Dec. 28, 1943. J. HERTRICH 2,337,817

LOADING GATE FOR CENTRIFUGAL MACHINES

Filed Jan. 7, 1941

Fig. 1.

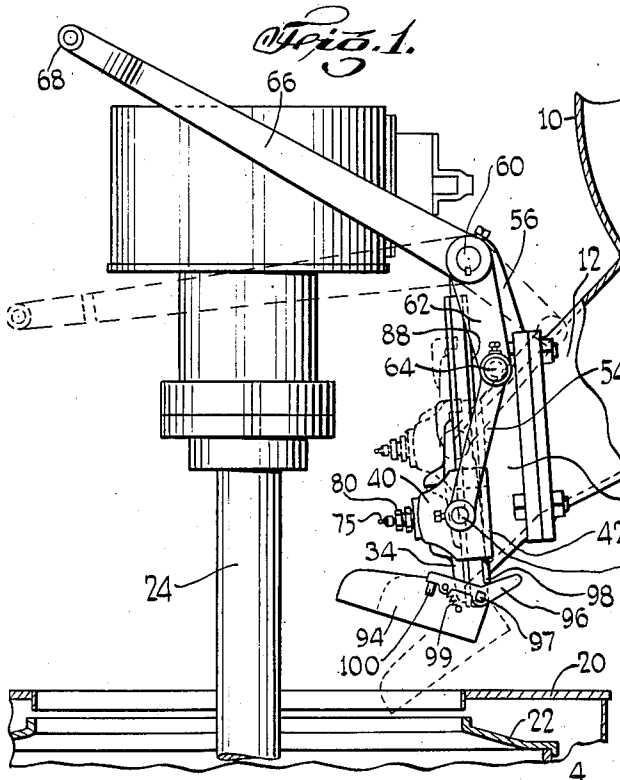


Fig. 4.

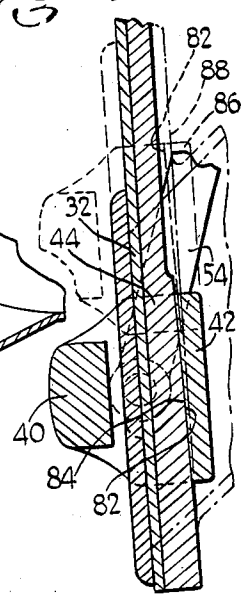


Fig. 5.

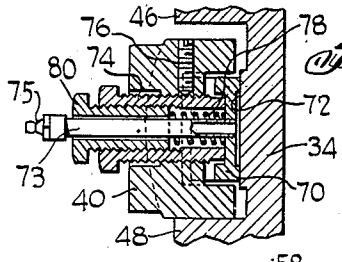


Fig. 2.

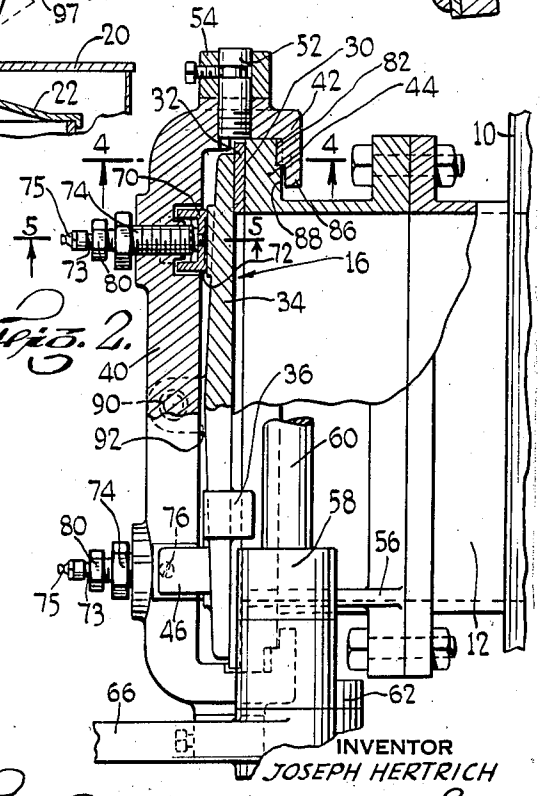
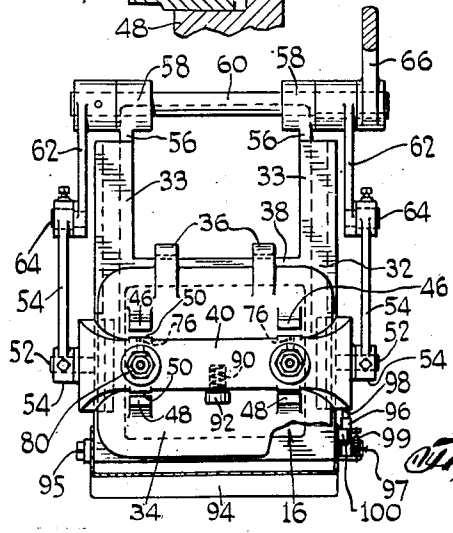


Fig. 3.



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2,337,817

LOADING GATE FOR CENTRIFUGAL MACHINES

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Application January 7, 1941, Serial No. 373,397

13 Claims. (Cl. 221—145)

This invention relates to new and useful improvements in loading gates or spout discharge mechanisms, particularly for loading charges of sugar massecuite or magma into sugar centrifugals.

In the sugar manufacturing industry, the separation of sugar crystals from mixtures of sugar crystals and syrup is carried out by treating charges of the mixture in centrifugal machines of the filtering type. A supply tank, or "centrifugal mixer," is usually provided adjacent to a group of centrifugal machines, to hold a comparatively large quantity of the mixture. Loading spouts or chutes extend from the bottom of this tank to positions permitting charges of the mixture to be loaded into the baskets of the respective centrifugals. Each loading spout is equipped with a loading gate by which to control the loading operations. The loading gate is usually actuated by hand, although automatic actuation may be provided if desired.

The object of the present invention is to provide a new and improved loading gate construction, for centrifugal mixer tanks and the like, which makes it easier for an attendant to load each centrifugal, which enables the centrifugal to be loaded faster than in the use of gate constructions heretofore used, which prevents leakage of syrup or other liquid from the loading spout when the gate is closed and prevents such leakage along the face of the gate when the same is opened, which possesses a distinct wedging or self-locking action when moved to closed position, and which can be readily moved from closed to open position notwithstanding this self-locking action, even when sticking has occurred.

A more specific object of my invention is to provide a loading gate for centrifugal mixer spouts and the like, which comprises a sliding closure or gate that moves in a rectilinear path across the spout outlet, together with means for automatically locking the gate, so as to prevent inadvertent opening thereof, as the gate actuating mechanism is moved to closed position. Another object is to provide such a gate construction comprising means for holding the gate in sealed relation to a gate facing, under constant pressure, whenever the gate is not locked or clamped in closed position, together with means for adjusting the pressure of the gate against its facing. Still another object is to provide a self-locking gate construction which becomes unlocked in the initial movement of the gate actuating mechanism toward open position, after which the full force of such mechanism is available to open the gate itself.

A further object of my invention is to provide such a loading gate construction in which movement of the gate to open position may be effected by a downward pull upon a hand lever constituting part of the gate actuating mechanism, thereby facilitating the opening of the gate and also causing the hand lever to be disposed out of the way of the centrifugal attendant when the gate is closed. Still another object is to provide such a construction which causes the gate to stay in any desired position between its fully opened and fully closed positions, without falling or sliding of its own accord when the hand lever is released.

A further object of my invention is to provide a centrifugal loading gate having a drip pan associated therewith so as to direct material from the gate into the centrifugal basket and prevent undesirable dripping of syrup or other liquid on or about the centrifugal casing, together with means whereby the drip pan immediately drops to its loading position at the start of a loading operation, means responsive to closing movement of the gate actuating mechanism for raising the drip pan to a drip-catching position, and means allowing movement of the drip pan to its lower position, under manual pressure, while the gate is closed.

The foregoing and other objects, features and advantages of my invention and a suitable manner of practicing the same will be apparent from the following description of an illustrative embodiment of the invention, when considered in connection with the accompanying drawing, in which

Figure 1 is a fragmetary side elevation, partly in section, showing portions of a centrifugal mixer and mixer spout, portions of a centrifugal machine arranged to be loaded from the mixer spout and a preferred form of the new gate construction associated with the end of the spout.

Figure 2 is a plan view, partly in section, showing the end of the mixer spout and part of the loading gate associated therewith.

Figure 3 is a front elevation of the loading gate assembly.

Figure 4 is an enlarged vertical section of part of the gate construction, as viewed substantially along the line 4—4 of Figure 2; and

Figure 5 is a fragmentary cross section along line 5—5 of Figure 2, showing certain details of construction.

In Figures 1 to 5, inclusive, the invention is

illustrated as applied to a mixer tank for sugar centrifugals, of the so-called "refinery" type. The bottom portion 10 of the tank is provided with a loading chute or spout 12 which extends laterally and downwardly to a position overlying the curb or casing 20 and rotatable basket 22 of a sugar centrifugal. The basket 22 is suspended in the usual manner from a centrifugal spindle 24, which is adapted to be driven at high speed by suitable means (not shown) in order to separate syrup from each charge of sugar massecuite or magma in the basket and expel the syrup or liquid content of the charge through the usual perforate side wall of the basket.

In the illustrated form, the spout 12 is rectangular in shape and has bolted thereto and forming the end portion thereof a gate body 14 upon which the loading gate and the gate actuating mechanism are mounted. The end wall of body 14 has a plane face 30 to which is fitted a facing 32 of bronze or other material capable of providing a smooth plane bearing surface for the gate 34. The facing 32, as seen in Figure 3, may be described as being H-shaped with the cross member 38 of the H overlying the upper margin of the spout outlet and the lower ends of the H connected together across the lower margin of the outlet. The upper legs 33 of the H project above the gate body and provide a slideway for the gate 34 in its movement away from and to closed position across the spout outlet opening 16.

The closure member or gate 34 preferably consists of a cast metal plate having a smooth inner face which in closed position across opening 16 rests throughout its perimeter on the bronze facing 32. Lugs 36 are secured to the gate 34 in such manner as to overlie the cross member 38 and prevent downward movement of the gate beyond its closed position.

Sliding movement of the gate 34 on the facing 32, away from and back to closed position, is effected by gate actuating mechanism including a cross head 40 which extends transversely across the outer side of the gate and has inturned end portions 42 which embrace or slide on cooperating parts 44 of the gate body. The cross head 40, as seen in Figure 3, is located between upper and lower pairs of abutments 46 and 48, respectively, on the outer face of the gate 34, and flat contact spots 50 are provided on the cross head in position to engage these abutments and cause vertical movement of the gate when the cross head itself is moved vertically. This connection between the cross head and the gate is a lost-motion connection which, for reasons hereinafter to be described, has an important function in the operation of the new apparatus.

From opposite ends of the cross head 40 extend stub shafts 52 upon which, respectively, the lower ends of two parallel levers 54 are swivelled. Brackets 56, joined integrally to the gate body 14, extend vertically above the gate body and support hubs 58 in which an actuating shaft 60 is mounted. Two parallel levers 62 are keyed at their respective upper ends to shaft 60, and at their lower ends they are articulated to the upper ends of the levers 54 by means of stub shafts 64. An actuating lever 66 also is keyed to shaft 60, and this lever extends forwardly from the loading gate and terminates in a handle 68 which is positioned for convenient operation by an attendant of the centrifugal. It will be understood that the connection between shaft 60 and cross head 40, through the parallel sets of levers 54 and 62, constitutes a toggle connection that causes vertical movement of the cross head 40, and therefore of the gate 34, when shaft 60 is turned on its axis. As seen in Figure 1, when the actuating lever 66 is in its upper position, the cross head 40 and gate 34 are located in closed position across the spout opening 16. When the handle 68 is grasped and pulled downwardly, lever 66 turns shaft 60 and, through the toggle connection of levers 62 and 54, causes vertical movement of the cross head 40 and gate 34 to permit the discharge of material by gravity through the outlet 16. The mechanism may be designed so that a lever ratio of approximately 9 to 1 will exist at the beginning of opening movement of the gate, which is the point of greatest resistance to movement, and so that at no time will the lever ratio affecting the gate be less than 3 to 1. It will be further understood that in the case of a vertically movable gate the double or parallel linkage connecting the cross head 40 with the actuating shaft 60 ensures parallel motion of the cross head and the sliding gate 34.

In order that the margins of the gate may fit snugly against the facing 32, while still providing a proper clearance or tolerance permitting the requisite sliding motion, means are provided between the cross head 40 and the gate 34 by which to regulate the clearance and also to regulate and hold constant the pressure of the gate against the facing. For example, washers 70 are carried by the cross head in position to bear against flat spots 72 on the outer side of the gate. Hollow screws 74 are threaded in the cross head so as to limit movement of the washers 70 away from the gate. When the desired clearance between the end of each screw 74 and the cooperating washer 70 has been established, this clearance can be maintained indefinitely by locking screw 74 with a set screw 76. In addition, compression springs 78 are located inside of the screws 74 so as to push the washers 70 against the gate under constant pressure. The pressure of springs 78 can be adjusted by means of screws 80, which are threaded inside of the screws 74. With this arrangement, the sliding gate 34 is at all times held against the gate facing 32 under constant pressure, except when it is wedged or clamped in closed position under greater pressure, as hereinabove described. Syrup consequently is hindered from seeping between the gate and the facing and later cooling off to form sugar crystals which would interfere with proper sliding movement of the gate.

Referring now to the self-locking feature of the new construction, the inturned end portions 42 of the cross head 40 are formed with vertically elongated wedges or tapered surfaces 82 (see Figures 2 and 4), and these cooperate with similarly tapered surfaces 84 on parts 44 of the gate body 14. Whenever the gate 34 is in open or partly open position and the cross head lies substantially above its normal closed position, the tapered surfaces 82 are held out of contact with the tapered surfaces 84 by reason of the engagement of the ends 86 of portions 42 with straight surfaces 88 on parts 44. As soon, however, as the gate has reached its closed position, a slight additional downward movement of the cross head, for example, about $\frac{3}{16}$ of an inch, causes the tapered surfaces 82 to wedge tightly against the tapered surfaces 84, thereby locking the gate in closed position and clamping it tightly against its facing. See Figure 4. For best results, the angle of taper of the surfaces 82 and 84 is approximately 2 de-

grees, which ensures a strong wedging effect that holds the gate locked once it has been wedged tightly in closed position. The wedging and self-locking effect is increased by the fact that the tapered surfaces are elongated and therefore present a substantial area of frictional engagement; in the illustrated embodiment they approximate 6 inches in length.

A further important feature of the illustrated embodiment is that the self-locking or wedging action just described takes place by movement of the cross head 40 after the gate 34 has been closed, without requiring corresponding movement of the gate itself. This results from the lost-motion connection, as hereinabove described, between the cross head and the sliding gate. In upward movement of the gate the cross head bears against the abutments 46 and lifts the gate to open position; in downward movement to close the gate, motion of the cross head 40 is transmitted into motion of the gate through the medium of a compression spring 90, which bears against a lug 92 integral with the gate. When, however, the gate has reached its closed position and the lugs 36 have engaged against the cross member 38 of the gate facing, the cross head 40 is still free to move a certain distance, against the compression of spring 90, until it bears against the lower abutments 48 on the gate. It is this additional movement of the cross head itself which effects the wedging and self-locking action, during which the washers 70 slide on the flat spots 72 on the gate face. Further by reason of this lost motion connection, when it is desired to open the gate the actuating mechanism first moves the cross head and thereby destroys the locking effect of the wedges before the cross head abuts against the abutments 46 and assumes the load of opening the gate. Consequently, any sticking of the gate against the facing does not affect the facility with which the wedging or locking of the gate may be released, and a highly satisfactory closure is provided without imposing additional strains on the attendant operating the centrifugal.

It will be evident that the locking and unlocking of the gate takes place as a part of the normal closing and opening movements, respectively, of the gate actuating mechanism and do not require any separate operation to be performed by the centrifugal attendant. This renders the new construction readily susceptible to automatic or power actuation, wherever desired, in place of manual actuation. When the gate is closed, the actuating lever 66 is disposed out of the way of the attendant and does not interfere with his freedom of movement about the centrifugal, nor with easy cleaning of the centrifugal curb 20 or the drip pan 94, hereinafter described. The mechanism is such that the gate will remain in any desired position after the lever 66 has been released, without dropping or sliding of its own accord.

In order to obtain the locking action of the cross head with minimum effort, means are provided for lubricating the points of frictional engagement between the washers 70 and the flat spots 72. For example, tubes 73 extend through the screws 30 and are threaded at their inner ends in the washers 70, so as to supply lubricant to the inside faces of the washers. At their outer ends the tubes 73 carry fittings 75 for grease lubrication.

It will be understood that the mixture to be loaded into the centrifugal basket 22 flows from the spout 12 as soon as the gate is opened, through the space between the lower edge of the gate 34 and the lower margin of opening 16. A drip pan 94 is provided at the bottom of the gate structure for the dual purpose of directing each charge of the mixture into the centrifugal basket and catching any drippings that may fall from the gate after a loading operation. This drip pan, as shown in Figures 1 and 3, is swivelled near its back side to supports 95 screwed into the sides of the gate body. A lever 96 is articulated between its ends, as at 97, so as to be held in the full line position of Figure 1 by a pin 98 on cross head 40 when the gate is in closed position. A tension spring 99 connects the other end of lever 96 with the drip pan and normally holds the drip pan in a position in which a lug 100 thereon abuts against lever 96.

As a result of this arrangement, the drip pan is freed from the constraint of pin 98 and drops immediately to the dotted line position of Figure 1 as soon as the cross head is moved a short distance away from its normal closed position. This tends to speed up the loading operation, as there is no spring tension or counterweight to be overcome by the mass entering the drip pan before the pan will assume the position required for loading. Nevertheless, the drip pan rises automatically when pin 98 engages and moves lever 96 upon closing of the gate. Another result of this arrangement is that the drip pan can always be pushed downwardly, against the tension of spring 99, by applying a pressure against the pan itself. Thus, an attendant who has just closed the gate after a loading operation can readily scrape adhering material from the drip pan and into the centrifugal by means of a paddle or the like, and manual pressure applied through the paddle will serve to lower the drip pan into the desired position.

As already indicated to some extent, the new loading gates embodying my invention possess a number of distinct advantages in comparison with the constructions heretofore used in the art. They allow the use of large spout or gate openings without encountering trouble from leakage, which enables the volume of flow and the loading speed to be increased. They make it easier for an attendant to load each centrifugal, because a natural pulling movement is used to actuate the gate, permitting a strong force to be readily applied, and the effective lever ratio is great enough to move the gate readily under almost any circumstances. After the gate has been closed, the actuating lever is disposed entirely out of the way of the centrifugal attendant and does not interfere with easy cleaning of the drip pan or the centrifugal curb. The gate is securely and tightly locked in closed position between successive loading operations, without danger of leaking or of sliding partly open because of vibrations or other inadvertency. This locking effect is obtained automatically by the normal movement of the actuating mechanism, without requiring any separate operation. The locking effect is destroyed in the same way, and before the actuating mechanism assumes the load of the gate itself. The gate closure is constantly held against its facing under substantial pressure, even when the gate is partly or entirely open, so that the tendency of syrup to infiltrate between the gate and the facing is greatly reduced, thus obviating much of the trouble which has heretofore resulted from the cooling and

crystallization of syrup on the facing. Furthermore, the pressure of the gate against its facing and the clearance between these parts are subject to regulation at will so as to meet any particular conditions encountered in the use of the apparatus.

Although the illustrated embodiment of my invention is a loading gate adapted especially for a mixer spout of the so-called "refinery" type, it will be apparent that the invention may be embodied in other forms and designs of apparatus without restriction to either the details or the specific arrangements of the illustrated embodiment. In the case of a tank and spout of the so-called "plantation" type, the gate body and actuating mechanism may be mounted so that the cross head and gate move in a substantially horizontal plane, to allow material to flow almost vertically downward from the tank and spout. In such cases, a single toggle linkage may be preferred for moving the gate, and the actuating lever may be arranged so as to be pulled forwardly by the centrifugal attendant in unlocking and opening the gate. It should also be apparent that the actuating lever may be moved manually or by means of a motor, hydraulic or pneumatic cylinder or other automatic device connected therewith. I therefore desire that my invention be accorded a scope fully commensurate with its novel contributions to the art, as intended to be set forth in the appended claims.

I claim:

1. A loading gate for loading a centrifugal machine or the like comprising means adapted to form the end portion of a loading spout and having a plane end face to surround the spout outlet and extend to a side thereof, a gate fitted to slide on said face and normally to close said outlet, means to maintain the gate constantly in engagement with said face, gate actuating means including a lost motion-connection providing lost motion between the same and the gate when the gate is in closed position, and means responsive to the lost-motion of said actuating means for clamping the gate tightly against said face.

2. A loading gate for loading a centrifugal machine or the like comprising means adapted to form the end portion of a loading spout and having a plane end face to surround the spout outlet and extend to a side thereof, a gate fitted to slide on said face and normally to close said outlet, means to maintain the gate constantly in engagement with said face, gate actuating means including a cross head traversing said gate, a lost-motion connection between said cross head and said gate, a fixed actuating shaft, a toggle connection between said cross head and said shaft for sliding said gate on said face and means responsive to the lost-motion of said cross head relative to said gate for clamping the gate tightly in closed position against said face.

3. A loading gate for loading a centrifugal machine or the like comprising means adapted to form the end portion of a loading spout and having a plane end face to surround the spout outlet and extend to a side thereof, a gate fitted to slide on said face away from and to a closed position covering said outlet, means to maintain said gate constantly in engagement with said face, gate actuating means having only a lost-motion connection with said gate for moving said gate along said face, and means responsive to the continued lost-motion of said gate actuating means after said gate has been moved thereby to closed position for clamping said gate tightly against said face.

4. In a loading gate for loading a centrifugal machine or the like, a hollow gate body adapted to form the end portion of a loading spout, a facing attached to the end of said body and providing a plane bearing surface surrounding and having parallel legs extending to a side of the body outlet, a gate fitted to slide on said surface away from and to a closed position covering said outlet, a cross head traversing the outer side of said gate and having backwardly and inwardly turned end portions adapted to slide on runways parallel to the legs of said facing, a lost-motion connection between said cross head and said gate, an actuating shaft, a toggle connection between said shaft and said cross head and operative when said shaft is turned to move said cross head and slide said gate away from or back to its closed position, and interfitting tapered surfaces on said end portions and said gate body for clamping said gate tightly against said facing in response to continued movement of said cross head after the gate has been closed.

5. In a loading gate for loading a centrifugal machine or the like, a hollow gate body adapted to form the end portion of a loading spout, a gate facing on the end of said body providing a plane bearing surface surrounding and extending to a side of the body outlet, a gate fitted to slide rectilinearly on said surface away from and to a closed position covering said outlet, a cross head traversing the outer side of said gate and connected with said body for movement in a path parallel to the longitudinal axis of said facing, said gate having abutments on its outer face embracing said cross head and forming a lost-motion connection therewith, means operated by lost motion of said cross-head between said abutments for clamping said gate against said facing, and lever means for moving said cross head in said path.

6. In a loading gate for loading a centrifugal machine or the like, a hollow gate body adapted to form the end portion of a loading spout, a gate facing attached to the end of said body and providing a plane bearing surface surrounding and extending to a side of the body outlet, a gate fitted to slide rectilinearly on said surface away from and to a closed position covering said outlet, a cross head traversing the outer side of said gate and connected with said body for movement in a path parallel to the longitudinal axis of said facing, means for moving said cross head in said path, a lost-motion connection for moving said gate with said cross head, means operated by the lost motion of said cross-head relative to said gate for clamping said gate against said facing, a plurality of washers carried on the inner side of said cross head and bearing against the outer side of said gate, and means on said cross head for holding said washers against said gate.

7. In a loading gate for loading a centrifugal machine or the like, a hollow gate body adapted to form the end portion of a loading spout, a gate facing attached to the end of said body and providing a plane bearing surface surrounding and extending to a side of the body outlet, a gate fitted to slide on said surface away from and to a closed position covering said outlet, a cross head traversing the outer side of said gate and connected with said body for movement in a path parallel to the longitudinal axis of said facing, means for moving said cross head in said

path, a lost-motion connection for moving said gate with said cross head, a plurality of washers carried on the inner side of said cross head and bearing against the outer side of said gate, means on said cross head for holding said washers against said gate, said last recited means including hollow screws threaded in said cross head and adapted to limit the clearance between said washers and said gate and compression springs inside of said hollow screws to press said washers against said gate and means operated by the lost motion of said cross-head relative to said gate for clamping said gate against said facing.

8. In a loading gate for loading a centrifugal machine or the like, a hollow gate body adapted to form the end portion of a loading spout, a gate facing attached to the end of said body and providing a plane bearing surface surrounding and extending to a side of the body outlet, a gate fitted to slide on said surface away from and to a closed position covering said outlet, a cross head traversing the outerside of said gate and connected with said body for movement in a path parallel to the longitudinal axis of said facing, means for moving said cross head in said path, a lost-motion connection for moving said gate with said cross head, means operated by the lost motion of said cross-head relative to said gate for clamping said gate against said facing, a plurality of washers carried on the inner side of said cross head and bearing against the outer side of said gate, means on said cross head for holding said washers against said gate, said last recited means including hollow screws threaded in said cross head and adapted to limit the clearance between said washers and said gate, compression springs inside of said hollow screws to press said washers against said gate and screws threaded in said hollow screws to adjust the pressure of said spring.

9. In a loading gate for a centrifugal machine or the like, a gate body adapted to form the end portion of a loading spout and defining an outlet to lead toward the centrifugal, a slidable gate normally closing said outlet, means for sliding said gate to and from an open position, a drip pan pivotally mounted below said outlet for movement from an upper, drip-catching position to a lower, loading position, and means operative when the gate is closed and rendered inoperative when the gate is opened for holding said drip pan in its upper position, said holding means including spring means connected with the drip pan and with another element of the holding means so that the drip pan may be moved to its lower position under manual pressure while the gate is closed.

10. In a loading gate for loading a centrifugal machine or the like comprising means adapted to form the end portion of a loading spout, said means having a plane end face to surround the spout outlet and extending to a side thereof, a gate fitted to slide on said face and normally to close said outlet, actuating means for sliding said gate on said face, adjustable stop means for limiting the clearance between said gate and said face, compression spring means for constantly pressing said gate against said face and separately adjustable means for varying the compression of said spring means.

11. A loading gate for loading a centrifugal machine or the like comprising means adapted to form the end portion of a loading spout and having a plane end face surrounding the spout outlet, a gate fitted to slide on said face and normally to close said outlet, said plane face extending beyond said outlet to a side thereof a distance sufficient for the gate to slide along the face and substantially uncover the outlet, means including a cross-head extending across said gate for sliding said gate on said face, and resilient means carried by said cross-head for constantly pressing said gate against said face.

12. A loading gate for loading a centrifugal machine or the like comprising means adapted to form the end portion of a loading spout and having a plane end face surrounding the spout outlet, a gate fitted to slide on said face and normally to close said outlet, said plane face extending above said outlet a distance sufficient for the gate to slide thereon and substantially open the outlet, actuating means connected with said gate for sliding the same so as to open and close the outlet, compression spring means between said gate and part of said actuating means for constantly pressing said gate against said face, and adjustable means for varying the compression of said spring means.

13. A loading gate for loading a centrifugal machine or the like comprising means adapted to form the end portion of a loading spout and having a plane end face surrounding the spout outlet, a gate fitted to slide on said face and normally to close said outlet, said plane face extending beyond said outlet a distance sufficient for the gate to slide thereon and substantially uncover the outlet, means including a cross-head extending across said gate for sliding said gate on said face, adjustable means carried by said cross-head for limiting the clearance between said gate and said face, and compression spring means carried by said cross-head for constantly pressing said gate against said face.

JOSEPH HERTRICH.

CERTIFICATE OF CORRECTION.

Patent No. 2,337,817. December 28, 1943.

JOSEPH HERTRICH.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 41, claim 1, after "including" insert --a hand-operated member movable to slide said gate along said face away from and to its closed position, said actuating means also including--; 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 8th day of February, A. D. 1944.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)