Sept. 22, 1942. C. W. SHIELDS 2,296,313

INTERNAL CLOSURE AND MEANS FOR OPERATING SAME

Filed Aug. 22, 1939 2 Sheets-Sheet 1

Fig. 2

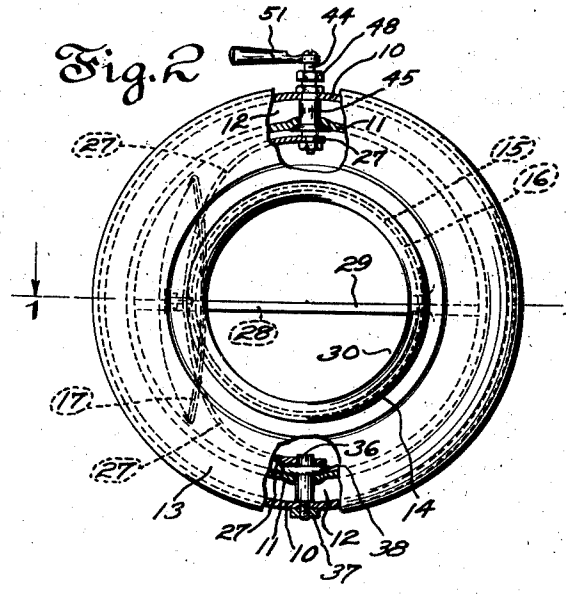


Fig. 5

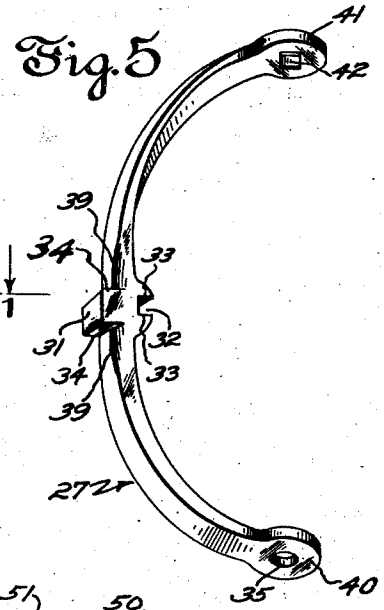


Fig. 1

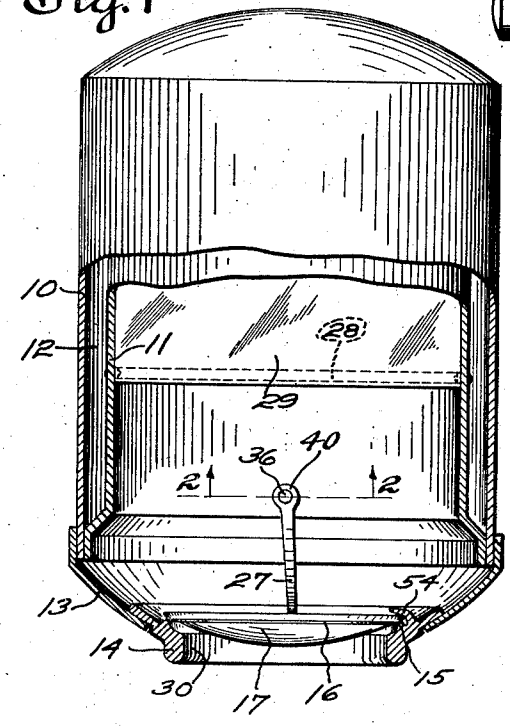


Fig. 4

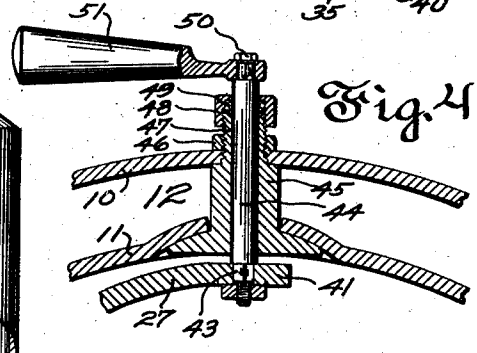
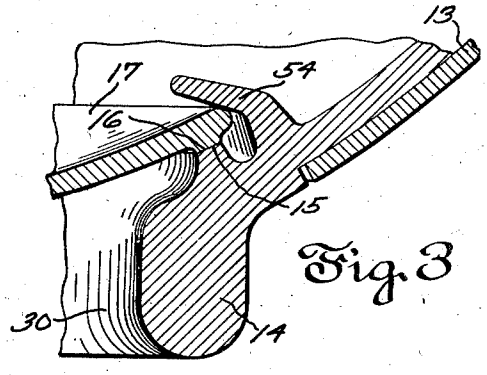


Fig. 3



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INTERNAL CLOSURE AND MEANS FOR OPERATING SAME

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Fig. 7

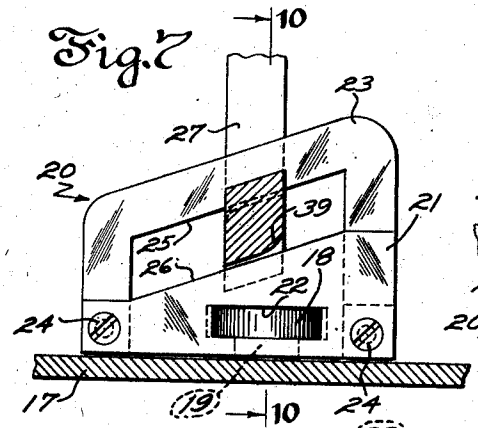


Fig. 9

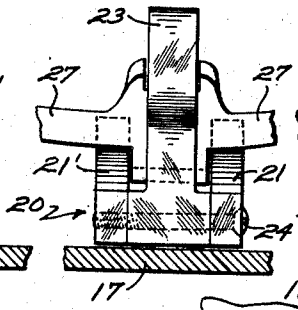
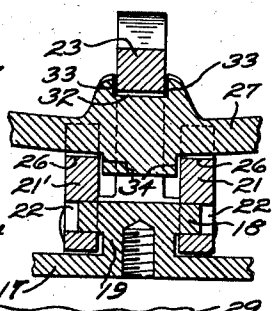


Fig. 10



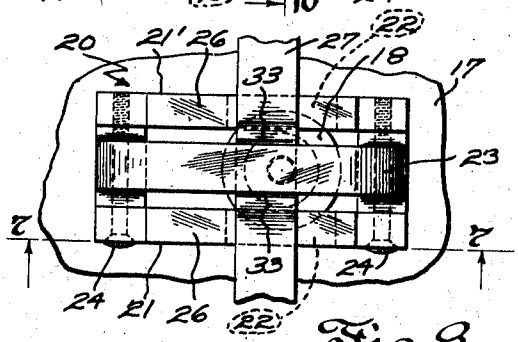


Fig. 8

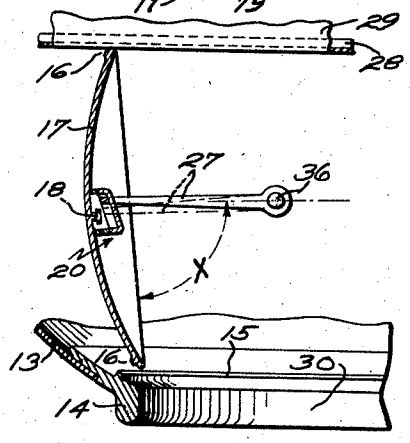


Fig. 13

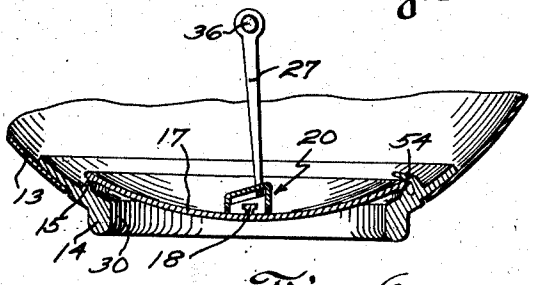


Fig. 6

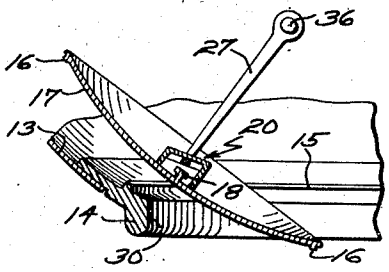


Fig. 12

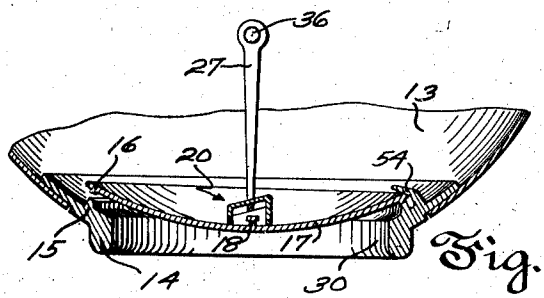


Fig. 11

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UNITED STATES PATENT OFFICE

2,296,313

INTERNAL CLOSURE AND MEANS FOR OPERATING SAME

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Application August 22, 1939, Serial No. 291,303

13 Claims. (Cl. 220—36)

This invention relates to manually operable closures for sterilizers of the type shown in my U. S. Patent No. 1,015,847 wherein the closure comprises a dished, plate-like door carried at the middle of a bowed arm or bail which swings on a pivotal axis located within the sterilizer centrally inward of the hand opening which is closed by the door.

One object of the invention is to dispense with certain exterior mechanism which formerly was required to counterbalance and lock the closure member of my aforesaid patent in its various positions.

A further object is to eliminate the danger of a relatively sharp door edge sweeping downwardly across the hand opening of the sterilizer in a way that may catch or strike the hand of the operator.

A further object is to provide ability for a closure having an annular, steam tight seat, to swivel on the middle of its carrying arm in a manner to eliminate the necessity for a given point on the closure seat always mating with the same point on the casing seat. This promotes a better distribution of wear between the seat surfaces and makes it possible to grind the seat surfaces as a corrective for any wear which may have taken place without removing the closure from the swinging arm or bail which carries it.

A further object is to provide a characteristic path of movement of the closure relative to its seat which shall to a maximum extent preclude scraping of the seat surfaces in the movements of the closure relative to the casing of the sterilizer.

A still further object is to equip my improved closure operating mechanism with an external handle enabling all movements of the closure to be effected and controlled solely by a single hand of the operator so that the other hand will be left free for placing articles in the sterilizer or removing them therefrom. I preferably locate this handle so that the natural position assumed by the operator for manipulating the handle will cause him to be shielded from the burst of steam outwardly from the sterilizer that accompanies initial breaking of the steam seal at the closure seat followed by continued opening movement of the closure.

Other objects relate to the provision of a swivel connection structure which enables the closure itself, as well as its carrying bail, each to be made an integral casting or part and yet to be readily assembled and disassembled by means of the connecting structure referred to.

The foregoing and related objectives of these improvements will further be explained in the following description of a preferred construction in which the improvements may be embodied, such description having reference to the accompanying drawings wherein:

Fig. 1 is a plan view of the body of the sterilizer showing its casing walls broken away and partly in section on the plane 1—1 in Fig. 2 looking in the direction of the arrows and showing only the bottom arm of the closure carrying bail.

Fig. 2 is a view looking at the front end of the sterilizer body, the closure being swung clear of the hand opening and portions of the casing walls being shown in section on the plane 2—2 in Fig. 1.

Fig. 3 is a greatly enlarged fragmentary view of certain of the parts in Fig. 1 in the neighborhood of the closure seat and its stop.

Fig. 4 is an enlarged sectional view of the upper pivotal bearing for the operating shaft of the closure carrying bail.

Fig. 5 is a perspective view of the closure carrying bail detached.

Fig. 6 is a fragmentary view of the parts shown in Fig. 1 with the closure door and its operating bail shown in central horizontal section.

Fig. 7 is an enlarged plan view of the parts which connect the closure and bail of Fig. 6 taken in section on the plane 7—7 in Fig. 8 looking in the direction of the arrows.

Fig. 8 is a view looking at the structure of Fig. 7 from the top of said figure.

Fig. 9 is an end view looking from the left at Fig. 7.

Fig. 10 is a view taken in section on the plane 10—10 in Fig. 7 looking in the direction of the arrows.

Fig. 11 is a view similar to Fig. 6 showing the breaking of the steam seal which accompanies the initial movement of the bail in opening direction.

Fig. 12 shows the same parts with the closure swung to substantially half open position.

Fig. 13 shows the same parts with the closure swung to fully open position.

As in the case of my aforesaid earlier patent, that much of the complete sterilizer is shown which comprises a cylindrical vessel having a dome-shaped front and a spherical door or closure adapted to be supplied with steam under pressure through pipes and passageways not herein shown. The vessel and the door may be of shapes other than circular but preferably of suitable shape to be capable of partaking of the benefits of these improvements. The vessel is herein shown to be formed by a cylindrical outer

jacket wall 10 joined in steam-tight relation to an inner cylindrical chamber wall 11 leaving a space 12 between said walls. Also joined steam-tight with the jacket wall 10 is the dome-shaped head or front wall 13 carrying centrally thereof the casing ring 14 on which is machined the annular conical seat 15 adapted to receive a mating conical seat 16 provided on the outer surface of the door or closure indicated as a whole by 17. Closure 17, as shown, may comprise a dished plate-like casting having formed integrally therewith or fixedly attached thereto the button-headed trunnion 18 whose shank portion 19 is of reduced diameter.

Swivelled on trunnion 18 is a compound skeletonized connector structure referred to in certain of the claims as a coupling and indicated as a whole by 20 composed of top and bottom cam plates 21 and 21' each of which contains an elongated aperture 22 into which projects a segmental portion and peripheral edge of the circular head on trunnion 18. This head overhangs its shank 19 in a manner to retain the connector structure 20 while permitting it to swivel bodily as a whole relative to the closure 17. The cam plates 21 and 21' flank and are fixedly secured to a bridge member 23 by means of bolts 24 which pass through clearance holes in cam plate 21 and have threaded engagement with holes in cam plate 21'. The cam edge 25 of bridge member 23 in Fig. 7 and the cam edges 26 of plates 21 and 21', while lying in relatively offset relation, form inclined ways which are slidingly engaged with and supported and guided by the enlarged median portion of bail 27 in a manner clearly apparent from Figure 10. Bail chamfer 39 affords proper clearance to permit and limit closure tilting.

As shown most clearly in Figures 5, 7 and 10, this median portion of bail 27 is provided at the front with a transverse lug 31 and at the rear with a transverse groove 32, the former riding between the cam plates 21 and 21' of the connector structure and the latter slidingly fitting the bridge member 23 so that the bail may slide freely between the left ends of ways 25, 26, 26 and the right ends of said ways, in Fig. 7. The top and bottom shoulders 33 formed by notch 32 slidingly engage with top and bottom marginal surfaces of the bridge member 23 while the top and bottom shoulders 34 formed by lug 31 slidingly engage respectively with the marginal inner surfaces of top and bottom cam plates 21, 21' in a manner enabling the closure 17 to be supported in a vertical disposition in forwardly offset relationship to the vertically extending bail by which it is carried.

Bail 27 is pivotally supported and anchored at its enlarged bottom end 40 by means of a round hole 35 therein which has bearing engagement on a pivot stud 36 fixedly secured against the inner surface of chamber wall 11 by the nut 37, the bail end 40 resting upon the stud flange 38. The enlarged upper end 41 of bail 27 contains the square aperture 42 which as best shown in Fig. 4 is fixedly clamped to the squared bottom terminal 43 of a vertical operating shaft 44 having a bearing in the fixed bushing 45 which passes through both the chamber wall 11 and jacket wall 10 and is sealed in steam tight relation to both of these walls. A retaining nut 46 has threaded engagement with the bushing neck 47 as has also the packing cap 48 which may contain any suitable packing material 49 for preventing outward escape of steam from the sterilizer. Fixed to the upper and outer end 50 of shaft 44 is the closure operating handle 51. A horizontal shelf 29 is rigidly supported inside the sterilizer by any suitable bracket 28 made fast to the chamber wall 11.

Fig. 3 shows in enlarged detail a suitable shape and relationship of the closure and casing portions in the neighborhood of seats 15, 16 at the point along these seats whereat is located a stop abutment 54 that projects from casing ring 14 and may be cast integral therewith. Stop abutment 54 includes a radially inward directed tongue axially spaced from seat 15. This stop has a threefold function in connection with the movements of the closure relative to its seat 15 as will further appear from the following description of operation.

In Figures 1 and 6 the closure is shown as fully seated in steam-tight relation to the casing ring 14 with the bail 27 swung as far as possible counterclockwise or toward the right by means of its operating handle 51. When this handle is swung by the hand of the operator in a direction to open the closure, the initial increment of the corresponding clockwise swinging movement of bail 27 about its pivots 36 and 45 shifts the bail 27 into a different relationship to closure 17 as indicated in Fig. 11. This first results in the separation of seats 15 and 16 only at and about the left side of the closure as shown in said figure. The closure so reacts to the initial movement of the bail because its seat 16 at the right side of the closure is at first held from any appreciable separation thereat from seat 15, seat 16 at this point being backed up by the casing carried stop 54 which because of being radially inward directed overhangs the interior edge of rim of the closure. Since the mating seats 15 and 16 meet as conically disposed surfaces, it would be impossible for the closure to first move bodily and edgewise toward the left in unison with the initial increment of bail swing toward the left because of this initial retention of seat 16 close to seat 15 in the neighborhood of stop 54. Hence the inward pulling of the bail upon the closure as it slides relative thereto along the inclined connector way 25 results in canting of the closure seat relative to the casing seat and in the consequential one sided seat separation shown in Fig. 11.

At this point in the opening movement of the bail and closure, the closure as a whole becomes bodily free to swing edgewise in unison with the swinging of the bail and hence further clockwise swinging of the bail to the position shown in Fig. 12 will carry with it the closure and without causing further relative movement between the bail and the closure. Thus the relationship of closure and bail shown in Fig. 11 prevails during continued opening movement of these parts until the leading edge or rim of the closure brings up abruptly against some suitable fixed obstruction or stop stationed inside of the sterilizer and which I have herein chosen to illustrate as the bracket 28 rigid with chamber wall 11 and supporting the sterilizer shelf 29. At the time of contact between the closure edge and bracket 28, bail 27 occupies its broken line position in Fig. 13. Following such contact, bail 27 continues its clockwise swinging to full line position while the closure remains arrested against further edgewise travel. However, a counterclockwise turning moment with respect to plate 17 relative to the bail 27 and the relative movement between the bail and the closure plate which thus ensues swings

the trailing edge of the closure farther toward the right in Fig. 13 thus decreasing the angle X which in Fig. 13 represents the degree of inclination of the plane in which the closure is disposed relative to a line passing centrally through the radial stretch of the bail arms.

This reduction of angle X I conveniently refer to as the "cocking" of the closure relative to the bail. It is brought about by the fact that the point on bracket **28** contacted by the rim of the closure thereafter serves as a fulcrum so that the continued movement of the bail from broken line position to full line position in Fig. 13 acts against the inclined way **25** in a manner to draw the connector **20** toward the rear, or inwardly of the sterilizer. This "cocking" action I find to be of importance because it increases the clearance between the seats **15** and **16** when the closure is returned to cover the hand opening **30**.

In the reverse or closing movement, the edge or rim of the closure approaches the overhanging stop **54**, while the reduced angle X remains constant and such that the closure rim is assured free ability to enter between said stop **54** and the seat **15** with practically no rubbing of seats **15** and **16** by any structure whatever. To facilitate this approach it will be noted that stop **54** is inclined. A degree of constraint is imparted to the closure with respect to variation in angle X by the limited degree of clearance provided between the ways **25**, **26**, **26**, and the surfaces of the bail which ride thereagainst. The tapered pocket-like space between seat **15** and stop **54** is preferably such as shall just accommodate admittance thereto of seat **16** into free self centering engagement with seat **15**. The least amount of needless clearance between the closure edge and the casing seat and stop is preferable. After the edge of the closure strikes stop **54**, the bail continues to move counterclockwise or toward the right from its position in Fig. 11 to its position in Fig. 6, the wedging or camming action of the bail against the inclined ways **26**, **26** forcing the seats **15** and **16** together so that escape of steam past these seats is arrested, the internal fluid pressure thus building up and acting to maintain seats **15** and **16** even more tightly forced together for sealing opening **30** against escape of steam. I may refer to shelf structure **28**, **29** as the opening stop and to lug **54** as the closing stop.

In the apparatus disclosed in my aforesaid patent, the closure is swung up and down with respect to the hand opening instead of from front to side as in the present improvements and the action of gravity on the closure tended to tilt it in such direction relative to the bail as was favorable to the maintenance of maximum clearance between the seats and consequent minimum scraping wear thereof. But accidental or premature abrupt dropping of the door edge across the opening was a source of danger to the hand or arm of the operator reaching into the sterilizer interior. Attempts to attain the desirable advantages of front-to-side closure movement over vertical closure movement which enables me to dispense with counterbalancing weights, and attempts to make possible the operation of a very hot closure solely by manipulating a single cool handle located remotely from the very hot contents of the sterilizer, have been encountered by difficult problems which I believe to be solved for the first time by the devices and expedients disclosed. It will be noted that a right handed operator will naturally stand a little to the left of the front center of the sterilizer in reaching and operating handle **51**. Thus the operator will tend to be shielded from the steam exhausting from the sterilizer through hand opening **30** while closure **17** is in process of being opened.

In the matter of long life and low cost of servicing, the ability of the closure **17** to swivel unrestrictedly relative to bail **27** in a plane perpendicular to the axis of seat **15** permits regrinding of the seat **16** against the seat **15** without requiring the apparatus to be disassembled. However when disassembly is desired, this may readily be accomplished by reaching in through hand opening **30** and removing bolts **24** when the closure is positioned as in Fig. 13. By these improvements I am enabled, if desired for the further advantages of minimum weight, to make the closure **17** entirely of die-drawn or spun sheet metal having a rolled or corrugated rim about its circular edge properly shaped to form seat **16** and to protect the same against accidental contacts and scraping against seat **15** or other parts of the sterilizer casing. In this modification I may provide the trunnion **18** as a screw machine produced part attached rigidly, and if desired removably, to the sheet metal closure.

Within the scope and spirit of this invention, various departures from the exact shapes and arrangements of parts herein chosen to teach a preferred embodiment of the improvements will be suggested to those skilled in the art by this disclosure, and the appended claims are intended to cover all such departures and equivalents which fall fairly within the scope of their terms.

I claim:

1. In combination, a vessel casing having a hand opening, a seat on said casing extending about said opening, a closure plate movable edgewise to and away from a position to cover said opening, a seat on said plate adapted to mate with said casing seat, an arm pivotally mounted to swing about a vertical axis and carrying said plate at the free end thereof in a manner to permit limited tilting of said plate relative to said arm, and a stop inside of said casing stationed in the arcuate path of opening movement of said plate as impelled by said arm so that said opening movement causes the edge of said plate to be thrust against said stop in a direction setting up with respect to said plate a turning moment relative to said free end of the arm thereby causing said plate to tilt relative to said arm into a cocked position better enabling said plate to clear said casing seat when the plate is subsequently returned by said arm to its said covering position.

2. In combination, a vessel casing having a hand opening, a seat on said casing extending about said opening, a closure plate movable edgewise to and away from a position to cover said opening, a seat on said plate adapted to mate with said casing seat, an arm pivotally mounted to swing about a vertical axis and carrying said plate at the free end thereof in a manner to permit limited tilting and sliding of said plate relative to said arm, and a stop inside of said casing stationed in the arcuate path of opening movement of said plate is impelled by said arm so that said opening movement causes the edge of said plate to be thrust against said stop in a direction setting up with respect to said plate a turning moment relative to said free end of the arm thereby causing said plate to tilt and slide relative to said arm into a cocked position better enabling said plate to clear said casing seat when

the plate is subsequently returned by said arm to its said covering position.

3. In combination, a vessel casing adapted to with stand internal fluid pressure and having a hand opening provided with a conical seat, an internal closure therefor having at its edge portion a mating conical seat, a crank bail swingably mounted within said vessel, a connector structure on said closure forming an elongated slot slidably engaged by said bail, and a stop stationed on and projecting from the interior of said vessel near the edge of said hand opening including a tongue directed radially inward past said conical casing seat and spaced axially therefrom sufficiently to admit said edge portion of the closure between said tongue and said casing seat into a position permitting fluid tight mating of said seats, the said elongated slot being inclined relative to the path of swing of the bail in a direction to cause one portion of the edge of said closure to part from said conical seat when said bail is swung while another portion of said closure edge is held close to said seat by said radially inward directed tongue.

4. In combination a vessel casing adapted to withstand internal fluid pressure and having a hand opening provided with a conical seat, an internal closure therefor having at its edge portion a mating conical seat and movable edgewise to and away from a position to cover said opening, a crank bail swingably mounted within said vessel, a connector structure on said closure forming an elongated slot pivotally and slidably engaged by said bail, a closing stop stationed on and projecting from the interior of said vessel near the edge of said hand opening including a tongue directed radially inward past said conical casing seat and spaced axially therefrom sufficiently to admit said edge portion of the closure between said tongue and said casing seat into a position permitting fluid tight mating of said seats the said elongated slot being inclined relative to the path of swing of the bail in a direction to cause one portion of the edge of said closure to part from said conical seat when said bail is swung while another portion of said closure edge is held close to said seat by said radially inward directed portion of said tongue, and an opening stop inside of said casing stationed in the arcuate path of opening movement of said plate as impelled by said bail so that said opening movement causes the edge of said plate to be thrust against said stop in a direction setting up with respect to said plate a turning moment relative to said crank bail thereby causing said plate to tilt relative to said bail into a cocked position.

5. The combination of a vessel adapted to withstand internal pressure and having a circular hand opening bordered by a stationary annular seat, an internal disc-like closure carrying an annular seat encircling a central horizontal axis of said closure and cooperative with said stationary seat, a crank-like member mounted to swing about a vertical axis within said vessel including a vertically elongated staff flanking the interior face of said closure and presenting fixed carrier shoulders near the central portion of said closure, a coupling for suspending said closure from said crank-like member constructed and arranged to engage slidably with said carrier shoulders so that said crank-like member supports the weight of said closure while permitting said member and closure to move relatively to each other in horizontal directions, and means connecting said coupling pivotally to said closure in a manner to restrict movement of said coupling relative to said closure to movement in planes perpendicular to the horizontal axis of the closure.

6. The combination defined in claim 1 in which the said coupling means has unlimited rotary movement relative to the said closure about the said horizontal axis of the latter.

7. Structure for connecting and permitting relative movement between a closure and a carrier therefor, including in combination, a trunnion fixed on said closure, guiding shoulders formed on said carrier, and means connecting said closure and carrier constructed and arranged for swivel engagement with said trunnion and for sliding engagement with said shoulders.

8. Structure as defined in claim 6, in which the said trunnion comprises a button-headed post having a shank portion of reduced diameter cooperatively engaging with the said connecting means in a manner to hold the latter and said trunnion operatively together.

9. Structure as defined in claim 6, in which the said trunnion comprises a button-headed post having a shank portion of reduced diameter, and the said connecting means include spaced plates flanking said shank portion of the trunnion and each containing an aperture occupied by a segmental portion of the head of said trunnion post.

10. Structure as defined in claim 6, in which the said trunnion comprises a button-headed post forming a projecting integral part of the said closure having a shank portion of reduced diameter, and the said connecting means include separably assembled plates each containing an aperture occupied by a segmental portion of the head of said trunnion whereby said connecting means may be removed from said trunnion by disassembling said plates.

11. Structure as defined in claim 6, in which the said connecting means include a base member and a bridge member shaped and assembled in a manner to form between spaced respective edges of said members an elongated slot obliquely disposed in relation to the axis of the said trunnion.

12. Structure as defined in claim 6, in which the said guiding shoulders on the said carrier comprise the respective edges of a straight groove and of a straight lug, and the said connecting means are provided with straight edges forming ways spaced and positioned to cooperate respectively with said groove and lug.

13. Structure as defined in claim 6, in which the said connecting means comprise an apertured central bridge member flanked on each side by an apertured plate, said member and plates being assembled together by bolts passing through one of said plates and said member and having threaded engagement with the other of said plates.

CURTIS W. SHIELDS.

CERTIFICATE OF CORRECTION.

Patent No. 2,296,313. September 22, 1942.

CURTIS W. SHIELDS.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 68, claim 2, for "is impelled" read --as impelled--; page 4, first column, line 4, claim 3, for "with stand" read --withstand--; and second column, line 11, claim 6, for the reference claim numeral "1" read --5--; and lines 23, 29, 37, 47, 54, and 61, claims 8 to 13 inclusive, for the claim reference numeral "6" read --7--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 27th day of October, A. D. 1942.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)