July 12, 1932. W. B. MERCER 1,867,462

DISCHARGE CHUTE FOR STORAGE BINS

Filed Jan. 14, 1932

Fig. 1

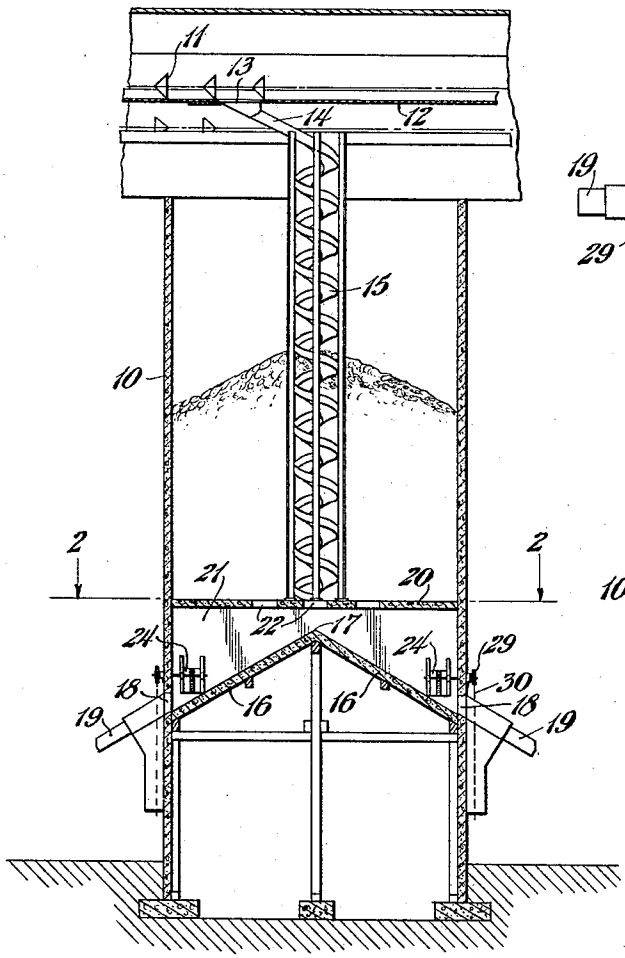


Fig. 2

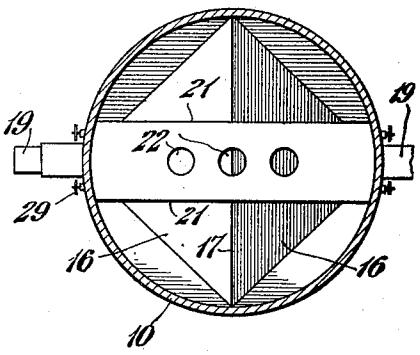


Fig. 3

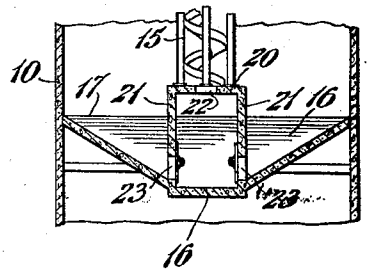


Fig. 4

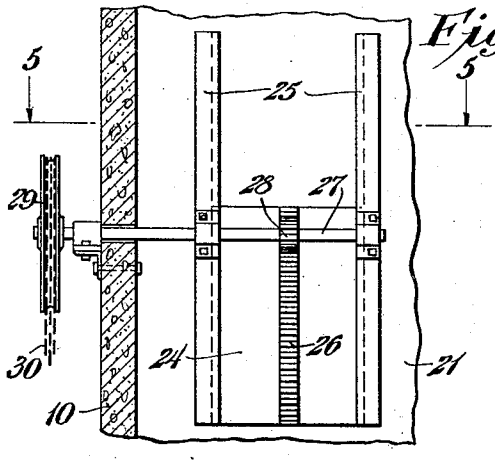
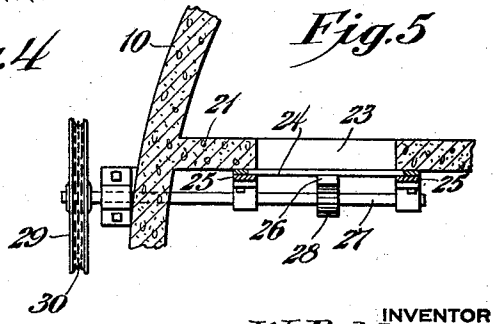


Fig. 5



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UNITED STATES PATENT OFFICE

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DISCHARGE CHUTE FOR STORAGE BINS

Application filed January 14, 1932. Serial No. 586,683.

This invention relates to chutes for storage bins and aims, among other objects, to provide an improved chute construction which prevents segregation of the various sizes of material immediately before discharge by a remixing of the material, during discharge, and which also minimizes the breakage of material in the bin due to the mass above bearing down against the bottom layers of material.

In the drawing, showing a preferred embodiment of the invention,

Fig. 1 is a vertical sectional view of a storage bin and showing the improved discharge chute;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary sectional view taken at right angles to Fig. 1;

Fig. 4 is an enlarged detail view of one of the control gates employed in the chute; and

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4.

In the handling of materials such as coal and coke, it is generally desirable to elevate them into storage bins for quick loading by gravity into cars or trucks. In a mass of coal or the like, especially soft coal, there are lumps of various sizes and it is a well known fact that when filling the bins, the smaller sizes and fines are deposited in the center, while the larger and heavier lumps roll to the outside. As the material is usually withdrawn through chutes at the sides of the bin, the larger sizes are withdrawn first. Hence, the customers get coal of different sizes at different times rather than a uniform mixture. Also, when drawing coal from a bin, the whole mass bearing down against the coal at the bottom causes breakage due to a crushing and grinding action arising from the pressure and movement of material toward the outlets. As coal is always screened to eliminate dust before being loaded into the trucks, it follows that a certain part of the original mass is lost due to this crushing and grinding action; and the per cent of loss of salable coal is a direct loss in profits. According to the present invention, the construction is such as to cause the material to be thoroughly mixed and at the same time breakage during discharge is reduced to an extremely low figure.

Referring particularly to the drawing, the invention is there shown in connection with a single silo or bin, which is illustrative of a commercial installation including many such silos. The material is conveyed over the silo 10 and then discharged or deposited therein by any well known conveyor means. In the present instance, the coal or other material is conveyed by buckets 11 of an endless conveyor through a trough 12 and discharged through an opening 13 into a curved chute 14 which carries the coal to a spiral lowering chute 15. The spiral chute is arranged coaxial with the silo 10 and the coal slides by gravity to the bottom, without breakage, gradually filling the silo. The bottom 16 of the silo usually slopes downwardly in opposite directions from a central ridge 17 so as to direct the coal to openings 18 which are located at the lower ends of the sloping surfaces and at opposite sides of the silo and which lead to discharge chutes 19. The height of the bottom from the ground is preferably such as to permit wagons or trucks to drive under the lower ends of the chutes 19 so as to be loaded entirely by gravity.

To prevent breakage and to mix the coal as it is withdrawn, a floor 20 is provided which extends between opposite sides of the silo above the ridge 17 and transversely thereof. The floor 20 is relatively narrow in width, being slightly wider than the openings 19, and is supported by spaced vertical walls 21 extending between the floor and the bottom 16. The bottom of the spiral chute 15 rests on the floor and several openings 22 are provided in the floor to permit coal to flow into the compartment formed by the bottom 16, the floor 20 and walls 21. Herein, there are three openings 22, one being central above the ridge and one on each side adjacent to the central opening. When the silo is being filled, the coal first flows through the openings 22 into the compartment and also fills the space around the outside of the compartment. As the silo fills, the mass of coal is

supported by the floor 20 and the bottom 16 outside the walls 21. As coal is drawn out through the chutes 19, the coal following will flow through the openings 22, being relieved of the pressure of the mass above by the floor 20 and side walls 21.

On being deposited in the silo, the top of the coal pile assumes a cone shape, with the larger sizes at the outside and the smaller sizes and fines at the center, as before stated. In operation, with the present construction, a small amount of coal is first withdrawn from the center, causing the top of the pile to assume an inverted cone shape. The larger pieces of coal then roll to the center from the outside edge and mix with the smaller pieces so that equal proportions of large and small sizes may then be withdrawn.

In order to obtain the coal which is left on each side of the compartment after the coal has reached the floor level, openings 23 are provided in each wall adjacent to the lower ends of the bottom 16. The openings are controlled by gates 24 which may be opened so that the coal may flow into the compartment at each end and be withdrawn through the chutes 19. The gates are shown as being slidably mounted inside the compartment in guides 25 and each has a vertical rack 26 secured thereto. A transverse shaft 27, mounted in suitable bearings, is provided for each gate and has a pinion 28 thereon engaging with the rack 26. Each shaft has one end extending outside of the silo so that a wheel 29 may be secured thereto to turn the shaft. Any suitable means may be used to operate the wheel such as a chain 30. Thus, practically all of the coal in the silo may be withdrawn. The loss due to breakage will be materially reduced and the customers will be assured of thoroughly mixed coal.

The preferred form of the invention is shown in the drawing, but within the scope of the appended claims many different structures may be built which will have at least some of the advantages of the preferred form. One example of a less desirable structure would be a silo with a chute at the bottom having no openings either in its top or in its sides, only an inlet and an outlet at its opposite ends, the inlet being spaced from the center of the silo. Such a construction would diminish breakage but would not affect the very desirable remixing which the preferred form will accomplish.

Obviously, the present invention may be employed wherever heavy fluent materials composed of particles of relatively fine and coarse sizes are stored for subsequent use; its field of usefulness is much wider than the coal yard.

Obviously, the present invention is not restricted to the particular embodiment thereof herein shown and described. Moreover, it is not indispensable that all the features of the invention be used conjointly since they may be employed advantageously in various combinations and subcombinations.

What I claim is:—

1. In combination with a silo having a discharge opening, a bottom in the silo sloping downwardly to the opening; a discharge chute communicating with the opening and extending outwardly from the wall of the silo; a floor in the silo above the upper edge of the bottom; said floor being relatively narrow and extending from above the discharge opening to the opposite side of the bin; said floor having openings therethrough adjacent the upper edge of the floor; spaced side walls extending between the floor and the bottom; and gate-controlled openings in the walls adjacent to the lower edge of the bottom.

2. In combination with a silo, an elongated closed compartment extending between opposite walls of the bin near the bottom thereof, said compartment having a top; side walls and bottom, said bottom being inclined downwardly from its mid portion to the sides of the bin; said top having openings therethrough in its mid portion; said silo having a discharge opening in the walls thereof at the ends of the compartment; and a discharge spout for each opening.

3. In combination with a silo, a bottom in the silo inclined downwardly in opposite directions from the mid portion thereof to the walls of the silo; the walls of said silo having discharge openings therein at the lower ends of the bottom; a discharge spout for each opening; a relatively narrow floor extending above the bottom and between the opposite walls of the silo in which the openings are located; said floor having openings therethrough; and spaced vertical walls extending between the floor and the bottom.

4. In combination with a silo, a bottom in the silo inclined downwardly in opposite directions from the mid portion thereof to the walls of the silo; the walls of said silo having discharge openings therein at the lower ends of the bottom; a discharge spout for each opening; a relatively narrow floor extending above the bottom and between the opposite walls of the silo in which the openings are located; said floor having openings therethrough; and spaced vertical walls extending between the floor and the bottom, said vertical walls having openings therethrough near the lower ends thereof; and a gate for controlling each opening in the vertical walls.

5. In combination with a silo, a bottom in the silo inclined downwardly in opposite directions from the mid portion thereof to the walls of the silo; the walls of said silo having discharge openings therein at the lower ends of the bottom; a discharge spout for each opening; a relatively narow floor extending above the bottom and between the opposite

walls of the silo in which the openings are located; said floor having openings therethrough; spaced vertical walls extending between the floor and the bottom, said vertical walls having openings therethrough near the lower ends thereof; a gate slidably mounted to close each opening in the vertical walls; a vertical rack on each gate; a horizontal shaft for each gate; a pinion on the shaft engageable with the rack; one end of each shaft extending outside of the silo; and means on the extended end of each shaft to rotate the same to open and close the gate.

6. In combination with a silo having a horizontal bottom wall with openings; said bottom wall covering only part of the total area of the silo at the bottom; a discharge chute below the bottom wall, said discharge chute comprising an inwardly and downwardly sloping wall and a vertical wall; said vertical wall extending from and joined onto said bottom wall; an opening in the vertical wall for discharge of the material; and an operator-controlled gate for said opening.

7. In combination with a silo, a chute having a top and two side walls extending transversely of the silo at the bottom; the chute having an inlet opening in one of its side walls and a discharge opening at the outer end.

8. In combination with a silo, a chute having a top and two side walls extending transversely of the silo at the bottom; the chute having an inlet opening in one of its side walls and also in the top wall and a discharge opening at the outer end; and a spiral gravity chute in the silo directly above the inlet opening in the top of the chute.

9. In combination with a silo, a discharge chute wholly enclosed by the silo and discharging through a side wall of the silo at the bottom; said discharge chute having small inlet openings at the top and at the sides also.

10. In combination with a silo, a discharge chute at the bottom of the silo having a top and two vertical side walls which are generally radial with respect to the silo, and a downwardly sloping bottom, so as to direct the material outwardly; said chute having an inlet opening spaced from the center of the silo and an outlet at the outer wall of the silo and below the inlet.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature.

WILLIAM B. MERCER.