# United States Patent [19]

**Carpentier**

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[54] **YARD HYDRANT**


[75] Inventor: **John H. Carpentier,** Fort Atkinson, Wis.

[73] Assignee: **Whitewater Mfg. Co.,** Whitewater, Wis.



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[52] **U.S. Cl.** ..... **137/282;** 137/302

[51] **Int. Cl.** ..... **E03b 9/08;** E03b 9/14

[58] **Field of Search** ..... 137/302, 303, 304, 282; 239/318, 422, 200



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*Primary Examiner*—Robert S. Ward, Jr.

*Attorney, Agent, or Firm*—Wheeler, Morsell, House & Fuller



[57] **ABSTRACT**

A frost-free hydrant includes a reservoir below the frost line which is completely sealed from ground water and which is emptied by a venturi in the valve when the hydrant is used. An indicator raised by a float warns of undue accumulation of water in the reservoir and seals the air vent to the reservoir. An actuating handle for the valve is depressed to permit water to flow and may be swung laterally in either direction to hold any adjustment from trickle to full flow. Anti-siphoning openings are included in the valve actuating rod.


**10 Claims, 6 Drawing Figures**

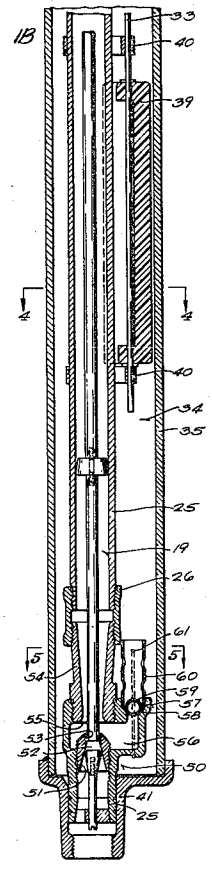


Fig. 1A

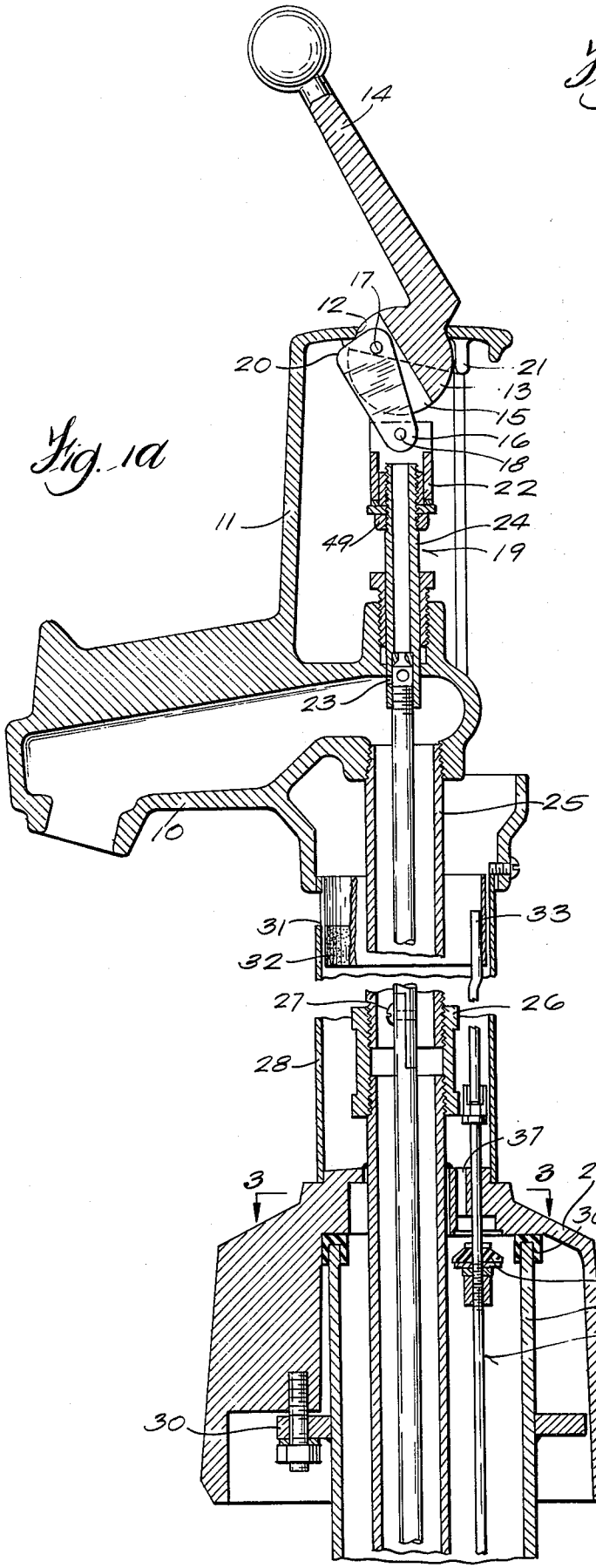
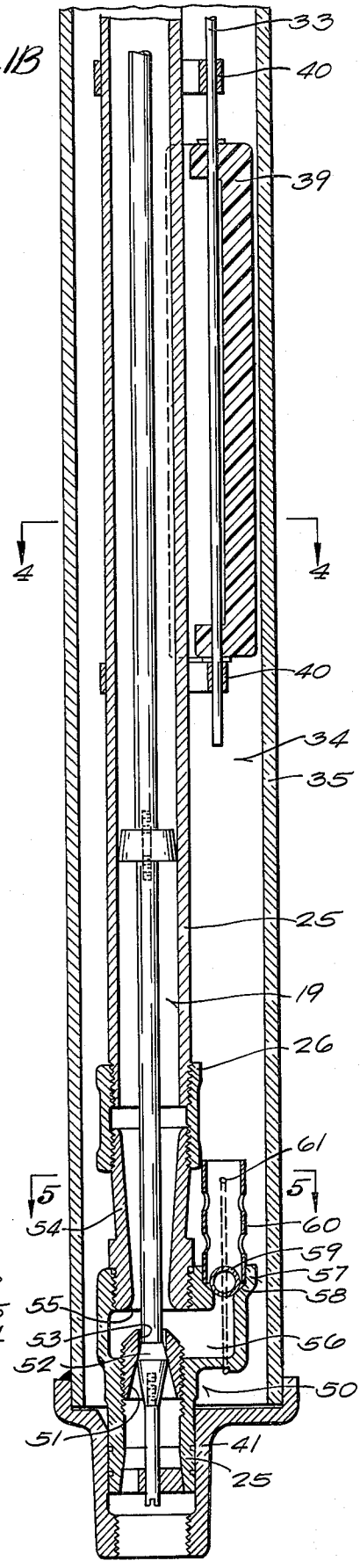

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Fig. 1B


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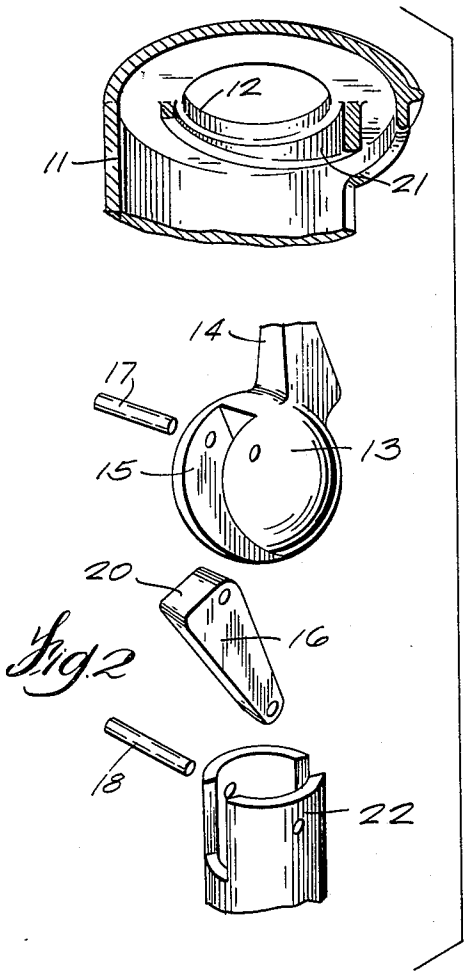



Fig. 2

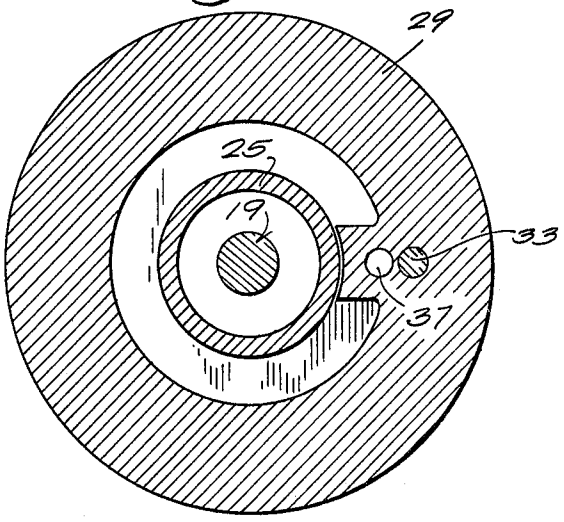



Fig. 3

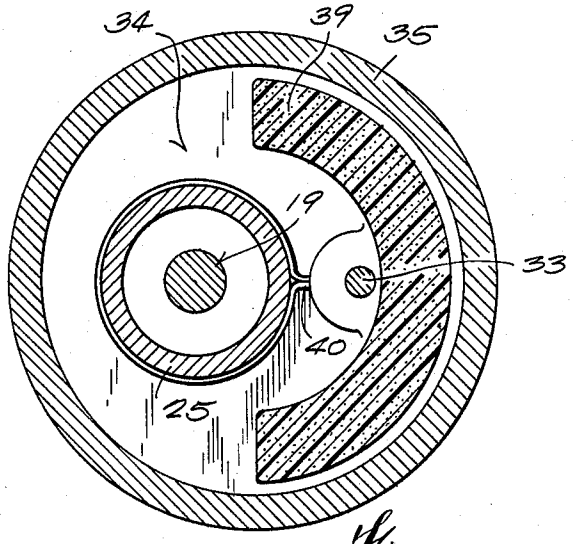



Fig. 4

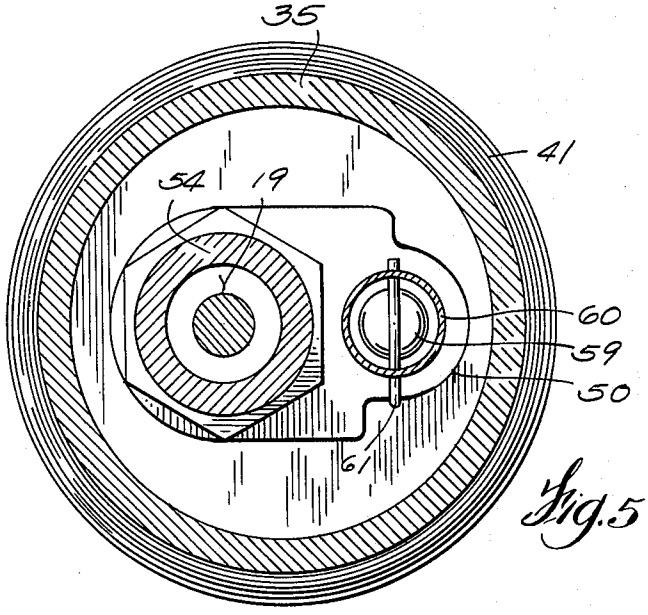



Fig. 5

# YARD HYDRANT

## BACKGROUND OF THE INVENTION

Existing frost-free yard hydrants drain water which is left standing above the buried valve in the hydrant into the ground. Such provisions require an opening from the water pipe to the ground below ground level. Any such opening, however it is protected and sealed, is vulnerable to the entrance of unsanitary ground water, which may thereafter be supplied with water from the hydrant.

## SUMMARY OF THE INVENTION

The present hydrant solves the sanitation problem with a reservoir which is completely sealed from contact with ground water. The reservoir is filled through a check valve having a buoyant sealing ball and is emptied during use of the hydrant by entraining the stored water in the stream of newly supplied water by means of a venturi combined with the valve, until the buoyant ball seals the check valve. Because the stored water is completely sealed from ground water it is as wholesome as the newly supplied water and does not detract from the quality of the water supplied.

A venturi may be ineffective to remove the stored water during periods when the hydrant is turned on only slightly. Accordingly, a float within the reservoir lifts a visible signal into view of the operator when the level of the stored water becomes excessive. At the same time, the air vent at the top of the reservoir is sealed to prevent further accumulation of water above frost level. When the signal is displayed, the operator opens the hydrant fully for a time, thus draining the reservoir and averting any damage from freezing.

A novel provision against back siphoning is provided at the spout of the hydrant. The valve operating rod extends through the spout, and the upper portion of the rod is a tube having a side opening within the spout to admit air to the spout in sufficient quantity to prevent siphoning.

A novel operating handle for the valve rod comprises a universally mounted generally spherical base for the operating lever biased upwardly into engagement with a retaining means. As shown this is a circular opening in the housing. A link extends from a pivot secured to the spherical base at a point removed from the center of the sphere to pivot in a rotatable connection with the top of the valve operating rod, to depress the valve operating rod whenever the operating lever is depressed in any direction. The link is provided with a surface laterally beyond the surface of the sphere. A stop is provided against which the link surface can be urged by the biasing force to retain the rod in a desired position. As shown, the stop is a circular inclined cam concentric with the sphere and preferably having the form of a cylinder terminating along a plane at an angle to the axis of the cylinder. The projecting surface, or shoulder, of the link may be engaged against the cam, or stop, to hold the valve operating rod against the bias of the rod in any position from fully raised to fully depressed without further attention by the operator, merely by depressing the operating handle until the correct flow of water is achieved and then rotating the handle until the shoulder of the link strikes the circular cam surface. Upon releasing the operating lever the flow of water will be maintained at the present level. To turn off the water the operating lever is returned to a position approximately in line with the spout and released. Because the shortest axial dimension of the cam is at that point, the release of the lever permits the valve to shut off under the bias of the water pressure (or an optional mechanical biasing means such as a spring) acting on the valve rod.



Whenever the hydrant is shut off the check valve permits the column of water within the hydrant to drain into the reservoir, especially since the valve element of the check valve is buoyant. Retainer means are provided to keep the sealing ball of the check valve above the valve seat.

The venturi which drains the storage reservoir includes a converging cone and a jet formed by the valve itself. The converging cone of the venturi is the valve seat. The valve rod carries a valve closure having a conical surface complementary to the converging cone of the venturi-valve-seat and extends through the center of the orifice, in effect forming the inner wall for a ring shaped jet projecting a high speed stream of water across a chamber open to the storage reservoir through the check valve. Because the valve closure member is a part of the converging walls of the ringshaped venturi, the opening of the venturi is the same as the opening of the valve, rather than remaining fixed. Accordingly, a relatively high speed jet is produced even at rather small valve openings, to assist in emptying the reservoir under a wide range of operating conditions. After crossing the chamber the jet enters a very short second converging section of the venturi which merges immediately into the diverging cone section, which is joined to ordinary piping leading to the hydrant spout.

The reservoir is provided with an air relief vent at the upper end so that water may freely enter and leave the reservoir. The reservoir is also provided with means to signal over-filling. As shown this is a float located near the frost line and fixed to a rod extending upwardly through a valve member adapted to close the air vent when raised, and terminating in a visible indicator that the water level in the reservoir is too high. The specific form shown in a sleeve fastened to the top of the float rod, the sleeve being painted in a warning color such as red and being so formed as to be visible through a window in the housing only when the float is lifted by an excessive water level. Thus when the indicator is visible the operator is warned to turn the hydrant on full to drain the reservoir to a safe level. The return of the indicator to concealed position indicates that the reservoir has in fact been sufficiently drained. The structure desired could, if desired, be modified to indicate on a scale the level of the water within the reservoir.

The valve in the vent makes the reservoir stop filling when it closes. A principal advantage is that when flow of water from the hydrant is restricted, as when a hose is blocked by kinking or by a vehicle resting on the hose, the water is prevented from rising beyond a preset level. Under those conditions the venturi is ineffective and the reservoir may fill at pressures as high as pump pressure. The vent valve then closes to prevent the upper portion above the reservoir from receiving water from the vent, and the signal warns that the reservoir has filled. The presence of the signal with the hydrant on warns of this condition.

## DRAWINGS

FIG. 1A is the top portion of a vertical, axial cross-sectional view through the hydrant of my invention.

FIG. 1B is a downward continuation of the view of FIG. 1A. In FIGS. 1A and 1B portions of the height are omitted which do not contain additional detail and which are of optional length to suit the depth required for frost protection.

FIG. 2 is an exploded perspective view of the principal parts of the operating lever, with portions of the housing broken away to show detail.

FIG. 3 is a cross-sectional view on line 3—3 of FIG. 1A.

FIG. 4 is a cross-sectional view on line 4—4 of FIG. 1B.

FIG. 5 is a cross-sectional view on line 5—5 of FIG. 1B.

## DETAILED DESCRIPTION

Although the following description is detailed in order to best set forth the illustrated embodiment of the invention, the details are intended by way of explanation rather than limitation, the invention being defined in the attached claims.

As shown in FIG. 1A my yard hydrant has a spout **10** extending laterally and downwardly from an integral upper housing **11** provided with a circular opening **12.** Opening **12** is smaller in diameter than a sphere **13** and forms a seat or universal mount for the sphere. Sphere **13** forms the base of an operating lever **14,** the major portion of the sphere being within housing **11** and below opening **12.** The sphere **13** is slotted at **15** to receive a link **16** extending from a pivot **17** within the slot **15,** but spaced from the axis of sphere **13,** to a pivot **18** on the axis of valve operating rod **19.** Thus handle **14** may be depressed to move valve rod **19** downwardly through the action of link **16.**

Link **16** has a surface or shoulder **20** extending laterally beyond the surface of sphere **13** and beyond opening **12.** Opening **12** is surrounded by a circular stop or cam **21** having the form of a cylinder cut on a plane at an angle to its axis, the diameter of cam **21** being such that shoulder **20** of link **16** will strike some part of the end of cam **21** whenever link **16** moves upwardly.

Valve rod **19** is axially biased upwardly by water pressure and if desired may be further biased upwardly toward sphere **13** by means of a spring (not shown). Whenever handle **14** is released the upward bias on valve rod **19** moves link **16** upwardly, rotating handle **14** and sphere **13** in seat **12** until shoulder **20** strikes cam **21.** In the position shown in FIG. **1A** the valve will then be off.

Pivot **18** is mounted on a swivel **22** which comprises the upper end of valve rod **19,** permitting handle **14** and link **16** to be rotated by any degree about the axis of valve stem **19.** Nut **49** below swivel **22** is adjusted up and down on rod **19** to assure proper closing action. When handle **14** is depressed and rotated shoulder **20** strikes cam or stop **21** at a different elevation, permitting the flow from spout **10** to be maintained at any level. Furthermore, the flow from spout **10** may be temporarily increased by depressing handle **14** without rotating it and upon release of handle **14** the flow will return to the former level. By aligning handle **14** with spout **10** and releasing the handle the valve is closed and the flow terminates.

The upper portion of valve rod **19** extending from swivel **22** through a packing into spout **10** is provided with a passage **23** to admit air into the top of spout **10.** For that purpose said upper section of valve rod **19** may desirably be a rigid tube **24.** A check valve prevents upward flow through tube **24.**

Water is supplied to spout **10** through pipe **25** which extends downwardly to a valve below frost level, and thence to a source of water. Sections of pipe **25** may be joined as needed with conventional couplings **26** and extensions of valve rod **19** through pipe **25** may be joined by conventional couplings such as the half-lapped coupling joined with a screw shown at **27.**

Pipe **25** is surrounded by an outer housing pipe **28** which extends from spout **10** to skirt **29,** skirt **29** being bolted to a flange **30** near ground level on reservoir pipe **35.** The connections between spout **10,** outer housing pipe **28,** and skirt **29,** are such as to shed water away from pipe **25.**

Outer housing pipe **28** may desirably be provided with a window **31.** A warning sleeve **32** has a colored portion (shown stippled) to serve as an indicator which may be viewed through window **31** only when sleeve **32** is raised. Sleeve **32** is supported on float rod **33** which extends downwardly through skirt **29** into a reservoir **34** having a side wall comprising a pipe **35** sealed by a gasket **36** at the top to skirt **29,** sealing pressure being applied by the bolts which hold skirt **29** to flange **30.**

Reservoir **34** is provided with a vent **37** through skirt **29** into the space enclosed by outer housing pipe **28.** Vent **37** may be sealed by a valve **38** fixed to float rod **33.** As best shown in FIG. **1B** float rod **33** is fixed to a float **39** and is desirably provided with guides **40.** When the water rises too high in reservoir **34** it encounters float **39** and lifts it, raising rod **33.** Rod **33** carries valve **38** into engagement with vent **37,** sealing it, and at the same time raises warning sleeve **32** to a position in which the indicator portion is visible through window **31.** Since that portion of sleeve **32** is highly visible, desirably red, this conveys a warning that reservoir **34** is too full.

Reservoir **34** is closed at the bottom by means of a fitting **41** sealed to pipe **35** and to a source of water here shown as pipe **25.**

A valve and venturi fitting **50** receives water from pipe **25** where it enters fitting **41.** The valve and venturi are a single structure including a valve seat **51** comprising a converging conical passage. A double conical valve closure **52** mates with seat **51** and is secured to valve operating rod **19.** A valve orifice **53** surrounds rod **19** and is sufficiently larger than the rod to permit full flow when rod **19** is depressed enough to fully open the valve by movement of valve closure **52** downwardly within valve seat **51.**

Axially aligned with orifice **53** is a diverging cone **54** which desirably begins with a short section of converging passage radius **55** to assure that the cylindrical jet of water emerging from orifice **53** around rod **19** will be efficiently transferred to diverging cone **54** of the venturi. The jet of water emerging from orifice **53** is surrounded by cavity **56** which opens to reservoir **34** though check valve **57.** Check valve **57** consists of a seat **58,** a buoyant ball **59,** and a perforated passage **60** extending from valve seat **58** to the interior of reservoir **34.** The buoyant ball **59** is kept within perforated passage **60** by the small diameter of seat **58** at one end and by a clip **61** having a leg extending through perforated passage **60** to retain the ball **59** within the passage and a second leg extending around fitting **50** to maintain the clip in assembled relationship.

Desirably main valve seat **51** is threaded into fitting **50**, as is the diverging venturi cone **54**.

The operation of the structure just described is such that when valve closure member **52** is moved downwardly by valve operating rod **19**, a circular orifice **53** is opened permitting water to travel at high speed across cavity **56** and into diverging cone **54**. The low pressure present in cavity **56**, which is the high speed portion of the venturi, draws water from reservoir **34**, along with supply water, up pipe **25** to spout **10** as long as buoyant ball **59** is supported by the water within reservoir **34** against clip **61**. When sufficient water has been withdrawn from reservoir **34** so that the buoyant ball approaches check valve seat **58**, the flow of water and the low pressure in cavity **56** seals ball **59** to seat **58** closing the check valve and terminating flow from reservoir **34** up pipe **25**. At that time, little water remains in reservoir **34**. When the main valve is closed by moving valve closure **52** upwardly to seat against complementary valve seat **51** (either by water pressure or by a biasing spring) there is no longer a flow of water across cavity **56** to lower the pressure. However, there is a column of water extending from fitting **50** to spout **10**. Since valve closure **52** is maintained in closed position by water pressure or by spring bias or both, the column of water displaces ball **59** upwardly in perforated tube **60** toward clip **61**. This permits the water in pipe **25** to escape into reservoir **34** through the perforations in tube **60**. Pipe **35** forming reservoir **34** is of adequate diameter, and extends to a sufficient depth when properly placed, to permit all water in pipe **25** to flow downwardly to a level below the frost level, preferably with a reserve capacity to accommodate additional water if reservoir **34** is not sufficiently drained in a particular cycle of operation.

As noted previously, reservoir **34** is vented at **37**, and the vent is closed by float **39** and valve **38** if the water level in reservoir **34** becomes high enough to present a danger of frost damage, at the same time giving a visible signal by lifting sleeve **32** to a position in which the indicator is visible through window **31**. The operator then merely depresses operating lever **14** sufficiently to fully open valve closure **52** and lets the water run for a short period while reservoir **34** drains.

It will be seen that I have provided a novel, convenient, and highly sanitary system for draining the upper portion of a yard hydrant to a level below the frost line, while keeping the water in the hydrant entirely separated from the ground water, and preventing backsiphoning, and have provided a number of novel mechanisms for carrying this invention into effect.

I claim:

**1.** In a yard hydrant having a spout, a valve located below the frost line, a reservoir located below the frost line, a passage connecting the valve to the spout, and reservoir regulating means connecting said passage with said reservoir to drain said passage into said reservoir when said valve is closed and to withdraw water from said reservoir into said passage only when said valve is open, said valve including a valve seat and a complementary valve closure member, said valve seat and said valve member comprising the converging cone of a venturi in said passage, said venturi having a throat open to said reservoir regulating means, said valve member being secured to a valve rod extending through said valve seat, said valve rod, valve member and valve seat cooperating to form a variable opening annular jet orifice for water passing through said valve, said orifice being smaller at smaller valve openings, whereby to create an area of lowered pressure around said jet at substantially all valve openings.

**2.** The device of claim **1** in which said reservoir includes an upper air vent, a second valve member movable into said vent to close the vent, and a float within the reservoir operably attached to the valve member to close the vent only when the float is sufficiently raised by water within the reservoir.

**3.** The device of claim **1** in which said hydrant further comprises a universally mounted sphere, a link pivotally secured to the sphere at a point spaced from the center of the sphere, said link being pivotally secured to said valve rod, means attached to the sphere for manually rotating the sphere, a surface on said link beyond the surface of the sphere, and stop means adjacent the path of said surface when said sphere is rotated and adapted to engage said surface and thereby prevent free rotation of said sphere in at least one position of said shoulder and said sphere.

**4.** The device of claim **3** wherein the stop means comprises a circular cam concentric with the sphere and having a cam surface in the form of the end of a cylinder terminated along an intersecting plane at an angle to the axis of the cylinder, the axis of the cylinder coinciding with the axis of the valve rod, and means biasing the valve rod axially toward the sphere.

**5.** The device of claim **1**, further comprising an operating handle secured to said valve rod to move said rod axially, and adjustment means effective to adjust the distance from the point at which said handle is secured to said rod to the valve member, said adjustment means being at the top of the rod and accessible without dissassembly, to ensure proper closing of said valve.

**6.** The device of claim **1** wherein said valve seat is threadedly engaged with a supporting member for adjustment.

**7.** In a yard hydrant having a spout, a valve located below the frost line, a reservoir located below the frost line, a passage connecting the valve to the spout, and reservoir regulating means connecting said passage with said reservoir to drain said passage into said reservoir when said valve is closed and to withdraw water from said reservoir into said passage only when said valve is open, said valve including a valve seat and a complementary valve closure member, said valve seat comprising the converging cone of a venturi, said valve member being secured to a valve rod extending through said valve seat, said valve rod and valve seat cooperating to form an annular jet orifice for water passing through said valve, whereby to create an area of lowered pressure around said jet, said connection between said passage and said reservoir comprising a cavity around said orifice and said jet, including an upper air vent, a valve member movable into said vent to close the vent, and a float within the reservoir operably attached to the valve member to close the vent when the float is sufficiently raised by water within the reservoir, a signal member, housing means concealing the signal member, and means operated by said float to move said signal member to visible position when said float is raised.

**8.** In a yard hydrant having a spout, a valve located below the frost line, a reservoir located below the frost line, a passage connecting the valve to the spout, and reservoir regulating means connecting said passage

with said reservoir to drain said passage into said reservoir when said valve is closed and to withdraw water from said reservoir into said passage only when said valve is open, said reservoir regulating means further comprising a check valve extending vertically and connected to said passage at the bottom and said reservoir at the top and having a valve seat at the bottom of the valve, said check valve having a buoyant closure element arranged to float away from the valve seat only when excess water is present in the reservoir, and which will seal on the valve seat when the water in the reservoir declines to a level approaching the level of the valve seat and the pressure is lowered in said cavity.

**9.** In a frost proof hydrant having a spout, a water passage to the spout, a variable opening valve in the water passage below the frost line, a reservoir below the frost line connected to receive water from the passage above the valve when the valve is closed, and a venturi in the passage connected to draw water from the reservoir into the throat of the venturi when the valve is open, the improvement comprising means to vary the size of the passage through the venturi with variations in the opening of the valve, whereby to increase the effectiveness of the venturi to drain the reservoir at small valve openings.

**10.** The device of claim **9** wherein the means to vary the size of the venturi is a conical valve closure member operating in the converging portion of the venturi to close the valve and the venturi when in contact with the wall of the venturi and to simultaneously control the valve opening and venturi opening in all other operating positions.

* * * * *