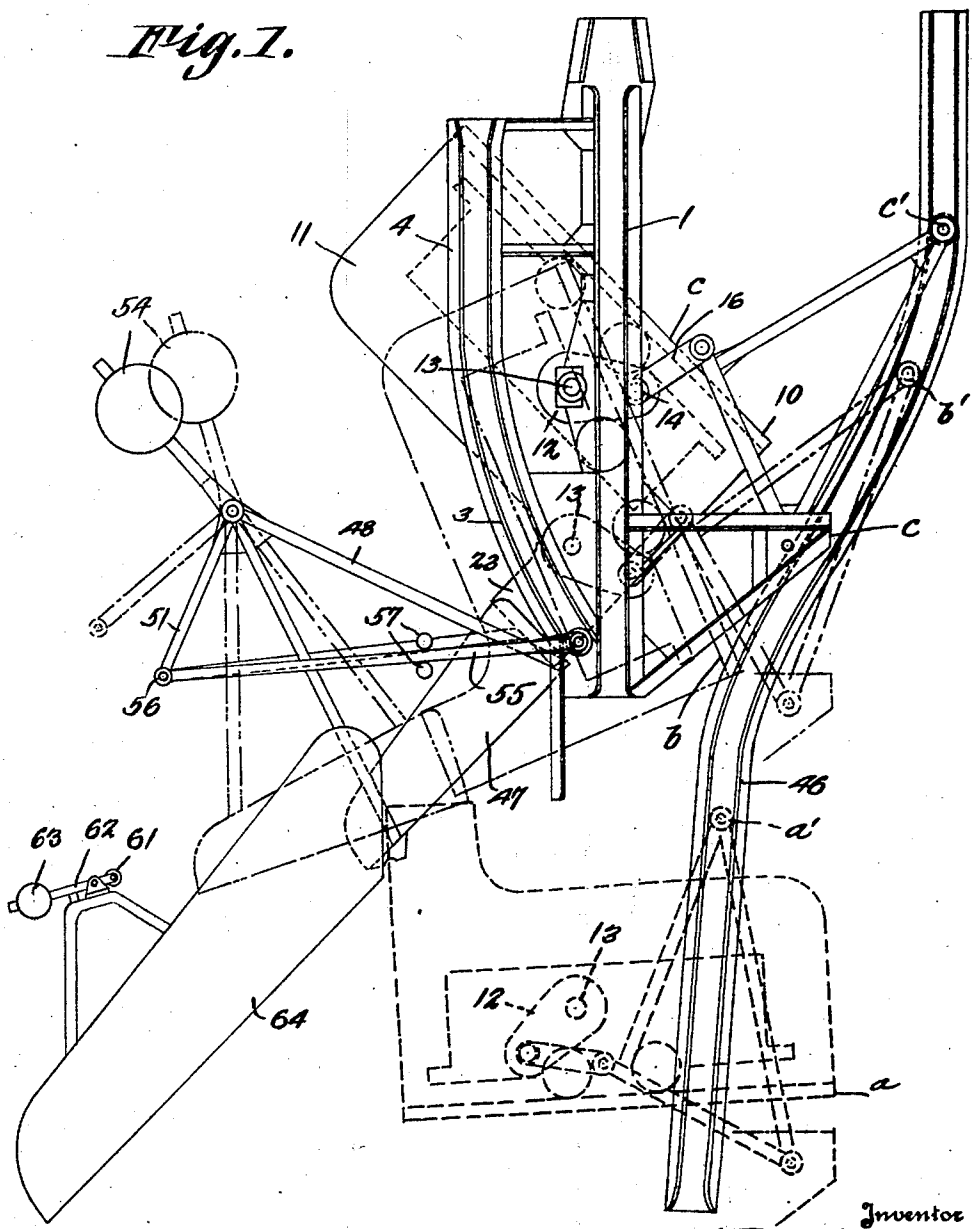
Dec. 29, 1925. 1,567,522

D. F. LEPLEY

OVERTURNING CAGE

Filed Nov. 2, 1923 4 Sheets-Sheet 1

Fig. 1.



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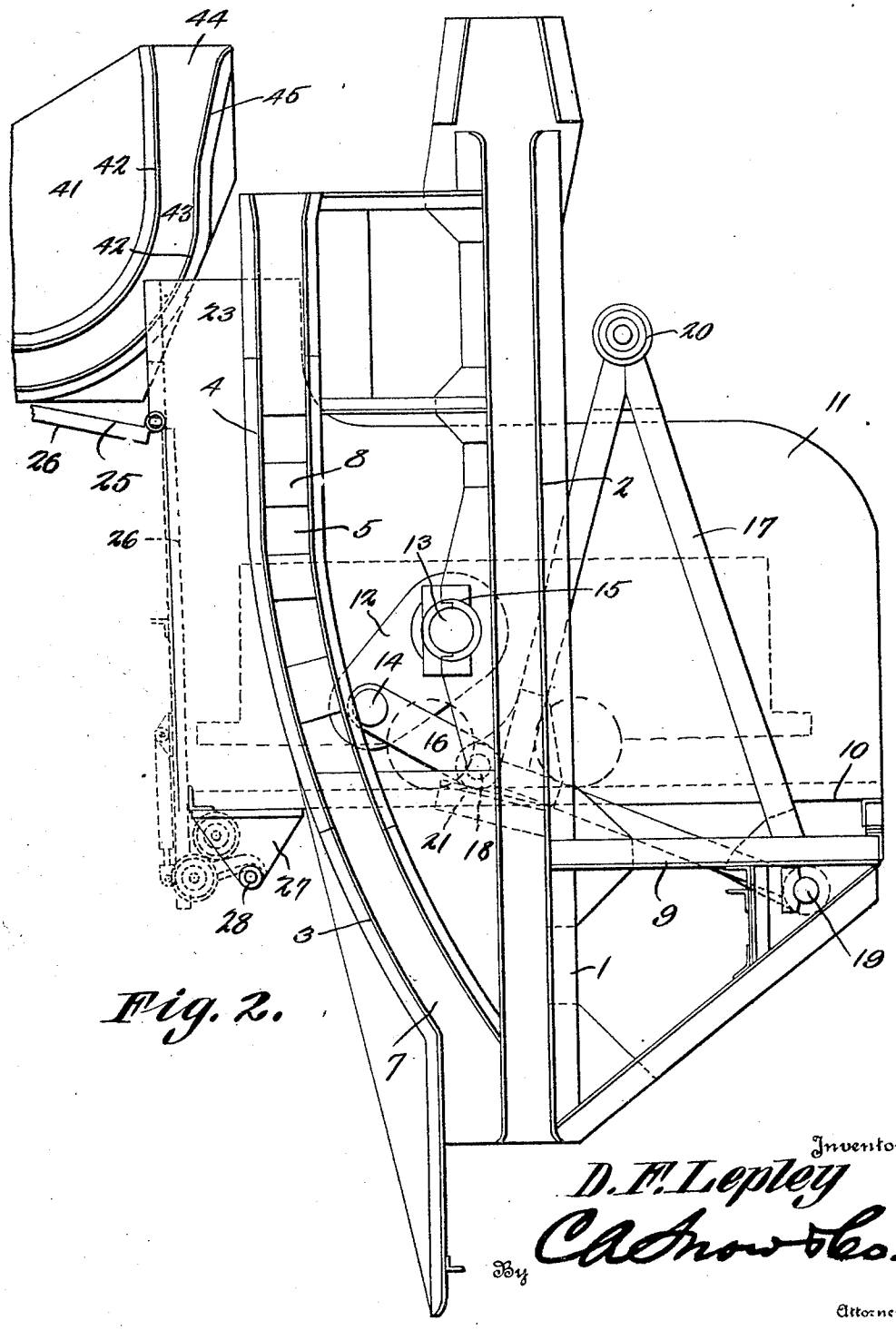


Fig. 2.

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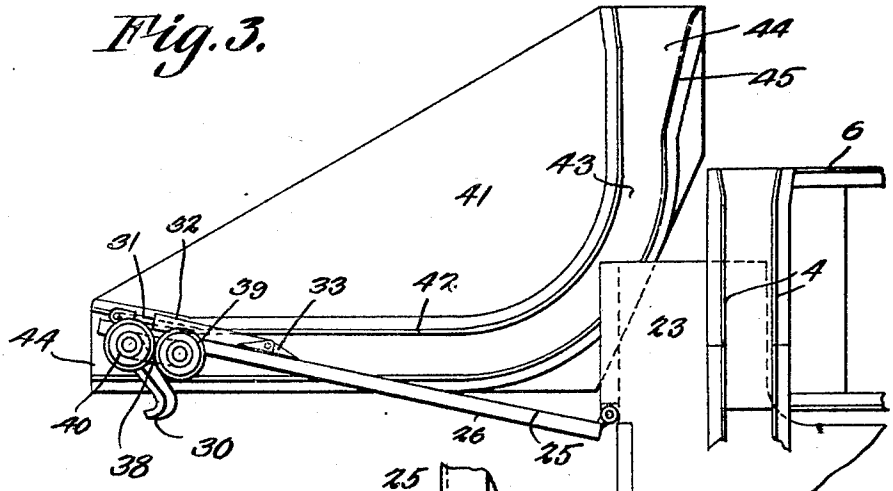
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D. F. LEPLEY

OVERTURNING CAGE

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Fig. 3.



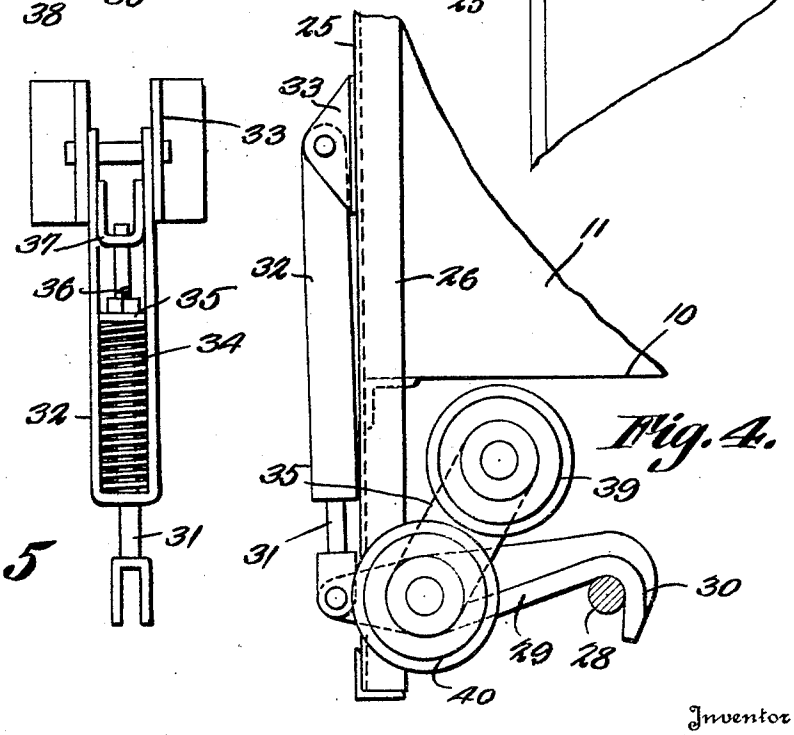


Fig. 4.

Fig. 5

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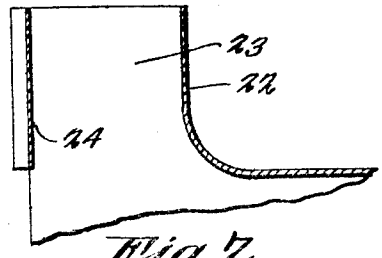


Fig. 7.

Fig. 6.

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UNITED STATES PATENT OFFICE.

DANIEL F. LEPLEY, OF CONNELLSVILLE, PENNSYLVANIA.

OVERTURNING CAGE.

Application filed November 2, 1923. Serial No. 672,389.

To all whom it may concern:

Be it known that I, DANIEL F. LEPLEY, a citizen of the United States, residing at Connellsville, in the county of Fayette and State of Pennsylvania, have invented a new and useful Overturning Cage, of which the following is a specification.

This invention relates to overturning cages for use in mines, the cage being of that type adapted to receive a loaded car and elevate it to the point of delivery where the platform of the cage is overturned with the car attached thereto and said platform used as a chute for delivering the contents of the car into a chute provided therefor.

Heretofore dumping or overturning cages of this type have been used but, by reason of their construction, it has been almost impossible to prevent a portion of the material being delivered from falling down the shaft of the mine or from being tossed away from the shaft and scattered promiscuously because of the centrifugal force resulting from the rapid overturning of the cage at the dumping point.

One of the objects of the present invention is to provide an overturning cage having means cooperating therewith whereby a guide chute located adjacent the side of the shaft is brought automatically into position to receive all of the material delivered from the cage, thereby preventing the material from falling down the shaft.

A further object is to provide the overturning portion of the cage with an outlet spout that is comparatively short so that centrifugal force due to the overturning action is greatly reduced, this shortening of the outlet spout being permitted in view of the fact that the intermediate chute is brought automatically to position to receive material delivered from the spout.

A further object is to provide the overturning portion of the cage with a door at the spout end thereof which will open automatically when the cage arrives at the point of loading so that a loaded car can pass readily onto and off of the cage, there being means for automatically closing and fastening the door when the cage begins to ascend.

Heretofore overturning dumping cages have consisted of two main members, namely, the bail which is always suspended from the cable and the body which carries the load and is pivotally mounted within the bail, the cage being operated by some form of curved stationary guide fixed within the tipple structure. When the tilting member or body of the cage with its load has been swung far enough to discharge its load a large part of its weight is supported in the tipple at a point well removed from the rope or cable. This has imposed a greatly increased burden upon the hoist when lifting the loaded cage from the bottom of the shaft because it has been necessary to pivot the load carrying body far out of line with the guides in order to effect the proper dumping action. This has been the cause of considerable complaint on the part of the mine operators because it increases the starting load and affects the power rate so that the costs of operating are much higher than where cages are at all times kept in balance or substantially in balance. One of the objects of the present invention is to so mount the tilting portion of the cage that it is practically balanced at all times, thereby reducing the cost of operation, the efficiency of the action being further increased by reason of the fact that the tilting of the body and its load is gradual and thus insures against breaking down such as where abrupt movements of the tilting body are necessary.

With the foregoing and other objects in view which will appear as the description proceeds the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being understood that changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

In the accompanying drawings the preferred form of the invention has been shown.

In said drawings

Figure 1 is a view showing diagrammatically several positions of the overturning portion of the cage and the parts co-

operating therewith, during the arrival of the cage at the point of delivery of the load.

Fig. 2 is a side elevation of the cage, the door thereof being shown by dotted lines in closed position and a portion thereof being shown by full lines in open position.

Fig. 3 is an elevation of a portion of the cage and the means employed for opening the door thereof, said door being shown in open position.

Fig. 4 is an enlarged side elevation of a portion of the door and its latch.

Fig. 5 is a front elevation of the latch controlling spring and parts cooperating therewith.

Fig. 6 is a view showing in side elevation the stationary and intermediate chutes and those parts that cooperate to actuate the intermediate chute.

Fig. 7 is a vertical section through a portion of the overturning member of the cage.

Referring to the figures by characters of reference 1 designates the usual frame or bail of a cage, the same being provided with guides 2 for engagement with the rails within the shaft of a mine so that the cage will be caused to travel along a straight line during its up and down movement. Secured to this frame are parallel upwardly and laterally curved rails 3 merging, at their upper ends, into straight upwardly extending portions 4 so that a channel 5 is thus formed between the rails, the upper portions of the rails being connected firmly to the cage structure by means of suitably arranged braces 6. A plate 7 constitutes a connection between the lower portions of the rails and the cage and also cooperates with smaller plates 8 for holding the rails properly spaced apart.

Extending laterally from the frame of the cage is an extension frame 9 constituting a support for one end of a tilting platform 10 having upstanding side walls 11. Only one of these side walls has been illustrated but it is to be understood that each of them has a plate 12 suitably secured thereto and provided with outstanding studs 13 and 14. The studs 13 constitute trunnions mounted in bearings 15 secured to the sides of the frame and are located adjacent the center of gravity of the cage so that the minimum power is required to tilt the cage when loaded. Studs 14 are connected by links 16 to triangular levers 17 as indicated at 18, these levers being fulcrumed on the extension frame 9 as shown at 19 while the upper ends of the levers project above the sides 11 of the platform 10 and carry rollers 20. A stop plate 21 is located under each of the levers 17 and serves to limit the downward movement of the pivotal connection 18 just after said pivotal connection moves downwardly past the dead center. Thus when the pivotal point 18 is in normal position as in Fig. 2 the platform is fastened against tilting and cannot be caused to tilt in the bail until the pivotal point 18 is lifted above the dead center.

The top of the overturning cage is closed by a plate 22 and the side walls 11 of the cage are formed with extensions 23 forming the side walls of the short delivery spout. The plate 22 is extended between these extensions 23 and forms another wall of the spout. An end wall 24 is provided between the extensions 23 and forms a portion of the bottom of the outlet spout when the cage is overturned. The remaining portion of the bottom is made up of a door 25 hingedly supported at the lower edge of the wall 24 and having side flanges 26 adapted to lap the side walls of the cage when the door is in normal or closed position. Brackets 27 are secured to the bottom of the platform 10 and carry a cross rod 28. The door 25 is extended below platform 10 and has a lever 29 pivotally mounted at each side thereof. This lever has a hooked terminal 30 adapted to engage the rod 28 and fasten the door 25 in closed position. A rod 31 is pivotally connected to the other end of the lever and is slidable in an elongated yoke 32 pivotally connected to a bracket 33 mounted on the door 25. In this yoke is a spring 34, that bears at one end against the bottom of the yoke and at its other end against a disk 35 adjustably connected to the rod 31 as shown at 36. It will be noted that a guide plate 37 is fastened in the yoke and that the rod is slidable therein. As the spring exerts an upward thrust against the disk 35 the hooked end or head 30 of the lever 29 will be held firmly in engagement with the rod 28. Rotatable with the lever 29 is an arm 38 and journaled on this arm is a roller 39. Another roller 40 is journaled on the lever 29 and is concentric with the pivotal center of the lever.

Fixedly mounted adjacent the bottom of the shaft in which the cage operates is a plate 41 having guide rails 42 extending downwardly at one side of the path of the door 25 and thence laterally away from said path. These rails form a channel 43 therebetween, the ends of which are flared as shown at 44. The channel is so located that when the cage descends the rollers 40 and 39 will enter the upper end of the channel and come against the inclined portion 45 of one of the rails 42. This inclined portion will act to deflect roller 39 laterally so as to swing lever 29 to disengage the head or hook 30 from rod 28. As the cage continues to descend the rollers 39 and 40 will travel along the channel 43 and move laterally away from the cage, at the same time causing the unfastened door to swing outwardly relative to the cage and to the ultimate position illustrated in Fig. 3. Thus the cage is open at both ends and a car can

pass through it or into and out of either end. Consequently a loaded car can be readily caged after which the hoist cage can be operated to elevate the load. As the cage moves upwardly the operation of the door 25 and its fastening mechanism will be reversed so that as the cage passes upwardly away from the rails 42 the door will be fastened automatically in shut position.

Located adjacent the upper limit of movement of the cage is a track 46 adapted to receive the roller 20 and effect the overturning of the platform portion of the cage so that the contents of the caged car will be dumped out onto the platform and be delivered therefrom through the spout formed by the walls 23 and 24 and the plate 22. Heretofore it has been necessary to provide a spout sufficiently long to insure delivery of the hoisted material beyond the wall of the shaft but owing to the length of the spout employed and the rapid rotation or sweep set up during the overturning of the platform, the contents of the spout have been thrown outwardly and scattered by centrifugal force. By providing the short spout such as shown and described this objection is overcome but in the absence of some special means for receiving the material from the spout said material would fall down the shaft.

For the purpose of receiving and guiding the dumped material from the overturned platform and delivering it to a stationary chute or the like located beyond the wall of the shaft, there is provided an intermediate or supplemental chute 47 suspended by hangers 48 from a pivot rod 49 mounted in bearings 50. An arm 51 is extended laterally from the hangers and is suitably braced as shown at 52. An arm 53 is extended upwardly from the pivot 49 and carries a counterbalance 54. A rod 55 is pivotally connected to the arm 51 as shown at 56 and is movably mounted between guide rollers 57, there being a roller 58 at the free end of this rod normally supported in the path of the channel provided between the upper end portions 4 of the rails 3. An ear 59 is extended downwardly from the outlet end of the chute 49 and normally seated in a notch 60 therein is a roller 61 provided at one end of a lever 62. A weight 63 is carried by the other end of this lever and serves to press the roller into the notch 60. Thus under normal conditions the chute 47 is held against movement.

As the cage moves upwardly with the platform held against tilting as shown in Fig. 2, the roller 20 enters the channel between the rails of track 46 and these rails gradually shift lever 17 with the result that within a relatively short distance the platform begins to tilt as shown at *a* in Fig. 1, this tilting gradually increasing to the intermediate position shown at *b* and finally to the position shown at *c* to insure gravitation through the platform spout of all of the contents of the caged car. The locations of the roller 20 at the three positions mentioned have been indicated at *a'*, *b'* and *c'* respectively. As the platform begins to dump when in position *a* the roller 58 is received between the upper end portions 4 of the rails 3 and this roller is shifted inwardly toward the bail 1 during the continued upward movement and dumping of the platform. The parts are so timed that the intermediate or supplemental chute 47 is swung toward the cage and inclined so that the upper or receiving end of chute 47 will ultimately be brought to position under the end of the delivery spout of the platform, thus to receive the discharged contents and direct them into a stationary spout 64 located beyond the mine shaft. Obviously the discharged material cannot fall down the shaft and as the sweep of the delivery spout of the platform is comparatively short the material will not be scattered by centrifugal force. It will be apparent that by providing rails 3 shaped as shown and described, the intermediate chute 47 will be swung into material receiving position at a speed which gradually increases in proportion to the upward speed of the bail 1. In other words the intermediate chute will be gradually "picked up" so that there will be no sudden jar and consequent breakage such as would result by the abrupt contact of the rapidly moving bail or other part with an operating lever or the like. As soon as the cage starts to move downward after having delivered its load the platform is returned by reversal of the action of the mechanism controlling the same and at the same time the rod 55 swings the intermediate chute 47 back to its normal position where the roller 61 snaps into notch 60 and the parts are held until further delivery of the material takes place. As the cage approaches the bottom of the shaft, the door 25 will be opened as heretofore explained.

While the various mechanisms herein described for overturning the cage, operating the door, and shifting the intermediate chute, have been shown applied to one side only of the cage, it is to be understood that all or any of the mechanism can be duplicated at the two sides of the cage 10 and as the construction will be the same at both sides under those conditions, it has not been deemed necessary to illustrate the same.

By providing the particular means described for transferring material from the spout of the overturned cage to a chute located outside of the mine shaft, it becomes possible to mount the cage at its center of gravity, thus reducing the power required to overturn the cage while approaching the point of delivery. This has not been possi-

ble heretofore where a long delivery spout has been necessary in order to convey the unloading material from the overturned cage to a chute outside of the mine shaft.

What is claimed is:—

1. The combination with a bail, a cage tiltably mounted therein and means for tilting the cage, said cage having an integral delivery spout normally extending upwardly therefrom, of a chute supported normally outside of the path of the cage, and means operated by the upward movement of the bail during the tilting of the cage for moving said chute at a speed gradually increasing in proportion to the upward speed of the cage into position to receive material delivered from the spout.

2. The combination with a bail, a cage tiltably mounted therein and having an integral delivery spout normally extending upwardly therefrom and means for tilting the cage to deliver the contents thereof through the spout, of a movably supported chute normally removed from the path of the cage, and means operated by the movement of the cage to delivering position for shifting the chute at a speed gradually increasing in proportion to the upward speed of the cage, into position to receive material delivered from the spout.

3. The combination with an overturning cage having an integral delivery spout normally extending therefrom, and means for overturning the cage on reaching one limit of its movement, of a chute normally outside of the path of the cage, and means operated simultaneously with the overturning of the cage for bringing the chute into position to receive a load from the spout, the speed of movement of the chute into material receiving position, gradually increasing in proportion to the upward speed of the cage.

4. The combination with an overturning cage, a delivery spout normally extending upwardly therefrom and means for overturning the cage when brought to one limit of its movement, of a chute located outside of the path of the cage, an intermediate chute movably supported thereabove, and means operated simultaneously with the overturning of the cage for shifting the intermediate chute at a speed gradually increasing in proportion to the upward speed of the cage, into position to transfer material from the spout of the overturned cage to the first named chute.

5. The combination with an overturning cage, a normally upstanding spout thereon, and means for overturning the cage when reaching one limit of its movement, of a main chute located outside of the path of the cage, an intermediate chute suspended thereabove, yielding means for holding the intermediate chute against movement, and means operated simultaneously with the overturning of the cage for moving the intermediate chute at a speed gradually increasing in proportion to the upward speed of the cage into position to transfer material from the spout of the cage to the main chute.

6. The combination with a bail, an overturning cage, a spout normally extending upwardly therefrom, means for overturning the cage when brought to one limit of its movement, of a counterbalanced chute normally supported outside of the path of the cage, an operating member movably connected to the counterbalanced chute, and projecting close to the path of the bail, and means movable with the bail and cooperating with said member for shifting the chute at a speed gradually increasing in proportion to the upward speed of the bail into position to receive material from the spout of the overturned cage.

7. The combination with a vertically movable structure, an overturning cage carried thereby, a spout normally extending upwardly from the cage, and means for overturning the cage when brought to one limit of its movement, of a movably supported chute normally outside the path of the cage, a counterbalance therefor, means for holding the chute normally against movement, and cooperating means connected to said chute and to the vertically movable structure for moving the chute at a speed gradually increasing in proportion to the upward speed of the cage into position to receive material discharged from the spout of the overturned cage.

8. The combination with an overturning cage having an outlet spout normally extended upwardly, means for overturning the cage, and a stationary chute outside of the path of the cage, of a counterbalanced intermediate chute mounted for oscillation above the stationary chute, means for holding the intermediate chute normally against movement, an actuating member connected to the chute and projecting close to the path of the cage, and means cooperating with said member and movable during the overturning of the cage for shifting the intermediate chute at a speed gradually increasing in proportion to the upward speed of the cage into position to transfer unloading material from the spout of the overturned cage to the stationary chute.

9. The combination with a bail, an overturning cage tiltably mounted therein and a spout normally extending upwardly from the cage, of a door normally closing one end of the cage and adapted, when the cage is overturned, to form the bottom of the cage, a latch for fastening the door in closed position, stationary guide means adjacent one limit of movement of the cage, and

means carried by the latch and movable into engagement with the guide means for unlatching the door and moving the door to open position during the movement of the cage to one limit of movement.

10. The combination with a cage and a hinged door closing one end thereof, of a yieldingly held pivoted latch for fastening the door in closed position, an arm radiating from the fulcrum of the latch, rollers carried by the latch and arm, and stationary means for engagement by the rollers during the movement of the cage in one direction for successively unlatching the door and swinging the door to open position.

11. The combination with a cage and a hinged door normally closing one end thereof, of a latch lever fulcrumed on the door, means engaged by the lever for fastening the door in closed position, yielding means engaging the lever for holding said lever in fastening position, spaced rollers movable with the lever about the fulcrum thereof, and stationary means for engagement by the rollers during the movement of the cage in one direction to successively shift the lever to unfastening the door, and swing the door to open position.

12. The combination with a bail, of an overturning cage having an outlet spout normally extending upwardly, from one end thereof, means for pivotally supporting the cage within the bail close to the center of gravity of the loaded cage, a movably supported chute and means operated during the movement of the cage to overturned position for shifting the chute at a speed gradually increasing in proportion to the upward speed of the bail into position to receive material gravitating from the spout of the cage.

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

DANIEL F. LEPLEY.