

F. S. INGOLDSBY.
SELF CLEANING BIN.
APPLICATION FILED OCT. 25, 1909.

1,031,120.

Patented July 2, 1912.
3 SHEETS—SHEET 1.

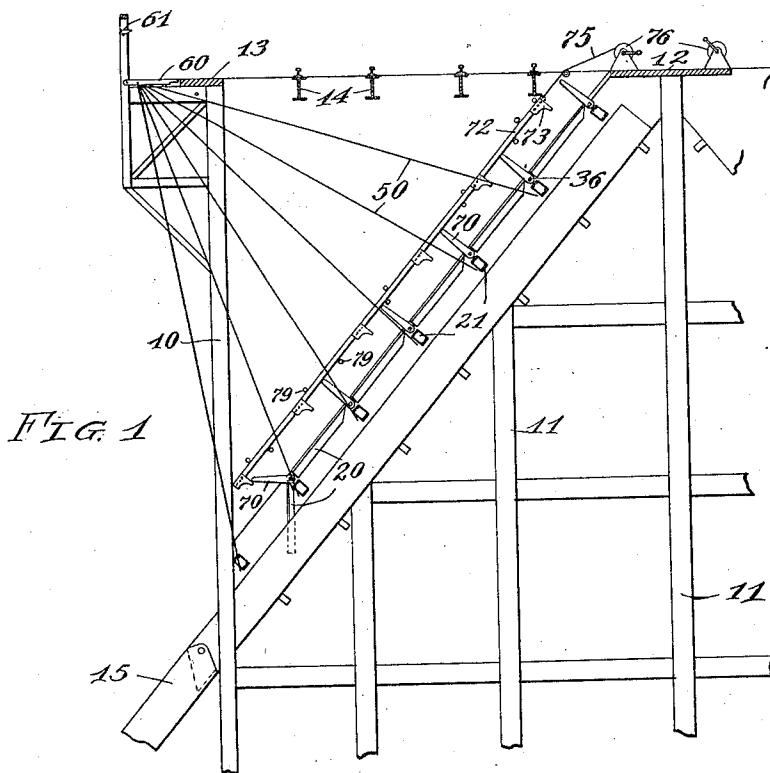


FIG. 1

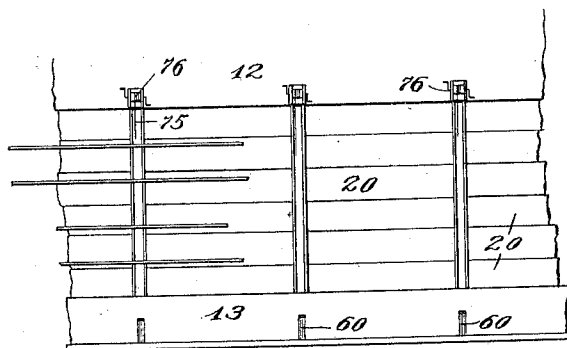


FIG. 2

WITNESSES:
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BY Rake, Fouts & Hull
ATTYS.

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3 SHEETS-SHEET 2.

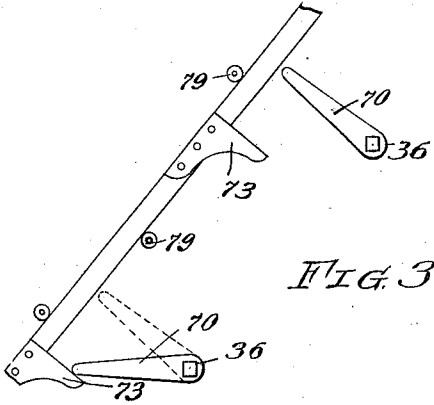


FIG. 3

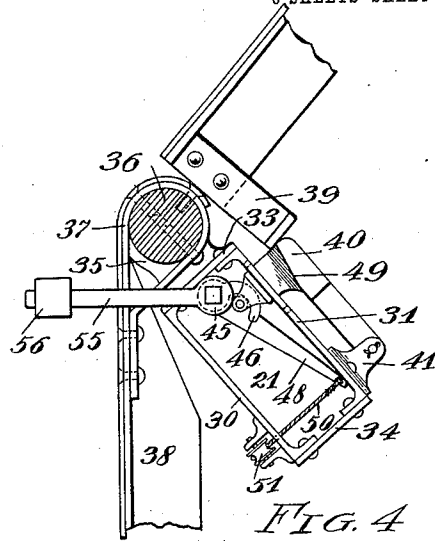


FIG. 4

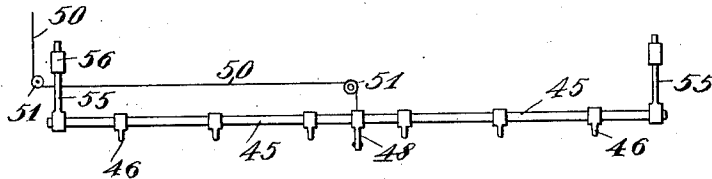


FIG. 5

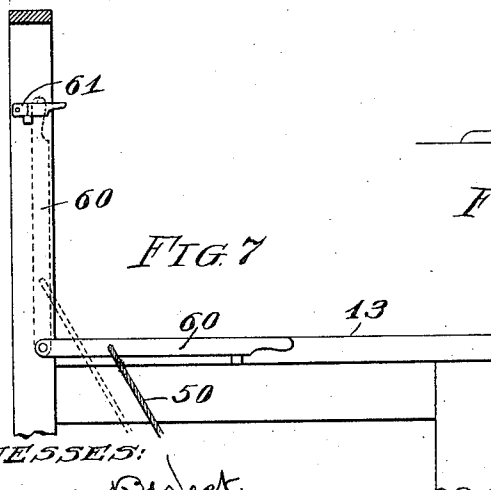


FIG. 7

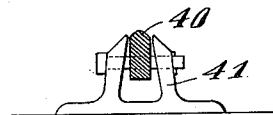


FIG. 6

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Oliver M. Kappeler.

INVENTOR:

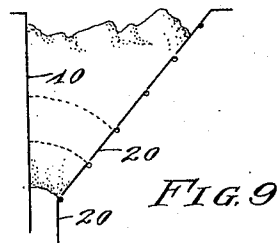
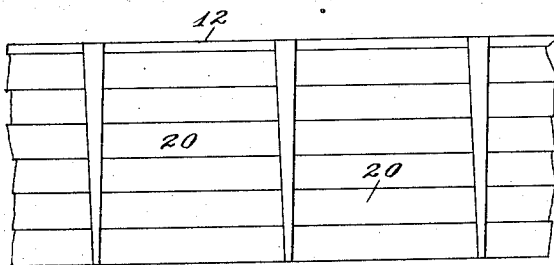
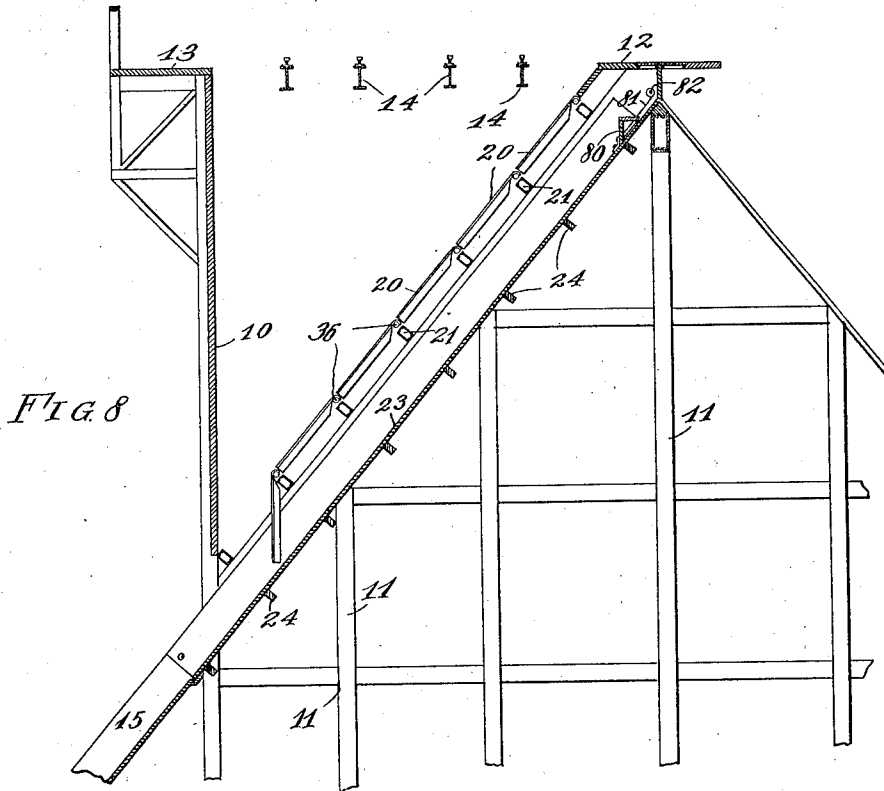
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F. S. INGOLDSBY.
SELF CLEANING BIN.
APPLICATION FILED OCT. 25, 1909.

1,031,120.

Patented July 2, 1912.
3 SHEETS—SHEET 3.



WITNESSES:
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UNITED STATES PATENT OFFICE.

FRANK S. INGOLDSBY, OF ST. LOUIS, MISSOURI.

SELF-CLEANING BIN.

1,031,120.

Specification of Letters Patent.

Patented July 2, 1912.

Application filed October 25, 1909. Serial No. 524,316.

To all whom it may concern:

Be it known that I, FRANK S. INGOLDSBY, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a certain new and useful Improvement in Self-Cleaning Bins, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

10 It is customary to store ore and other bulk material in bins having inclined floors, the slope of the floor being relied upon to cause the discharge of the material when the bin is opened at the lower end of the slope.

15 With some classes of material, especially certain grades of ore, there has been great difficulty with the material hanging up, and the only practical way in use, so far as I have observed, for the removal of such clinging ore, has been to have workmen undermine it with bars or poke it down with long poles. This has been expensive in requiring on a large ore dock the continuous employment of many men, for this purpose, and as the present method means that some of the men must work at the bin openings as well as other men working on top of the bin the force is divided and therefore it is difficult to oversee the work as it should be, besides which considerable danger to life or limb is ever present to the men working near the bin openings. Moreover, the operation of releasing the ore according to present methods frequently results in the sudden loosening of large quantities of material which have been hung up on the upper portion of the incline thus causing a sudden and severe shock to the front of the bin. Accidents have sometimes happened from the sudden giving away of the material and the workmen have been precipitated into the bin and injured or killed.

20 The object of this invention is to provide a bin which shall be self cleaning and shall unload the material in it whether it is hung up, bridged or otherwise, thus allowing the complete discharge of the entire contents of the bin automatically and thereby saving the expense referred to and being safe to operate, keeping the working force all on the main floor of the dock and overcoming the other disadvantages of the present system.

I accomplish the desired result by making the inclined floor of the bin in the form of a series of drop doors so that if the material does not run down the slope and discharge at the open end, but hangs up, doors may be opened farther and farther up the slope; thereby releasing the support of such material and insuring the load dropping. My dropping doors make substantially an entire inclined floor of the bin, and are adapted to drop the load vertically into an inclined runway beneath them. Suitable means are provided for releasing any door as desired and for bringing the doors back into closed position, the latter means preferably bringing back all the dropped doors at once.

Other features contributing to the production of an efficient self cleaning bin are included within my invention, a convenient embodiment of which is herein shown and more fully described.

In the drawings Figure 1 is an end elevation of a bin having my invention; Fig. 2 is a plan of a series of such bins; Fig. 3 is a fragmentary side elevation of a portion of the mechanism for returning the doors to closed position; Fig. 4 is a sectional side elevation of the support for the doors and means for latching them; Fig. 5 is a plan of the latch operating mechanism shown in Fig. 4; Fig. 6 is a detail of the pivotal support of the door latch; Fig. 7 is a side elevation of the mechanism for operating the unlatching rope; Fig. 8 is a vertical section through the bin; Figs. 9 and 10 are diagrams illustrating the arching of the material and the sloping of the bin ends.

Referring to the drawings, 10 represents the front wall of a suitable bin, 11 various upright frame supports, 12 and 13 the floors of the dock, 14 the girders supporting the tracks over the bin, 15 the discharge chute for receiving the contents of the bin. This much of the construction is of a usual type.

The floor of my bin instead of being a stationary incline is composed of a series of drop doors 20 arranged when closed to present a continuous inclined surface. The slope of this incline may be anything desired. I consider about fifty degrees from the horizontal to be a very convenient inclination. Each of the doors 20 is hinged

to a transverse beam 21 extending across the bin. Beneath the doors and cross beams is a continuous discharge floor or runway 23 shown as carried by suitable cross beams 24. This runway is located such a distance below the doors that they may swing downward into vertical position to discharge the load onto the runway from which it slides into the discharge chute 15.

The doors are normally latched to form a continuous incline, wherefore, when closed, they carry the load after the manner of the ordinary inclined floor of a bin. Means are provided, however, for allowing any one or more of the doors to drop when desired. Accordingly, if the forward door be dropped and the load tends to arch above it onto the second door, as shown in the diagram, (Fig. 9) the dropping of the second door will relieve that arch and cause the material to drop onto the runway 23; then if an arch forms farther back, the dropping of the door which supports it will relieve it, and in this manner the entire load may be effectively and rapidly discharged without the necessity of manually undermining the load or poking into it from above.

The doors are preferably hinged at the upper edges of the beams 21. These beams may conveniently be box girders, as shown in Fig. 4, composed of two channels 30 and 31 a plate 33 and strips 34. These box girders may carry ears 35 in which are journaled shafts 36 to which the doors are secured by straps 37 or other means. The doors are shown as made of metal mounted on floor beams 38 and at their free edges have brackets 39 which are adapted to rest on latches 40, each latch being carried by the cross beam next below the one carrying the hinge. The latch 40 may be the L-shaped member shown pivotally mounted in an ear 41 carried on the face of the floor beam.

To swing latches 40 inwardly to release the doors, and also to allow them to swing automatically under the doors when the doors have come into closed position, I provide the following mechanism. Extending across each beam 21 is a rock shaft 45. On this shaft are mounted a series of cam hooks 46 adapted to occupy openings in the inner extensions of the latches 40. Accordingly, when the shaft is given a partial rotation in the right hand direction (Fig. 4), the latch is drawn inwardly to release the door, while when the shaft is returned, the convex face of the hook forces the latch outwardly.

To release the latch from the level of the dock or other suitable point, I provide on each rock shaft 46 a lever 48 from which a cable 50 runs over sheaves 51 to a lever 60 pivotally mounted on the floor level of the dock. In the normal position of the parts this lever 60 may stand horizontally within

the floor 13 of the dock which is the position corresponding to the position of the latch shown in Fig. 4. When, however, the lever is drawn up into vertical position as shown in dotted lines in Fig. 7, the pull on the cable swings downwardly the lever 48 and turns the rock shaft to draw the latch inwardly, releasing the door. The latches may be held in this position by a keeper 61 which may swing over and hold the upper end of the lever 60. The compound leverage for operating the latches enables their convenient movement by hand power no matter how great the load in the bin.

The movement of the rock shaft to releasing position raises the arms 55 on the shaft which carry weights 56. These weights operate whenever the release of the cable allows it to return the latch to normal position. With the latch in this position, if the door is brought back home, it simply swings across the latch forcing it backwardly and elevating the weight until the door has cleared the latch, when the latch automatically returns to position. The weighted lever arm accordingly obviates the use of a spring.

To prevent any clogging of the opening through which the latch arm extends into the beam 23, I provide the latch with flaring sides 49 so that it entirely covers that opening when in its innermost position. The ear 41 is preferably undercut beneath the latch, as shown in Fig. 6, to allow easy clearance of material, and is beveled on its upper edges to prevent any lodgment. The outer face of the latch may also be beveled for a similar purpose. The transverse beam which supports the doors also automatically clears itself of material by reason of standing in the inclined position shown in Fig. 4. If for any reason, it is desired to place the hinge elsewhere than on top of the beam, the beam may be acutely beveled to provide a shedding ridge.

It is to be understood that there is one latch and operating mechanism, comprising a cam, rock shaft, lever, cable and operating lever for each door, so that whenever it is desired to drop a door it is simply necessary to take hold of the corresponding lever 60 and raise it to the upright position. These levers and the mechanism they operate, are independent for each door so that any door may be dropped as desired. When the door is dropped it swings downward into vertical position and allows the material above the door to drop vertically onto the inclined runway. The lower edge of the door in its dropped position, preferably clears the runway by some distance so that any material dropped onto the runway above that door may the more easily slide downward beyond it. The doors, however, are free to swing when dropped, so that the upper ma-

terial sliding down the runway may easily shove forward any door depending into that runway.

I provide a very simple mechanism for returning at one operation any or all of the doors which have been dropped. This mechanism is as follows: As stated, each door is rigidly connected with a rock shaft 36 journaled along the upper edge of the cross beam. On one of the outer ends of these rock shafts are rigidly mounted rock arms 70. These arms stand at an angle to the floors and in a free space between projections 73 on a bar 72 which passes loosely through openings in the upright frame members 78 and is suitably guided parallel with the normal incline of the floors by rollers 79. Each projection is normally such a distance below the corresponding lever as will allow the door to swing into a vertical position. The bar 72 is connected at its upper end by a chain or cable 75 with a hand or power windlass 76 located on the floor of the dock. Whenever the windlass is rotated to wind in the chain and draw the bar 72 diagonally upward, the arms 70 of any doors which may be down are engaged by the projections 73 and swung to a sufficient angle to bring the doors back to normal position. Accordingly, it makes no difference whether more than one door is down or all the doors, or any intermediate number. The simple raising of the bar returns to normal position all the doors which may be down, and as soon as the doors are raised they are automatically latched by the latches 40. As soon as the raising operation ceases the chain 75 is automatically released the bar will automatically return by gravity to its normal position. The arc of the circle through which the doors have to pass in closing, and the fact that this arc is from the vertical to the slope of the bin floor, makes it possible to close a very heavy and strong door with comparatively little effort or power.

The mechanism for returning the doors to closed position is operated within the partitions between the bins, and it is also in this space that the cables leading from the levers 60 to the rock levers are located. All these parts are therefore out of the way and protected. The operating lever 60 when the latches are closed, preferably has its upper edge flush with the dock floor, as shown in Fig. 7, so that it is out of the way.

It is to be noted that with any material which would run on the fixed slope of a bin floor, no other door than the first one would have to be opened. Even with such an operation and without considering the doors back of the first, my bin has very decided advantages, among which may be mentioned that the opening is clear across the bin, that there is a vertical drop to all the material

above the first door, and that the operation of opening and closing may be performed from the top of the structure instead of near the opening. For material which will not run on a fixed floor, my bin has all these advantages, and the further advantages heretofore referred to of being able to release the load in sections, thus effectually breaking any hanging up or arching thereof. Another valuable feature is that as soon as the doors are closed they are automatically latched and secured in place so that a glance into the bin from the top shows whether or not the closing has been done, and if it is not, the whole operation is performed by the man without leaving the top of the dock.

A preferred feature of the invention, shown in the drawing consists in making the transverse beams so that they will shed the falling material, and placing the hinges which are round on top of the beams so that there are no flat surfaces for the material to rest on. If there should be a bridging of the material from the hinge of one dropped door to the hinge of another (a very remote contingency) a simple movement of the door on its hinge would be sufficient to dislodge the material.

To further insure the complete discharge of the load, I preferably incline the ends of the bin so that it is somewhat larger measured parallel with the track at the bottom, than at the track, as shown in Fig. 10. This increases the freedom of the load from the bin sides.

In order to clear the runway should any material stick on its surface, as well as to provide a convenient platform for workmen in making repairs or inspection, I provide a scraper adapted to work in the space between the doors and the runway and acting as such platform. The scraper is shown in the drawing at 80. It is a heavy member extending clear across the runway and having at its lower forward edge a scraping shoe. It is normally held in its elevated positions by cables 81 passing around a drum 82. When these cables are released the scraper descends by gravity, scraping ahead of it any material which may be on the surface of the runway. The upper surface of the scraper is substantially horizontal and this provides a most convenient platform for workmen to stand upon to repair the hinges or doors, and for other purposes. These workmen are also in a convenient position to manually remove, with a chisel or otherwise, any material which may stick to the runway so hard that it is not removed by the weight of the scraper.

It will be seen from the above description that my bin has many advantages, that it is a thoroughly automatic self-cleaning structure, that it provides for a practically complete opening of the bottom of the bin and

a vertical drop of the contents thereof. Obviously, the most rapid way to discharge a load, is to allow it to drop vertically, and where the entire bottom may drop, the maximum of discharging efficiency is obtained.

Having thus described my invention, what I claim is:

1. The combination of a bin having an inclined bottom formed of a series of doors, means for dropping any door at will independently of the others, and an inclined runway beneath the doors for receiving the discharge of the doors and directing it to a common point.

2. The combination of a bin, an inclined bottom therefor composed of a series of doors, cross beams supporting said doors near their upper edges, and suitable latches adapted to support the doors near their lower edges.

3. The combination of a bin having an inclined bottom composed of a plurality of inclined doors, beams to which said doors are respectively hinged near their upper edges, latches for supporting the doors near their lower edges, the latch for each door being carried by the beam relating to the next lower door.

4. The combination of a bin having an inclined bottom formed of a series of dropping doors, and means having operating mechanism located at the top of the bin for releasing any door desired independently of the others.

5. A bin having a floor formed of a series of inclined doors adapted to shed their load to the doors beneath them, means for dropping any door independently of the others to allow it to discharge its load vertically, and an inclined runway for receiving such discharged load.

6. The combination of a bin having an inclined floor formed of a series of doors at substantially the same angle to the horizontal, each door above the bottom one being adapted to shed its load onto the door next beneath it, cross beams to which the respective doors are hinged near their upper edges, and a continuous inclined runway beneath all of said doors.

7. The combination of a bin having an inclined floor formed of a series of doors, a runway beneath such doors adapted to receive a discharge from any of them and direct it to a common point, and means near the top of the bin for releasing any door desired independently of the others.

8. The combination of a series of bins located end to end and each having inclined floors made up of a series of dropped doors, and means between the bins for operating said doors.

9. The combination of a series of bins mounted end to end, each bin having an in-

clined floor with a series of dropped doors, latches for holding said doors, operating mechanism at the top of the bins and connecting means between the operating mechanism, and latches occupying the space between the bins.

10. A bin having an inclined floor formed of a series of doors, means for dropping any door at will, and means for concurrently returning all of the dropped doors.

11. A bin having an inclined floor formed of a series of doors, means for dropping the same independently, means for receiving the discharge of the doors, and means for concurrently returning all of the dropped doors.

12. A bin having an inclined floor formed of a series of doors, means for dropping the same, means for receiving the discharge of the doors, means for concurrently returning all of the dropped doors, the returning means being located in the space between the abutting ends of consecutive bins.

13. The combination of a bin having a series of dropping doors, means for releasing said doors independently, means for returning the doors to closed position, and means at the top of the bin for operating both means mentioned.

14. The combination with the walls of a bin, of transverse beams located in inclined series, and doors hinged to the tops of said beams and each forming a portion of the floor of the bin.

15. The combination with the walls of a bin, of an inclined floor having a series of independently hinged drop doors adapted to swing down vertically, and an inclined runway beneath said doors substantially parallel with them in their closed position, each door when dropped being adapted to swing freely in the direction of discharging material on the runway.

16. In a bin, the combination, with a front wall and an inclined bottom having inclined load supporting drop doors in it one higher than another and adapted to shed the load toward the lowermost door, of an inclined runway beneath the doors, and a chute at the front of the bin coacting with the runway to receive the material sliding down the runway.

17. In a bin, the combination of a series of drop doors, normally standing with their upper surfaces in inclined alinement to constitute a smooth inclined bin floor, means for dropping said doors to discharge the respective loads through the respective doorways, and an inclined runway to receive such discharge.

18. The combination of a series of bins placed end to end, the end walls of the adjacent bins being spaced apart, mechanism for discharging the bins, and mechanism located between the bins for operating the discharging mechanism.

19. In a bin, the combination with the front walls thereof, of a series of beams, and a series of doors hinged to the tops of said beams and adapted to form a continuous inclined floor for the bin.

20. In a bin, the combination of a series of beams located in successively higher positions, a series of doors each hinged at its upper edge to the top of a beam, and means carried by the next lower beam for supporting the free edge of such door.

21. In a bin, the combination, with the walls, of a series of doors adapted when closed to form an inclined floor for the bin, means for releasing said doors, a runway beneath the doors for receiving the discharge thereof, means for returning the doors to closed position, and means for automatically latching them.

22. The combination, in a bin, a series of doors adapted when closed to form a continuous inclined floor, means for supporting said doors near their upper edges respectively, latches for supporting the doors near their lower edges respectively, means for withdrawing the latches to allow the doors to drop, and means for automatically returning the latches to normal position.

23. In a bin, the combination with a series of doors hinged at their upper edges respectively and adapted to stand in inclined alinement to support a gravitating load, a latch for supporting the free edge of each door, a rock shaft for each latch, an arm on such rock shaft connecting with the latch, whereby the rocking of the shaft may withdraw the latch, and means for automatically returning the latch.

24. In a bin, the combination, with a front wall, of an inclined bottom adapted to enable the load to gravitate toward the bottom of the bin, said bottom being composed of doors in inclined alinement hinged near their upper edges respectively and latches for respectively holding the lower edges of the doors.

25. In a bin, the combination with a plurality of doors adapted when closed to form a continuous inclined floor for the bin and when released to swing down at their lower edges into a substantially vertical position, rock shafts rigid with said doors near their upper edges, latches for supporting the doors near their lower edges, means for operating the latches, and means acting on said rock shafts to return the doors to normal position.

26. In a bin, the combination with a plurality of doors adapted when closed to form a continuous inclined floor for the bin and when released to swing down at their lower edges into a substantially vertical position, rock shafts rigid with said doors near their upper edges, a movable bar having projections adapted to engage arms on a plurality

of said rock shafts, and means for moving said bar to close the doors.

27. In a bin, the combination with the front and end walls, of a plurality of doors forming an inclined bottom for the bin, said doors being hinged at their upper edges by means of rock shafts, arms on the ends of said rock shafts, a movable inclined bar located in the space between consecutive bins and adapted to engage said arms, and means at the top of the bins for moving said bar diagonally upward to return the doors.

28. In a bin, the combination with the front and end walls, of a plurality of doors forming an inclined bottom for the bin, said doors being hinged at their upper edges by means of rock shafts, arms on the ends of said rock shafts, a movable inclined bar located in the space between consecutive bins and adapted to engage said arms, means for operating said bar to close the doors, latches for supporting the free edges of the doors, and means at the top of said bins on their opposite sides from the closing means mentioned for releasing any door desired.

29. In a self-cleaning bin, the combination with the front and end walls, of a series of doors adapted to form a continuous inclined bottom for the bin, means for hinging said doors, means for supporting and releasing them, means for returning them to normal position, an inclined runway beneath all the doors adapted to receive the discharge thereof, means adjacent to the top of the front wall of the bin for independently operating the mechanism supporting the free edges of the doors, and means adjacent to the top of the bin at its back side for operating mechanism to concurrently return all of the dropped doors.

30. In a bin, the combination of a load-supporting door, a latch for supporting the free edge of the door, mechanism for withdrawing the latch to allow such free edge to drop by gravity, said mechanism being in the natural path of the discharging load, and means for protecting such mechanism from the discharging material.

31. In a bin, the combination of a series of box girders, a series of hinged doors, latches carried by said box girders for supporting said doors, and mechanism within the girders for operating the latches.

32. In a bin, the combination of a door, a latch for supporting the same, a member carrying the latch, the latch having means projecting through said member, operating mechanism connected with said means on the opposite side of said member, said latch being provided with a portion adapted to close the opening through said member when the latch is withdrawn to allow the discharge of the load.

33. In a bin, the combination with doors each adapted to form a portion of an in-

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clined floor of the bin, means for supporting said doors on a hinge, cross beams, latches carried thereby for supporting said doors near their lower edges, said beams being placed with their faces diagonally to shed the load discharged thereon when the doors are released.

34. In a bin, the combination with doors each adapted to form a portion of an inclined floor of the bin, means for supporting said doors on a hinge, cross beams, latches carried thereby for supporting said doors near their lower edges, the devices supporting individual latches being formed to automatically clear themselves of material discharged thereon.

35. In a bin, the combination with the end walls and front wall, of a series of doors adapted when closed to form a continuous inclined floor for the bin leading diagonally upward from the front of the bin, beams beneath such floor extending substantially parallel to the edges of the doors, said beams being located with their cross section diagonally, each of the intermediate beams carrying a hinge for one of the doors and a latch for the door next above it.

36. In a bin, the combination with the end walls and front wall, of a series of doors adapted when closed to form a continuous inclined floor for the bin leading diagonally upward from the front of the bin, beams beneath such floor extending substantially parallel to the edges of the doors, said beams being located with their cross section diagonally, each of the intermediate beams carrying a hinge for one of the doors and a latch for the door next above it, the hinge being located on the top of the beam, and operating mechanism for the latch in such position that it is protected by the face of the beam from the discharging load.

37. In a bin, the combination with the end walls and front wall, of a series of doors adapted when closed to form a continuous inclined floor for the bin leading diagonally upward from the front of the bin, beams beneath such floor extending substantially parallel to the edges of the doors, said beams being located with their cross section diagonally, each of the intermediate beams carrying a hinge for one of the doors and a latch for the door next above it, the hinging of the doors being by means of rock shafts carried by the beams, and means operatable from points adjacent to the top of the bin for swinging said rock shafts and for operating said latches.

38. In a bin, the combination with a plurality of load-discharging doors, a box girder beam, a hinge for one door carried by the beam, a latch for the adjacent door carried by the same beam, and means for operating the latch.

39. In a bin, the combination with the walls, of an inclined floor composed of a series of dumping doors, an inclined runway beneath the doors, a scraper adapted to move downwardly by gravity on the surface of the runway beneath the doors, and means for re- turning the scraper.

40. In a bin, the combination with the walls, of a series of doors forming a continuous inclined floor, each door being adapted to drop and discharge the load vertically downward, an inclined runway beneath the doors, a member extending crosswise of the runway and adapted to be out of the path of the discharging load and formed to move downwardly on its surface, and means for returning such member to the position near the upper end of the runway.

41. In a bin, the combination, with the walls, of horizontal beams extending across the bin and arranged in a plane extending diagonally upward, and doors hinged to the respective beams, and latches for coöperating with the doors carried by the beams, each latch coöperating with a door hinged to the adjacent beam.

42. In a bin, the combination, with the walls, of a series of beams extending across the bin and located continuously higher as one progresses transversely, and doors hinged near their upper edges to the respective beams and individual latches for the doors.

43. In a bin, the combination, with the walls, of a series of horizontal beams arranged in an incline, doors hinged adjacent to their upper edge to the respective beams, and latches coöperating with the other edge of the doors.

44. In a bin, the combination, with the front and end walls, of beams extending from one end wall to the other and hinged in a plane extending diagonally upward from the front toward the rear, doors constituting a floor for the bin and hinged near their upper edges to their respective beams, and means for supporting said doors.

45. In a bin, the combination, with the front and end walls, of beams extending from one end wall to the other and located in a plane extending diagonally upward from the front toward the rear, doors constituting a floor for the bin and hinged to their respective beams at the upper edge of the doors, and means carried by the adjacent beams for supporting the other edge of the doors.

46. In a bin, the combination, with the front and end walls, of beams extending from one end wall to the other and located in a plane extending diagonally upward from the front toward the rear, doors constituting a floor for the bin and hinged to their respective beams at one edge of the

doors, means carried by the adjacent beams
for supporting the other edge of the doors,
mechanism for independently operating said
supporting means to allow the doors to drop
5 individually, and a continuous inclined run-
way beneath the doors to receive the mate-
rial discharged by them.

In testimony whereof, I hereunto affix my
signature in the presence of two witnesses.

FRANK S. INGOLDSBY.

Witnesses:

ALBERT H. BATES,
BRENNAN B. WEST.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."