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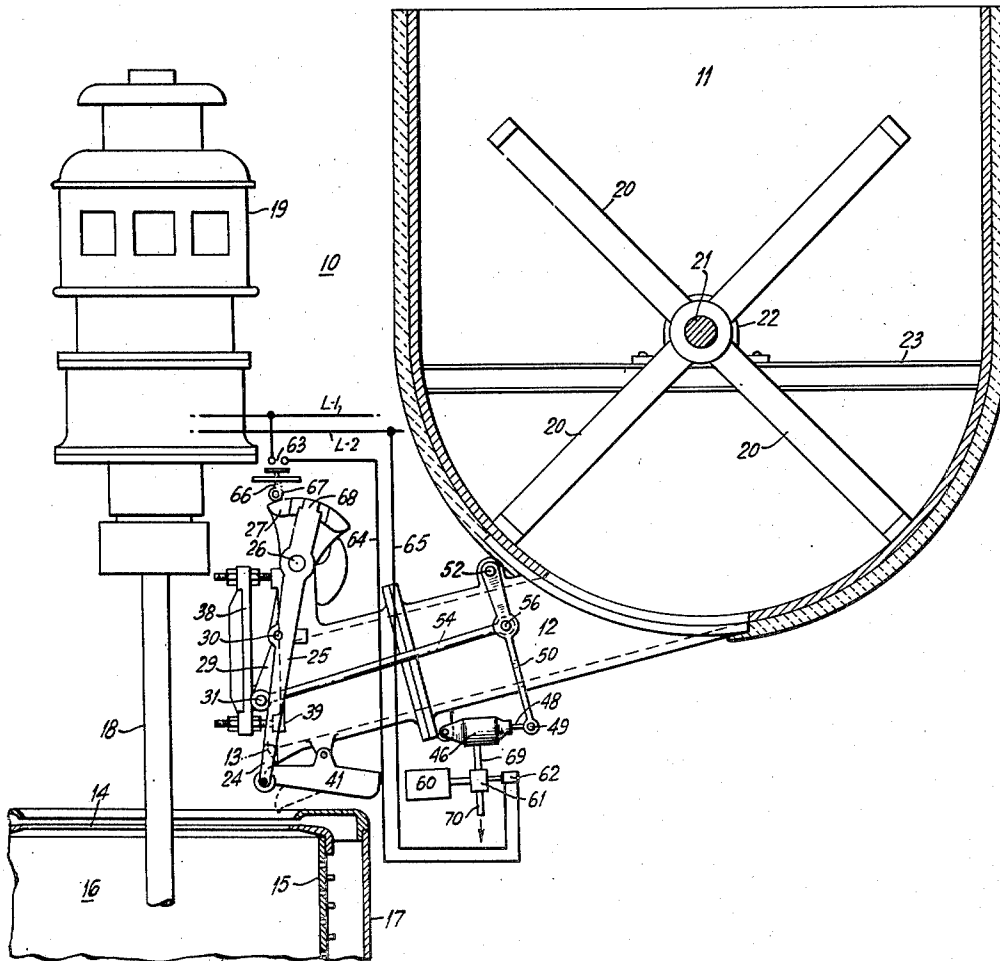
2,517,408

GATE OPERATING MECHANISM

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3 Sheets-Sheet 1

Fig. 1.



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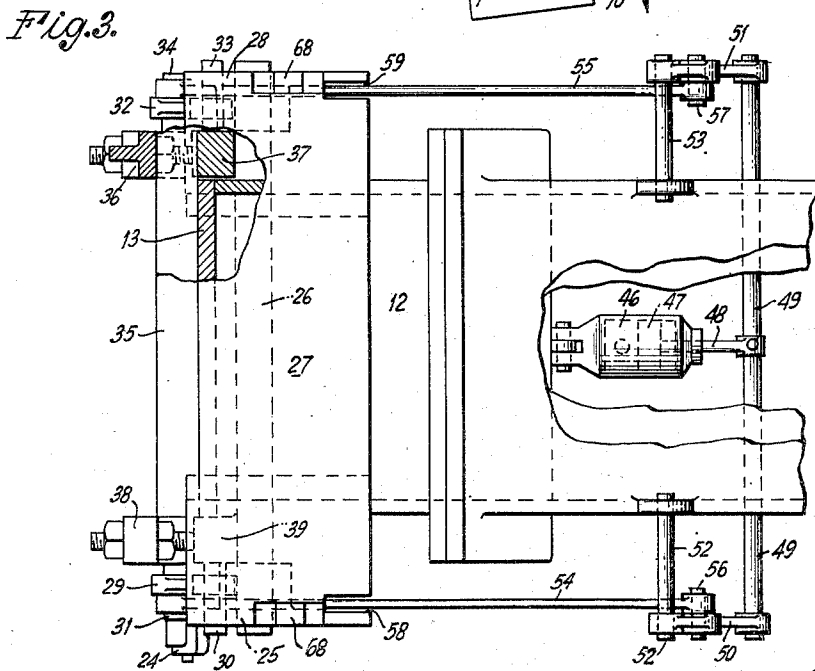
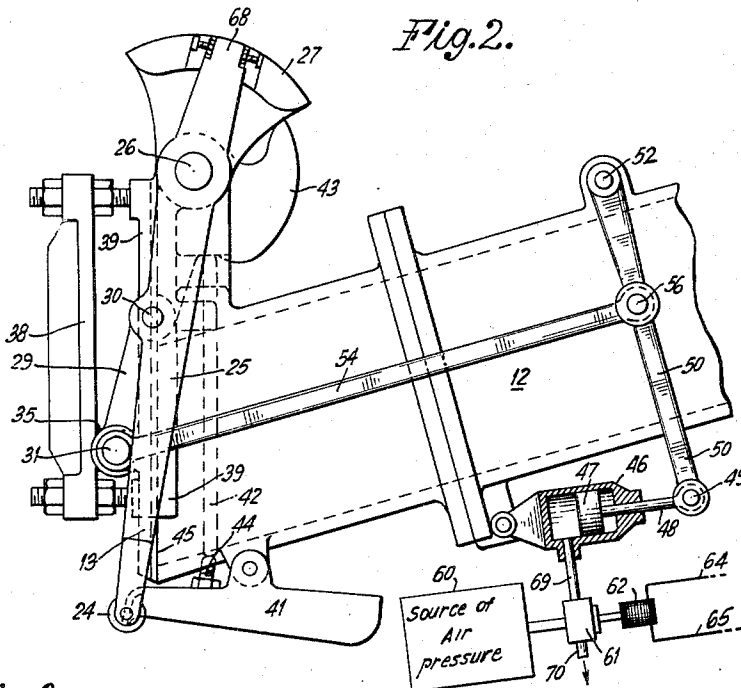
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GATE OPERATING MECHANISM

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5 Claims. (Cl. 222-504)

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This invention relates to gate-operating mechanisms and more specifically to a mechanism for opening and closing a charging gate such as is commonly used for admitting magma from a sugar centrifugal mixer into a centrifugal basket.

An object of this invention is to provide an improved gate-operating mechanism, one which does not require careful adjustment, is easy to operate and which will not become loose due to wear except after very long periods of operation.

In the manufacture of sugar, prior to the centrifuging stage, the magma is mixed, heated and stirred in a tank called the mixer. This tank has a spout at the bottom portion thereof which overhangs the opening in the top of the basket in a sugar centrifugal. The terminus of the spout is provided with a vertically movable charging gate which is operated to permit the flow of the warm magma into the centrifugal basket or to cut off this flow. In widely used apparatus of this type, after the slide gate has been moved practically into its final closed position by a manually-operated toggle mechanism, a part of this mechanism is forced against a wedge and this wedge action forces the gate firmly against the face of the spout. This gate mechanism in general works satisfactorily provided it is always kept in proper adjustment. However, in the course of time, the parts become so worn that the wedge no longer forces the gate tightly enough against the face of the spout to prevent leaking. It is then necessary to adjust the wedge and if this is done without exercising the utmost precision and care, it is either too tight, making the gate difficult to operate, or else is loose, allowing leakage.

It is accordingly another object of this invention to provide a gate-operating mechanism which does not have the above-mentioned disadvantages.

It is still another object of this invention to provide power-operated means for assisting the manual means in closing the gate and for ensuring that the gate is tightly seated.

The above-mentioned and related objects are attained in accordance with an illustrative embodiment of the invention by providing an air cylinder having a piston and connecting rod attached to a lever which in turn is connected to two lever systems, one on each side of the spout, respectively joined to opposite sides of the toggle mechanism for operating the gate. A solenoid valve, controlled by an electrical switch opened and closed by the movement of the toggle mechanism,

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causes air to be admitted to the cylinder when the gate is almost closed and air to be vented therefrom when it is desired to release the pressure and open the gate. When the gate is open, the solenoid is deenergized and the cylinder is inactive as it is cut off from the air pressure and vented to the atmosphere. In closing the gate, the operator pushes down a handle which operates the toggle mechanism and the gate is moved downwardly towards the closed position. When the gate is almost closed and the handle has only about one more inch to go, a counterweight forming a portion of the toggle mechanism engages the switch and closes the circuit to the solenoid valve, closing the vent and applying air pressure to the cylinder. By means of this cylinder and the lever systems connected to it, the gate can be forced against the face of the spout with a very high pressure, as, for example, 2000 pounds. Only a very small pressure on the handle is enough to push it completely down to the gate-closed position because of the high pressure exerted by the cylinder and the lever systems. A very small movement of the handle in the opposite direction causes the switch to be opened thus cutting off the air pressure to the cylinder and venting it, relieving the pressure on the gate and permitting it to be easily opened. It is obvious that substantially the same high pressure is obtained regardless of the amount of wear which has taken place and this does not depend upon careful adjustment.

The invention will be more readily understood by referring to the following description and the accompanying drawings forming a part thereof, in which:

Fig. 1 is a side view, partly in cross-section, of a centrifugal installation including a mixer tank with its accompanying spout and gate-operating mechanism in accordance with the invention, the gate being shown in the almost closed position;

Fig. 2 is a side view, drawn to a somewhat larger scale, of the spout and gate-operating mechanism of Fig. 1;

Fig. 3 is a top view of the apparatus shown in Fig. 2; and

Fig. 4 is a perspective view of the spout and the gate-operating mechanism, the gate being shown in the open position.

Referring more particularly to the drawings, Fig. 1 shows, by way of example for purposes of illustration, a centrifugal installation 10 embodying a mixer tank 11 provided with a spout 12 having its end remote from the mixer closed by a gate 13 which is adapted to be raised and lowered

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in a vertical path by the gate-operating mechanism in accordance with the invention, shown more fully in Figs. 2, 3 and 4 and which will be described in detail below, and a sugar centrifugal machine 16. The spout 12 is adapted to be positioned so that magma can flow therefrom into the opening 14 in the top of the basket 15 of the centrifugal machine 16. The basket is surrounded by a suitable outer casing 17 and is supported and rotated by a spindle 18 which is driven by any well-known means such as, for example, an individual electric motor 19 positioned above it.

The mixer 11 can be of any known type. By way of example, it is provided with paddles 20 rotating about a shaft 21 supported in a suitable housing 22 attached to a framework 23. The spout 12 is attached to the mixer 11 at the lowermost part thereof. Means (not shown) for heating or stirring the magma while it is in the spout can be provided, if desired. A mixer tank of the type shown in Fig. 1 provided with a long spout and with means for heating and stirring the magma in the spout is disclosed in an application Serial No. 520,603, filed February 1, 1944, by Charles A. Olcott, now abandoned.

The gate 13 is located at the end of the spout 12 remote from the tank 11. It is adapted to be raised and lowered by means of the handle 24 on the end of a long lever 25 pivoted about a lever rod 26 and terminating in or being attached to a counter-weight 27. The counter-weight is also attached to a lever 28 which is pivoted about the lever rod 26 on the side of the spout 12 opposite the lever 25. The lever 25 is connected to and forms a toggle mechanism with the lever 29 by means of lever rod 30 and is attached to the gate 13 by rod 31. Similarly, on the opposite side of the spout 12, the lever 28 is connected to and forms a toggle mechanism with the lever 32 by means of lever rod 33 and is attached to the gate 13 by rod 34. The rods 31 and 34 are attached to a bar 35 rigidly connected to the gate 13 at substantially the middle of the gate. The bar 35 is restrained to a vertical path by means of guides 36 and 37 on one side of the spout 12 and guides 38 and 39 on the other side of it. Movement of the handle 24 upwardly from the position shown in Figs. 1, 2, and 3 to the position shown in Fig. 4 causes the gate 13 to be raised, permitting magma to flow out the opening 40 in the spout 12. When the magma is flowing into the opening 14 in the basket 15, the drip pan 41 is forced to assume the position shown in dotted lines in Fig. 1 because the rod 42 (see Fig. 2) is forced against the bolt 44 by the cam action of the curved portion 43 of the counter-weight 27, but when the gate 13 is closed, the pan 41, due to the way that its weight is distributed, assumes the full line position of Fig. 1. For simplicity and clarity in the drawings, the parts 42, 43 and 44 have been omitted from Figs. 1, 3 and 4 of the drawings since they form no part of the present invention.

Due to wear and improper adjustment, the gate 13 will not always fit tightly against its seat 45. In accordance with the invention, a power-operated mechanism has been provided to assist the manual operation of the gate closing mechanism and to ensure a tight fit—one that does not depend upon careful adjustment and which remains tight regardless of wear. To accomplish this, there is provided an air-pressure cylinder 46 under the spout 12. In the cylinder is a piston 47 attached to a connecting rod 48 which is con-

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nected to a member 49 which acts both as a connecting pin and as a bridge member spanning the space between the two levers 50 and 51 and the cylinder 46. The levers 50 and 51 pivot around fulcrums 52 and 53 and to these levers are connected, respectively, the tie-bars 54 and 55 by means of the respective pins 56 and 57. The tie bars are connected to the rods 31 and 34, cut-out places 58 and 59 being provided in the counter-weight 27 so that the counter-weight can reach the position shown in Fig. 4 without striking the rods 54 and 55. The air cylinder 46 is connected to a source of air pressure 60 through the 3-port, 2-way valve 61. The solenoid 62 to operate this valve is connected to the power lines L—1 and L—2 through switch 63 and connections 64 and 65. The switch 63 is biased by spring 66 so as to be normally open, as shown in Fig. 1, except when it is closed by roller 67 engaging the middle raised part 68 of the counter-weight 27. The solenoid valve when deenergized closes the line leading to the source 60 and opens the connection 69 between the cylinder 46 and the vent 70.

The operation of the gate-closing mechanism will now be described. When the gate 13 is open (the position shown in Fig. 4), the solenoid 62 is deenergized because the switch 63 is open. The cylinder 46 is inactive as it is cut off from the air pressure source 60 and vented to the atmosphere through pipe 69, valve 61 and vent pipe 70. In closing the gate, the operator pushes down the handle 24 which lowers the lever 25 and (through the counter-weight 27 and the lever rod 26) the lever 28. This is easily done because the gate 13 does not bear tightly against the face of the spout 12. When the gate 13 has been lowered to the extent that, for example, its lower edge has started to overlap the lower flat face 71 (see Fig. 4) of the end of the spout, and the handle 24 has only about one more inch to go, the upper part 68 of the levers 25 and 28 (considering the counter-weight 27 as part of the levers 25 and 28) engages the roller 67, closing switch 63 and the circuit to the solenoid 62. This closes the vent pipe 70 and applies air pressure to the cylinder 46 from the source 60 through the valve 61 and pipe 69. By way of example, the piston may be 4 inches in diameter and thus, under a pressure of 80 pounds per square inch, exerts a push of about 1000 pounds at the rod 49 which becomes about 2000 pounds of pull on the gate 13 by reason of the lever systems (due to the construction of the levers 50 and 51). The handle 24 still has about one inch to go, but in this last movement, the gate 13 moves only about .002 inch and thus the handle has a lever advantage of 500 to 1. The co-efficient of friction of the gate 13 with the spout 12 is not more than 50% and for this reason a pressure of from 2 to 4 pounds is enough to push it home. Similarly, moving the gate 13 only .002 inch for opening the gate only 2 to 4 pounds pull is required to move the handle enough to cause the portion 68 to become disengaged from the switch 63. This, by de-energizing the solenoid 62, cuts off the air pressure to the cylinder 46 and vents it through the pipes 69 and 70, thus relieving the pressure on the gate 13 and permitting it to be easily opened. Obviously, this same pull of about 2000 pounds is obtained regardless of the amount of wear which has taken place. Moreover, the intensity of this pull does not depend in any way upon careful adjustment.

Obviously, various modifications can be made in the embodiment described above without de-

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parting from the spirit of the invention, the scope of which is indicated in the appended claims. For example, instead of operating the 3-port valve 61 by electrical means, it can be mechanically operated by the movement of the lever 25. Moreover, the switch or valve can be actuated by any other moving part of the gate or its lever systems instead of by the arrangement shown, the important feature being that the movement of the gate to its nearly closed position causes the air pressure to be admitted to the cylinder. It is also obvious that water or other fluid can be used in place of air and that other power means can replace the cylinder. For example, a solenoid energized by the closing of the switch may replace the air cylinder and its 3-port valve.

What is claimed is:

1. In combination, a movable closure member for a container operable in one direction to restrict the flow of fluid and in another direction to increase the flow of fluid from said container, manually controlled means for selectively actuating said closure member and including apparatus controllable to hold said member in a partially open position as long as desired, and electrically controlled means operated only when the closure means has been moved almost to the closed position for assisting the manually controlled means in the operation of the closure member.

2. In combination, a vertically movable gate for controlling the flow of fluid from a container, a seat for said gate, manually controllable toggle means for raising and lowering said gate, a fluid pressure cylinder, means for connecting said cylinder to said toggle means, and means for energizing said cylinder when said gate is almost closed by said manually controllable means to apply pressure to said toggle means to force the gate tightly against its seat and for venting the pressure from said cylinder when said manually controllable means is operated in the direction to open said gate.

3. In combination, a vertically movable gate for controlling the flow of liquid from a container, a seat for said gate, including a lower flat face, manually controllable toggle means for raising and lowering said gate, a fluid pressure cylinder, means for connecting said cylinder to said toggle means, and means for energizing said cylinder, where said gate has been moved by said manually controllable means to a position where it overlaps said flat face, to apply pressure to said toggle means to force the gate tightly against its seat and for venting the pressure from said cylinder

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when said manually controllable means is operated in the direction to open said gate, said means for connecting the cylinder to the toggle means comprising two series of levers the two series being respectively on opposite sides of said gate.

4. In combination, a vertically movable gate for controlling the flow of liquid from a container, a seat for said gate including a lower flat face, manually controllable toggle means for raising and lowering said gate, a fluid pressure cylinder, means for connecting said cylinder to said toggle means, and means for energizing said cylinder, where said gate has been moved by said manually controllable means to a position where it overlaps said face, to apply pressure to said toggle means to force the gate tightly against its seat and for venting the pressure from said cylinder when said manually controllable means is operated in the direction to open said gate, said means for energizing and venting pressure from said cylinder comprising a solenoid-operated valve, and electrical contact means operated by the movement of said toggle means for operating the solenoid.

5. In combination, a movable closure member for a container operable to control the flow of liquid therefrom, manually controlled means for actuating said closure member and including apparatus controllable to hold said member in a partially open position as long as desired, and power-actuated means operated by said member and initiated when the latter has reached a position in which the major portion of the flow past said closure member is halted for completely barring the passage of fluid from said container, said power-actuated means comprising a fluid-pressure cylinder mechanically connected to said manually controlled means and having its operation controlled by electrical circuit opening and closing means operated by the movement of said manually controlled means.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,040,237	Pearson	Oct. 1, 1912
2,001,941	Rowe et al.	May 21, 1935
2,313,095	Schneider	Mar. 9, 1943
2,337,817	Hertrich	Dec. 28, 1943