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2,102,299

GASHOLDER

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FIG. 1.

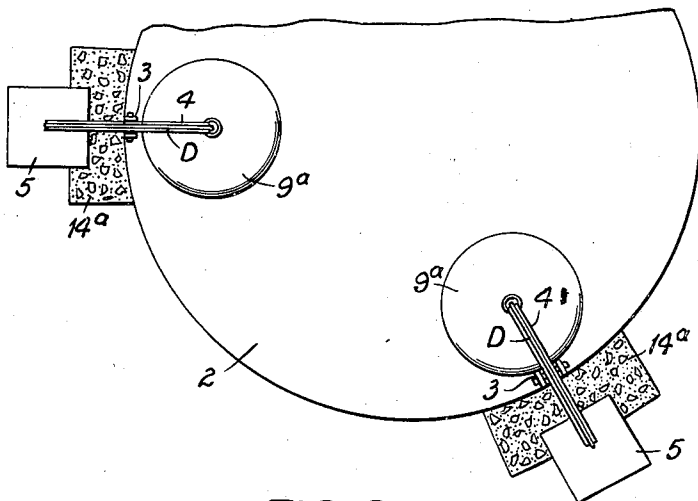


FIG. 2.

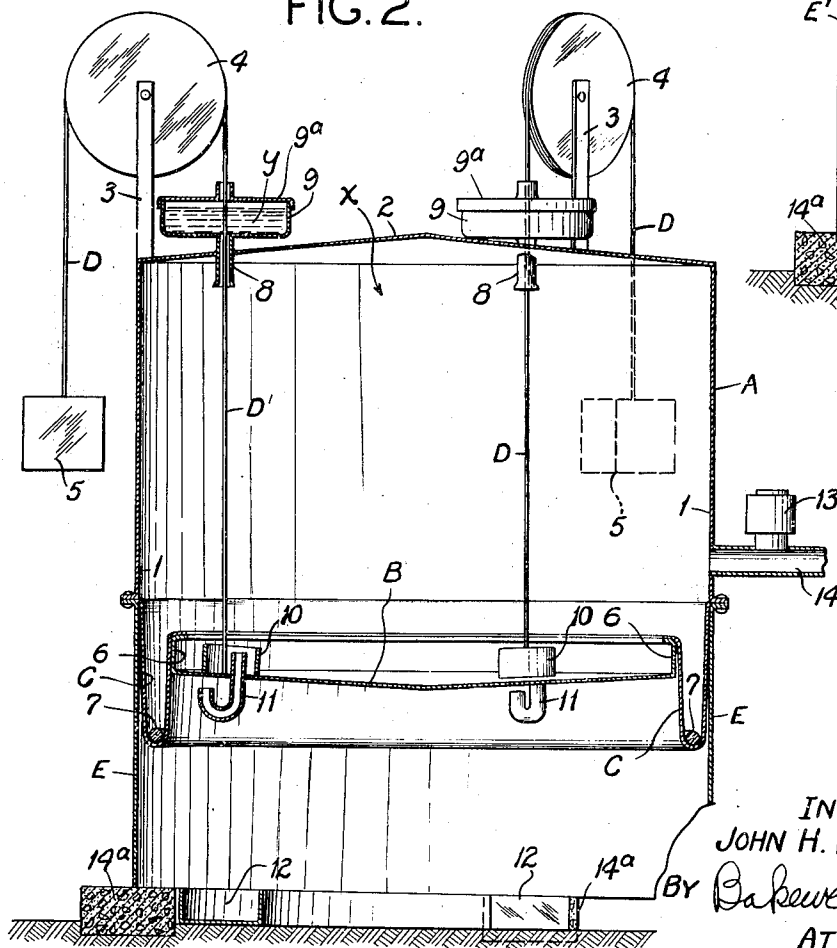
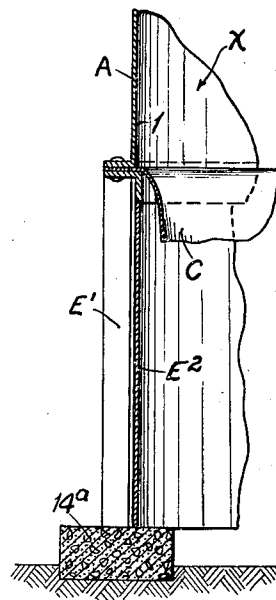


FIG. 3.



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GASHOLDER

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9 Claims. (Cl. 48-174)

This invention relates to gas holders of the type in which the gas storage space or chamber comprises a stationary, vertically-disposed side wall, a piston or equivalent member which moves vertically with relation to said side wall, so as to vary the internal volume of said gas chamber, and a flexible, non-metallic sealing element which produces a gas-tight joint or connection between said piston and side wall and still provides for the vertical movement of the piston.

My present invention is an improvement upon the apparatus described in my application for patent Serial No. 16,995, filed April 18, 1935, now issued as Patent No. 2,050,686, dated Aug. 11, 1936, and has for one of its objects to provide a gas holder that embodies the essential characteristics and/or features of the apparatus described in said patent, but which is less expensive to build and easier to erect.

Another object is to provide a gas holder that embodies the distinguishing features and characteristics of the apparatus described in my said patent, and which is particularly adapted for use in a vapor balancing system for volatile oil tanks, due to the fact that it is of such design and construction that it operates best under a slight positive pressure.

And still another object of my invention is to provide a gas holder of simple design and inexpensive construction, in which the piston and the non-metallic sealing element associated with same are housed and protected in a novel way from rain, snow and the like.

Briefly described, my present invention consists of a gas holder in which the upper portion of the gas storage space or chamber is formed by a substantially inverted, cup-shaped metal member. A piston or vertically-movable member is arranged inside of said inverted cup-shaped member so as to form in effect the bottom or lower portion of the gas chamber. The annular space between the piston and the upright side wall of the stationary, inverted cup-shaped member is sealed by a flexible, non-metallic sealing element, and a counterbalancing mechanism or equivalent means is used to sustain the piston and permit it to move downwardly and upwardly during the operation of admitting and exhausting gases to and from the gas chamber. By constructing the holder in the manner above described, the piston and the sealing element will be effectively protected from rain, snow and ice by the inverted cup-shaped member constituting the upper portion of the gas chamber, and hence, I can omit the weather roof or shield

used in my prior apparatus, thereby reducing the cost and simplifying the construction of the apparatus. A means similar to that disclosed in my patent previously referred to, is employed to control the flexing, bending or movement of the sealing element and protect the same from strains that tend to tear or disrupt said sealing element.

Figure 1 of the drawing is a fragmentary top plan view of my improved gas holder.

Figure 2 is a vertical transverse sectional view of said holder; and

Figure 3 is a fragmentary view, illustrating another method of supporting the inverted cup-shaped member that constitutes the upper portion of the gas chamber.

Referring to the accompanying drawing, which illustrates the preferred form of my invention, A designates a substantially inverted, cup-shaped member that constitutes the upper portion of the gas storage space or chamber, B designates a piston that is adapted to move vertically inside of said member, C designates a flexible, non-metallic sealing element arranged so as to produce a gas-tight joint or connection between the piston and the side wall 1 of the member A and still provide for the vertical movement of said piston, and D designates cables counterweighted cables that sustain the piston and permit it to rise and fall as gases are withdrawn from and admitted to the gas storage space or chamber x of the holder. The inverted, cup-shaped member A is preferably stationarily mounted in an elevated position, and the sealing element C is so proportioned that the piston B can move upwardly to a point in close proximity to the top wall 2 of the gas chamber and move downwardly to a point considerably below the bottom edge of the side wall 1 of the member A, thereby producing a gas storage chamber of relatively great capacity.

The inverted cup-shaped member A, which is of gas-tight construction, is made of metal, and uprights or supports 3 are erected on the permanent roof or top wall 2 of the gas chamber, so as to sustain pulleys 4 over which the cables D travel, said cables having counterweights 5 attached to the free ends of same, and said pulleys being so disposed that the weights 5 will clear the side wall of the member A and the supporting structure that sustains said member A when said weights rise and fall, due to the vertical movement of the piston B. The piston B may be formed conveniently from a flexible metal diaphragm provided at its peripheral edge with an annular flange or other suitable rein-

forcing element 6, although it is not essential that the piston B be flexible. In order to insure proper folding and unfolding of the sealing element C when the piston B moves upwardly and downwardly, an annular row of roller weights 7 is combined with said sealing element in the manner described in my patent previously mentioned. In certain positions of the piston the vertical side wall of the stationary member A acts as a backing for the sealing element C, and in other positions the supporting structure on which the member A is erected, acts as a backing for the sealing element.

Any suitable means may be used to seal the holes or openings in the stationary top wall 2 of the gas chamber through which the cables D pass, the means herein illustrated for this purpose consisting of friction-less stuffing boxes 8 on said wall through which the cables pass. The stuffing boxes 8 may be lined with felt or other suitable packing material, or said stuffing boxes may be combined with liquid reservoirs 9 that hold a viscous liquid *y*, which seals the cables, each of said reservoirs 9 being preferably provided with a removable rain-tight cover 9^a having an opening through which the cable passes, as shown clearly in Figure 2. The sealing liquid that leaks through the stuffing boxes and flows downwardly along the cables, collects in cups or holders 10 attached to the top side of the piston B at the lower end of the cables D, and in order that the liquid which may collect in the cups 10 will be removed automatically therefrom, each of said cups is provided with a syphon drain 11, arranged so as to discharge into a discharge reservoir 12, arranged directly thereunder, as shown in Figure 2. The gas storage chamber *x* may be provided with any suitable type or kind of venting mechanism, and therefore, I have simply illustrated said chamber as being equipped with a conventional pressure vacuum vent 13 attached to a pipe 14 at the lower end of the side wall 1 of the gas chamber, through which gases are admitted to and withdrawn from said chamber.

As previously stated, the member A is preferably arranged in an elevated position, so as to permit the piston to move downwardly to a point below the lower end of said member, and thus produce a gas chamber *x* of relatively great capacity. In the form of my invention shown in Figure 2 the member A is mounted on and rigidly supported by an annular metal shell E disposed so as to serve as a backing or abutment member for the sealing element C under certain conditions. This shell E need not be gas-tight, but it is preferable to mount said shell on concrete blocks or other suitable supports 14, so as to hold the bottom edge of said shell spaced away from the ground, and thus vent the space inside of said shell. In Figure 3 of the drawing I have illustrated the member A as being supported by posts or uprights E', which have attached to same a backing E² formed by a screen, a slatted structure, a piece of sheet metal, or, in fact, anything that will absorb strains exerted on the sealing element C in a direction tending to flex said element outwardly, and thus tear or strain the same.

In order that the piston B will move upwardly at substantially zero internal pressure of the gas storage chamber, during the operation of withdrawing gases from said chamber, the counterbalancing mechanism, or counterweighting mechanism that sustains said piston is constructed

so as to equal or be slightly greater than the dead weight of the piston B and the parts carried by or attached to same, the term "zero internal pressure" being herein used to mean a zero differential between atmospheric pressure and the pressure in the gas storage chamber or the oil tank or tanks from which vapor passes into said storage chamber. During the operation of withdrawing gases from the chamber *x* the piston B rises at substantially atmospheric internal pressure, and as the counterweights 5 weigh slightly more than the weight of the piston, the internal pressure will be slightly greater than atmosphere, and the sealing element C will be pushed downwardly into the position shown in Figure 2, which is the most desirable manner of operating the device. The roller weights 7 assist the natural tendency of the sealing element to properly fold and unfold during the vertical movement of the piston, and when the gas chamber is empty, and the piston B is in its extreme elevated position, the side wall 1 of the said chamber acts as a backing to resist outward movement or flexing of the sealing element. When the gas chamber *x* is full, and the piston B is in its extreme lowermost position, the shell E in the form of the invention shown in Fig. 2, or the backing E² in the form of the invention shown in Figure 3, effectively resists outward flexing or movement of the sealing element C.

While the gas holder above described embodies the good features and characteristics of the apparatus described in my said Patent No. 2,050,686, it differs from said apparatus, in that it acts more efficiently, so far as the sealing element is concerned, when it is operated under a slight positive pressure with relation to atmosphere. Accordingly, it is better adapted than my prior apparatus for use in connection with vapor balancing systems for volatile oil tanks, i. e., for use in cases where the thermal expansion from volatile oil tanks during the day is accumulated in a gas holder and fed back to the tanks during the night, because in such a system it is desirable to maintain substantially zero pressure at the roof of the volatile oil tanks. In such a system the vapor column is heavier than air and the heavier column of vapor will exert a pressure at the gas holder. This slight pressure can be balanced at the gas holder by operating the same at a slight positive pressure, which would give a substantially zero pressure at the top of the oil tanks, and my improved gas holder herein illustrated is of such design or construction that it acts best when operated under a slight pressure. As previously explained, constructing the upper portion of the gas chamber from a substantially inverted, cup-shaped member makes it possible to omit the weather shield or roof employed in the apparatus described in my patent previously referred to, because said member effectively protects the piston B and the sealing element C from rain, snow and ice. This change materially reduces the cost of constructing the holder, and it greatly simplifies the erection of same.

Another desirable characteristic of the gas holder herein illustrated is that if the holder is used to handle vapors which are heavier than air, any leakage through the piston B or sealing element C will fall by gravity into the supporting structure on which the member A is erected and will escape freely from same to the atmosphere through the ample venting spaces with which said supporting structure is provided.

Having thus described my invention, what I 75

claim as new and desire to secure by Letters Patent is:

1. A gas holder provided with a gas storage chamber whose upper portion is formed by a stationary member of substantially inverted cup shape, a vertically-movable piston inside of said member that forms the bottom of said chamber, a flexible sealing element attached to said piston and to the side wall of said stationary member, counterweighted cables attached to said piston and leading upwardly through openings in the top wall of the gas chamber, and reservoirs on said top wall for holding a viscous liquid that seals the openings through which the cables pass.

2. A gas holder provided with a gas storage chamber whose upper portion is formed by a stationary member of substantially inverted cup shape, a vertically-movable piston in said member that forms the bottom wall of the gas chamber, a counterbalancing mechanism for the piston comprising a part attached to the piston and extending upwardly through a hole in the top wall of the gas chamber, a reservoir for holding a viscous liquid that seals said hole, and means for recovering sealing liquid that escapes from said hole.

3. A gas holder provided with a gas storage chamber whose upper portion is formed by a stationary member of substantially inverted cup shape, a vertically-movable piston in said member that forms the bottom of the gas chamber, a flexible, non-metallic sealing element attached to said piston and to the side wall of said chamber, counterweighted cables attached to the piston and leading upwardly through holes in the top wall of the gas chamber, reservoirs mounted on said top wall for holding a viscous liquid that is used to seal the holes through which the cables pass, devices on the piston for receiving sealing liquid that escapes from said reservoirs and flows downwardly on said cables, and syphon drains associated with said collection devices.

4. A gas holder provided with a gas storage chamber whose upper portion is formed by a stationary member of substantially inverted cup shape, a supporting structure on which said mem-

ber is erected, a vertically-movable piston in said member that forms the bottom of said chamber, a flexible, non-metallic sealing element attached to said piston and to said stationary member and proportioned so that when the gas chamber is empty, said sealing element will be backed up by the side wall of said chamber, and when said chamber is full of gases, said sealing element will be backed up by said supporting structure, and a counterbalancing mechanism for said piston comprising a part that leads upwardly from the piston through a sealed opening in the top wall of the gas chamber.

5. A device for the purpose described, comprising a gas storage chamber formed by a stationary member having a side wall and a top wall both of which are fixed or immovable, a vertically movable piston in said stationary member which forms the bottom of said storage chamber, and means for closing the space between said piston and side wall.

6. A device, according to claim 5, having a counter-balancing mechanism attached to the piston.

7. A device, according to claim 5, having a counter-balancing mechanism attached to said piston by cables passing through one of the fixed walls of the gas storage chamber with a gas-tight seal.

8. A device of the kind described in claim 5 in which the means for closing the space between said piston and the side wall of said gas storage chamber consists of a flexible sealing element.

9. A device for the purpose described, comprising a gas storage chamber formed by a stationary member having a side wall and a top wall both of which are fixed or immovable, a vertically movable piston in said stationary member which forms the bottom of said storage chamber, and a flexible sealing element attached to said piston for closing the space between said piston and the side wall of said storage chamber, said flexible sealing element being folded into a loop which depends from said vertically movable piston.

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