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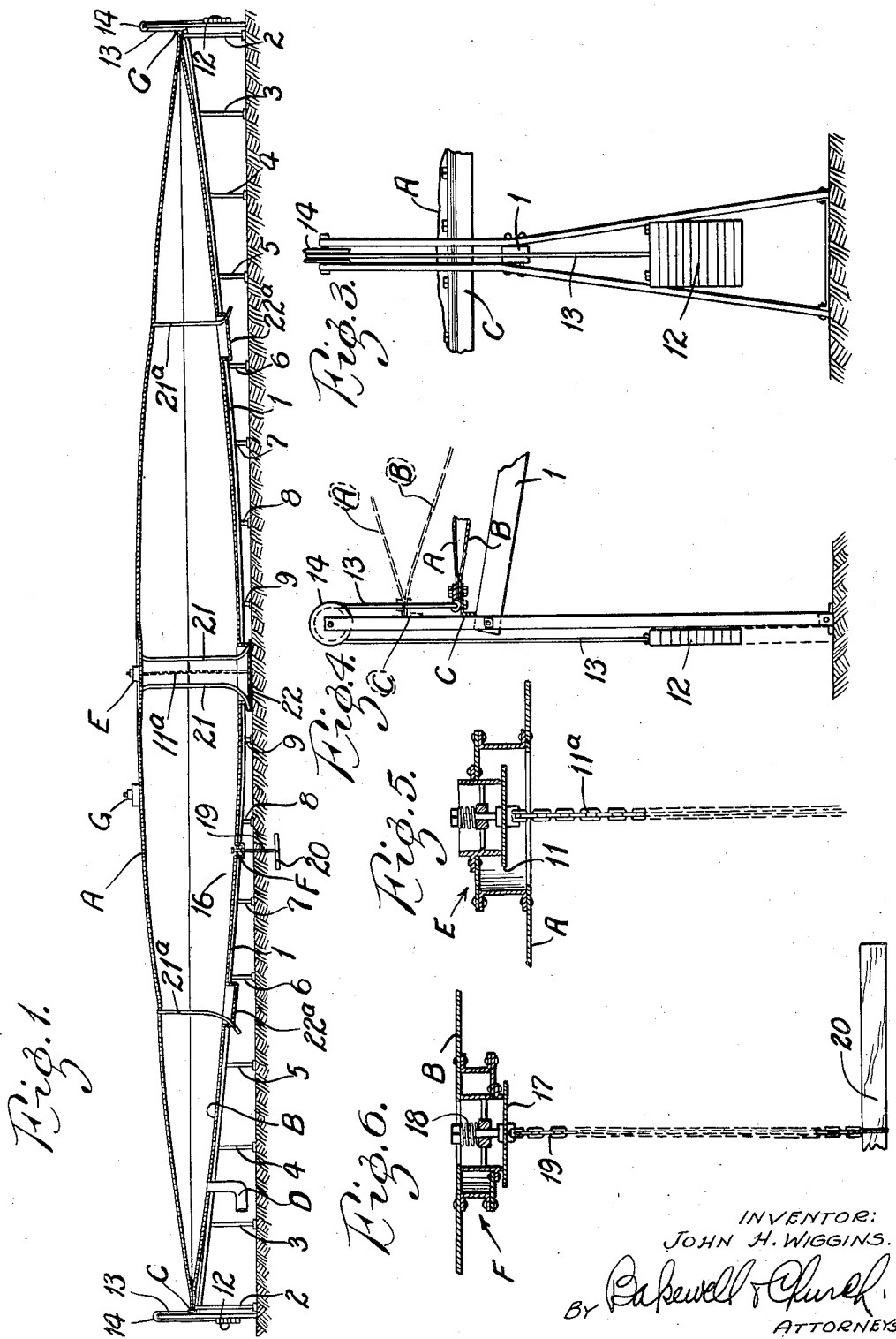
J. H. WIGGINS

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GAS AND LIQUID STORAGE DEVICE

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GAS AND LIQUID STORAGE DEVICE

John H. Wiggins, Tulsa, Okla.

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This invention relates to devices of the kind that are used for storing or holding gases and volatile liquids, and particularly, apparatus of the type in which the gas space or chamber of the device is provided with a flexible metallic wall or portion that is adapted to flex in such a way as to vary the volume of said chamber.

The principal objects of my present invention are to reduce the cost of manufacturing or erecting devices of the general type mentioned; increase the capacity of the gas chamber without increasing the size of the apparatus or adding materially to the cost of manufacturing the same, and eliminate the possibility of the walls of the gas chamber collapsing or being ruptured in the operation of withdrawing the medium stored in said chamber.

Another object is to provide a novel means for increasing the capacity of a metallic storage chamber of the breather type and for reducing the strains on the portion of the chamber which flexes outwardly during the operation of admitting the medium to be stored or when the internal pressure of the gas chamber increases from any cause.

Another object is to provide a metallic storage chamber of the breather type that has two opposed flexible portions which are of such arrangement and construction that notwithstanding the fact that they flex in such a way as to increase and decrease the volume of said chamber during the operation of admitting and withdrawing the medium stored in same, the chamber will be under a positive pressure in the normal operation of the apparatus.

And still another object is to provide a device of the kind described whose storage space or chamber is formed by opposed flexible metallic sheets that are arranged in contact or approximate contact with each other when the device is empty, and which, upon the introduction of the medium to be stored, will move or flex in a direction tending to produce a sphere, whereby the volume of the storage space will be increased, not only by the outward flexing of one sheet, but also by the bodily movement of the outwardly flexed sheet and the change in shape or curvature of both sheets. Other objects and desirable features of my invention will be hereinafter pointed out. I have herein illustrated my invention embodied in a gas holder, but I wish it to be understood that many features of my invention are applicable to tanks and similar devices that are used for storing or holding volatile liquids.

Figure 1 of the drawings is a vertical transverse sectional view of a gas holder embodying my present invention, showing the gas chamber filled with gases.

Figure 2 is a top plan view of said gas holder, 60 partly broken away so as to more clearly illustrate the construction of the holder.

Figure 2^a is a fragmentary sectional view, taken on the line 2^a-2^a of Figure 2.

Figure 3 is an enlarged end view of the counterweighting mechanism attached to the peripheral portion of the structure that constitutes the gas chamber.

Figure 4 is a side elevational view of said counterweighting mechanism.

Figure 5 illustrates the positively actuated volume control valve; and

Figure 6 illustrates the vacuum valve.

Briefly described, my improved gas holder consists of a gas chamber of the breather type formed of metal and comprising a stationary part that constitutes one wall or a portion of one wall of said chamber, a limber part that is capable of moving bodily relatively to said stationary part, and a flexible peripheral portion that joins said parts together, said elements being of such construction and arrangement that when the holder is empty said limber part will be in contact or approximate contact with said stationary part thus producing a gas space of practically zero volume, and when gases are admitted to the holder, said limber part will flex outwardly and increase the volume of the gas space, and the flexible peripheral portion will flex in such a way as to permit said limber part to move bodily relatively to said stationary part, and thus further increase the volume of the gas space. When gases are withdrawn from the holder the elements previously mentioned resume their former shape or position, and in so doing, cause the gas chamber to change from a gas receiving space of relatively great volume to a gas receiving space of substantially zero volume. In the preferred form of my invention herein illustrated the element previously referred to as a limber part is formed by a metal diaphragm that constitutes the top wall of the gas storage space and which is arranged in opposed relation to a bottom diaphragm having a stationary central part and a flexible peripheral portion. Said bottom diaphragm is mounted on a frame or supporting structure, and when the holder is empty, the top diaphragm rests upon and is sustained throughout substantially its entire area by the bottom diaphragm. Each of said diaphragms is made

up of a plurality of metal plates joined together by gas-tight joints in such a manner as to produce a substantially imperforate limber sheet and the frame or supporting structure on which the bottom diaphragm rests is preferably made of such shape that the bottom diaphragm will be of substantially concave form, when the holder is empty. The peripheral edge of the top diaphragm is joined to the outer edge of the flexible peripheral portion of the bottom diaphragm, and in view of the fact that the top diaphragm is constructed in the form of a limber sheet, it has a natural tendency to assume a substantially concave form and rest upon the bottom diaphragm when the holder is empty. During the operation of admitting gases to the holder the top diaphragm constituting the limber element, rises or moves upwardly away from the bottom diaphragm, and as the admission of the gases is continued, said top diaphragm flexes outwardly and assumes a substantially convex shape or form, just the reverse from its former shape, thereby causing the volume of the gas receiving space to be increased automatically. During the admission of the gases, the peripheral portion of the holder, herein illustrated as being formed by the peripheral portions of the top and bottom diaphragms, moves upwardly bodily, and in so doing, increases the distance between the top diaphragm and the stationary central part of the bottom diaphragm, thereby further increasing the volume of the gas chamber. While I have stated that the essential elements of the holder, to wit, the limber part, the stationary part and the flexible peripheral portion are arranged and constructed in the particular manner above described, various changes may be made in the construction and arrangement of said elements without departing from the spirit of my invention.

Preferably, means is provided for assisting the flexing of the peripheral portion of the structure during the operation of admitting gases to the gas chamber, thereby eliminating injurious strains that might be created if the internal pressure were relied upon solely to effect the flexing of said peripheral portion in a direction to cause the limber part of the structure to move bodily relatively to the stationary part of the structure. While I have herein illustrated said means as consisting of counterweights attached to the peripheral edge of the structure formed by the top and bottom diaphragms, I wish it to be understood that any other suitable means may be used for this purpose without departing from the spirit of my invention. As is the usual practice in gas holders of this general type, a positively operated volume control valve is provided for automatically venting the gas chamber so as to relieve the internal pressure of said chamber, after the top diaphragm has reached a certain approximate position during the operation of admitting gases, and thus prevent said top diaphragm from being strained.

In the accompanying drawings which illustrate the preferred form of my invention, A and B designate two opposed diaphragms, each of which is constructed from a plurality of metal plates joined together by gas-tight joints in such a manner as to produce a substantially imperforate limber sheet. Said diaphragms are herein illustrated as being arranged in a substantially horizontal position with the diaphragm A disposed directly over the diaphragm B, and the peripheral edges of said diaphragms are joined together

by a gas-tight joint and are preferably attached to a circumferential member C that imparts rigidity to the peripheral edge of the structure, the member C preferably being herein illustrated as consisting of an angle, as shown in Figure 4. The bottom diaphragm B is sustained by a supporting frame of any preferred construction, which is erected on the ground and preferably made of such form that the bottom diaphragm will be of substantially concave shape. Usually, said supporting frame will be made up of frame members 1 that extend radially from the center of the bottom diaphragm to the peripheral edge of same and a plurality of circular rows or posts 2, 3, 4, 5, 6, 7, 8 and 9 on which the frame members 1 are rigidly mounted.

A gas pipe D through which gases are admitted to and withdrawn from the gas storage or receiving space between the diaphragms A and B, is attached to the bottom diaphragm B at a point some distance inwardly from the peripheral edge of same, and a volume control valve or pressure relief valve E of any preferred type or kind is mounted on the top diaphragm A, preferably at the center of same, as shown in Figure 1, so as to automatically vent the gas chamber, as previously described. The volume control or pressure relief valve E herein illustrated is of the type that comprises a valve element 11 that is normally held seated by a spring or by the internal pressure of the gas chamber, and an actuating device 11^a is provided for positively unseating said valve element. Said actuating device may consist of a chain, cable or other flexible element attached to the bottom diaphragm and to the valve element 11 of the valve E in such a way that when the top diaphragm A flexes or moves upwardly to a certain approximate position, the valve element of the valve E will be positively pulled away from its seat by the device 11^a, and thus relieve the pressure in the gas chamber.

In order that the peripheral portion of the bottom diaphragm B will be able to flex upwardly, as previously described, before the metal in same starts to stretch, I prefer to construct the diaphragm B in such a manner that the peripheral portion of same will contain sufficient excess metal to produce wrinkles in said peripheral portion when the holder is empty, or when the peripheral portion of the bottom diaphragm B is resting upon the frame members 1. One convenient way of obtaining this result is to raise or block up the outer end portions of the radially-disposed frame members 1 prior to joining together the plates that constitute the bottom diaphragm and connecting said diaphragm to the circumferential angle C. Said plates are supported by the frame members 1 while they are being joined together to form the bottom diaphragm B, and after said bottom diaphragm has been completed, the peripheral edge of same is attached to the angle C. The outer end portions of the frame members 1 are then dropped or restored to their normal position, thus causing the peripheral portion of the diaphragm B to wrinkle slightly. The next step in the operation of erecting the holder is to join together the plates that are used to form the top diaphragm A, and in order that the top diaphragm will be stretched slightly and maintained under a slight tension when it is in its extreme downwardly flexed condition, said plates are joined together while the inner end portions of the frame members 1 are in a slightly raised position. This result can be attained by raising

the rows of posts 4, 5, 6, 7 and 8 in such a way that the inner end portions of the frame members 1 will not slope downwardly to such a degree or at such a sharp angle as in their former position. The plates constituting the top diaphragm are joined together while they are supported by the frame members 1 whose inner end portions have been slightly raised, and after said top diaphragm has been completed and attached to the circumferential angle C, the rows of posts 4, 5, 6, 7 and 8 are restored to their former or normal position, with the result that the central portion of the diaphragm A will drop slightly, thus causing said central portion to be placed under a slight tension when the top diaphragm is in its downwardly flexed condition. While the above described method of constructing the top and bottom diaphragms is preferable, it is not essential.

In order to assist the peripheral portion of the structure to move upwardly or rise from the frame members 1, during the operation of admitting gases to the holder or when the internal pressure of the storage chamber increases abnormally from any cause, counterweights 12 are attached to the circumferential element C by means of chains or cables 13 that pass over pulleys 14 carried by uprights 15, said counterweights being preferably so proportioned that they will be capable of lifting a considerable portion of the weight of the periphery of the structure.

Due to the fact that the top diaphragm A rests upon and is sustained by the bottom diaphragm B when the holder is empty, it is impossible for the walls of the gas chamber to collapse or be disrupted by a high vacuum produced in said chamber during the operation of withdrawing gases from the same. In fact, the gas chamber of my improved holder will always be under a pressure in the normal operation of the holder, notwithstanding the fact that said chamber comprises opposed flexible diaphragms that flex in such a way as to increase and decrease the volume of said chamber during the operation of admitting and withdrawing gases to and from the holder. If desired, the holder can be equipped with a vacuum relief valve for automatically admitting air or an inert gas to the gas space between the diaphragms A and B, in the event a suction is exerted on the gas pipe D after the top diaphragm A has reached its extreme downwardly flexed condition. When the holder is constructed in this manner a spacing means, designated as an entirety by the reference character 16, is mounted on the top face of the diaphragm B, so as to prevent a comparatively small restricted area of the diaphragms A and B from contacting or coming together in the zone where the spacing means 16 is located. A vacuum valve F is mounted on the bottom diaphragm B, usually at approximately the center of the zone or area taken up by the spacing means 16. The particular construction of the spacing means 16 is immaterial, but it will usually consist of a skeleton-like frame whose center portion is arched so as to leave sufficient clearance between the same and the portion of the diaphragm that carries the valve F, to permit said valve carrying portion to flex upwardly under certain conditions. Figure 2^a shows how the valve carrying portion of the bottom diaphragm is normally spaced away from the spacing frame 16. The vacuum valve F comprises a valve element 17 that is held against its seat by a spring 18, and

an actuating device 19 is provided for unseating the valve element 17 or moving it away from its seat in the event the zone or portion of the bottom diaphragm to which the vacuum valve E is attached, flexes upwardly. The actuating device 19 has its lower end attached to an anchoring device 20 that is imbedded in the ground. If a suction is exerted on the gas pipe D when the holder is empty and the top diaphragm is resting on the bottom diaphragm, the portion of said bottom diaphragm that carries the vacuum F will flex upwardly towards the top diaphragm, due to the suction that is exerted on this portion of the bottom diaphragm. During the upward flexing of this portion of the bottom diaphragm the valve actuating device 19 becomes taut, with the result that the valve element 17 will open and admit air to the gas space between the diaphragms A and B. As soon as the suction on the top side of the valve carrying portion of the bottom diaphragm ceases, said portion flexes back to its normal position, shown in Figure 2^a, and the valve element 17 of the vacuum valve F closes.

Rain water that falls on the top diaphragm is conducted from same by a plurality of flexible drain conduits 21 that are attached to the central portion of the top diaphragm A at points in alignment with drain holes in said diaphragm, said conduits 21 extending downwardly through holes in the bottom diaphragm, and being connected to said bottom diaphragm by gas-tight joints. When the top diaphragm is in its extreme downwardly flexed condition, the flexible drain conduits 21 are positioned in depending housings 22 on the bottom diaphragm which are deep enough to receive the conduits 21 and permit the top diaphragm to rest upon the bottom diaphragm. Any rain water which falls on the top diaphragm at such times, namely, when the holder is empty, will be carried away by the drain conduits 21. Rain water presents a problem, however, when the holder is partly full and the top diaphragm A is in a partly upwardly flexed condition. At such times rain water is liable to collect on the top face of the diaphragm A at some point between the center and the peripheral edge of said diaphragm and put such a load on said diaphragm that it will not flex or move upwardly as the admission of the gases to the holder continues. This is liable to produce an abnormal pressure in the holder, and in order to prevent such a thing from occurring, I have provided the top diaphragm with a pressure relief valve G of the pressure differential type, constructed so that it will open automatically whenever the internal pressure of the gas chamber exceeds a certain approximate degree, whereby said chamber will be vented and the top diaphragm A caused to flex downwardly sufficiently to permit the rain water to escape either through the center drain conduits 21 or through a circular row of auxiliary flexible drain conduits 21^a that are located intermediate the center drain conduits and the peripheral edge of the top diaphragm. The bottom diaphragm is provided with depending housings 22^a for receiving the auxiliary drain conduits 21^a when the top diaphragm is resting on the bottom diaphragm.

When the holder is empty the top diaphragm A rests upon and is supported throughout substantially its entire area by the bottom diaphragm B. When gases are admitted to the gas space between said diaphragms, the top diaphragm A tends to rise, with the result that

part of the peripheral load on the top diaphragm will be supported over the entire area of the bottom diaphragm B. As soon as the internal pressure reaches a certain approximate degree the top diaphragm starts to rise, and if the counterweights 12 are heavy enough, the periphery of the top diaphragm will start to rise at the same time. As soon as the top diaphragm is in its upwardly flexed position, substantially the reverse of its normal downwardly deflected position, the internal pressure will become greater than the actual weight of the metal of the top diaphragm. As soon as this occurs, the periphery of the structure tends to rise more, and as the internal pressure increases above this point, the periphery of the structure will rise more and more. The rising of the periphery will take place under sufficient internal pressure, regardless of whether the periphery is counterweighted or not, since the entire structure tends to go into the form of a sphere during the operation of admitting gases to the holder, this, of course, being due to the fact that the top wall of the gas receiving space is formed by a limber metallic sheet that is capable of flexing into a substantially convex shape or form when it is subjected to the pressure of the inflowing gases, and the bottom portion of the gas receiving space comprises a stationary central part and a flexible peripheral portion that is joined to the peripheral edge of said limber top wall. While the peripheral angle C will take considerable compression, it will, nevertheless, go into a succession of fine curves which allows the horizontal projection of its circumference to decrease, as these curves become steeper. Hence, the structure formed by the top and bottom diaphragms is capable of approaching a spherical form when gases are being admitted to said structure.

One of the reasons for counterweighting the periphery of the structure formed by the diaphragms A and B, is to relieve the strains in the top diaphragm necessary to raise said top diaphragm a given amount. In other words, for a one foot rise of the periphery, the counterweighting mechanism can be so designed that this much rise will occur as soon as the top diaphragm A is raised to its uppermost position without increase in pressure above its own weight. Any further rise of the periphery than this one foot may be accomplished either by counterweighting or by allowing a slight tension to occur in the top and bottom diaphragms. It will thus be seen that in a gas holder of the construction above described the volume of the gas receiving space is increased automatically, during the admission of gases, by the upward movement of the top diaphragm away from the bottom diaphragm, by the upward flexing of the top diaphragm and by the change in shape of the peripheral portion of the bottom diaphragm which rises from the frame members 1, and in so doing, increases the distance between the diaphragms. In the operation of withdrawing gases from the holder the volume of the gas receiving space or chamber is decreased automatically by the flexing of the top diaphragm and the peripheral portion of the bottom diaphragm, and by the bodily movement of the top diaphragm towards the bottom diaphragm. A gas holder of the construction above described is inexpensive to build and maintain in operative condition, and it is of such design that it is impossible for the walls of the gas receiving space to collapse or be disrupted by a vacuum or minus pressure in said

chamber. In fact, the gas receiving space of my improved holder is always maintained under a positive pressure in the normal operation of the holder, notwithstanding the fact that the gas receiving space is formed by two flexible diaphragms that are adapted to flex in one direction to increase the volume of the gas space, and to flex in the opposite direction to decrease the volume of said space. My improved gas holder is comparatively inexpensive to build, as it consists simply of two metal diaphragms joined together at their peripheral edges and mounted on a framework or supporting structure that is erected on the ground; such a gas holder will not be injuriously affected by the elements, and it is not liable to become leaky, due to the fact that the gas chamber or gas receiving space of same is made of metal sheets, and still another desirable feature of such a gas holder that adds greatly to its commercial utility, is the fact that ample provision is made for carrying off rain water that falls on the top diaphragm, the holder being so designed that if an exceptionally heavy load of rain water collects on the top diaphragm when the holder is partly filled with gases, the pressure produced by said load will cause the gas receiving space to be vented, with the result that the top diaphragm will assume such a position that the rain water will escape either through the center drain conduits 21, or the auxiliary drain conduits 21^a that are located intermediate the center and the peripheral edge of the top diaphragm.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A device of the kind referred to, having a storage space that comprises two opposed walls, one of said walls being constructed of metal plates combined so as to form a limber sheet that is adapted to flex outwardly to increase the volume of said storage space, and the other wall comprising a stationary central portion and a flexible peripheral portion whose shape is adapted to change so as to increase the volume of said storage space, during the operation of admitting the medium being stored.

2. A device of the kind referred to, having a storage space formed by two opposed walls combined in such a way that said walls are in contact or approximate contact with each other when the device is empty, one of said walls being constructed of metal plates combined so as to form a limber sheet that is adapted to flex outwardly to increase the volume of said storage space during the operation of admitting the medium being stored, and the other wall having a stationary central portion constituting the major portion of the diameter of said wall, and a limber peripheral portion which is adapted to flex in a direction to increase the distance between said walls during the operation of filling said storage space.

3. A device of the kind referred to, having a storage space that comprises a limber metallic top wall which is adapted to flex upwardly to increase the volume of said space and downwardly to decrease the volume of said space, a stationary bottom part that serves as a support for said top wall when the storage space is empty or approximately so, and a flexible peripheral portion whose shape is adapted to change and thus cause said top wall to move bodily relatively to said stationary part due to the pressure exerted on said top part by gases in the storage space.

4. A device of the kind referred to provided with

a storage space having a bottom part that comprises a substantially concave-shaped stationary central portion, a substantially concave-shaped top part, said top part being constructed of metal plates combined so as to form a limber sheet that is capable of flexing upwardly into a substantially convex shape during the operation of admitting the medium to be stored and said bottom part having a peripheral portion that is capable of flexing in a direction to permit said top part to move bodily relatively to said bottom part during the admission of the medium being stored.

5. A device of the kind referred to, provided with a storage space composed of two limber metal diaphragms arranged in superimposed relation and having their peripheral edges joined together, and a supporting structure on which the bottom diaphragm rests, constructed so as to impart a substantially concave shape or form to said bottom diaphragm, said top diaphragm being adapted to flex upwardly, due to the pressure of gases in the storage space, so as to increase the volume of the storage space, and the peripheral portion of the bottom diaphragm being adapted to flex upwardly or rise from said supporting structure, whereby the top diaphragm will be bodily raised or lifted.

6. A device of the kind referred to, consisting of a structure that comprises a metallic top part which is adapted to flex upwardly and downwardly and a bottom part having a flexible peripheral portion joined to said top part, the space between said top and bottom parts constituting a storage chamber, a supporting means that sustains said structure, and means attached to the peripheral portion of said structure for assisting said peripheral portion to rise during the upward flexing of said top part.

7. A device of the kind referred to, provided with a storage space, formed by a structure that comprises a metallic top part which is adapted to flex in a direction to increase the volume of said space and a bottom part having a flexible peripheral portion joined to said top part, a supporting means that sustains said structure, and counterweights attached to the periphery of said structure to assist said top part to rise bodily during the operation of admitting the medium to be stored.

8. A device of the kind referred to, provided with a storage space, formed by two limber metal diaphragms whose peripheral edges are joined together, the bottom diaphragm being of substantially concave form and having a stationary central portion and a peripheral portion which is capable of flexing so as to change the shape of said bottom diaphragm during the operation of admitting and withdrawing the medium stored in the device, and a supporting structure that defines the shape of the stationary central portion of said bottom diaphragm.

9. A device of the kind referred to, provided with a storage space, comprising a flexible top wall and an opposed bottom wall that supports said top wall throughout substantially the entire area of same when the holder is empty, a flexible drain conduit attached to said top wall and passing through an opening in said bottom wall, and a housing on said bottom wall for receiving said conduit when the top wall is resting on the bottom wall.

10. A device of the kind referred to, provided with a storage chamber having a flexible metallic top wall that is adapted to assume a substantially

convex form when said chamber is full or substantially full, drain conduits attached to said top wall at the center of same and at points between the center and the peripheral edge of said wall, and a differential pressure relief valve for venting said chamber in case an excessive load of rain water on said top wall causes an abnormal pressure to be created in said chamber.

11. A device of the kind referred to, provided with a storage space, or chamber comprising two limber metal diaphragms arranged in superimposed relation, a supporting means on which the bottom diaphragm rests, shaped so that the central portion of said diaphragm will be deflected downwardly, the top diaphragm being adapted to rest on the bottom diaphragm when the device is empty and being capable of flexing upwardly during the operation of admitting the medium to be stored in the device, counterweights attached to the periphery of the structure formed by said diaphragms so as to assist the peripheral portion of the bottom diaphragm to flex upwardly under certain conditions, and a pressure relief valve operated by the upward flexing of the top diaphragm.

12. A device of the kind referred to, provided with a storage space, or chamber comprising two limber metal diaphragms arranged in superimposed relation, a means that serves as a support for the central portion of the bottom diaphragm, a supporting means on which the bottom diaphragm rests, the top diaphragm being adapted to rest on the bottom diaphragm when the device is empty and being capable of flexing upwardly during the operation of admitting the medium to be stored in the device, counterweights attached to the periphery of the structure formed by said diaphragms so as to assist the peripheral portion of the bottom diaphragm to flex upwardly under certain conditions, a pressure relief valve operated by the upward flexing of the top diaphragm, and means for carrying off rain water that falls on said top diaphragm.

13. A device of the kind referred to, provided with a storage space, formed by flexible metal diaphragms arranged in superimposed relation and having their peripheral edges joined together, the top diaphragm being adapted to flex upwardly during the operation of admitting the medium to be stored and being adapted to rest on the bottom diaphragm when the device is empty, a means interposed between said diaphragms for preventing a restricted area of said diaphragms from contacting with each other when the device is empty, a vacuum relief valve mounted on said restricted area of the bottom diaphragm, and means for utilizing the inward flexing of this restricted area of the bottom diaphragm to operate said vacuum relief valve to admit a medium to the space between the diaphragms under certain conditions.

14. A device of the kind referred to, provided with a storage space constructed of metal plates and comprising the following elements, i. e., a stationary part, an opposed limber part that is adapted to flex upwardly to increase the volume of said storage space, and a flexible peripheral portion whose shape is adapted to change so as to increase the volume of said storage space when said limber top part is moved upwardly by the pressure of gases in the storage space.

15. A device of the kind referred to, provided with a storage space constructed of metal plates and comprising a downwardly deflected, stationary bottom part, a limber top part in contact

or approximate contact with said bottom part when the device is empty and adapted to flex outwardly to increase the volume of said storage space during the operation of admitting the medium to be stored, and a flexible peripheral portion whose shape is adapted to change when said top part moves upwardly, due to the pressure exerted and thus increase the volume of said storage space, on same by gases in the storage space.

16. A device of the kind referred to, having a storage space comprising two limber metal diaphragms arranged in superimposed relation, and a supporting structure on which the bottom diaphragm rests, constructed so as to impart a substantially concave shape or form to said bottom diaphragm, said top diaphragm being adapted to flex upwardly during the operation of admitting the medium to be confined so as to increase the volume of the storage space and the peripheral portion of the bottom diaphragm being adapted to flex in a direction to permit the top diaphragm to move bodily relatively to the bottom diaphragm.

17. A device of the kind referred to, consisting of a structure that comprises a metal top part which is adapted to flex upwardly and downwardly and a bottom part having a flexible peripheral portion, the space between said top and bottom parts constituting a storage chamber, and means attached to the peripheral portion of said structure for assisting said peripheral portion to rise bodily.

18. In a device of the kind referred to, a storage chamber or space having a bottom part provided with a flexible peripheral portion that is adapted to flex upwardly, and a top for said chamber attached to said flexible peripheral portion.

19. In a device of the kind referred to, a storage chamber or space having a bottom part provided with a flexible peripheral portion that is adapted to flex upwardly, and a limber top wall for said chamber attached to said flexible peripheral portion and adapted to flex upwardly to increase the volume of said chamber.

20. In a device of the kind referred to, a storage chamber or space of the breather type having a top wall constructed from a flexible metal diaphragm, and means for permitting said top wall to rise bodily, in addition to its upward or outward flexing, for the purpose described.

21. In a device of the kind described, a storage chamber having a metallic top part which is adapted to flex outwardly, a bottom part having a flexible peripheral portion joined to said top part and adapted to flex upwardly, and means attached to the peripheral portion of said structure for assisting the flexible peripheral portion of said bottom part to rise.

JOHN H. WIGGINS.

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