May 11, 1954 A. V. CONSOLDANE ET AL 2,678,230

CLOSURE LATCHING MECHANISM FOR BOTTOM OPENING CHARGING BUCKETS OR THE LIKE

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Fig. 1.

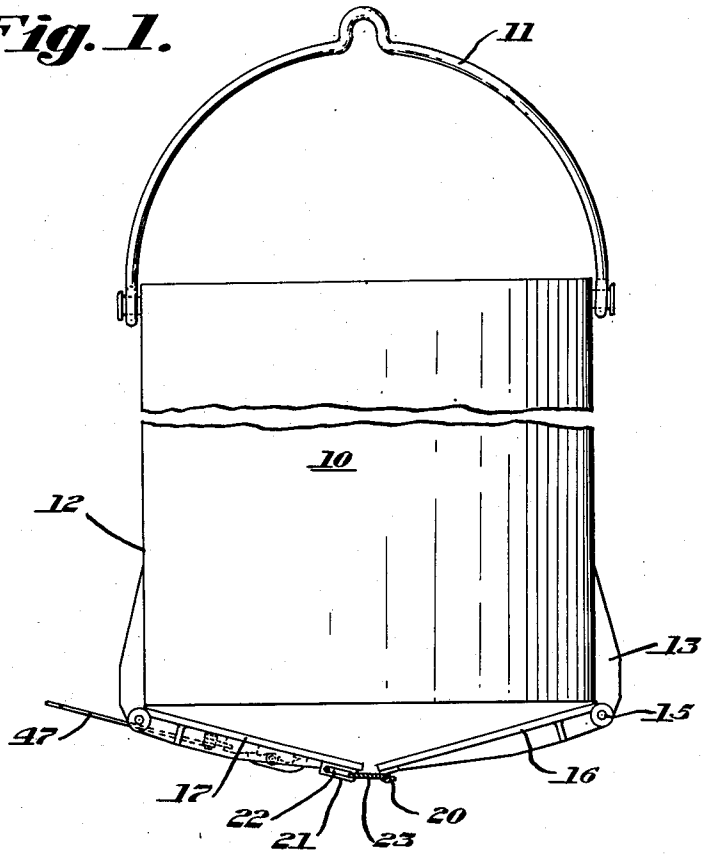
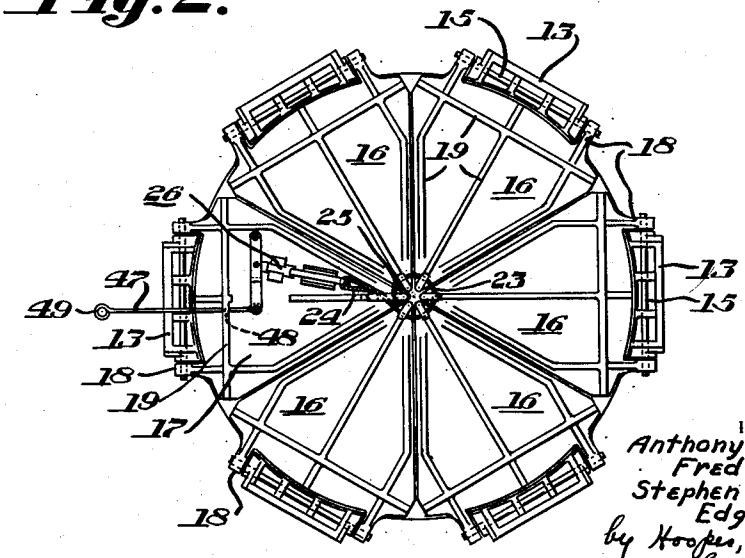


Fig. 2.



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Fig. 3.

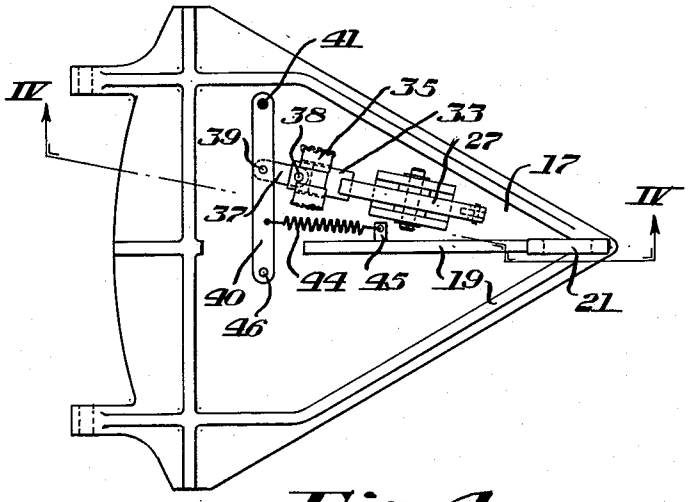


Fig. 4.

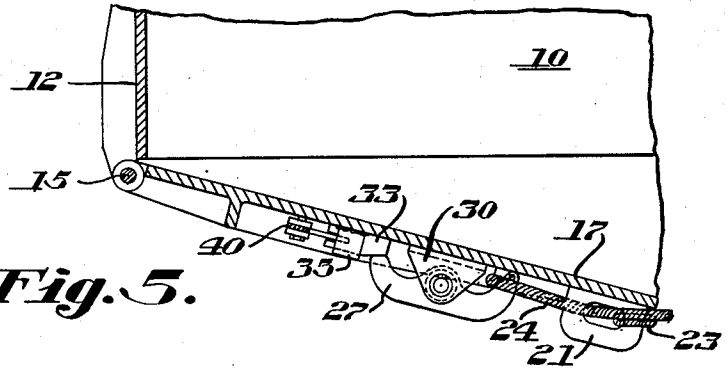


Fig. 5.

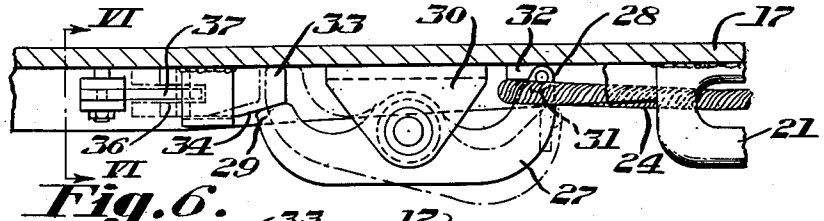
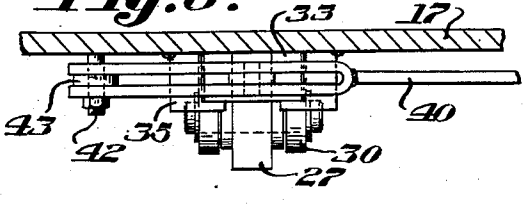


Fig. 6.



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CLOSURE LATCHING MECHANISM FOR BOTTOM OPENING CHARGING BUCKETS OR THE LIKE

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8 Claims. (Cl. 294—69)

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This invention relates to a closure latching mechanism for a bottom opening charging bucket or the like. More particularly, it relates to a new latch which, in closure position, coacts with a cable to hold closed the door sections at the bottom of an electric furnace charging bucket or the like.

The art of cable-latching mechanisms for bottom opening charging buckets is broadly old. However, in this invention a new and different closure latching mechanism is disclosed which is not subject to being easily tripped by accident; is not subject to quick deterioration by the wear of the parts; is able to hold the closure cable in a positive manner around the door sections even though some slack may be present in the cable; and does not have insecure structural characteristics. Hence, the latching mechanism of this invention is safer and quicker and easier to operate than prior such devices. Other objects and advantages will be apparent from the following description and accompanying drawings, in which,

Figure 1 is a view in elevation of a conventional charging bucket to which a preferred embodiment of the closure latching mechanism of this invention is applied and is shown in latched position;

Figure 2 is a view from the bottom of the charging bucket and closure latching mechanism of Figure 1;

Figure 3 is an enlarged view looking at the underside of the latching door section on the charging bucket of Figure 1 showing the closure latching mechanism in latched position;

Figure 4 is a view in side elevation taken along lines IV—IV of Figure 3;

Figure 5 is a further enlargement in side elevation of the closure latching mechanism of this invention illustrated in latched position in solid lines and in open or unlatched position in chain lines; and

Figure 6 is a view in end elevation taken along line VI—VI of Figure 5.

Referring to the drawings, a bottom opening charging bucket 10 such as is suitable for use with electric furnaces or the like is illustrated. This bucket may conveniently be carried by a bail 11 connected to opposite sides of a body 12 which may be circular in plan. Outstanding hinge frames 13 integral with body 12 are arranged around the outside of body 12 adjacent the bottom thereof. These frames have lower portions which depend somewhat below body 12, which dependent portions on each frame 13 are

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drilled in registry for the reception of a hinge pintle 15.

The bottom closure for bucket 10 comprises a plurality of triangular door sections 16, one of which may also be called a latching door section 17. The outer ends of door sections 16 are respectively provided with a pair of integral hinge ears 18 which span the respective frames 13. Each pair of ears 18 is drilled so that they may be connected by the common respective pintle 15 to the respective frame 13 and effect a hinge for the particular door section 16 concerned. The undersides of the door sections 16 are frequently strengthened by integral strengthening ribs 19. Adjacent the apex of each door section 16, other than latching door section 17, a cable-engaging member 20 is provided in the form of a hook having its outer end spaced away from the underside of its respective door section and pointing out toward the outside of bucket 10. Latching door section 17 in the embodiment shown is provided adjacent its apex with a cable-engaging member 21 in the form of a ring having an eye 22 therein. These cable-engaging members 20 and 21 are welded to the underside of their respective door sections 16. When closed, the dimensions of the door sections 16 are such that a complete bottom closure is formed for bucket 10, usually of inverted pyramidal form, the axis of which is coincident with the axis of body 12. Although a comparatively shallow bottom closure is illustrated in Figures 1 and 2, the closure latching mechanism of this invention will operate whether the door sections form a horizontal coplanar bottom closure or a bottom closure of inverted pyramidal form of greater altitude than that illustrated in Figure 1.

A cable 23 is provided having closed loops at the respective ends thereof, one of which, loop 24, is at the free end of cable 23 and the other, loop 25, is at the fastened or captive end of cable 23. One end of cable 23 is fastened to ring 21 by means of loop 25 passing through eye 22 and around ring 21. Other means for fastening this end of cable 23 to latching door section 17 may readily be provided. To close the bottom of bucket 10, door sections 16, after the bucket is emptied, are either manually or by means of a closing frame (not shown) moved into closed position illustrated in Figures 1 and 2. Free end 24 of cable 23 is then wound around hooks 20 in engagement therewith and passed through eye 22, which is of sufficient size, bringing loop 24 adjacent the closure latching mechanism 26 of this invention. It is apparent that unless loop

24 is firmly held, the weight of the contents of bucket 10 will pull loop 24 through eye 22 and cause cable 23 to unwind allowing door sections 16 to drop open and discharge the contents of the bucket 10. Cable 23 is preferably made of all steel wire rope or steel chain. Heretofore, such bottom closure door sections were held in closed position in many cases by lengths of fiber rope which was permitted to burn away to open the door sections. This latter practice is not only relatively expensive but is relatively time-consuming. Use of a steel cable 23 permits of indefinite reuse and is far less subject to any hazard of accidental breakage.

Closure latching mechanism 26 comprises a latch 27 having a bifurcated inner end 28 and an outer end 29. Latch 27 is substantially arcuate or convex when in position and viewing the underside of latching door section 17 to which mechanism 26 is attached. Latch 27 is pivotally mounted intermediate its respective ends in a bracket 30 affixed to the underside of latching door section 17 in such fashion that the axis of the longitudinal body of latch 27 passes through the axis of the inverted pyramidal form of the bottom closure of bucket 10. A catch 31 having a pendant leg 32 is pivotally and swingably mounted between the sides of latch 27 in the recess of the bifurcation at inner end 28. In latched position the pendant leg 32 of catch 31 points outwardly in the direction of the longitudinal body of latch 27, the inner end of which bears against the underside of latching door section 17. Hence, when catch 31 and inner end 28 are passed through loop 24 of cable 23, cable 23 is held in closure position in a positive manner by engagement with cable-engaging members 20 and 21. Even though there may be some slack in cable 23, after closing door sections 16 and before bucket 10 is recharged, nevertheless, cable 23 cannot unwind because loop 24 is locked between inner end 28 and catch 31 and the underside of latching door section 17.

A wedge block 33 having an inclined face 34 is slidably mounted in guides 35. Guides 35 are fastened to the underside of latching door section 17 by being welded thereto or otherwise affixed. Block 33 slides in a direction parallel to the axis of the longitudinal body of latch 27 and is adapted to have its inclined face 34 engage outer end 29 of latch 27 when block 33 is moved toward the apex of door section 17. Outer end 29 is so shaped as to have surface contact with inclined face 34, the angle of which relative the direction of movement is not so steep that it can be forced out by any pressure substantially normal to face 34.

The extent to which ends 28 and 29 of latch 27 extend toward the underside of latching door section 17, is such that when latch 27 is rocked, after block 33 is pulled outwardly, the respective ends alternate, that is, when inner end 28 substantially bears against the underside of door section 17 outer end 29 is away from the said underside of door section 17 and block 33 may be positioned between outer end 29 and said underside to hold latch 27 in latched or closed position. Conversely, when block 33 is removed, the tension in cable 23 pulls inner end 28 and catch 31 away from the underside of door section 17 and moves outer end 29 toward the said underside. Leg 32 is made of such length that outer end 29 must move substantially all the way up to the underside of door section 17, as shown by the chain lines in Figure 5, before loop 24 can pull free, swinging leg 32 in a clockwise arc as it does so. Leg 32 then falls substantially into the position shown in the chain line figure just mentioned. In this way, even if there is slight dislodgment of block 33 or wear on the underside of latching door section 17 adjacent respective parts of closure latching mechanism 26, unlatching of the door sections 16 will not take place until block 33 is deliberately withdrawn entirely by an operator.

Block 33 has a recess 36 at the rear thereof in which one end of a link 37 is pivotally connected by a pin 38. The other or outer end of link 37 is connected by a pivot pin 39 to an arm 40. Arm 40 rotates about a center 41 where it is affixed by a stud bolt and nut 42 to the underside of door section 17. The end of arm 40 extending from center 41 past pin 39 is bifurcated in such fashion that the outer end of link 37 fits between the opposed faces of the bifurcation in question. In this way, and by means of a washer 43, arm 40 is maintained without wobble in a plane substantially parallel to the underside of door section 17.

A spring 44 is connected to a bracket 45 integral with the central rib 19 of door section 17. The other end of spring 44 is connected to arm 40. This spring is so chosen that at all times it urges arm 40 and hence wedge block 33 inwardly, that is, into latched or closure position when the outer end 29 of latch 27 will permit. The outer end of arm 40 has an opening 46 by means of which an extension bar 47 is connected. Extension bar 47 is guided by an opening 48 through a rib 19 adjacent the periphery of bucket 10. A loop 49 in the outer end of extension bar 47 enables an operator with a hook bar to pull block 33 outwardly, allowing latch 27 to be moved into the chain line position of Figure 5 by the pull of cable 23 and, hence, allowing door sections 16 to fly open and discharge the contents into the electric furnace or other structure over which bucket 10 is then positioned. In some cases, an extension bar, such as bar 47, may not be needed and an operator may directly engage arm 40 through opening 46 to unlatch the bottom of the bucket. Whether or not an extension bar 47 is used, the device of this invention is not easily tripped because there are no members operable substantially directly vertically, as in the case of so many prior devices, which may be caught on projections or otherwise moved to discharge the bucket by accident. Any such accidental discharge is, of course, a substantial hazard to the workmen in the plant.

Although we have illustrated and described but a preferred embodiment and practice of the invention, it is to be understood that modifications may be made in the device of this invention without departing from the spirit thereof or the scope of the appended claims.

We claim:

1. A closure latching mechanism for a bottom opening charging bucket or the like having a plurality of triangular door sections arranged and adapted when closed to form a bottom closure for said charging bucket or the like, one of said door sections being a latching door section, a plurality of cable-engaging members respectively arranged on the underside of said door sections, comprising in combination, a cable adapted to engage said cable-engaging members to hold said door sections in closed position, said cable further being adapted to be held in latched position against the underside of said latching

door section, a latch movably mounted between the ends thereof on the underside of said latching door section and adapted to have its respective ends alternately rock toward and away from the underside of said latching door section, one of said ends being adapted to hold said cable in latched position when said one of said ends has been moved toward said underside of said latching door section, and pressure bearing means mounted on said latching door section to move generally parallel thereto between the other end of said latch and the underside of said latching door section to hold said one of said ends of said latch in latching position, whereby when said bearing means are removed, said cable will disengage from said cable-engaging members and allow said door sections to open.

2. A closure latching mechanism for a bottom opening charging bucket or the like having a plurality of bottom door sections arranged and adapted when closed to form a bottom closure substantially in inverted pyramidal form for said charging bucket or the like, a plurality of cable-engaging members respectively arranged adjacent the apices of said door sections on the lower sides thereof, comprising in combination, a cable adapted to engage said cable-engaging members to hold said door sections in closed position, said cable having one end fastened to one of said door sections, said cable further having a closed loop on the other and free end thereof adapted to be held in latched position against the underside of said one of said door sections, a latch, said latch being pivotally mounted intermediate the ends thereof and extending substantially in a direction radiating from the axis of said pyramidal form along the underside of said one of said door sections and adapted to have its inner end pass through said loop and bear against said underside of said one of said door sections when said latch is in closure position, a wedge block mounted on said one of said door sections adjacent the outer end of said latch to slide generally parallel to said one of said door sections between said outer end of said latch and said underside of said one of said door sections to hold said latch in closure position, and an arm pivotally connected to said block and adapted to move it out of engagement with said outer end of said latch, whereby when said arm is pulled outwardly said loop is quickly released by said latch permitting said door sections to open by the unwinding of the free end of said cable from said cable-engaging members.

3. A closure latching mechanism for a bottom opening charging bucket or the like having a plurality of triangular door sections arranged and adapted when closed to form a bottom closure substantially in inverted pyramidal form for said charging bucket or the like, a plurality of cable-engaging members respectively arranged adjacent the apices of said door sections on the lower side thereof, comprising in combination, a cable adapted to engage said cable-engaging members to hold said door sections in closed position, said cable having one end fastened to the latching door section, said cable further having a closed loop on the other and free end thereof adapted to be held in latched position against the underside of said latching door section, an arcuate rocking latch mounted between its ends on the underside of said latching door section in substantially convex position when viewing the underside of said latching door section, said rocking latch extending substantially in a direction radiating from the axis of said pyramidal form along said underside of said latching door section, a catch swingably mounted on the inner end of said latch adapted to pass through said loop and extend substantially in the direction said latch extends when in closure position, said loop being held by said inner end of said latch in said catch when said latch is in closure position against the underside of said latching door section, a wedge block slidably mounted on the underside of said latching door section adjacent the outer end of said latch to have its opposite sides engaged between said outer end of said latch and said underside of said latching door section when said latch is in closure position, said catch having a length adapted to prevent the opening of said latch by bearing against the underside of said latching door section unless and until said wedge block is substantially entirely removed from its position between said outer end of said latch and said underside of said latching door section, and an arm pivotally connected to said block and adapted to move it at least out of engagement with said outer end of said latch, whereby when said arm is pulled outwardly to slide said wedge block out of engagement with said outer end of said latch, said loop is quickly released by said latch and catch permitting said door sections to open by the disengagement of said cable from said cable-engaging members.

4. A closure latching mechanism for a bottom opening charging bucket or the like having a plurality of triangular door sections arranged and adapted when closed to form a bottom closure substantially in inverted pyramidal form for said charging bucket or the like, a plurality of cable-engaging members respectively arranged adjacent the apices of said door sections on the lower sides thereof, comprising in combination, a cable adapted to engage said cable-engaging members to hold said door sections in closed position, said cable having one end fastened to one of said door sections, said cable further having a closed loop on the other and free end thereof adapted to be held in latched position against the underside of said one of said door sections, a latch, said latch being pivotally mounted intermediate the ends thereof and extending substantially in a direction radiating from the axis of said pyramidal form along the underside of said one of said door sections, a catch swingably mounted on the inner end of said latch adapted to pass through said loop and point substantially outwardly when said latch is in closure position, a wedge block adjacent the outer end of said latch and positioned between said outer end of said latch and said underside of said one of said door sections when said latch is in closure position, an arm pivotally connected to said block and adapted to move it along said one of said door sections into and out of engagement with said outer end of said latch, and a spring connected to said arm to urge said block toward said outer end of said latch and into closure position, whereby when said arm is pulled outwardly said loop is quickly released by said latch and catch permitting said door sections to open by the unwinding of the free end of said cable from said cable-engaging members.

5. A closure latching mechanism for a bottom opening charging bucket or the like having a plurality of bottom door sections arranged and adapted when closed to form a bottom closure substantially in inverted pyramidal form for said

charging bucket or the like, a plurality of cable-engaging members respectively arranged adjacent the apices of said door sections on the undersides thereof, comprising in combination, a cable adapted to engage said cable-engaging members to hold said door sections in closed position, said cable having one end fastened to one of said door sections, said cable further having a closed loop on the other and free end thereof adapted to be held in latched position against the underside of said one of said door sections, a latch, said latch being pivotally mounted intermediate the ends thereof and extending substantially in a direction radiating from the axis of said pyramidal form along the underside of said one of said door sections and adapted to have its inner end pass through said loop and bear against said underside of said one of said door sections when said latch is in latched position, a wedge block slidably mounted on the underside of and generally parallel to said one of said door sections adjacent the outer end of said latch and positioned between said outer end and said underside when said latch is in latched position, said wedge block being movable out of the path of movement of said outer end of said latch to enable said latch to be opened, an arm pivotally connected to said block and adapted to move it into and out of engagement with said outer end of said latch, said arm being further pivotally connected adjacent one end thereof to said underside of said one of said door sections, and means for supporting said arm in relatively stable position in a plane substantially parallel to said underside of said one of said door sections.

6. A closure latch mechanism for a bottom opening charging bucket or the like having a plurality of triangular door sections and a plurality of closure cable-engaging members on said door sections and to hold said door sections in closed position, said cable having at least one end adapted to be held in latched condition against the underside of said latching door section, comprising in combination, a rocking latch pivotally mounted on the underside of one door section in spaced generally parallel relation thereto, the respective ends of said latch being alternately movable toward said door section, a wedge block slidably mounted on the underside of said one door section adjacent to one end of said latch, said wedge block being engaged on opposite sides thereof between said end of said latch and the underside of said one door section when the other end of said latch is moved toward said one door section into latching position therewith, and means connected to said wedge block to move it out of said engagement to open said latch mechanism.

7. In a closure latching mechanism for a

furnace charging bucket or the like, in combination, a generally planar closure section having a supporting surface, a bracket connected to said supporting surface, a unitary rockable latch pivotally mounted in said bracket intermediate the ends of said latch, said ends being alternately rockable about a pivot towards said supporting surface, one of said ends being movable towards said supporting surface to form a latching enclosure therewith between said one end and said bracket, a block connected to and generally movable along said supporting surface adjacent the other end of said latch to engage said supporting surface and said other end on opposite sides of said block when said latching enclosure is formed, means for limiting the movement of said block to that portion of said latch on the same side of said pivot as said other end, and means for moving said block out of engagement between said other end and said supporting surface to open said latching enclosure.

8. In a closure latching mechanism for a furnace charging bucket or the like, in combination, a generally planar closure section having a supporting surface, a bracket connected to said supporting surface, a unitary rockable latch pivotally mounted in said bracket intermediate the ends of said latch, said ends being alternately rockable towards said supporting surface, one of said ends being movable towards said supporting surface to form a latching enclosure therewith between said one end and said bracket, a block connected to and generally slidable along said supporting surface adjacent the other end of said latch to engage said supporting surface and said other end on opposite sides of said block when said latching enclosure is formed, means for guiding the sliding of said block generally in the plane of movement of said latch, means urging said block toward said other end of said latch to separate said other end from said supporting surface and form said latching enclosure, and means for moving said block out of engagement between said other end and said supporting surface to open said latching enclosure.

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