Oct. 22, 1957 G. E. DATH 2,810,355

LATCH MECHANISM FOR HOPPER CAR DOORS

Filed Jan. 23, 1953 4 Sheets-Sheet 1

Fig. 3

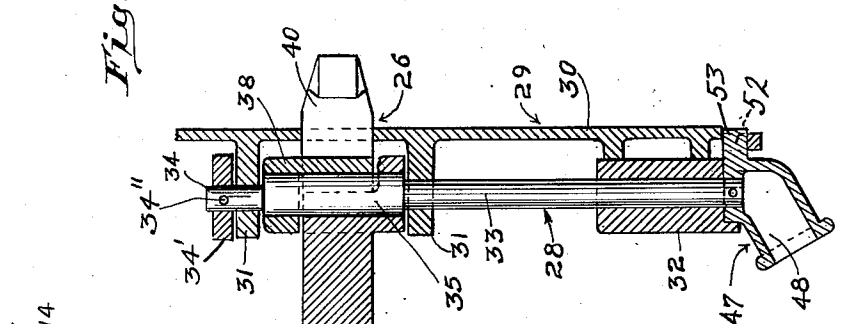
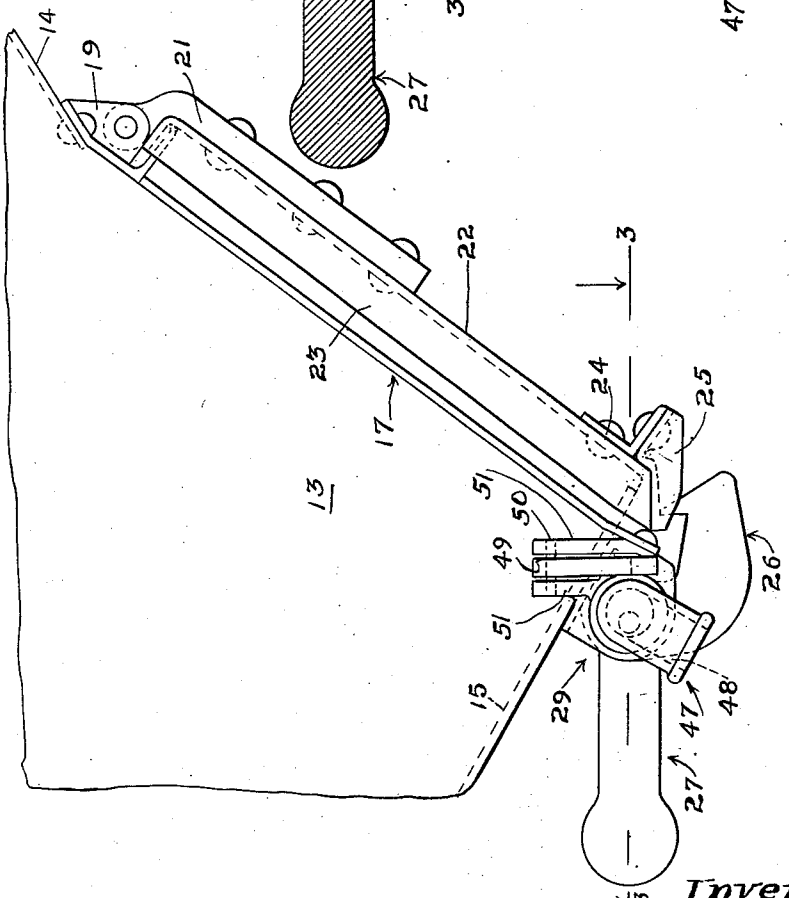


Fig. 1



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LATCH MECHANISM FOR HOPPER CAR DOORS

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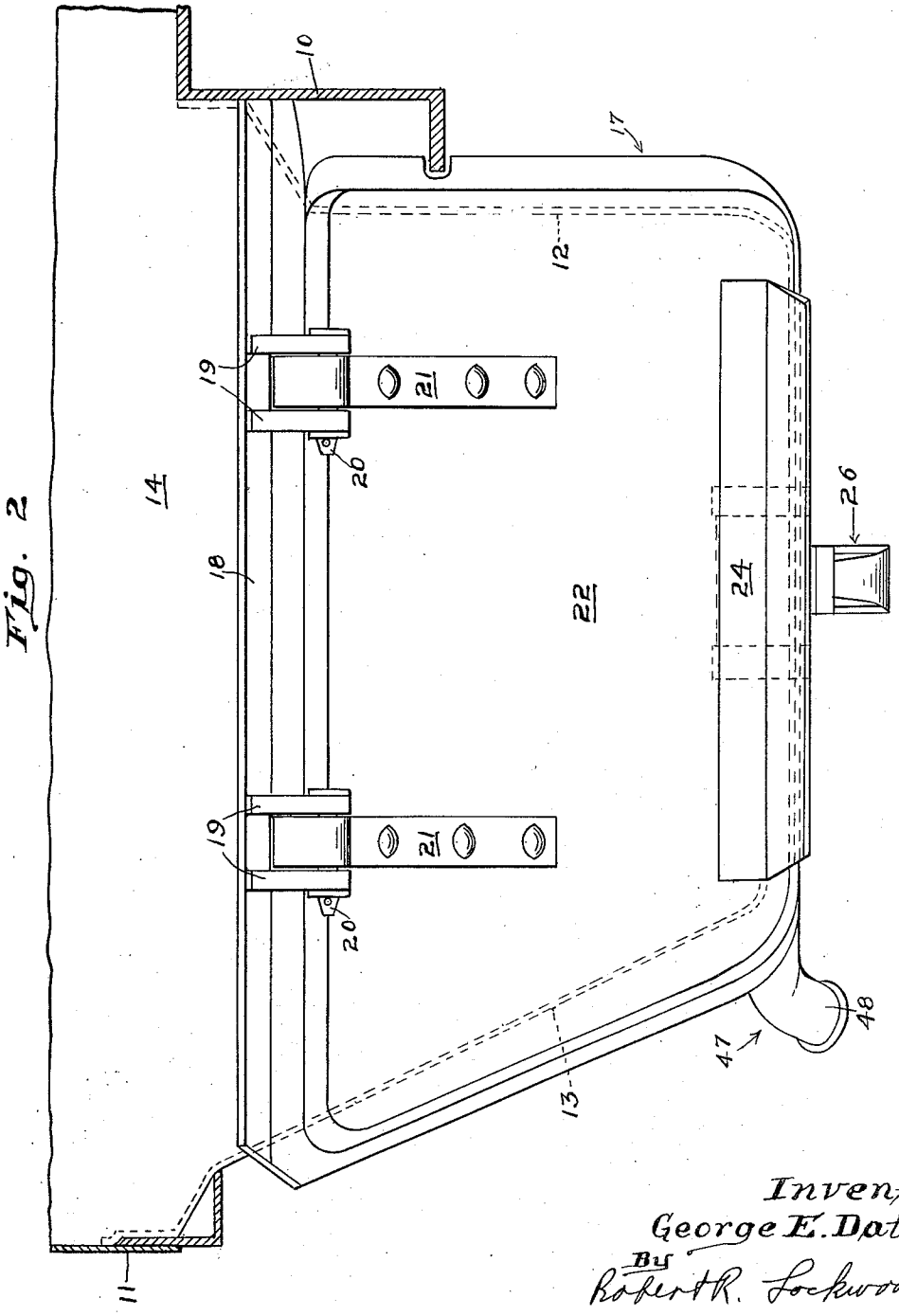


Fig. 2

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LATCH MECHANISM FOR HOPPER CAR DOORS

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Fig. 4

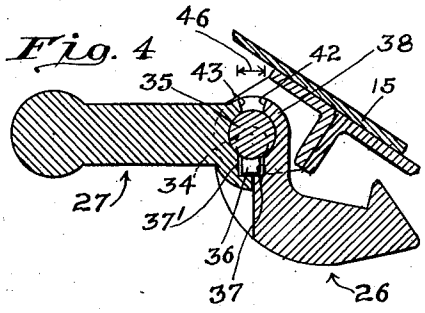


Fig. 7

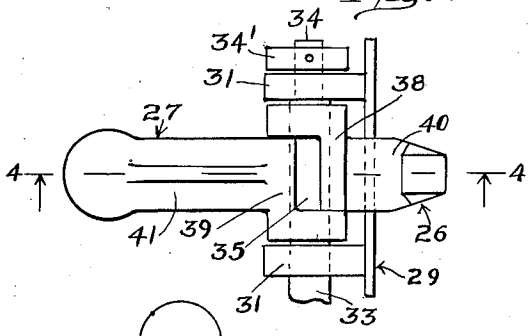


Fig. 5

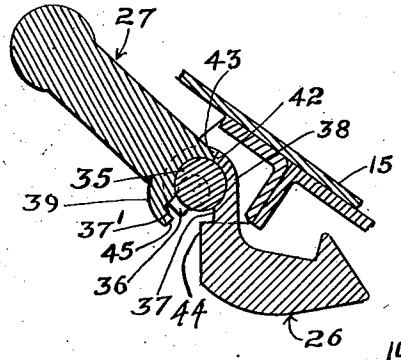


Fig. 11

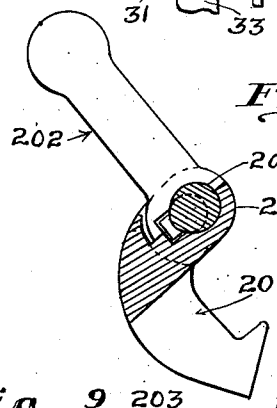


Fig. 9

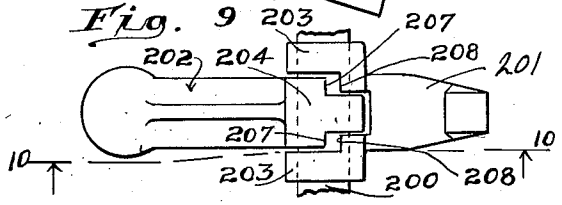


Fig. 6

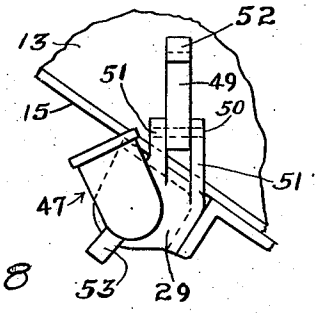


Fig. 10

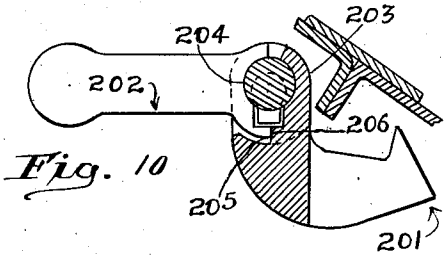
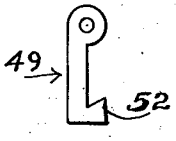


Fig. 8



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LATCH MECHANISM FOR HOPPER CAR DOORS

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Fig. 14

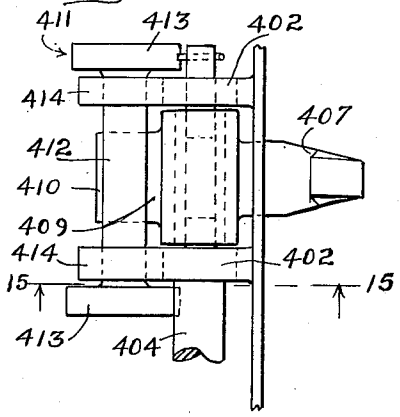


Fig. 16

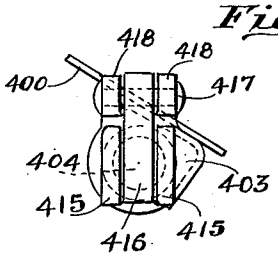


Fig. 15

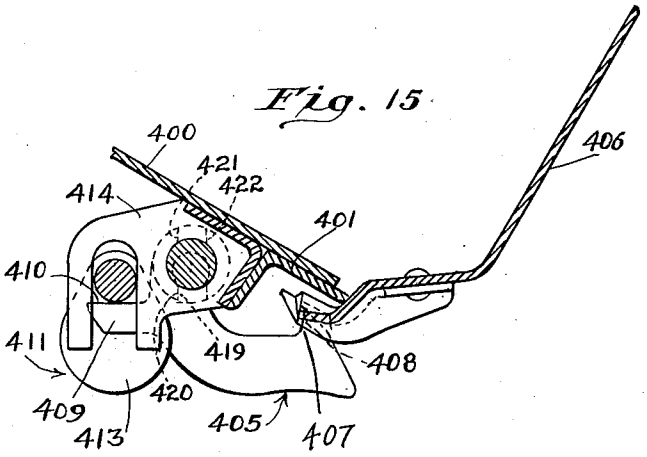


Fig. 13

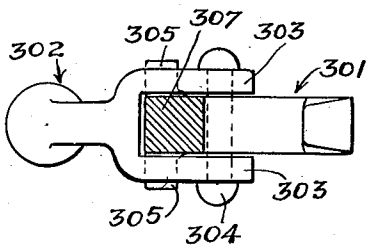
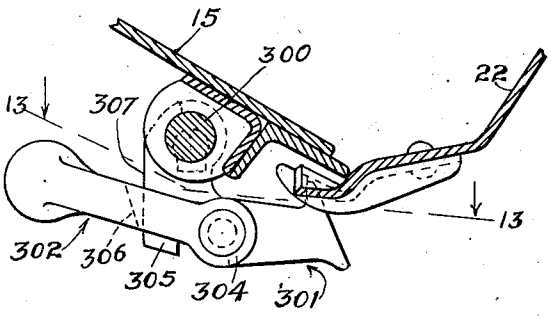


Fig. 12



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LATCH MECHANISM FOR HOPPER CAR DOORS

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Application January 23, 1953, Serial No. 332,987

10 Claims. (Cl. 105—308)

This invention relates to an improved latching device for hopper car doors and the like and is especially related to that type of latch having a shouldered portion biased to move upwardly into latching position.

The invention is by way of an improvement on the conventional type of counterweighted latch wherein the shouldered part of the latch is counterbalanced by a rigidly mounted rearward extension which operates to bias the latch into operative position. In such structures wherein movement of the weighted part of the latch is in unison with the latch, accidental displacement of the weighted portion of the latch operates to displace the latch from latching position. It is one of the objects of this invention to provide for limited upward movement of the weight independently of the latch and to this end the invention contemplates a two-part latch device. A further object of the invention is to provide a counterweight for a latch which is formed as a separate element from the latch proper thereby enabling the manufacture of the latter from a drop forging without the necessity of incorporating in the latch proper a large mass of expensive metal. A further object of the invention is to provide a pawl member or locking dog adapted to swing on an axis disposed at an angle to the axis of rotation of the shaft and having an interlocking portion adapted to engage with the shaft to prevent reverse rotation thereof.

The invention therefore contemplates an improved latch device in which the counterweight is formed as a separate element from the latch proper and related to the latter through the medium of interengaging abutments with a degree of lost motion therebetween whereby the weight operates to bias the latch to latching position and whereby the weight may still have limited movement in a counter-latching direction without affecting the latching security of the latching device.

Another object of the invention is to provide an improved and simple form of hook lock for retaining the shaft against reverse rotation in an unlocking direction.

For further comprehension of the invention reference may be had to the accompanying drawings wherein:

Figure 1 is a side elevational view of the lower portion of a hopper car showing as much of the car as necessary to illustrate a hopper structure and a discharge door therefor, said view showing the door in closed position and the mechanism in fully latched position;

Figure 2 is a frontal elevational view of the structure shown in Figure 1, said view showing approximately one-half of the width of the car;

Figure 3 is a sectional plan view taken through the lower portion of the hopper generally on a line 3—3 of Figure 1 with the flooring omitted and certain parts broken away to better illustrate the construction;

Figure 4 is a vertical sectional view of the latch as seen on a line 4—4 of Figure 7;

Figure 5 is a view similar to Figure 4 showing the counterweight swung to the uppermost position;

Figure 6 is an end elevational view of the handle in released position with the locking dog in raised and released position;

Figure 7 is a top plan view of the latch and counterweight construction;

Figure 8 is a view, in side elevation, of the locking dog;

Figure 9 is a top plan of a modification of the latch and counterweight construction;

Figure 10 is a sectional view taken along the line 10—10 of Figure 9;

Figure 11 is a view, similar to Figure 10, showing the latch in the released position;

Figure 12 is a side elevational view of the lower portion of a hopper incorporating still another modification of the invention wherein the counterweight is mounted directly on a depending portion of the latch;

Figure 13 is a top plan and sectional view of the structure taken generally on line 13—13 of Figure 12;

Figure 14 is a top plan view of another modification of the invention;

Figure 15 is a vertical sectional view taken generally along the line 15—15 of Figure 14; and

Figure 16 is a view, in end elevation, of the operating shaft shown in Figure 14 with an improved operating head and locking dog therefor.

Referring to the structure shown in Figures 1 to 8, inclusive, 10 indicates a portion of the center sill of the car and 11 one of the side walls. Interposed between the side wall and center sill is a hopper structure including inner and outer side walls indicated at 12 and 13 and upper and lower sloping floors indicated at 14 and 15, respectively, and which slope in opposite directions to direct lading to a discharge opening defined in part by the marginal edge portions of said floors and walls.

Surrounding the bottom floor and side walls is an angle-shaped frame 17 having an upper beam portion 18 underlying the upper sloping floor 14. The beam portion 18 of the frame 17 is provided with a pair of hinge butts 19—19 which support pivots 20 that in turn carry door hinge straps 21. Rigidly secured to the straps 21 is a door 22 having upwardly extending marginal edges 23 which provide a pan-shaped door adapted to enclose the frame 17 when the door is in closed position.

The door 22 is provided on its outer side with a bracket 24 having a seat 25 for cooperation with a shouldered latch shown generally at 26 and carried by the lower floor 15 of the hopper structure. The door 22, when open, gravitates to a substantially vertical pendant position. It is swingable therefrom to an inclined closed position, as shown in Figure 1, and is there retained by the shouldered latch 26 in cooperation with the seat 25 of the bracket 24.

The shouldered latch 26 is part of the latch assembly which includes a counterweight 27 extending in a direction opposite to the latch portion and operates to bias the latch 26 to engaging position with the seat 25 on the door 22. The latch 26 and counterweight 27 are pivotally mounted on a shaft 28 which extends lengthwise beneath the lower sloping floor 15 in parallelism with the hinge axis of the door 22. The shaft 28 is rotatably mounted in a bearing bracket 29 having a body portion 30 secured to the underside of the floor 15 and inner and outer bearing brackets indicated at 31 and 32, respectively. The

shaft 28 includes concentrically related circularly shaped bearing portions 33 and 34 which extend within bearing brackets 31 and 32 and intermediate said bearing portions 33 and 34 there is disposed a circularly shaped hub section 35 which is eccentrically related to the bearing portions 33 and 34 and pivotally mounted on said eccentric hub section 35 are the latch 26 and counterweight 27. A collar 34', secured to the bearing portion 34 by a transverse pin 34'', cooperates with the outer bracket 32 to limit endwise movement of the shaft 28.

The hub section 35 of the shaft 28 and the latch 26 are provided with an interengaging lug and shoulder as indicated at 36 and 37, respectively, for the purpose of effecting operative connection between the shaft 28 and the latch 26 to bring the latter to fully closed position. The lug 36 also is arranged to engage a shoulder 37' on the counterweight 27 to rock it and thereby the latch 26 to release it for unlatching the door 22.

The latch 26 includes an annular bearing portion 38 which encircles the hub section 35 and similarly the weighted portion 27 includes an annular bearing portion 39 which also encircles the hub section 35. The respective bearing portions 38 and 39 are disposed in different vertical planes and on opposite sides of the body 40 of the latch 26 and of the body 41 of the counterweight 27. In alignment with these body portions 40 and 41 there are disposed radial seats 42 and 43, Figure 4, and 44 and 45, Figure 5, on the latch and weight, respectively. These seats permit the counterweight 27 to have a free upward movement for an appreciable extent as indicated at 46. It will be apparent that the latch 26 can be swung to the open position when the radial seats 42 and 43 are in engagement as shown in Figure 5. When the radial seats 44 and 45 are in engagement, as shown in Figure 4, the counterweight 27 biases the latch to the latched position.

Since the counterweight 27 has a substantial degree of lost movement relative to the latch 26, an accidental blow struck against the former ordinarily will have no effect on the position of the latter. There is then little likelihood that the latch 26 will be inadvertently unlatched from the seat 25 and the door 22 allowed to swing.

The shaft 28 is rotated from a location adjacent the outer side wall 13 of the hopper by means of a handle 47 having a hollow socket portion 48 for the accommodation of a removable operating bar whereby the shaft 28 is rotated. The latch 26 is bodily movable towards and away from the door 22 by reason of its eccentric mounting by the hub section 35 on the shaft 28 and the door 22 is held in preliminary partly closed position and is drawn to fully closed position by rotation of the shaft 28 and consequent bodily movement of the latch 26.

The shaft 28 is maintained against reverse rotation by means of a shouldered detent or latching dog 49 pivotally mounted at 50 between a pair of walls 51—51 which are preferably formed integrally with the bracket 29. The latching dog 49 is sandwiched between the walls 51—51 and, when in operating latching position, gravitates to a substantially vertical position with a shouldered part 52 engaging with a lug 53 formed on the socket handle 47.

Referring now to the modification shown in Figures 9, 10 and 11 of the drawings, the shaft is indicated at 200, the latch at 201 and the counterweight at 202, with the former being provided with a pair of jaws 203—203 which straddle the bearing portion 204 of the counterweight, said jaws 203 and bearing portion 204 being in the form of annular sections which encircle an eccentric hub section of the shaft similar to the section 35 of the shaft 28 previously described. The weighted end interengages with the latch for the purpose of biasing the latch to latching position through the medium of abutment stops formed on the counterweight and latch as indicated at 205 and 206, respectively, and other abutment stops 207 and 208 are provided for interengagement between the latch 201 and the counterweight 202 in a latch releasing direction. The abutments 205, 206, 207, and 208 are radially directed and provide limited free movement of the counterweight 202 in relation to the latch 201 or a limited degree of lost motion therebetween. The operation of the modification shown in Figures 9, 10, and 11 is essentially the same as described for the embodiment of the invention shown in Figures 1 through 8.

Referring now to the modification shown in Figures 12 and 13 the eccentric hub section of the shaft is indicated at 300, the latch at 301 and the counterweight at 302, the latter having a forked end presenting jaws 303—303 which straddle the latch 301 and is pivoted thereto at 304. The counterweight 302 is restrained against downward movement by stops 305—305 and with the counterweight 302 so supported, the latch 301 is biased to latching position. Upward throw of the counterweight 302 is limited by engagement of a wall 306 carried thereby with the rear face of an upwardly extending arm 307 of the latch 301. The arm 307 is rockably mounted at its upper end on the eccentric hub section 300 which corresponds to the hub section 35 previously described. The counterweight 302 is freely movable to have upward movement independently of the latch 301 and consequently possibility of the latch 301 being displaced by the weighted part encountering snow or lading is greatly lessened.

Referring now to the modification shown in Figures 14, 15 and 16, the hopper structure is shown as including the sloping floor 400 and the surrounding frame member 401, said member having secured thereto a member carrying inner and outer bearing brackets indicated at 402 and 403, respectively. Rotatably carried by said brackets is an operating shaft 404 having a shouldered latch element 405 rockably mounted thereon and having cooperating engagement with a door 406 through the medium of interengaging shoulders 407 and 408 formed on the latch and door, respectively. The latch 405 is provided with a rearward extension 409 presenting a ledge 410 on which a counterweight 411 loosely rests. The counterweight 411 is generally of dumbbell shape and includes an elongated bar portion 412 and weighted depending portions 413—413 at the respective ends of the bar portion. The bar portion 412 extends between guiding walls 414—414 which are preferably integrally formed with the inner bracket portion 402.

As shown in Figure 16, the outer end of the shaft 404 is formed with a pair of jaws 415—415 between which a removable bar can be inserted for rotating the shaft 404. Cooperable with said jaws for locking the shaft 404 in latching position is a detent or locking dog 416 which is adapted to assume a position between the jaws 415.

The detent 416 is pivotally mounted at 417 between a pair of walls 418—418 formed integrally with the outer bracket 403. The axis of the pivot 417 extends substantially at right angles to the axis of rotation of the shaft 404 and above the same thereby permitting the detent 416 to gravitate to locking position.

The latch 405 is eccentrically mounted on the shaft 404 and loosely mounted thereon to allow a limited extent of free movement between the latch and shaft, there being provided interengaging abutments on the shaft and latch as indicated at 419 and 420, respectively, for limiting movement between the shaft 404 and latch 405 in a door closing direction and 421 and 422, respectively, for limiting similar movement in a door releasing direction.

What is claimed as new is:

1. In combination with a hopper structure having an opening and a door pivotally mounted along the upper side of the opening to assume an open pendant position and swingable therefrom to an inclined closed position, a latching device including a seat on said door and a shouldered latch pivotally mounted on said hopper and swingable upwardly to position the shoulder thereon in locking engagement with said seat to hold said door closed, a counterweight rockably mounted on said hopper and lost motion connecting means between said counterweight and said latch for biasing the latter to latching position

while permitting movement of the former independently of said latch in a counterlatching direction, and means holding said latch in latching position when said counterweight moves in the counterlatching direction.

2. In combination with a hopper structure having an opening and a structure carried by a door for closing the opening, a door latching device pivotally carried by one of said structures for engagement with a seat on the other of said structures for retaining the door in closed position, said device including mounting means on said one structure and a pair of arms extending in opposite directions from and pivotally mounted on said mounting means and having a latching portion on one arm for engaging said seat and the opposite arm operating as a counterweight for biasing the latching portion to latching position, means loosely mounting said counterweighted arm with respect to the opposite arm for movement therewith in a latching direction and independently thereof in a counterlatching direction, and means holding said one arm in latching position when said counterweighted arm moves in the counterlatching direction.

3. In combination with a hopper structure having an opening and a door pivotally mounted adjacent one side of the opening to assume an open pendant position and swingable therefrom to an inclined closed position and having a seat, latching mechanism including a shaft carried by the hopper and a shouldered latch pivotally mounted thereon for limited swinging movement, said shoulder of the latch being movable upwardly to engage with the seat on the door, a weight pivotally mounted on the shaft and reacting against the latch to bias it to latching position, lugs on the weight between the shoulders of the latch engaging said shoulders, said weight and shouldered latch being separated to provide lost motion between the latch and weight whereby the latter may be displaced in a counterlatching direction independently of the latch, and means holding said latch in latching position when said weight moves in a counterlatching direction.

4. In combination with a hopper structure having an opening and a door pivoted adjacent said opening for closing the same and having a seat, a shaft carried by said hopper structure along the swinging edge of said door, a shouldered latch rockably mounted on said shaft for engaging the seat on said door to hold the same closed, a counterweight rockably mounted on said shaft separate and distinct from said latch and having a lost motion connection therewith to bias the same into latching engagement with said door and permitting said counterweight to move through a limited extent relative to said latch in the direction opposite to the direction it moves to bias said latch, and means holding said latch in latching position when said counterweight moves in said opposite direction.

5. In combination with a hopper structure having an opening and a door pivoted adjacent said opening for closing the same and having a seat, a rotatable shaft carried by said hopper structure along the swinging edge of said door, a shouldered latch rockably mounted on said shaft for engaging said seat on said door to hold the same closed, a counterweight rockably mounted on said shaft separate and distinct from said latch and having a lost motion connection therewith to bias the same into latching engagement with said door and permitting said counterweight to move through a limited extent relative to said latch in the direction opposite to the direction it moves to bias said latch, said latch and counterweight having bearing portions disposed in end to end relation on said shaft, means on said shaft engaging said latch to hold it in latching position, and means holding said shaft in latching position when said counterweight moves in said opposite direction.

6. In combination with a hopper structure having an opening and a door pivoted adjacent said opening for closing the same and having a seat, a shaft carried by said hopper structure along the swinging edge of said door, a shouldered latch rockably mounted on said shaft for engaging said seat on said door to hold the same closed, a counterweight rockably mounted on said shaft separate and distinct from said latch and having a lost motion connection therewith to bias the same into latching engagement with said door, said lost motion connection between said latch and counterweight including engaging radial seats whereby said counterweight biases said latch as aforesaid and has limited freedom of movement relative thereto in the direction opposite its biasing movement, and means holding said latch in latching position when said counterweight moves in said opposite direction.

7. In combination with a hopper structure having an opening and a door structure pivoted adjacent said opening for closing the same, a seat on said door structure, a shaft carried by said hopper structure, a two-part latching device pivotally mounted on said shaft and engageable with said seat to maintain said door structure in closed position, one of the parts of said latching device being pivoted on said shaft and including a seat engaging shoulder and the other part being pivoted on said shaft and including a weighted element biasing said shoulder into engagement with said seat, one of said parts of said latching device including a forked end mounted to straddle the other part of said latching device where they are pivotally mounted on said shaft, and a lost motion connection between said parts of said latching device including limiting stops carried by the respective parts in one position interengaging to cause said parts to move in unison during the latching movement of said latching device while permitting movement of said weighted element independently of said part carrying said seat engaging shoulder when said weighted element moves in a counter latching direction.

8. In combination with a hopper structure having an opening and a door pivoted adjacent said opening for closing the same and having a seat, a rotatable shaft carried by said hopper structure along the swinging edge of said door, a shouldered latch rockably mounted on said shaft for engaging said seat on said door to hold the same closed, a counterweight rockably mounted on said shaft separate and distinct from said latch and having a lost motion connection therewith to bias the same into latching engagement with said door and permitting said counterweight to move through a limited extent relative to said latch in the direction opposite to the direction it moves to bias said latch, said latch having a forked end straddling said counterweight where they are mounted on said shaft, and means holding said latch in latching position when said counterweight moves in said opposite direction.

9. In combination with a hopper structure having an opening and a door pivoted adjacent said opening for closing the same and having a seat, a rotatable shaft carried by said hopper structure along the swinging edge of said door, a shouldered latch rockably mounted on said shaft for engaging said seat on said door to hold the same closed, a counterweight rockably mounted on said latch in spaced relation to said shaft and having a lost motion connection therewith to bias the same into latching engagement with said door and permitting said counterweight to move through a limited extent relative to said latch in the direction opposite to the direction it moves to bias said latch, and means holding said latch in latching position when said counterweight moves in said opposite direction.

10. In combination with a hopper structure having an opening and a door pivoted adjacent said opening for closing the same and having a seat, a shaft carried by said hopper structure along the swinging edge of said door, a shouldered latch rockably mounted on said shaft for engaging the seat on said door to hold the same closed, a counterweight of generally dumbbell shape loosely carried by said latch and having a lost motion connection therewith to bias the same into latching engagement with said

door and permitting said counterweight to move through a limited extent relative to said latch in the direction opposite to the direction it moves to bias said latch, a pair of walls carried by said hopper structure on opposite sides of said latch having downwardly opening elongated slots in which the central portion of said counterweight is guided, and means holding said latch in latching position when said counterweight moves in said opposite direction.

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