April 23, 1957 W. GRIESELHUBER 2,789,730

HORIZONTALLY OPERATING LOADING GATE FOR CENTRIFUGAL MACHINES

Filed May 18, 1955 2 Sheets-Sheet 1

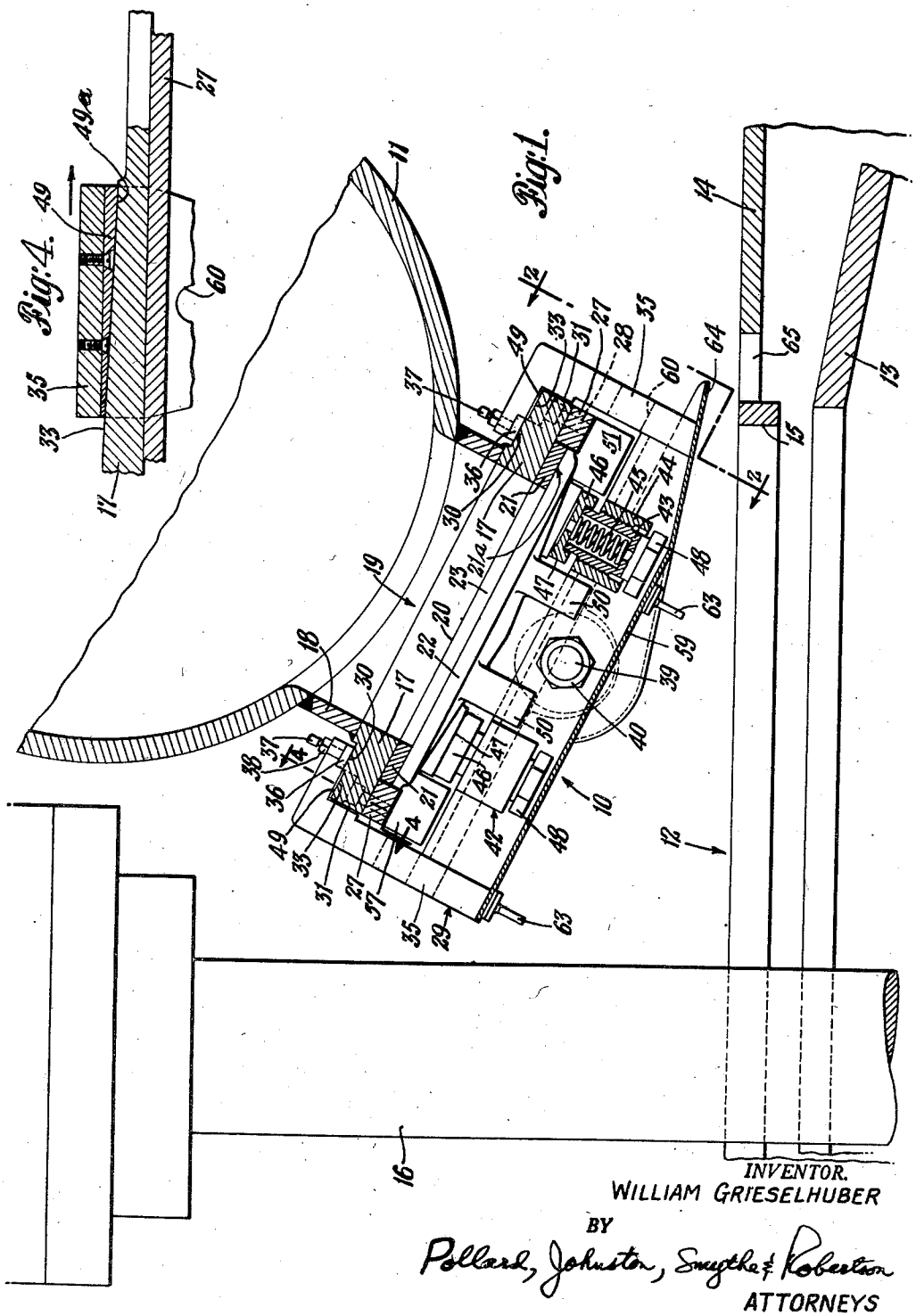


Fig. 1.

Fig. 4.

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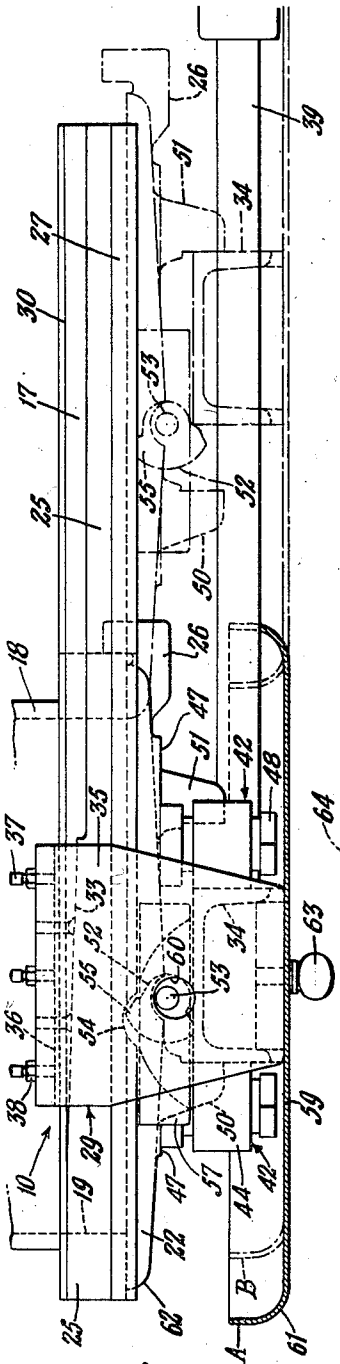


Fig. 2.

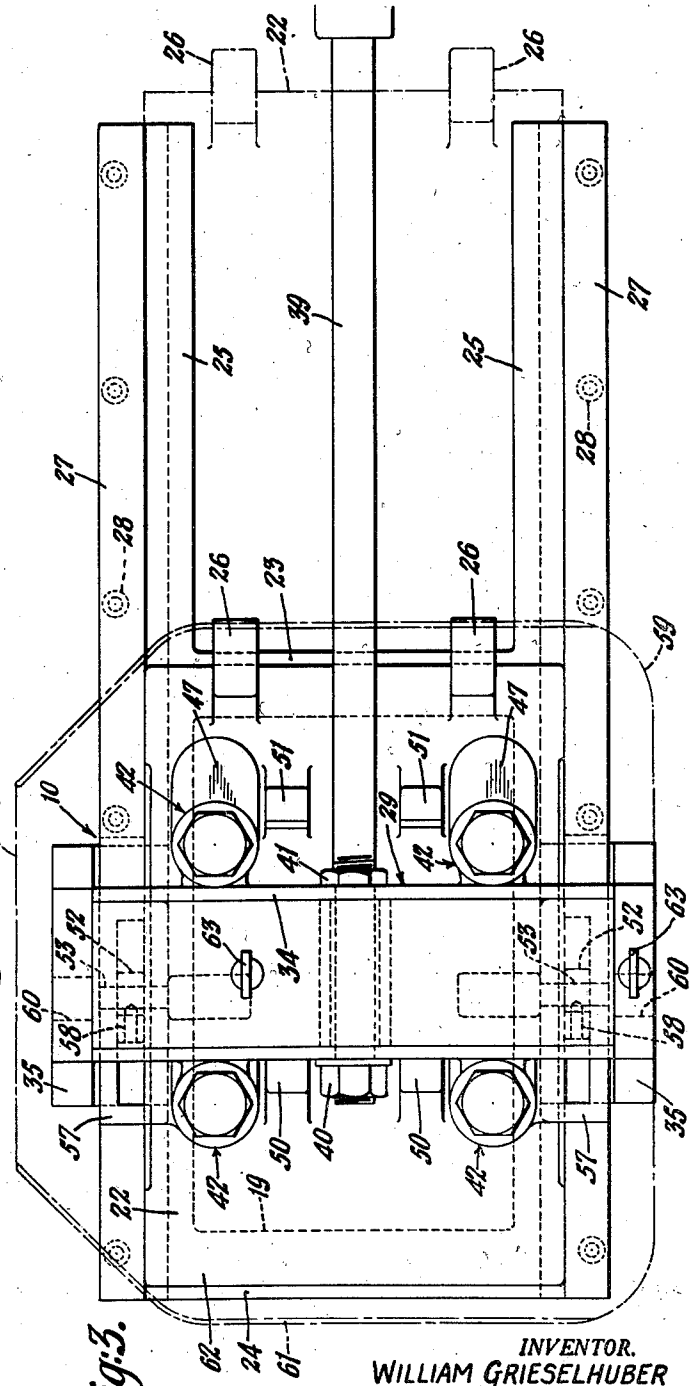


Fig. 3.

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HORIZONTALLY OPERATING LOADING GATE FOR CENTRIFUGAL MACHINES

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9 Claims. (Cl. 222—108)

This invention relates to a new and improved loading gate, and more particularly to a horizontally operating loading gate for delivering material from a downwardly opening outlet of a supply tank directly into the rotatable basket of a sugar centrifugal or the like.

In the sugar manufacturing industry, for example, 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 battery of centrifugal machines to hold a comparatively large quantity of the mixture that is to be centrifuged. Gate controlled outlets are provided at the bottom of the tank from which the material can flow into the baskets of the respective centrifugal machines through an opening in the curb top of each machine.

At the beginning of each centrifugal operating cycle, the loading gate of the centrifugal machine is opened while the centrifugal basket is either at rest or rotating at a suitable loading speed. The charge material then flows from the tank into the basket, and when a charge of the desired volume has formed in the basket, the gate is closed. The gate usually remains closed until the machine is again ready to be loaded at the beginning of the next cycle.

In some installations, it is desirable to have horizontally operating gates to admit material from downwardly opening tank outlets directly into the baskets of the centrifugal machines. While gates so arranged are known, the known horizontally operating gates have not dealt satisfactorily with the need to prevent drippings from falling into or about the machines while charges are being processed in the machines.

An object of this invention is to provide a horizontally operating loading gate for a downwardly opening outlet of a centrifugal mixer tank or the like, having a drip-catching pan which is so associated and coordinated with movements of the gate closure that drippings from the gate will be prevented from falling into or about the centrifugal machine and yet the pan will never obstruct the free downward flow of the charge material in the course of loading operations.

According to this invention, such a horizontally operating gate construction is provided whereby the gate closure normally is locked in closed position and becomes unlocked only after a certain initial movement of the gate operating mechanism in gate-opening direction, and a drip-catching pan is associated with the gate operating mechanism in such a manner that the pan is moved from its normal drip-catching position to a retracted position away from the path of charge material loaded through the gate concomitantly with the unlocking of the gate closure.

Other objects, features and advantages of this invention will appear from the following detailed description and the accompanying drawings of an illustrative embodiment thereof.

In the drawings:

Fig. 1 is a vertical cross section of the loading gate assembly showing it in association with portions of the basket and curb of a centrifugal machine;

Fig. 2 is a side elevation of the gate taken in the direction of arrows 2—2 in Fig. 1;

Fig. 3 is a bottom plan view of the gate assembly as shown in Fig. 2, the drip-catching pan having been removed and represented by phantom lines; and

Fig. 4 is a fragmentary view taken in the direction of arrows 4—4 in Fig. 1.

In the arrangement shown for the purpose of illustrating the principles of this invention, there is provided a gate assembly generally identified by the reference numeral **10**. The gate assembly is associated with the downwardly opening spout or neck **18** of a supply tank **11** that is adapted to contain the charge material to be processed in the underlying centrifugal machine at **12**. A part of the curb top of the machine is shown at **14**, and a top part of the basket is shown at **13**. The tank outlet and gate are so located above the centrifugal that gravity will deliver the charge material downwardly into the basket **13** through a centrally located opening **15** in the curb top. The basket **13** is suspended in the usual manner from a centrifugal spindle or shaft **16**, which is adapted to be rotated at high speed by suitable means (not shown) in order to separate the liquid and solid constituents of the charge material delivered into the basket.

The gate assembly **10** includes a gate body **17** that is secured to the neck **18** at the bottom of the supply tank in such a manner that a downwardly opening outlet **19** is formed. The gate body surrounds this outlet, and at opposite sides thereof it is provided with parallel guide or rail structures which extend horizontally away from the outlet at one side thereof—the backward side, in this embodiment. The lower end **20** of the gate body, surrounding the outlet, carries an end facing **21** of bronze or other material which provides a smooth plane bearing surface or face **21***a* against which a gate closure **22** is seated. The end facing **21**, as seen in Fig. 3, may be described as being H-shaped with the cross member **23** of the H overlying the rear margin of the outlet **19** and the forward legs of the H connected together at one end to form the forward margin **24** of the outlet. The backward legs **25** of the H extend along the lower faces of the backwardly extending rail structures of the gate body and provide a slideway for gate closure **22** in its movement away from and to closed position across the outlet **19**.

The gate closure **22** consists of a cast metal plate having a smooth inner face which is held against the end face **21***a* of the gate body. In its closed position the plate or closure **22** completely covers outlet **19**, its margins bearing against the closed part of the H formed by the end facing **21**. Secured to the rearward part of the gate closure are integral lugs **26** located in such a manner as to contact the cross member **23** when the plate is in the closed position, thereby to prevent the movement of the gate forward of such a position. Stationary guides **27** secured by screws **28** form parts of the rail structures of the gate body at opposite sides of the outlet so as to maintain the closure on the proper longitudinal course in relation to the end face.

Sliding movement of the gate closure on the end face to and away from a position in which it closes the outlet is effected by gate actuating mechanism including a crosshead **29** that is slidably supported upon upper bearing surfaces **30** on the gate body. The bearing surfaces **30** are located inward of the longitudinal edges **31** of the gate body, and extend along substantially the entire

length of the rail structures. Inclined surfaces 33 are located outwardly of the bearing surfaces 30 and taper downward toward the right as seen in Fig. 2. Surfaces 33 extend only for a short distance along the gate body and are for a purpose to be described subsequently.

The crosshead 29 has a body portion 34 extending transversely across the bottom side of the gate closure, and has end portions 35 at each end of the body portion. As seen in Fig. 1, the end portions extend upwardly parallel to longitudinal edges 31 of the gate body and then turn inward so as to extend above longitudinal bearing surfaces 30. Bearing strips 36 are located on the upper inner surface of the end portions 35 of the crosshead and these slidably contact the bearing surfaces 30 of the gate body. A plurality of adjustment screws 37 are threaded into the end portions 35 and these extend therethrough in such a manner that the lower ends of the screws contact the bearing strips 36. By the rotation of the screws in the crosshead end portions, the bearing strips can be raised or lowered relative to their respective end portions. Since the lower surfaces of the bearing strips rest on the bearing surfaces 30, by such an adjustment of the vertical position of the bearing strips with respect to the end portions, it is possible to adjust the height with respect to the gate body that the crosshead normally will occupy. The adjustment screws 37 are provided with lock nuts 38 in order that the desired adjustments may be maintained.

The crosshead is moved along the gate body by a shaft 39 that is adjustably connected to the crosshead such as by nuts 40 and 41 in the manner shown in Fig. 3. Hydraulic means or electrical means may be employed to move the shaft and crosshead in the desired gate-opening or gate-closing direction, and as will be apparent to those skilled in the art, this operation can be coordinated with the other operations to be performed during the operating cycle of an automatically operating centrifugal machine.

In order that the gate closure may bear snugly against the end face 21*a* under a desired pressure, means are provided between the crosshead 29 and the gate closure by which to regulate the pressure of the gate closure against the end face. For example, four adjustable devices, which are shown generally at 42, are carried by the body portion 34 of the crosshead, each of these devices including a tubular member or sleeve 43 threaded into a suitable tapped bore located in a boss 44 on the crosshead body. Accommodated in each sleeve is a compression spring 45, and a small washer 46 is located upon each spring to be pressed by the spring against the bottom of the slide plate. These washers contact flat surfaces 47 on the bottom of the slide plate so that there is no rigid connection that would interfere with a degree of relative motion between the crosshead and the slide plate. Located on the lower portion of each sleeve 43 is a head 48 that makes it possible for the compression of the spring contained within the sleeve to be adjusted by means of a wrench. In this arrangement, the gate closure is at all times held against the end face under constant pressure, except when it is wedged or clamped in closed position under greater pressure, as hereinafter described. Syrup consequently is hindered from seeping between the gate and the end face and later cooling off to form sugar crystals which would interfere with proper sliding movement of the gate.

Referring now to the clamping feature of this apparatus, horizontally elongated wedges 49 are secured to the inturned end portions 35 of the crosshead 29, each wedge having a lower surface 49*a* to cooperate with a similarly tapered surface 33 on the upper portion of the gate body 17. Although the crosshead is supported throughout the greater part of its travel along the gate body by the bearing strips 36 sliding along the longitudinal bearing surfaces 30, this is not the case after the crosshead has moved a sufficient distance along the gate body to move the gate closure into the outlet closing position. By the time that the crosshead has moved the gate closure to such position, any further movement of the crosshead causes the tapered surfaces 49*a* of the crosshead to move up along the surfaces 33 of the gate body. The crosshead is raised somewhat with respect to the gate body because of such contact of the tapered surfaces, thereby clamping the gate closure tightly up against the end face 21. For best results, the angle of taper of the surfaces 33 and 49*a* is approximately 2°, which insures a strong wedging effect that holds the gate locked once it has been wedged tightly in the closed position. The details of the tapered surfaces are best seen in Fig. 4.

A substantial part of the crosshead wedging action takes place by means of motion of the crosshead independent of the gate closure after the gate closure has been moved to the outlet closing position. This independent motion of the crosshead is made possible by the fact that the crosshead is not positively connected to the gate closure, but rather the body portion 34 of the crosshead is located between front and rear abutments 50 and 51, respectively, formed in the bottom of the gate closure. The longitudinal spacing between the front and rear abutments is greater than the width of the crosshead body, forming a lost-motion connection.

The lost-motion connection between the crosshead and gate closure serves several important functions in addition to permitting the crosshead to be moved to the wedged position independently of the gate closure. One of these additional functions is that in which the crosshead is utilized to loosen the closure from any tendency to stick to the end face as a consequence of possible crystal and syrup deposits on the moving surfaces. As the crosshead is moved in the gate-opening direction away from the wedged position, the lost-motion connection allows it to move along the bottom of the gate closure until it impacts against the rear abutments 51. After the gate has been loosened by the crosshead, then the crosshead can move the gate closure into the open position by continued contact with the abutments 51.

When the gate closure is to be returned to the closed position, the crosshead does not move with respect to the closure so as to strike the forward abutments 50 until after the closure has reached the outlet-closing position. This is because of the presence of pawls 52 rotatably mounted upon pins 53 attached to the side edges of the gate closure. The pawls are responsible for maintaining a spaced relation between the forward edge of the crosshead and the forward abutments 50 until such time as the closure has reached the closed position. Upon the closure reaching such a position, the pawls are permitted to rotate upwardly into recesses 54 so as to be out of the path of movement of the crosshead, and thus to permit the crosshead to be moved into the wedged position.

The upper portions 55 of the pawls slide along the guides 27 as the closure is moved in the closing direction, until they reach the recesses 54. The recesses are so located on the bottom side of guides 27 as to receive the upper portions 55 of the pawls when the closure has reached the outlet closing position.

The pawls 52, in effect, form an interlock between the gate closure 22 and the gate body that prevents, in the first instance, any motion on the part of the gate closure when the crosshead is moved in the gate-opening direction away from the wedged position. When the crosshead is in the wedged position, the crosshead body 34 rests beneath the pawls so as to hold them in the upward or locking position. Since the gate closure is prevented by the presence of the pawls within the recesses 54 from sliding along the gate body, when the crosshead is moved in the opening direction toward the right in Fig. 2, it moves relative to the closure. Then, when the crosshead has moved away from the position directly under the pawls, the pawls are permitted to rotate downwardly out of the recesses 54, thus to allow the gate closure now to

be moved in the opening direction directly by the crosshead.

The pawl mounting pins 53 are mounted in bosses 57 on the side edges of the gate closure, and are accessible through openings 60 in the end portions 35 of the crosshead. Each pawl is held against rotation upon its mounting pin such as by a set screw 58, whereas the inner end of the mounting pin is rotatable in its respective boss 57.

According to this invention, a drip-catching pan 59 is provided beneath the gate closure to prevent drippings or other material from falling from the gate into the basket or onto the machine after the loading operation has been completed. This pan is secured to the bottom of the crosshead 29 and is movable by it relative to the gate closure 22 to and away from a drip-catching position in which the forward edge 61 of the drip pan extends beneath the forward edge 62 of the gate closure. The pan 59 is somewhat larger in area than the gate closure 22, so it is effective to catch drippings at whatever portion of the closure they occur. The pan preferably is made from sheet metal, and can be removably secured to the crosshead such as by thumb bolts 63 that are threaded into tapped holes appropriately placed in the crosshead.

In the position shown by full lines in Fig. 2, gate closure 22 is in the closed position, and the drip-catching pan is so located as to catch drippings that fall from the forward edge 62 of the closure. This position of the pan is designated position A. Just before the gate closure is to be opened, the pan is to be retracted with respect to the gate closure to a position in which the pan no longer extends beyond the forward edge 62. This latter position of the pan with respect to the closure is shown in phantom lines in this figure, and is designated position B. After the pan has been retracted, the closure is to be moved to its open position, so as to dispense some of the material contained in tank 11. The open position of gate closure is shown in phantom lines at the right hand side of Fig. 2. Then, after the dispensing operation has been completed and the gate closure reclosed, the pan is returned to the drip-catching position beneath the forward edge of the closure. Such independent motions of the closure and pan are necessary in order to prevent the material that flows from the supply tank from pouring directly into the pan 59 instead of falling into the basket 13 of the centrifugal machine.

The lost-motion connection between the crosshead and the gate closure permits such a coordination of movements of the pan with respect to the gate closure. By having the pan 59 movable with the crosshead 29, as the crosshead moves independently of the gate closure from the position contacting the front abutments 50 to the position contacting the rear abutments 51, the drip-catching pan is moved from its drip-catching position to its retracted position, and correspondingly, when the crosshead moves into its wedged position, it moves the pan back to the drip-catching position.

As shown in Fig. 1 of the drawing, the gate closure 22 and the gate body are placed at an angle with respect to the centrifugal in such a manner that while the gate is essentially operable in the horizontal direction, the gate closure itself is in a plane that makes an acute angle with the horizontal. The drip-catching pan 59, which is located beneath the gate closure, is also disposed at a similar angle with respect to the horizontal, and as a result, the drippings or other material that fall from the gate closure or the outlet are caught by the pan and allowed to flow to the lower side portion thereof. A pouring lip 64 is formed along the lower side edge of the pan and because of the substantial slope of the pan, the drippings flow along the inside of the pan to the pouring lip under the influence of gravity. An orifice 65 of preferably oblong shape is provided in the curb top 14 directly below this pouring lip so that the drippings can be received inside the curb of the machine, where they are allowed to flow across the top outside portion of the basket 13 and from there into the bottom of the curb.

It will be understood that the new features herein disclosed and set forth in the appended claims may be employed in ways and forms different from those in the preferred embodiments described above and illustrated in the drawings, without departing from the contributions of this invention.

What is claimed is:

1. In a loading gate for delivering material from a downwardly opening outlet, including a hollow gate body adapted to form the end of said outlet, said body having an end face surrounding said outlet and extending horizontally to a side thereof, a gate closure fitting said face and movable therealong to and away from a position in which it closes said outlet, and operating means for so moving said closure, said closure forming a delivery opening bordered by its forward edge as it is moved away from said position, a drip-catching pan disposed beneath said closure and normally extending forwardly beyond said forward edge when said closure is in closed position, said pan being movable with said operating means, and said operating means comprising a lost motion connection with said closure whereby said operating means is operative to retract said pan away from said forward edge prior to moving said closure away from closed position.

2. In a loading gate for delivering material from a downwardly opening outlet, including a hollow gate body adapted to form the end of said outlet, said body having an end face surrounding said outlet and extending horizontally to a side thereof, a gate closure fitting said face and movable therealong to and away from a position in which it closes said outlet, said closure forming a delivery opening bordered by its forward edge as it is moved away from said position, and a drip-catching pan disposed beneath said closure and normally extending forwardly beyond said forward edge when said closure is in closed position, means for moving said pan from its normal position to a position in which it is retracted away from said forward edge, and means operative for moving said closure away from closed position only when said pan is in its retracted position, the drip-catching surface of said pan being larger in area than and normally extending horizontally beyond all the edges of said closure, said pan being substantially horizontal in the direction of its movement but being sloped to one side and forming a pouring lip along its lower side edge to discharge drippings therefrom.

3. In a loading gate for delivering material from a downwardly opening outlet, including a hollow gate body adapted to form the end of said outlet, said body having an end face surrounding said outlet and extending to a side thereof, a gate closure fitting said face and movable therealong to and away from a position in which it closes said outlet, said closure forming a delivery opening bordered by its forward edge as it is moved away from said position, a drip-catching pan disposed beneath said closure and normally extending forwardly beyond said forward edge when said closure is in closed position, locking means normally operative to hold said closure positively in closed position, a motivator for operating the gate, and respective means responsive to the gate-opening movement of said motivator first to retract said pan to a position away from said forward edge, then to render said locking means inoperative, and then to move said closure away from closed position.

4. In a loading gate for delivering material from a downwardly opening outlet, including a hollow gate body adapted to form the end of said outlet, said body having an end face surrounding said outlet and extending to a side thereof, a gate closure fitting said face and movable therealong to and away from a position in which it closes said outlet, said closure forming a delivery opening bordered by its forward edge as it is moved away from said position, a drip-catching pan disposed beneath said closure

and normally extending forwardly beyond said forward edge when said closure is in closed position, locking means normally operative to hold said closure positively in closed position, a motivator for operating the gate, respective means responsive to the gate-opening movement of said motivator first to retract said pan away from said forward edge, then to render said locking means inoperative, and then to move said closure away from closed position, and means responsive to the gate closing movement of said operating means for first moving said closure to closed position, then reactivating said locking means and then returning said pan to its normal position.

5. In a loading gate for delivering material from a downwardly opening outlet, including a hollow gate body adapted to form the end of said outlet, said body having an end face surrounding said outlet and extending to a side thereof, a gate closure fitting said face and movable therealong to and away from a position in which it closes said outlet, said closure forming a delivery opening bordered by its forward edge as it is moved away from said position, a drip-catching pan disposed beneath said closure and normally extending forwardly beyond said forward edge when said closure is in closed position, locking means normally operative to hold said closure positively in closed position, a motivator for operating the gate, respective means responsive to the gate-opening movement of said motivator first to retract said pan away from said forward edge, then to render said locking means inoperative, and then to move said closure away from closed position, and means responsive to the gate-closing movement of said motivator for first moving said closure to closed position, then reactivating said locking means, and then returning said pan to its normal position, said means responsive to said gate-closing movement comprising a movable part of said locking means.

6. In a loading gate for delivering material from a downwardly opening outlet, including a hollow gate body adapted to form the end of said outlet, said body having an end face surrounding said outlet and extending horizontally to a side thereof, a gate closure fitting said face and movable therealong to and away from a position in which it closes said outlet, a crosshead for so moving said closure and connected thereto by a lost-motion connection, said closure forming a delivery opening bordered by its forward edge as it is moved away from said position, locking means operated by the continued lost-motion of said crosshead, after said closure has been moved to the closed position, to lock said closure against movement along said face, and a drip-catching pan disposed beneath said closure and normally extending forwardly beyond said forward edge when said closure is in the closed position, said pan being movable with said crosshead, said crosshead being operative in its gate-opening movement first to retract said pan away from said forward edge, then to unlock said locking means, and then to move said closure away from closed position.

7. In a loading gate for delivering material from a downwardly opening outlet, including a hollow gate body adapted to form the end of said outlet, said body having an end face surrounding said outlet and extending horizontally to a side thereof, a gate closure fitting said face and movable therealong to and away from a position in which it closes said outlet, a crosshead for so moving said closure and having a lost-motion connection therewith, said closure forming a delivery opening bordered by its forward edge as it is moved away from closed position, a drip-catching pan disposed beneath said closure and normally extending forwardly beyond said forward edge when said closure is in closed position, said pan being mounted for movement with said crosshead and being retracted away from said forward edge by backward lost motion of said crosshead, locking pawls pivotally mounted upon opposite side margins of said closure, fixed means on said body having elements cooperating with parts of said pawls to lock said closure in closed position, said pawls having elements engaged by said crosshead in a forward part of the lost motion of said crosshead to hold said pawls in locking position, said elements being released at a backward limit of such lost motion, whereby said closure is locked in closed position until said drip pan is retracted away from said forward edge.

8. In a loading gate for delivering material from a downwardly opening outlet, including a gate body adapted to form the end of said outlet, said body having an end face surrounding said outlet and extending horizontally to a side thereof, a gate closure fitting said face and movable therealong to and away from a position in which it closes said outlet, a crosshead for so moving said closure and having a lost-motion connection therewith, said closure forming a delivery opening bordered by its forward edge as it is moved away from closed position, a drip-catching pan disposed beneath said closure and normally extending forwardly beyond said forward edge when said closure is in closed position, said pan being mounted for movement with said crosshead and being retracted away from said forward edge by backward lost motion of said cross-head, locking pawls pivotally mounted upon opposite side margins of said closure, fixed means on said body having elements cooperating with parts of said pawls to lock said closure in closed position, said pawls having elements engaged by said crosshead in a forward part of the lost motion of said crosshead to hold said pawls in locking position, said pawl elements being released at a backward limit of such lost motion, whereby said closure is locked in closed position until said drip pan is retracted away from said forward edge, said pawl elements lying in the path of forward movement of said crosshead to obstruct the forward lost motion thereof when said closure is away from closed position, said pawl elements being moved by the forward movement of said crosshead first to return said closure to closed position and then to return said pawls to their locking position as said drip pan is returned to its normal position.

9. A loading gate as described in claim 8, said body having guide rails at opposite sides thereof extending backwardly therefrom, the ends of said crosshead comprising arms extending transversely over and riding on said rails, and said locking elements comprising recesses formed in lower faces of said rails to receive the locking parts of said pawls when said closure is in closed position.

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