4



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COMBINED WATER GAUGE AND AIR VOLUME CONTROL

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4 Claims. (Cl. 103—6)

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This invention comprises novel and useful improvements in a combined water gauge and air volume control and more explicitly pertains to a water level regulating means for the pressure tank of a water pressure system.

Although not limited in utility thereto, my improvement particularly relates to individual household water pressure systems of the type wherein a jet pump draws water from a well and stores it in a tank under pressure from air trapped therein, this compressed air serving to supply the water to the various points of use in a house, automatic means controlling the pump to maintain the water under a predetermined maximum and minimum pressure in said tank. Devices of this character are subject to the defect that the pressure tank tends to depart from the optimum proportion of air and water therein or the desired water level. Numerous attempts to correct or obviate this defect have been made and devices are now available on the open market for supplying additional air to the pressure tank when the water level is too high. These devices and said prior attempts have generally been unsatisfactory for the reason that they possessed too many wearing parts, were not durable or efficient in their operation or were too expensive.

The primary object of this invention is therefore to provide a device which is not subject to the above mentioned deficiencies of the prior art.

A very important object of the invention is to develop an apparatus for the foregoing purpose, which will visually indicate the existing water level in a pressure tank.

Another important object of the invention is to formulate a mechanism in accordance with the aforesaid objects, whereby the operativeness of the construction may be visually observed and verified.

An additional purpose of my invention resides in the construction of means conforming to the purposes mentioned above, wherein the operating means for injecting air into the pressure tank constitutes a water level gauge.

Still another important object of my invention is the provision of a means for injecting air corresponding to the preceding objects, in which the quantity of air injected is controlled by and proportioned to the amount of surplus water in the tank.

Yet another purpose of the invention consists in designing a mechanism in harmony with the previously set forth objects, wherein atmospheric

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air is drawn into the device when the pump is operating and is ejected into the tank when the pump is stopped.

These, together with various ancillary objects of the invention, to become later apparent as the ensuing description proceeds are realized by the invention, one embodiment only of which has been illustrated by way of example in the annexed drawings, wherein:

Figure 1 is vertical sectional view through the attachment forming a part of my invention, parts being broken away;

Figure 2 is a side elevation of my attachment;

Figure 3 is a front elevation of the float forming a part of the invention, and

Figure 4 is an elevation in perspective of a complete operative unit embodying the invention.

Specific reference is now made to Figure 4 of the drawings in which 10 designates a water pressure tank, to which a delivery conduit 12 establishes communication with the discharge side of a pump casing 14, mounted upon the cap 16 of a well, not shown. The pump illustrated is of the well known centrifugal pump and jet type, a suitable electric motor 18 powering the pump and being controlled by a pressure operating switch indicated at 20. As so far disclosed, this is a common and conventional type of pump pressure system, wherein, when the consumer demand lowers the tank pressure below a predetermined minimum, the switch 20 is actuated to energize the motor 18 until the pump 14 has restored the pressure to a desired maximum.

It is understood by those skilled in this art, that a tank of air at atmospheric pressure is supplied with water, compressing the entrapped air until a predetermined maximum pressure is attained. When delivery of water has lowered the pressure by allowing the entrapped air to expand, until the predetermined minimum pressure is reached, a certain fixed, desirable water level in the tank is attained.

At a suitable elevation above this water level, I attach a fitting 22 in which and in a lower cap 24 is mounted a vertically extending transparent tube 26, connected by conduit 28 with the intake or suction side of the pump housing 14. These fittings and connections, illustrated more clearly in Figure 1, form the substance of my improved device. The transparent tube 26 is threaded or otherwise secured in fluid tight engagement in aligned bores 30, 32 in the fitting and cap respectively. A screw threaded end 34 for engagement with tank 10 is provided upon the

fitting and a restricted passage 36 communicating with the tank interior extends therethrough into a vertical bore 38 which receives the screw threaded tubular end of a conventional pressure gauge 40. A conduit 42, establishing connection between the chamber 38 and 30 is in constant communication with an air valve chamber 44 by means of a passage 46. Loosely received for free reciprocation in chamber 44 is an inverted cup-shaped valve member 48, having a fibre, leather or rubber like seating member 50 socketed therein and an axially extending guide stem 52, freely movable in the confines of a guide recess 54 and a closure plug 56. The valve member 50 is adapted to releasably seat and seal the upper end of a bore 58 admitting atmospheric air into the chamber 44. The lower end of the tube 26 is seated in sealing engagement upon a resilient disk 60 of rubber, fibre or the like, tightly seated at the lower end of bore 32 of cap 24, an axial opening 62 extending through the disk 60 to connect the tube 26 to the conduit 28. Freely disposed in the transparent tube 26 is a cylindrical float 64 having a conical valve seat 66 at its lower end for sealing the opening 62 when the valve is in its lowermost position. At 68, I have indicated the desired minimum pressure water level.

The operation of the device is as follows. When for any reason the tank has too little air present for optimum operation, and the water level at the time of minimum pressure is disposed above the fitting 22, the tube 26 will be full of water and the float 64 will be at the top, visually indicating and evidencing this undersirable condition to the operator. When the pump is now automatically operated to restore the pressure to the desired maximum, the line 28 to the suction side of the pump withdraws water from the tube 26 causing the float to fall until the valve 66 seats upon and closes the bore 62. This action is visible to the operator and constitutes a positive indication that the device is functioning normally to correct the previously indicated detrimental condition of the water level. The aforementioned evacuation of the water from tube 26 produces a partial vacuum communicated to bores 42, 36 and 46. As tube 36 is covered by the abnormally high water level in tank 10, it tends to draw in water; but the restricted area prevents sufficient rate of admission to relieve the vacuum, and consequently the valve 48 is unseated and atmospheric air fills the chamber 44 and tube 26, with a charge of air. When the pump is cut off by switch 20 upon the obtaining of the predetermined maximum pressure, suction ceases upon conduit 28 and the pressure at the discharge and inlet side of the pump becomes equal in the manner conventional with centrifugal and other water pumps. The water therefore rises in conduit 28 unseating and lifting the float valve and rising in the tube 26 to the same level as in tank 10, expelling or ejecting the trapped air charge through passages 42 and 36 into the tank 10. The air contained within the tank is thus augmented by the volume of the atmospheric air thus entrapped, thereby proportionately displacing water from the tank and correspondingly lowering the water level towards the desired elevation. This operation is repeated, each time the pump is operated while the water level is above the level of fitting 22 at the period of minimum pressure. When the minimum pressure water level falls below the elevation of fitting 22, said level will be visible in the transparent tube 26. The float 64 will now not be at the top of tube 26 and consequently when suction is applied the water lever in 26 has a less distance to fall and consequently less air is taken in. Thus the quantity of inducted air diminishes as the minimum water level drops from fitting 22 to its desired position 68. During this period of operation, the air in the tube 26 above the water level and which is of course under the same pressure as the tank, expands to atmospheric pressure as the water level in 26 is lowered by suction in tube 28, before sufficient vacuum is created in 26 and 44 to open valve 48 and induct atmospheric air.

Upon attainment of the desired level 68, there is sufficient air in 26 to expand to prevent the establishment of a vacuum in 44 capable of opening valve 48, thus preventing entry of outside air. When operating at the desired air-water ratio, the float will move between its bottom position and the level 68 thus visually indicating the normal operation of the device.

Although I have relied upon gravity to seat the air check valve 48, it will be understood that in certain situations and in certain positions of the valve, I may substitute a spring means to perform this function.

By the foregoing description, it will be apparent that I have eliminated all moving parts except the valves 66 and 48, thus obviating the possibility of impairment of the control function by corrosion of springs by the water, breakage of diaphragms and the like. The two moving parts are simple, rugged and efficient and the device not only functions to regulate but provides a visual indication of its own operativeness as well as of the existing water level.

I claim as my invention:

1. In combination, a water pressure tank, a water pump having its discharge side connected to said tank, an L-shaped fitting comprising a body with a lateral, screw threaded, integral extension engaging said tank and a portion depending therefrom, a bore extending into the lower side of said depending portion, a first conduit comprising a straight unobstructed passage of uniform cross section extending through said lateral extension and communicating with the interior of said tank, a second conduit inclined to and connecting said bore with said first conduit, a chamber in said fitting having a closure plug therefor, a third conduit horizontally extending and connecting said chamber with the atmosphere and a fourth conduit connecting said chamber with the second conduit, a normally closed suction operated valve in said chamber controlling communication between said third and fourth conduits, said plug having a recess and said suction valve having a stem slidable in said recess, a transparent sight tube connected with and depending from said bore, a float freely slidable in said tube and having a valve on its lower end, a valve seat at the lower end of said tube controllable by said float valve and a passage connecting said valve seat with the intake side of said pump.

2. The combination of claim 1 wherein said first conduit, said second conduit and said bore are of progressively increasing cross sectional area.

3. The combination of claim 1 wherein said suction operated valve is adapted to control the end of said third conduit.

4. The combination of claim 1 wherein a second bore opens inwardly from the upper side of said body, a pressure gauge attached to said second

bore, said bore being interposed between and communicating with said first and second conduits.

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