Dec. 20, 1949 E. MARTIN 2,492,102

TENDER BIN DISCHARGE MEANS

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4 Sheets-Sheet 1

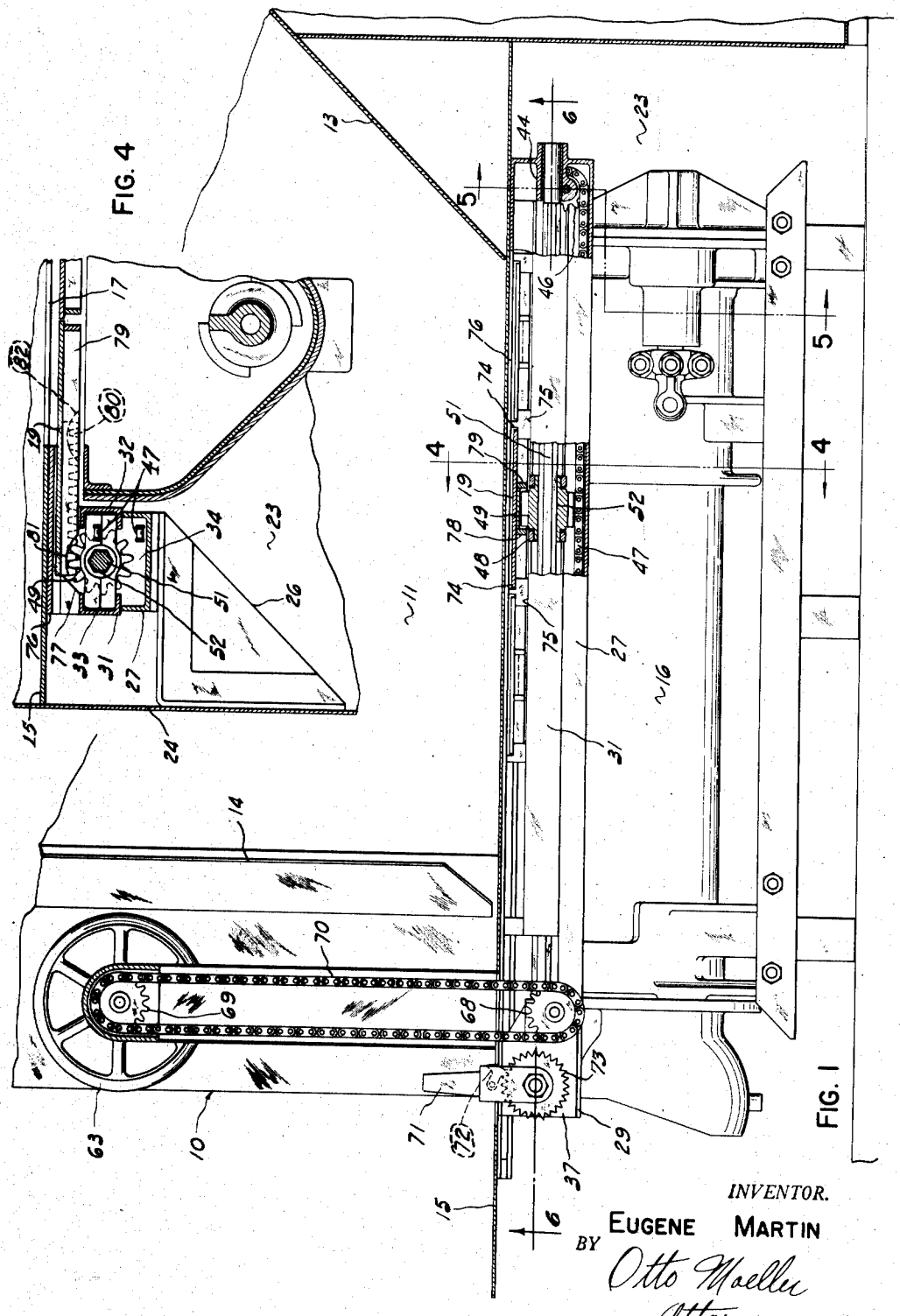


FIG. 1

FIG. 4

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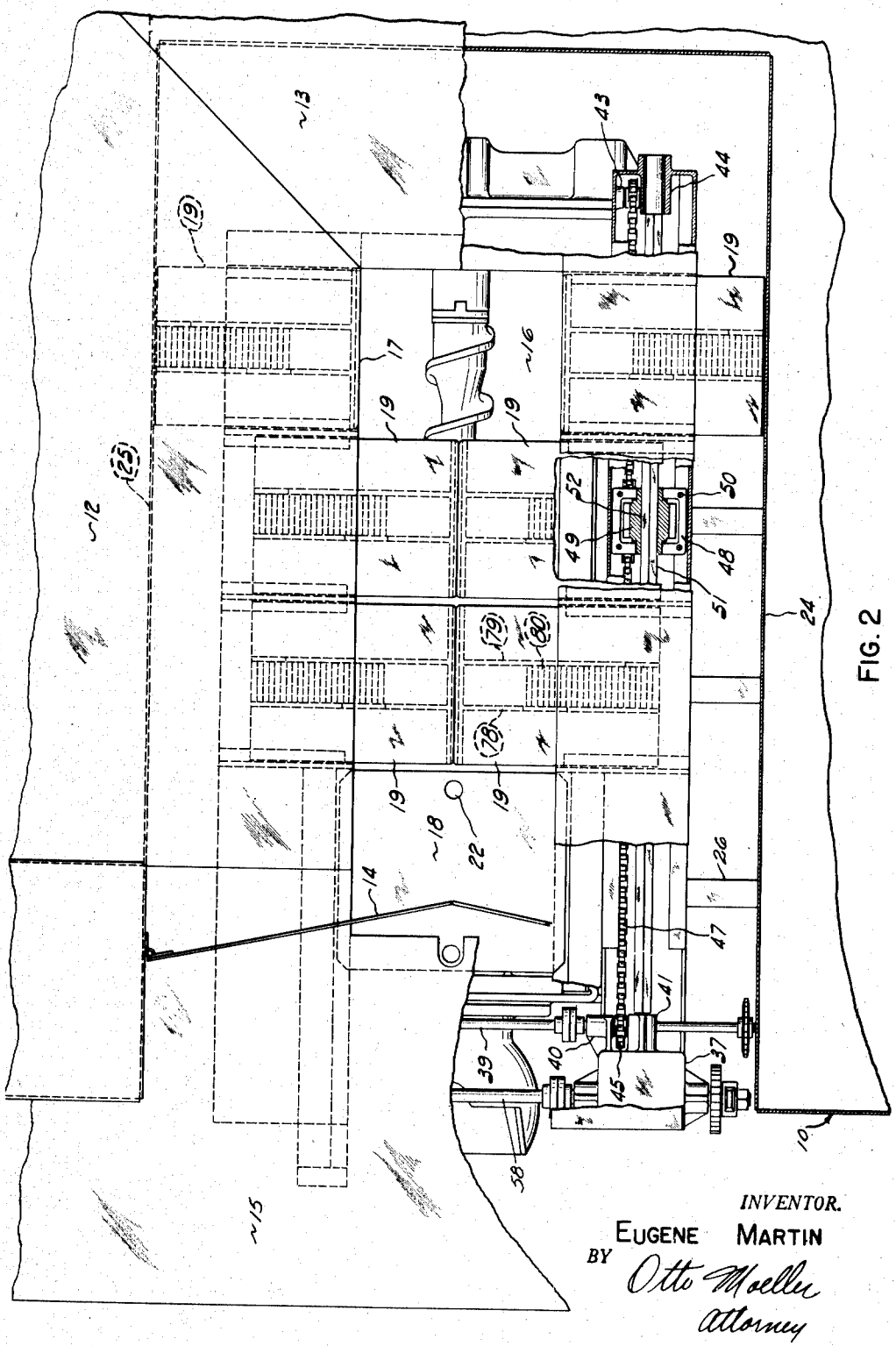


FIG. 2

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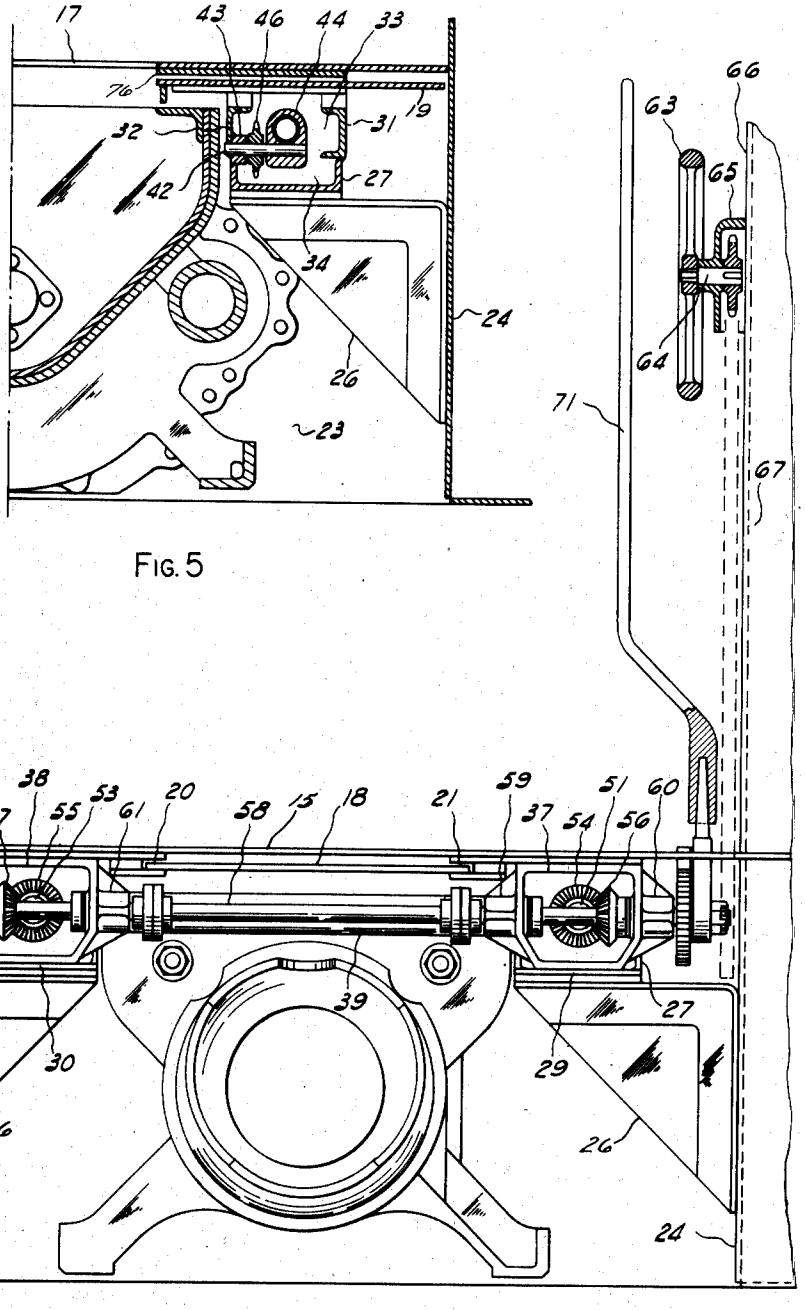


FIG. 5

FIG. 3

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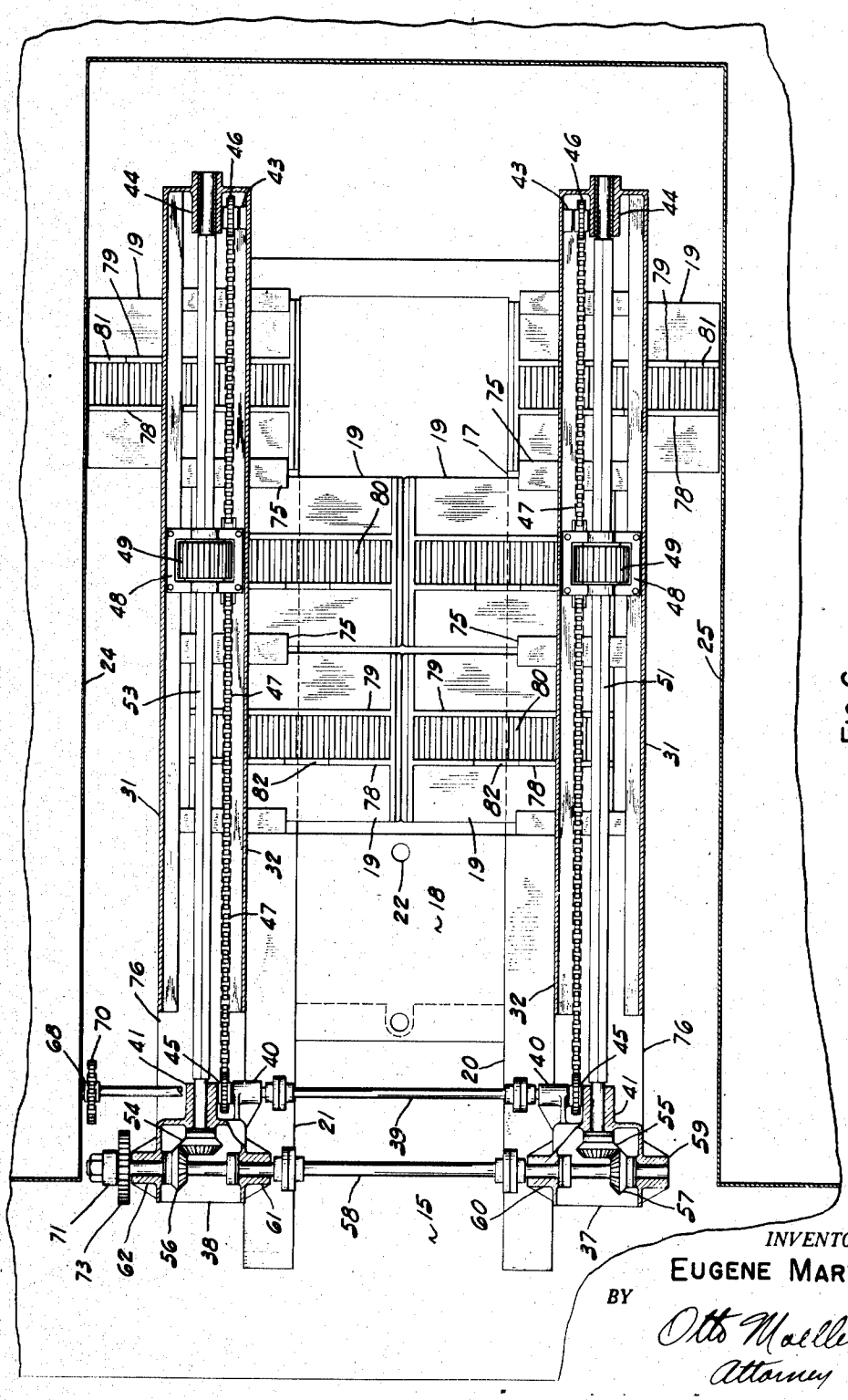


FIG. 6

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2,492,102

TENDER BIN DISCHARGE MEANS

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10 Claims. (Cl. 105—234)

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This invention relates to gravity discharge regulating means for hoppers or bins in which the floor is formed of a plurality of slidable plates arranged to be selectively moved from covering position, and it has particular reference to means of the type described for moving the coal bin slide plate of a stoker equipped locomotive tender.

In such devices currently in use, it is the practice to pull the slide plates forward successively from front to back of the tender fuel bin as the front face of the coal pile recedes in the bin. It is customary to replenish the coal supply prior to complete depletion of the fuel bin, so that the zone of coal at the rear of the bin is seldom disturbed and therefore rests on the rear slope sheet of the bin for an indefinite length of time. Because of this condition, the sheets against which this dormant mass of coal rests become corroded, requiring frequent removal and replacement.

Accordingly, it is an object of this invention to provide an arrangement in a tender whereby the coal will not remain dormant for long periods on the rear slope sheet of the fuel bin. More specifically, the invention contemplates a novel slide plate operating construction which permits opening the slide plates successively from the rear to the front of the fuel bin so that coal is removed from the bin from back to front.

It is apparent that the novel slide plate operating arrangement, whereby the coal is delivered from the bin to the stoker trough, first from the rear of the bin and then progressively from the rear to the front of the bin, provides at all times a readily available supply of coal at the front of the tender should the fireman in an emergency be required to manually deliver coal from the bin to the firebox. This constitutes another important advantage contemplated by the invention.

Another object of the invention is to provide novel mechanical means rendering the slide plates, in the floor of a material gravity discharging bin, more easily and conveniently removable from and to covering position.

Other objects and advantages of the invention reside in the novel construction, combination and arrangement of parts as will become apparent from the following description when read in connection with the accompanying drawings, in which

Figure 1 is a fragmentary longitudinal vertical sectional view through the forward end of a tender with the tender unit of a stoker and the

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novel slide plate operating means applied thereto and shown in elevation with parts broken away and shown in section;

Figure 2 is a fragmentary plan view of the structure shown in Figure 1 with parts broken away and shown in section;

Figure 3 is a fragmentary front elevation of the structure shown in Figure 1 with parts shown in section;

Figure 4 is a half section taken on the line 4—4 of Figure 1;

Figure 5 is a half section taken on the irregular line 5—5 of Figure 1; and

Figure 6 is a sectional view taken on the line 6—6 of Figure 1 looking upwardly in the direction of the arrows.

Referring to the drawings, the numeral 10 indicates a portion of a locomotive tender having a coal bin 11 defined by the inclined side walls 12, the rear slope sheet 13 and coal gate 14.

Underlying the floor 15 of the tender 10 is a fuel receiving trough 16 of a mechanical stoker into which coal may drop by gravity from the bin 11 through a longitudinally elongated opening 17, as best shown in Figure 4. The opening 17 extends substantially the length of the bottom of the coal bin 11 and is adapted to be closed by the longitudinally slidable front plate 18 and a plurality of laterally slidable plates 19, as best shown in Figure 2.

The longitudinally slidable front plate 18 is supported in the guideways 20 and 21, as best shown in Figure 3, the plates forming the guideways being rigidly secured to the under side of the tender floor 15. The plate 18 is manually operated by inserting a hand hook in the hole 22 and pulling the plate forwardly beneath the floor 15.

Since the present invention contemplates the discharge of coal from the bin 11 to the trough 16, progressively from the rear to the forward end of the bin, the rearmost pair of plates 19 are first moved from covering position. When the coal in the rearmost portion of the bin has been depleted, the next pair of plates 19 are moved from covering position and as the face of the coal pile recedes toward the front of the bin, the plates are successively moved from covering position from rear to front. With coal in the bin 11, it is apparent that the plates 19 are not conveniently accessible and novel means, hereinafter described in detail, is provided for successively moving the plates 19 mechanically, to open or closed position.

It will become evident, as the description pro-

ceeds, that a pair of mechanically operated plates 19 can be substituted for the manually operated plate 18, however, since in the present arrangement coal is taken progressively from back to front, there is little occasion for moving the front plate, and since it is conveniently accessible it is preferably shown as being manually movable. In addition, should tramp iron or other extraneous materials be lodged between the crusher (not shown), which is disposed at the front of the trough, and the screw conveyor, causing the stoker to stall, the slide plate 18 can be pulled forwardly beneath the floor 15 independently of the mechanism that operates the plates 19, making the crushing zone of the trough 16 accessible for removing the obstructing object.

The trough 16, the slide plates therefor, and the mechanism for operating the slide plates are mounted in compartment 23 beneath the floor 15 of the bin 11, the sides of the compartment 23 being formed by the longitudinally extending vertical side plates 24 and 25.

Secured to the plates 24 and 25 are a plurality of inwardly extending brackets 26 arranged to form a support for the slide plate operating means and the slide plates 19 themselves. Seated on the brackets 26 and extending longitudinally of the compartment 23 are the U-shaped channels 27 and 28, located one on each side of and adjacent the upper end of the trough 16. The forward ends of the channels 27 and 28 have their upright side walls cut away to form the plate-like extensions 29 and 30, as best shown in Figures 1 and 3.

Referring to Figures 1 and 4, a pair of U-shaped channels 31 and 32 are secured, as by welding, one on each of the upstanding walls of the channel 27. The channels 31 and 32 are arranged with their open ends facing each other to form a housing 33 superimposed on and communicating with a housing 34 formed by the channel 27. A similar arrangement of housings and channels is supported on the brackets 26 at the other side of the trough 16.

Mounted on the plate-like extensions 29 and 30 of the channels 27 and 28 are the gear housings 37 and 38, respectively. A rotatable shaft 39 extending transversely of the tender beneath the floor 15 and forward of the trough 16 is journaled at one side in the spaced bearings 40 and 41, preferably formed with the rearward end of the gear housing 37, and at the other side in similar bearings formed with the gear housing 38, as best shown in Figures 2 and 6. Referring to Figures 1 and 5, a transverse shaft 42 is journaled in the spaced bearings 43 and 44 within the rearward end of the channels 27, 31 and 32. A sprocket 45, see Figures 2 and 6, is rigidly secured to the shaft 39 between the bearings 40 and 41, and a sprocket 46 is mounted on the shaft 42 between the bearings 43 and 44. A sprocket chain 47 is trained around the sprockets 45 and 46, the upper run of the chain 47 extending through the housing 33 and the lower run of the chain 47 extending through the housing 34. While the above mechanism has been described and is shown in most of the drawings as applied to one side of the trough 16, it will be understood that a similar arrangement is provided on the opposite side of the trough 16 as shown in Figure 6, and for simplicity the similar parts are designated by similar reference characters.

Interposed in the upper run of the chain 47 is a gear cage 48 in which is rotatably mounted a gear 49. The gear cage 48 is horizontally split into an upper and a lower half as best shown in Figure 4. In order to assemble the gear cage 48 and gear 49, the upper and lower halves of the cage 48 are separated, the gear 49 is inserted and the two halves of the cage 48 are then secured together by suitable means, as by screws 50. Figure 2 shows the lower half of the gear cage 48 with the gear 49 mounted therein and Figure 6 shows the upper half of the gear cage 48 with the gear 49 mounted therein. The gear cage 48, as best shown in Figure 4 is arranged to slide forward and backward in the housing 33 formed by the spaced channels 31 and 32, movement being imparted thereto through the sprocket 45 and sprocket chain 47 by turning the shaft 39 in one direction or the other. A similar arrangement is provided on the opposite side of the trough 16 as shown in Figure 6, and for simplicity the similar parts are designated by similar reference characters.

In addition to being movable in a forward and rearward direction, the gear 49 is also rotatable, as previously pointed out. The means for rotating the gear 49 includes a polygonal shaft 51 extending longitudinally through the housing 33 formed by the channels 31 and 32 and projecting through a polygonal bore 52 in the gear 49. The gear 49 is thus slidable along the shaft 51 but rotatable with it. At its rearward end, the shaft 51 is journaled in the bearing 44, and at its forward end is journaled in the bearing 41, extending therethrough into the gear housing 37. A similar arrangement of parts is provided on the shaft 53 at the other side of the trough 16 as shown in Figure 6, and for simplicity the similar parts are designated by similar reference characters.

Referring particularly to Figure 3, bevel gears 54 and 55 are mounted on the forward ends of shafts 51 and 53, respectively, within the respective gear housings 37 and 38. The bevel gears 54 and 55 mesh with the bevel gears 56 and 57, respectively, mounted on the transversely extending shaft 58, the shaft 58 being journaled in bearing 59, 60, and 61, 62, preferably formed integral with the gear housings 37 and 38, respectively. Rotation of shaft 58 is thus transmitted through the described gearing to the shafts 51 and 53.

The shaft 39, which is operatively connected with the gears 49 for moving the latter forward or backward as explained above, is itself conveniently operated by turning a handwheel 63 located to be readily accessible for manual operation. As shown in Figures 1 and 3, the handwheel 63 is secured on a shaft 64 journaled in a bracket 65 which is attached to a side wall 66 of the bunker 67. Secured on extensions of the shafts 39 and 64 are the sprockets 68 and 69, respectively, about which is trained a sprocket chain 70. It is evident, then, that by turning the handwheel 63 in a clockwise direction, the gears 49 will be moved in a forward direction, and by turning the handwheel 63 in a counterclockwise direction, the gears 49 will be moved in a rearward direction.

The shaft 58, which as previously explained, is operatively connected with the gears 49 for imparting rotation thereto, is itself operated manually by a lever 71, conveniently located at the forward end of the tender, preferably close to the handwheel 63 as best shown in Figure 3. The lever 71 is freely mounted at its lower end on an extension of the shaft 58 and is provided with a pivotally mounted dog 72 arranged to

engage the teeth of a ratchet wheel 73 which is rigidly secured on the shaft 58. With the dog 72 in the position shown in Figure 1, pulling the lever 71 forward will cause the gear 49 on the right side of the tender to rotate in a counterclockwise direction, when viewed from the front of the tender. Pushing the lever 71 backward causes the dog 72 to ride over the teeth of the ratchet wheel 73, so that with the dog 72 as shown in Figure 1, the rotation of the gear 49 will be unidirectional. To reverse the direction of rotation of the gear 49, it is only necessary to flip the dog 72 over. It is apparent that operation of the lever 71 also operates the gear 49 on the left side of the tender, however, it is arranged to rotate in a direction opposite the direction of rotation of gear 49 on the right side of the tender.

The slide plates 19, which are operatively connected with the gears 49 in a manner hereinafter described, are supported in slideways 74 formed by the laterally extending longitudinally spaced inverted T-shaped guide plates 75 which are secured in any suitable manner, as by welding, to the channels 31 and 32, and the longitudinally extending plates 76. The inverted T-shaped guide plates 75 are each provided with a bottom recess 77, as shown in Figure 4, to permit longitudinal movement of the gears 49 past the guide plates 75.

Each of the slide plates 19 is provided with a pair of depending, transversely extending, spaced ribs, a front rib 78 and a rear rib 79. On the underside of each slide plate 19 between the front rib 78 and rear rib 79 is a rack number 80 arranged for engagement with the gear 49.

Referring particularly to Figures 4 and 6, the rear rib 79 of the slide plate 19 is provided with a recess 81, which is so located to permit passage therethrough of the gear 49 when the slide plate 19 is in its closed position. The front rib 78, in the same position of the slide plate 19 forms a stop for the gear 49, in which position of the gear 49 it will engage the rack number 80. When the gear 49 on the right side of the tender is now rotated in a clockwise direction, when viewed from the front of the tender, it will by reason of its engagement with the rack member 80 move the slide plate 19 to its open position. The front rib 78 is provided with a recess 82 which, in the open position of the slide plate 19, will permit passage of the gear 49 therethrough, whence it can be moved forward to engage the next slide plate. It is understood, of course, that all the slide plates 19 are similarly constructed and similarly operated.

For the purpose of describing the operation of the invention, let it be assumed that the bin 11 is filled with coal, the slide plates 19 all closed and the gears 49 in mesh with the racks 80 of the rearmost pair of slide plates 19. The operator works the lever 71 which, with the dog 72 in the position shown in Figure 1, will turn the gears 49 in a direction, as previously described, to open the rearmost pair of slide plates 19.

When the coal in the rearmost portion of the bin 11 has been depleted, the operator turns the handwheel 63 in a clockwise direction, the gears 49 will then pass through the recesses 82 of the front ribs of the rearmost slide plates 19, through the recesses 81 of the next pair of slide plates 19, and will be arrested by the front ribs of the said next pair of slide plates 19. In this position of the gears 49, they will mesh with the racks 80 of the said next pair of slide plates, which can then be opened by again manipulating the lever 71. As the coal in the bin becomes depleted, this procedure is repeated until all the slide plates have been opened.

In order to close the slide plates, the same procedure is followed, except that the dog 72 is now flipped over to the opposite side of the lever 71, in which position it will effect rearward movement of the gears 49 upon manipulation of the lever 71. The gears 49 can then be made to successively engage the racks 80 of one pair of slide plates 19 after the other from front to rear, the successive pairs of slide plates being closed by turning the handwheel 63 in a counterclockwise direction.

I claim:

1. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of shiftable plates adapted in one position to form a closure for said bottom outlet, mechanism for successively shifting said plates in rear front sequence to form a discharge opening the front marginal edge of which progressively moves forward as successive plates are shifted, said mechanism including a plate shifting member, means for actuating said member, means associated with said plates adapted for engagement with said member for shifting said plates upon actuation of said member, and means for moving said member forward in successive operative relation with said plates.

2. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of divided plates with complementary plate sections shiftable laterally toward and away from each other to close and open said bottom outlet, mechanism for successively shifting each pair of complementary plate sections away from each other in rear to front sequence and toward each other in reverse sequence, said mechanism including a pair of plate section shifting members, means for actuating said members, means associated with said plate sections adapted for engagement with said members for shifting said plate sections upon actuation of said members, and means for moving said shifting members forward and rearward in successive operative relation respectively with each pair of complementary plate sections.

3. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of laterally shiftable plates adapted in one position to form a closure for said bottom outlet, mechanism for successively shifting said plates in rear to front sequence to form a discharge opening the front marginal edge of which progressively moves forward as successive plates are shifted, said mechanism including a rotatable shaft, a plate shifting member mounted for rotation with said shaft, means associated with said plates adapted for engagement with said member for shifting said plates upon rotation of said member, means for moving said member along said shaft in successive operative relation with said plates, and means for actuating said last named means and said shaft.

4. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of shiftable plates adapted in one position to form a closure for said bottom outlet, mechanism for successively shifting said plates in rear to front sequence to form a discharge opening the front marginal edge of which progressively moves forward as successive plates are shifted, said mechanism including a rotatable shaft, a plate shifting member mounted for rota-

tion with said shaft, means associated with said plates adapted for engagement with said member for shifting said plates upon rotation of said member, chain and sprocket means for moving said member along said shaft in successive operative relation with said plates, and means for actuating said shaft and said chain and sprocket means.

5. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of shiftable plates adapted in one position to form a closure for said bottom outlet, mechanism for successively shifting said plates in rear to front sequence to form a discharge opening the front marginal edge of which progressively moves forward as successive plates are shifted, said mechanism including a rack member for each of said plates, a longitudinally extending rotatable shaft, a pinion mounted for rotation with said shaft, said pinion being adapted for engagement with a respective rack member for shifting a respective plate, chain and sprocket means for moving said pinion along said shaft for successively engaging the rack member of each plate, and means for actuating said shaft and said chain and sprocket means.

6. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of divided plates with complementary plate sections shiftable laterally toward and away from each other to close and open said bottom outlet, mechanism for successively shifting each pair of complementary plate sections away from each other in rear to front sequence and toward each other in reverse sequence, said mechanism including a longitudinally extending rotatable shaft below each side of said bin, a plate section shifting member mounted for rotation with each of said shafts, means associated with said plate sections adapted for engagement with said member for shifting said plate sections upon rotation of said member, chain and sprocket means for moving each of said members along said shaft in successive operative relation respectively with each pair of complementary plate sections, and means for actuating said shafts and said chain and sprocket means.

7. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of shiftable plates adapted in one position to form a closure for said bottom outlet, mechanism for successively shifting said plates in rear to front sequence to form a discharge opening the front marginal edge of which progressively moves forward as successive plates are shifted, a housing for said mechanism, said mechanism including a rotatable shaft mounted in said housing, a plate shifting member mounted for rotation with said shaft, means associated with said plates adapted for engagement with said member for shifting said plates upon rotation of said member, chain and sprocket means mounted in said housing for moving said member along said shaft in successive operative relation with said plates, said housing and mechanism being insertable as an assembled unit through the forward end of the tender, and means for actuating said shaft and said chain and sprocket means.

8. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of shiftable plates adapted in one position to form a closure for said bottom outlet, mechanism for successively shifting said plates in rear to front sequence to form a discharge opening the front marginal edge of which progressively moves forward as successive plates are shifted, said mechanism including a plate shifting member, means for actuating said member, means associated with said plates adapted for engagement with said member for shifting said plates upon actuation of said member, means for moving said member forward in successive operative relation with said plates, and stops associated with said plates to definitely limit the forward movement of said member.

9. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of divided plates with complementary plate sections shiftable laterally toward and away from each other to close and open said bottom outlet, mechanism for successively shifting each pair of complementary plate sections away from each other in rear to front sequence and toward each other in reverse sequence, said mechanism including a pair of plate section shifting members, means for actuating said members, means associated with said plate sections adapted for engagement with said members for shifting said plate sections upon actuation of said members, means for moving said shifting members forward in successive operative relation and rearward in successive operative relation with each pair of complementary plate sections, and stops associated with said plate sections to definitely limit the forward and rearward movement of said members.

10. Means for controlling the flow of fuel from a tender fuel bin having a bottom outlet, comprising a plurality of shiftable plates adapted in one position to form a closure for said bottom outlet, mechanism for successively shifting said plates in rear to front sequence to form a discharge opening the front marginal edge of which progressively moves forward as successive plates are shifted, said mechanism including a rack member for each of said plates, a longitudinally extending rotatable shaft, a pinion mounted for rotation with said shaft, said pinion being adapted for engagement with a respective rack member for shifting a respective plate, chain and sprocket means for moving said pinion along said shaft for successively engaging the rack member of each plate, means for actuating said shaft and said chain and sprocket means, and stops associated with said racks to definitely limit the forward movement of said pinion.

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