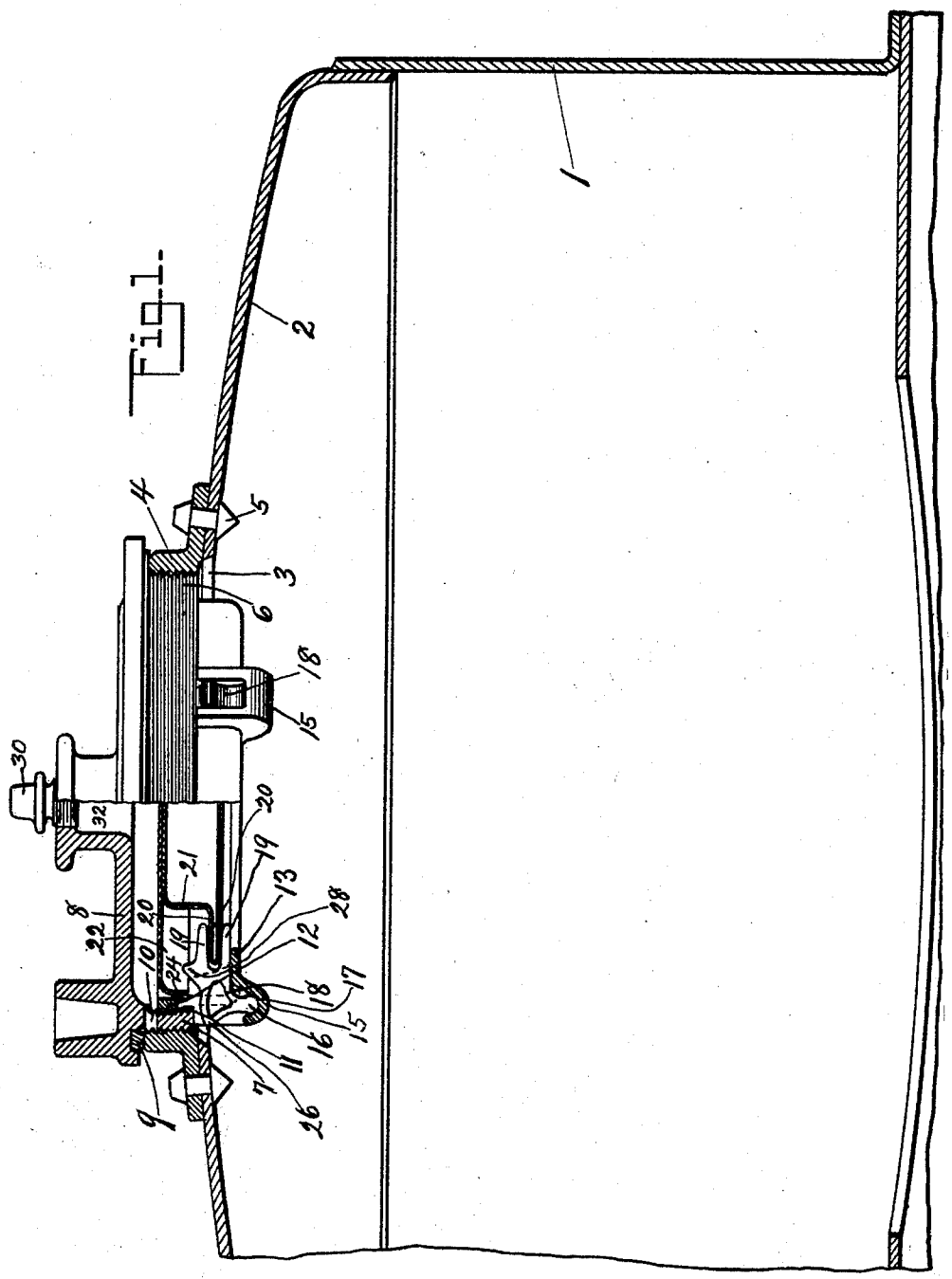
Jan. 22, 1929. 1,699,648

V. WILLOUGHBY

LOCKING MEANS FOR TANK DOME MANHOLE COVERS

Original Filed Nov. 24, 1924 3 Sheets-Sheet 1

Fig 1.



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Original Filed Nov. 24, 1924 3 Sheets-Sheet 2

Fig. 2.

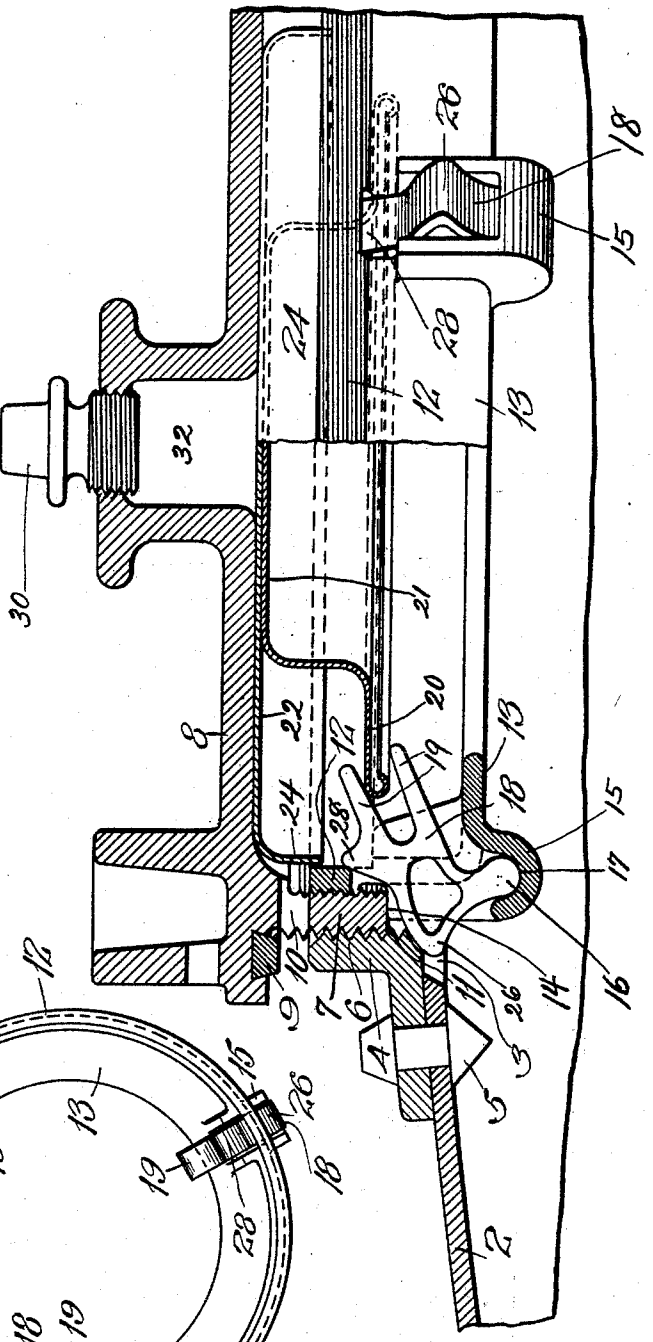

Fig. 3.

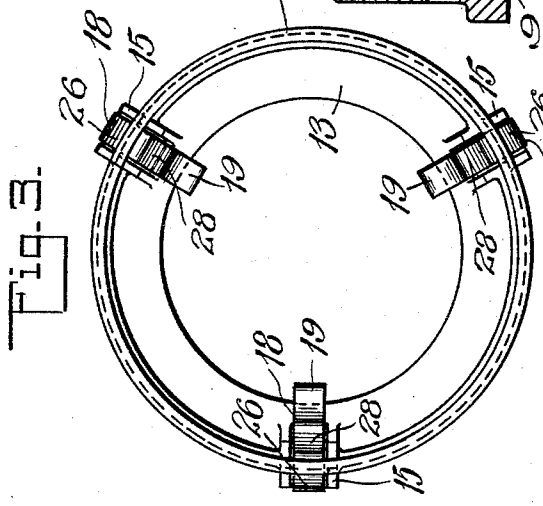

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Fig. 4.

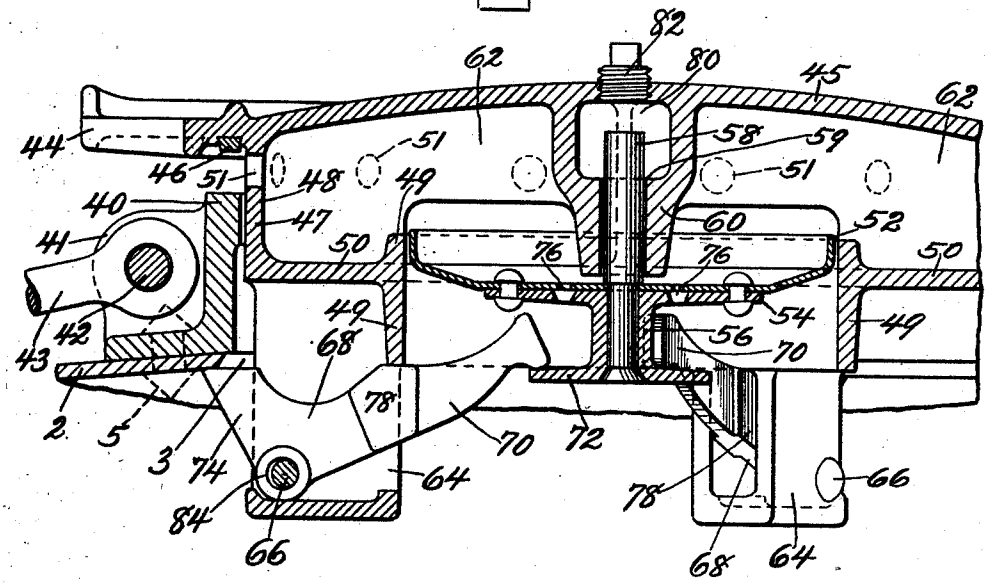
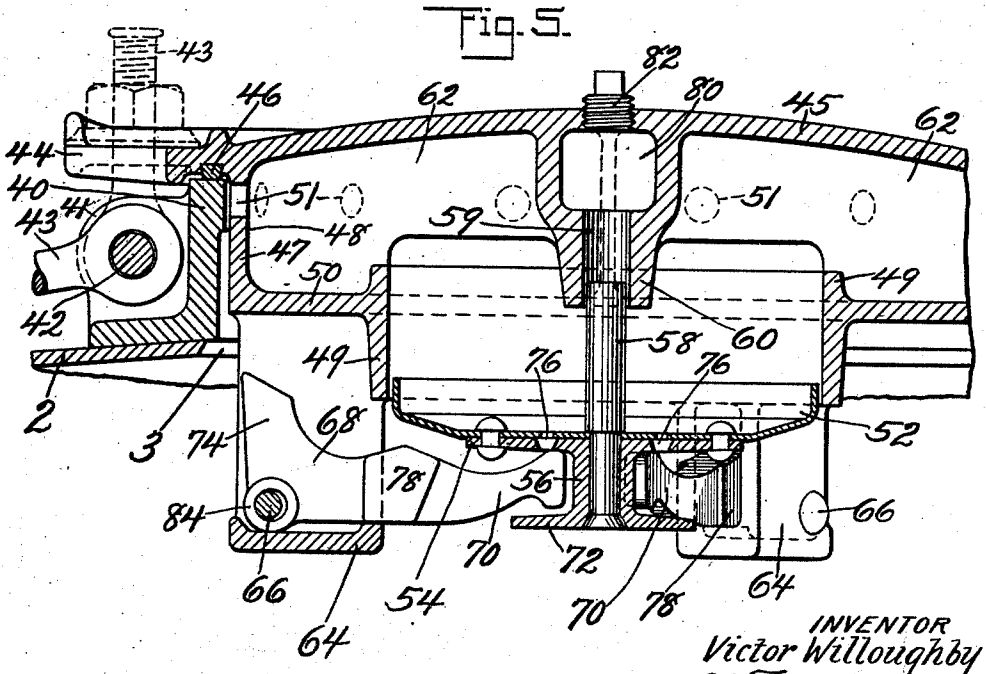


Fig. 5.



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Patented Jan. 22, 1929. 1,699,648

UNITED STATES PATENT OFFICE.

VICTOR WILLOUGHBY, OF RIDGEWOOD, NEW JERSEY, ASSIGNOR TO AMERICAN CAR AND FOUNDRY COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

LOCKING MEANS FOR TANK-DOME MANHOLE COVERS.

Continuation of application No. 751,750, filed November 24, 1924. This application filed January 26, 1926. Serial No. 83,986.

Reference is had to the accompanying drawings which illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details of construction shown and described, as it is obvious that various modifications thereof within the scope of the claims will occur to persons skilled in the art.

In said drawings:

Fig. 1 is a partial central vertical section of a tank car dome with a manhole cover, constructed in accordance with this invention, applied thereto, the manhole cover being shown in the fully closed position and partly in central vertical section and partly in elevation;

Fig. 2 is a view similar to Fig. 1, drawn to a larger scale, the manhole cover being shown in partly open position and the cover-locking means operated to prevent the removal of the cover;

Fig. 3 is a top plan view of the latches and the latch-supporting ring detached from the manhole cover.

Fig. 4 is a partial central vertical section of a tank car dome provided with a manhole cover and cover locking means of modified construction, the manhole cover being shown in partly raised position and the locking means operated to prevent removal of the manhole cover; and

Fig. 5 is a view similar to Fig. 4 showing the manhole cover of Fig. 4 in the closed position and the locking means of Fig. 4 in position to permit removal of the manhole cover.

This application is a continuation of my prior application, Serial No. 751,750, filed Nov. 24, 1924, and the invention disclosed herein relates to tank dome closures and has as an object the provision of an improved locking means for the manhole cover which will be operated by the discharge from the manhole opening to prevent the removal of the cover if an attempt is made to remove the dome cover while the tank contains gas under such pressure as to render the removal of the cover dangerous.

In the drawings the invention is shown in Figs. 1, 2 and 3 as applied to the usual tank dome 1 havig a dome head 2 in which is the usual manhole opening 3 surrounded by the flanged dome ring 4 which is secured to the dome head 2 by the rivets 5. The dome ring 4 is interiorly threaded as at 6 to receive the threaded flange 7 of a manhole cover 8. The cover 8 is substantially the usual construction having a packing 9 which engages the upper edge of the dome ring 4 and the vent openings 10 in the flange 7. The flange 7 is interiorly threaded as at 11 to receive the threaded flange 12 of a latch-supporting ring 13. The ring 13 is provided with slotted projecting lugs 15 which engage with the outer face 14 of the flange 7. The bottoms of the lugs 15 are depressed below the main body of the ring 13 and curved to form bearing seats 17 for the cylindrical surfaces on the lugs 16 of the latches 18. The latches 18 are provided with inwardly extending bifurcated portions 19 which are engaged by the outwardly projecting flange 20 of a pan-shaped member 21. The member 21 is secured to a pan-shaped member 22 which substantially fills the interior of the manhole cover and has a downwardly projecting flange 24 which fits loosely within the flange 12 of the latch-supporting ring 13.

In operation, when the manhole cover is closed and the latches 18 and members 21 and 22 are in the positions shown in Fig. 1, should pressure develop in the tank it will equalize on opposite sides of the pan-shaped member 22 by leaking past the flange 24. When an attempt is made to remove the manhole cover without having previously vented the pressure from the tank, the pressure above the member 22 will be vented through the ports 10 as soon as the ports 10 are opened by movement of the manhole cover away from its seat on the dome. Venting the pressure from above member 22 will permit the pressure beneath the member 22 and member 21 to force the members 22 and 21 to the top of the manhole cover, whereupon the latches 18, through their connection with the flange 20 of the member 21 will be rotated about their bearings in the seats 17 so as to bring the ends 26 of the latches beneath the bottom of the dome ring 4, while the shoulders 28 on the latches will engage with the ring flange 12 to prevent the latches from being moved too far.

With the latches moved to engaging position as shown in Fig. 2, removal of the manhole cover will be prevented by the engagement of the latches 18 with the dome ring 4. With the latches engaged with the dome ring it will be necessary in order to remove the

cover to vent the pressure from the tank and return the manhole cover partly to the closed position in order that the latches may be returned to the position shown in Fig. 1 upon equalization of the pressures upon opposite sides of the pan-members 21 and 22. Upon the return of the pan-members and latches to the positions shown in Fig. 1 the manhole cover may be removed. In case the latches and pan-members stick and do not return to the position shown in Fig. 1 from the position shown in Fig. 2, the plug 30 closing the opening 32 in the top of the manhole cover may be removed and a stick inserted to force the pan members and latches to the release position.

In the modified construction shown in Figs. 4 and 5, the dome head 2 is provided with the usual manhole opening 3 surrounded by a flanged dome ring 40 which is secured to the dome head 2 by the rivets 5. Formed integral with the dome ring 40 are spaced lugs or ears 41 having openings in which are mounted pins 42 which pivotally support locking bolts 43. The bolts 43 are adapted to engage bifurcated lugs 44 which project from the manhole cover 45 in order to secure the cover 45 to the ring 40. The cover 45 is provided with a packing 46 which engages the upper edge of the ring 40 and with a flange 47 of substantially Z-shape having parallel inwardly projecting portions 48 and 49 joined by an annular or ring portion 50. The cover 45 and the flange 47 form a chamber having a circular opening leading thereto formed by the portion 49 of the flange 47. Additional openings 51 are formed in the portion 48 of the flange 47 adjacent the junction of the flange 47 and the cover 45. The portion 48 of the flange fits within the dome ring 40 and prevents the rapid discharge of pressure between the flange 47 and the dome ring 40 as well as serving to guide the cover 45 to its seat on the ring 40. In the opening formed by the portion 49 of the flange there is movably mounted a pan-shaped member 52 which is secured at its center to the upper flange 54 of a spool or collar 56. Mounted in the collar 56 and projecting upwardly from the member 52 at its center is a cylindrical stem 58 which is adapted to reciprocate in an opening 59 in a hollow boss 60 to guide the members 52 and 54. The boss 60 is formed integral with the cover 45 and joins the inner ends of the reenforcing ribs 62 at the center of the cover.

Projecting downwardly from the portions 49 and 50 of the flange 47 are U-shape supporting brackets 64 formed integral with the flange 47 and having pins 66 mounted in the sides. Pivotally mounted on the pins are angular latches 68 having inwardly extending arms 70 which project between the upper flange 54 and the lower flange 72 of the collar 56. The latches 68 are also provided with arms 74 projecting upwardly at an angle to the arms 70 and of such length that they will project beneath the edge of the dome head 2 about the opening 3 when the arms 70 are raised.

The operation of the modified structure shown in Figs. 4 and 5 is the same as the operation of the structure shown in Figs. 1, 2 and 3. With the cover 45 held in closed position by the bolts 43 and the member 52 in the position shown in Fig. 5, should pressure develop in the tank it will equalize on the opposite sides of the member 52 by leakage between the member 52 and the portion 49 of the flange 47 and by leakage through the openings 76 in the member 52 and flange 54 of collar 56. In case enough of the bolts 43 are released when there is pressure in the tank to permit the pressure to raise the cover 45, the pressure above the member 52 will be be vented through the openings 51 and the member 52 will be raised, with respect to the cover 45, by the pressure in the tank. Raising the member 52 will operate the latches 68 bringing the arms 74 thereof beneath the edge of the dome head 2, as shown in Fig. 4, and bringing the enlarged portions 78 of the arms 70 into engagement with the portion 49 of the flange 47 and preventing the removal of the cover 45 from the manhole opening. As soon as the pressure in the tank has been discharged by leakage past the flange 47 or member 52, the cover 45, member 52 and latches 68 will be returned by gravity to the positions shown in Fig. 5 whereupon the cover 45 may be lifted from the opening. Should the member 52 be caught in the position shown in Fig. 4 it may be returned to the position shown in Fig. 5 by operating the stem 58 by means of a tool inserted in an opening 80 normally closed by the plug 82.

It will be noted that the pin openings 84 in the latches 68 are sufficiently larger than the pins 66 to permit the latches to bear directly against the supporting brackets 64. It will also be noted that after the latches 68 and cover 45 are operated to the positions shown in Fig. 4 the latches cannot be released as long as the pressure holds the cover in that position and that the stresses resulting from the pressure on the cover are transmitted directly to the cover 45 through the brackets 64 and flange portion 49 and to the dome head 2.

What is claimed is:

1. A tank with a manhole opening, a cover for said opening, and pivotal means operative in response to the existence of pressure in the tank when the cover is initially raised for thereupon locking the cover against removal.

2. A tank with a manhole opening, a cover for said opening, and means actuated by tank pressure for locking the cover against removal in response to venting of pressure when said cover is initially raised.

3. A tank with a manhole opening, a cover for said opening, latches for preventing removal of the cover, and means responsive to the initial venting of pressure when the cover is raised for thereupon causing said latches to lock the cover.

4. A tank with a manhole opening, a cover for said opening, latches on said cover for internally engaging the tank structure around said opening to prevent removal of the cover, and means responsive to tank pressure for causing engagement of said latches as aforesaid.

5. A tank dome having a manhole opening, a cover for said opening carried by said dome, latches for preventing removal of said cover, supporting means for said latches carried by said cover and fluid pressure operated means for operating said latches, responsive to the venting of pressure by opening of said cover.

6. A tank dome having a manhole opening, a cover for said opening carried by said dome, an annular member carried by said cover, latches for said cover mounted on said member and means to operate said latches to dome engaging position upon a partial raising of said cover from its seat on the dome.

7. A tank dome having a manhole opening, a cover for said opening engaging said dome, latches carried by said cover, pressure operated means for engaging said latches with said dome normally subjected to equal pressures on opposite sides and means for venting pressure from one side of said pressure operated means to operate said pressure operated means.

8. A tank dome having a manhole opening, a cover for said opening engaging said dome and having vent openings, latches pivotally mounted on said cover and means for rotating said latches into engagement with said dome, said means being normally subjected to equal pressures on opposite sides and operated upon the venting of pressure by said cover.

9. A tank having a manhole opening, a cover for said opening, locking means for said cover and fluid pressure operated means for operating said locking means, said cover controlling the operation of said pressure operated means.

10. A tank having a manhole opening, a cover for said opening, locking means for said cover and fluid pressure operated means for operating said locking means, said fluid pressure operated means being normally subjected to equal pressures upon opposite sides and operated by the venting of pressure from one side upon the raising of said cover.

11. A tank having a manhole opening, a cover for said opening, locking means for said cover and fluid pressure operated means for operating said locking means mounted on said cover, said fluid pressure operated means being normally subjected to equal pressures upon opposite sides, and means operating to vent pressure from one side of said pressure operated means, and thereby lock the cover upon the raising of said cover.

12. A tank having a manhole opening, a flanged cover for said opening, locking means for said cover and fluid pressure operated means for operating said locking means, said fluid pressure operated means being normally subjected to equal pressures upon opposite sides and said cover flange having openings for venting pressure from one side of said presure operated means and thereby lock the cover upon the raising of said cover.

13. A tank having a manhole opening, a cover for said opening, and locking means for said cover movable into and out of locking position upon variations of the pressure within the tank and upon movement of the cover whereby said pressure in the tank is varied.

14. A tank having a manhole opening, a cover for said opening, locking means for said cover, and means connected to said locking means and operative in response to variations in pressure resulting from opening of said cover to move said locking means into and out of locking position.

15. A tank having a manhole opening, a cover for said opening and locking means for said cover operable after rotation of the cover and a resulting partial venting of pressure from the tank.

16. A tank having a manhole opening, a cover for said opening, locking means for said cover, and fluid pressure operated means for controlling the operation of said locking means, said cover controlling the operation of said pressure operated means upon rotation.

17. A tank having a manhole opening, a cover for said opening, locking means for the cover, and means connected to said locking means and operative in response to variations in pressure resulting from partial rotation of the cover to move said locking means into and out of locking position.

18. A tank having a manhole opening, a cover for the opening, and pivoted locking means for the cover, said locking means being normally in inoperative position but adapted to be swung on its pivot into operable position after partial venting of pressure from the tank.

19. A tank having a manhole opening, a cover for the opening, and pivoted locking means for the cover placed into operable position only after partial venting of pressure from the tank.

20. A tank having a manhole opening, a cover for the opening, locking means for the cover, and pressure balanced means in the cover for retaining said locking means in inoperative position, said locking means being operated by the pressure balanced means

upon unbalancing of the pressures by partial venting of pressure from the tank.

21. A tank having a manhole opening, a cover for the opening, a locking means for the cover normally in inoperative position, and means in said cover for actuating said locking means to locking position after partial venting of pressure from the tank.

22. A tank having a manhole opening, a cover for the opening, locking means for the cover, and means connected to said locking means and operative in response to variations in pressure in the tank resulting from venting of pressure therefrom to actuate said locking means into and out of locking position.

23. A tank having a manhole opening, a cover therefor, locking means for the cover, and means in the tank for operating the locking means normally subjected to balanced pressures and operating to shift said locking means to cover locking position upon unbalancing of said pressures.

In witness whereof I have hereunto set my hand.

VICTOR WILLOUGHBY.