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3,230,003

SAFETY DUMPING BUCKET

Filed March 6, 1964

3 Sheets-Sheet 1

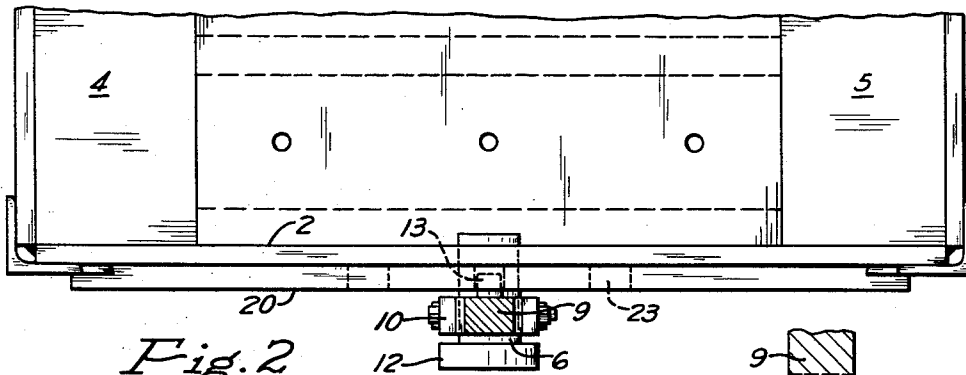


Fig. 2

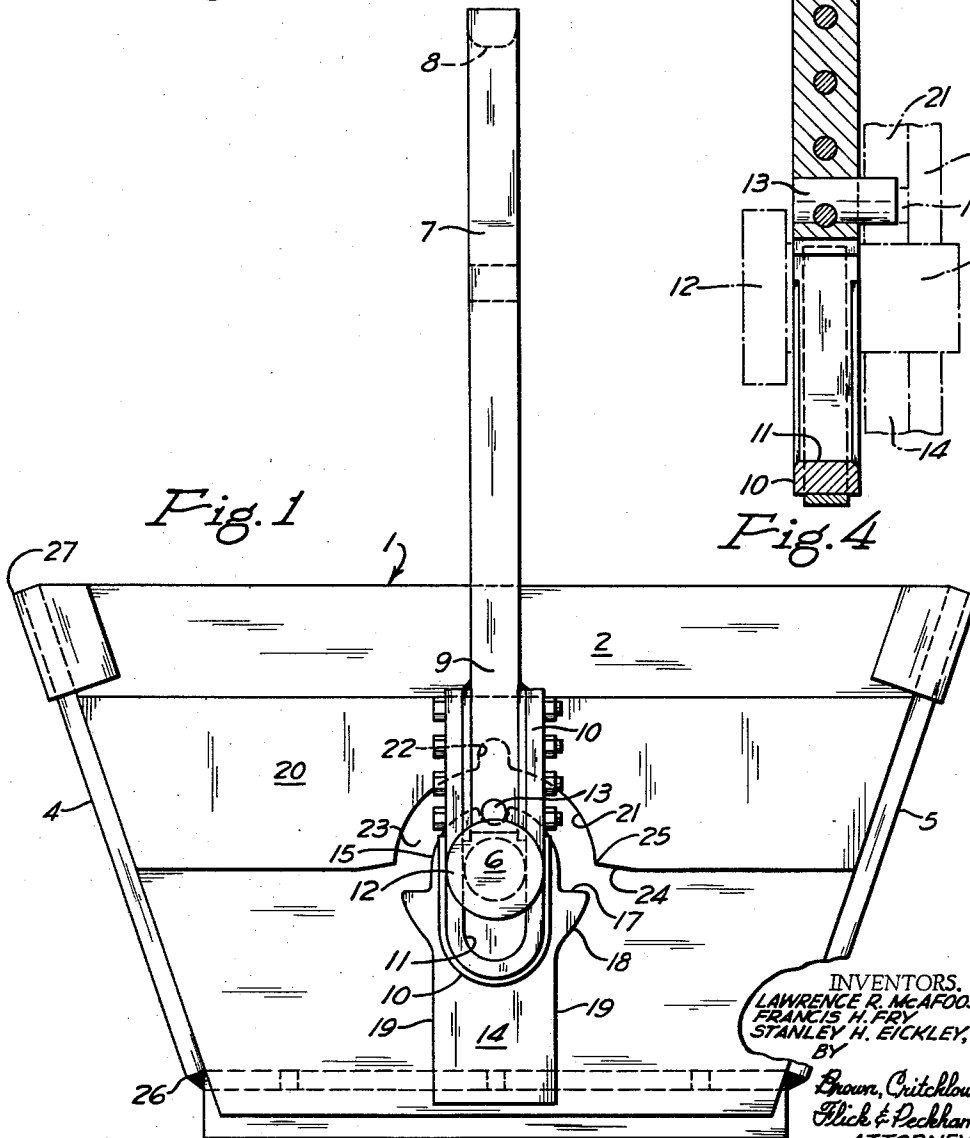


Fig. 1

Fig. 4

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3 Sheets-Sheet 2

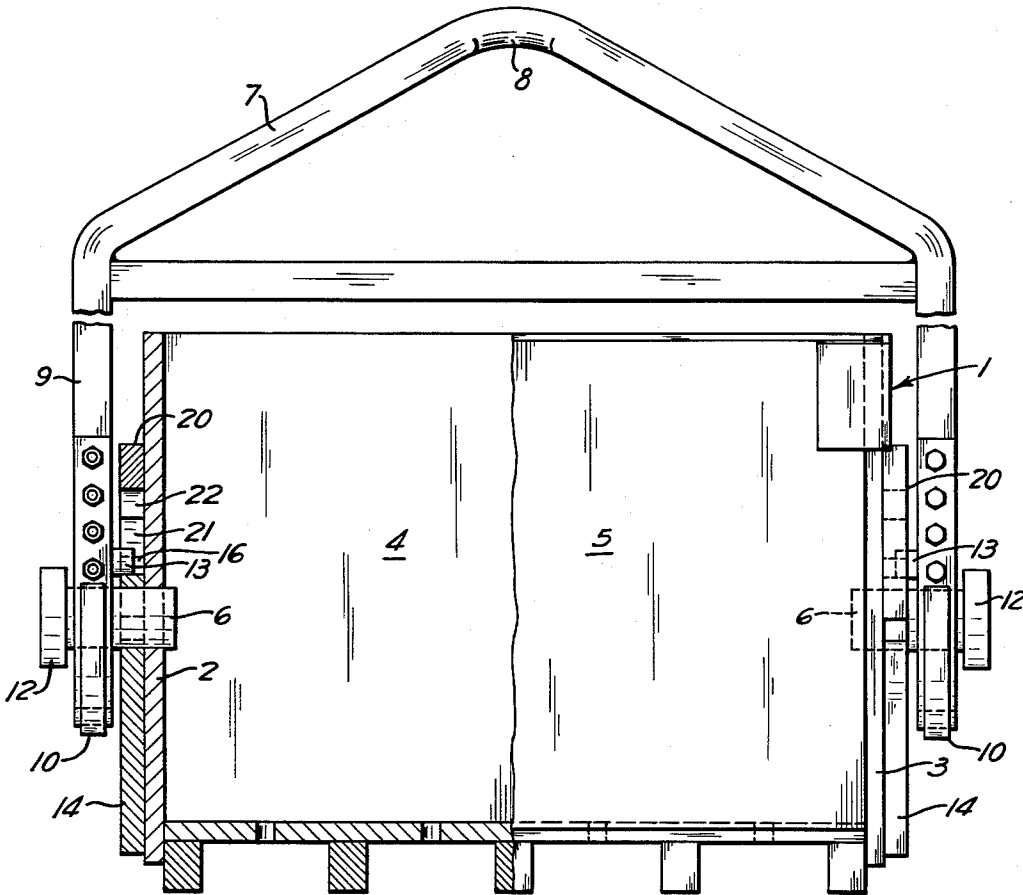


Fig. 3

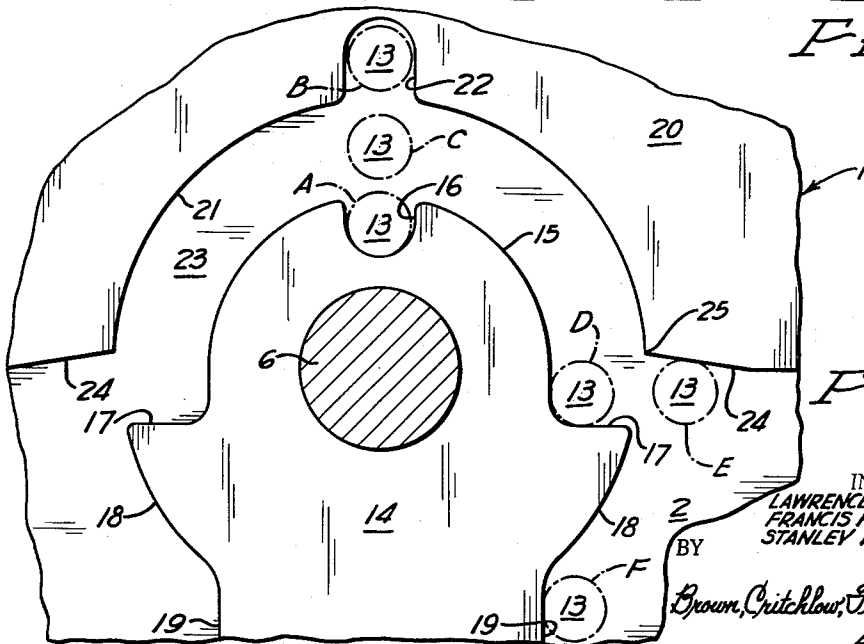


Fig. 5

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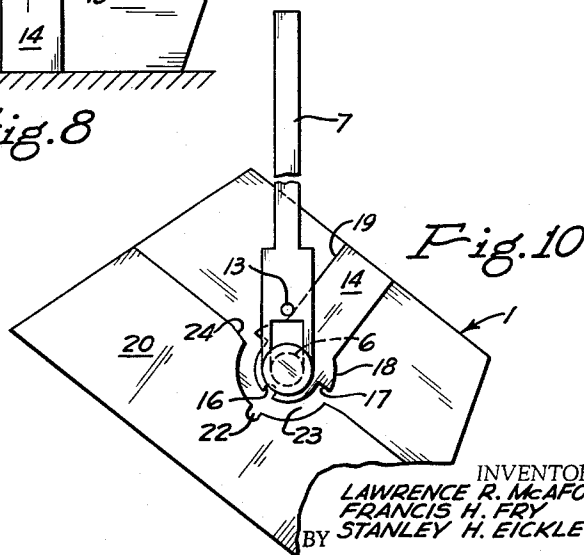
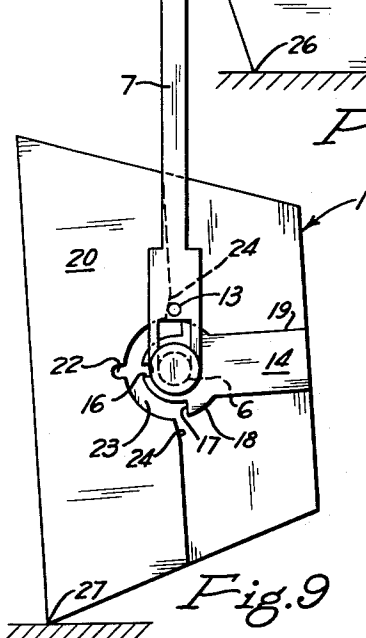
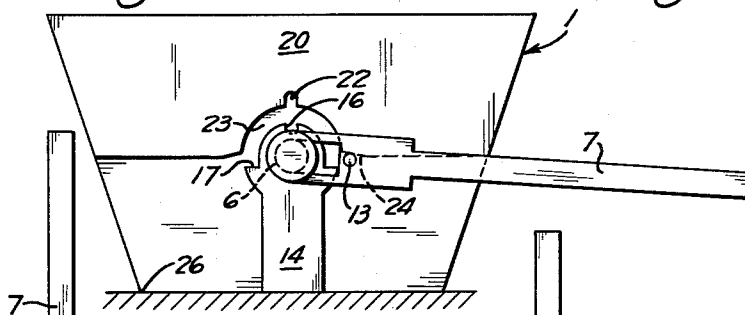
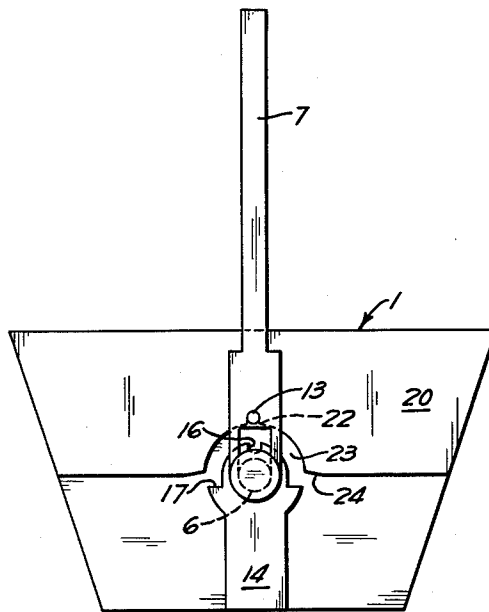
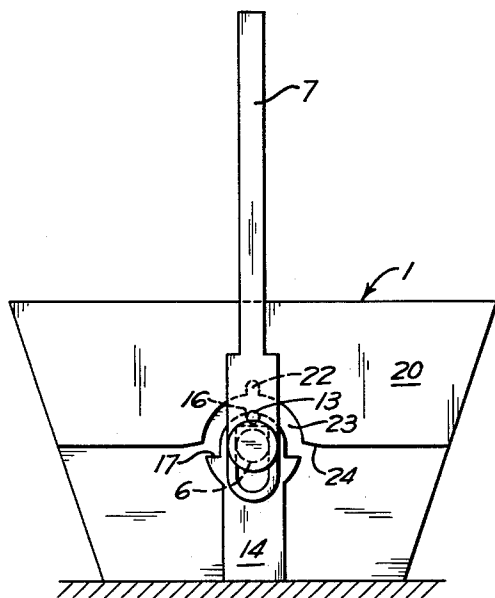
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3 Sheets-Sheet 3



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SAFETY DUMPING BUCKET

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9 Claims. (Cl. 294-73)

It is among the objects of this invention to provide a safety dumping bucket that can be used, for example, in a steel mill to transport cropped ends of billets or other heavy materials; that is provided with a bail for engagement with the hook of an overhead crane; and that can be transported, dumped, and returned to an upright position by manipulating the bail with the crane, including rotating and radially moving the bail about the trunnions on the bucket, without other mechanical or manual intervention. It is also an object of this invention to provide safety means by which the bail can be locked against rotation in a vertical position when the bucket is resting on the ground, as during loading, and that will also lock the bucket against rotational movement relative to the bail when the bail is lifted by the crane for transporting the bucket to another area of the plant.

Other objects of this invention will be apparent from the following description of a preferred embodiment, in connection with the attached drawings, in which

FIG. 1 is a side elevation of the dumping bucket of this invention;

FIG. 2 is a fragmentary view, partly in section, of this bucket;

FIG. 3 is a front elevation of the same, partly in section;

FIG. 4 is an enlarged detail of one of the trunnions and the adjacent end of the bail;

FIG. 5 is an enlarged detail of the retaining means on the bucket adjacent one of the trunnions; and

FIGS. 6 through 10 are diagrammatical representations of the various relative positions of bail and bucket in loading, transporting, and dumping the bucket.

The safety dumping bucket of this invention includes a bucket having two opposed side walls, on each of which is mounted an outwardly extending trunnion in axial alignment with the other trunnion. The trunnions are slidably and rotatably received within slots extending along the sides of a generally U-shaped bail. The slots are located at the ends of the bail and permit the bail to be rotated about and to have limited radial movement relative to the trunnions. As a result, the bail can occupy various positions as determined by the location of the trunnions in the slots. In a first position, the trunnions are adjacent the upper ends of the slots, as when the bucket is on the ground with the bail upright and unsupported by the crane. In a second position, the trunnions are at the lower ends of the slots, as when the bucket is lifted off the ground by the hook of a crane engaging the upright bail. In a third position, the trunnions are intermediate the ends of the slots. The means for preventing undesired rotation between bail and bucket, which include means for dumping the bucket, comprise a pin mounted on at least one side of the bail adjacent the slot on that side and pin retaining or engaging means mounted on the bucket. A first pin retaining means is adapted to engage the pin when the bail is upright and in its first position, as hereinabove defined, for locking the bail against rotation about the trunnions. A second pin retaining means is adapted to engage the pin when the bail is upright and in its second position, and its function is also to lock the bail against rotation about the trunnions. When the bail is in its third position, however, it is free

to rotate about the trunnions. After the bail has been rotated in this third position through a predetermined arc, the bail is shifted to its second position (as by the crane drawing the bail radially about the trunnions), permitting the pin to pass under and engage a shoulder on the bucket that prevents counter-rotation of the bail about the trunnions. If the bail is now lifted by the crane, the bucket will be dumped.

Referring to the drawings, a bucket 1 is provided with two opposed side walls 2 and 3, and inclined end walls 4 and 5. A trunnion 6 is rigidly mounted on each side wall 2 and 3. These trunnions extend outwardly and are in axial alignment with each other. A bail 7, of generally inverted U-shape, is provided with a hook-engaging apex 8. The lower end of each side portion 9 of the bail is slotted to receive one of the trunnions. Such an arrangement may be conveniently provided by securing to the lower ends of the bail U-shaped straps 10, part of which extend below the bottom ends of the bail to provide elongated slots 11 for slidably and rotatably receiving the trunnions. These trunnions are provided with end caps 12 to retain the bail thereon.

Preferably, each side portion 9 of the bail is provided with a heavy pin 13, which extends inwardly towards the bucket and is preferably mounted on the bail just above the slot 11. Each pin is adapted to engage retaining and guide means mounted on the adjacent side of the bucket for locking the bail against rotation relative to the bucket, thereby to render the bucket and bail safe while being loaded and transported and to permit dumping the bucket by manipulating the bail alone. These retaining and guide means may conveniently be formed from plate members that are welded or otherwise secured to the outside of the bucket. For example, a plate member 14 is mounted on the bucket surrounding each trunnion and its outer edge is contoured as shown in FIG. 5. This contoured edge includes an approximately semicircular convex portion 15 that is concentric with trunnion 6 and provided with a notch 16 directly above the trunnion for receiving the pin, 13, laterally extending shoulder or stop portions 17, inwardly and downwardly curved portions 18, and lower straight vertical portions 19. A second plate member 20 is mounted on each side of the bucket, adjacent but spaced from plate 14. This second plate also acts as a retaining or locking means and, in cooperation with the first plate, as a guide means for pin 13. The lower edge of this second plate is its functional edge and is contoured as shown in FIG. 5 to include a generally semicircular concave portion 21 that is concentric with the adjacent trunnion and is spaced from edge 15 of plate 14 by a distance substantially greater than the diameter of pin 13. It will be apparent from FIG. 5 that the two plates 14 and 20 with their opposed arcuate edges 15 and 21 provide an arcuate passage 23 for guiding pin 13 when the bail is rotated in its third position about the trunnions. At the highest point of the curved edge 21, directly above trunnion 6, plate 20 is provided with a notch 22 similar and opposite to notch 16 in plate 14. At the ends of its approximately semicircular curved portion 21, the bottom edge of plate 20 extends laterally and includes a tapered portion 24, extending outwardly and slightly downward. It should be noted that the corner 25 at the junction of edge portions 21 and 24 is located above shoulder 17 by a distance substantially greater than the diameter of pin 13 to permit the pin to move readily from a position in which it rests on shoulder 17 to a position in which it will engage the underside of edge 24.

The function and operation of the bail during the loading and dumping of the bucket are as follows. When the bucket is standing on the ground, it is generally most convenient to have the bail in an upright position, pro-

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vided it is securely locked against rotation so that it will not fall to either side and possibly injure a workman. In this position, as compared to those in which the bail is horizontal or in which its outer end is resting on the ground, the bucket is accessible from all sides and can be filled with croppings, scrap, or whatever else is to be loaded into it. At the same time, the bail stands ready to be lifted by an overhead crane. In this first position of the bail, the trunnions are adjacent the upper ends of slots 11. When the bail is upright in this position, pins 13 are received in notches 16 in the edge of plate member 14, as indicated by position A of pin 13 in FIG. 5. The bail is otherwise unsupported and held in locked position by its own weight (see FIG. 6).

When the bucket is to be moved, the hook of an overhead crane (not shown) engages the apex 8 of the bail, and the bail is lifted straight up until pins 13 engage slots 22 in plate member 20 as indicated by position B of pin 13 in FIG. 5. In this second position of the bail, the trunnions are adjacent the lower ends of slots 11 and are supported by straps 10 (see FIG. 7). It will be apparent that, so long as the bail is upright and in its second position, the bucket can be lifted off the ground and transported to some other place, with the bucket locked against rotation relative to the bail, so that, even if the bucket is unevenly loaded, there will be no danger of it tipping and dumping its contents prematurely.

When the bucket has reached the dumping area, it is lowered to the ground by the crane; and the bail is dropped slightly below its second position, but not so low as to occupy its first position. In this intermediate or third position of the bail, the trunnions are intermediate the ends of slots 11 and pins 13 are in the passages or grooves 23, as indicated by position C of pins 13 in FIG. 5, permitting the bail to be rotated about the trunnions by moving the overhead crane to one side or the other. The bail is preferably freely rotatable in either direction through an arc of approximately 90 degrees from the vertical until pins 13 engage shoulders 17 on plate 14, as indicated by position D of pin 13 in FIG. 5. The bail will then be supported in a substantially horizontal position, and continued tension on the bail to the right by the overhead crane will shift the bail from its third to its second position (where the trunnions are adjacent the lower ends of slots 11). With the outer end of the bail supported by the crane, pins 13 will be beneath shoulders 24, as indicated by position E of pin 13 in FIG. 5 and by FIG. 8. If the apex of the bail is now lifted by the crane, bail and bucket will turn together in a counter-clockwise direction (looking at FIG. 8) about the left-hand bottom edge 26 of the bucket, which can still rest on the ground. As the bail is lifted still higher and assumes a vertical position, shown in FIG. 9, the upper edge 27 of the bucket will be in contact with the ground and most of the bucket's contents will have been dumped. The bucket can be further inverted, if desired, by moving the crane to the left and lowering the bucket slightly until it assumes the position shown in FIG. 10, in which pins 13 will engage the straight edges 19 of plate 14, as indicated by position F of pin 13 in FIG. 5. The bail and bucket may then be returned to their initial upright positions by reversing the procedures described above.

It is among the advantages of this invention that the dumping bucket is always safe during the loading and transporting of the bucket. In each case, the danger is that the bucket will rotate relative to the bail; and, in each case, that danger is prevented by simple and sure means. An important feature of the invention is that those means are characterized by the absence of any moving parts. A further advantage is that the contents of the bucket can be dumped by manipulating the bail with an overhead crane, without the intervention of any other mechanical or manual means. This is a great convenience, since it permits the crane operator alone to

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handle the bucket. A still further advantage is that plates 14 and 20, which form the guide and retaining means for pins 13, also function as reinforcing plates that strengthen the structure of the bucket in the areas covered by the plates (see FIG. 1).

According to the provisions of patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described herein.

We claim:

1. A safety dumping bucket comprising a bucket member having two opposed side walls, a trunnion mounted on each side wall and extending outwardly therefrom in axial alignment with the other trunnion, a bail member of generally inverted U-shape having a slot adjacent each of its ends for receiving the trunnions to permit the bail to be rotated and to have limited radial movement relative to the trunnions, the bail being adapted to occupy various positions as determined by the disposition of the trunnions in the slots, including a first position in which the trunnions are adjacent the upper ends of the slots, a second position in which the trunnions are adjacent the lower ends of the slots and a third position in which the trunnions are intermediate the ends of the slots, a pin mounted on one of said members and extending towards the other member, first retaining means on the other member adapted to engage the pin when bucket and bail are upright and the bail is in its first position for locking the bail against rotation about the trunnions, second retaining means on the other member adapted to engage the pin when bucket and bail are upright and the bail is in its second position for locking the bail against rotation about the trunnions, the bail being free to rotate about the trunnions through a predetermined arc when the bail is in its third position, and shoulder means mounted on the other member and adapted to engage the pin after the bail has been rotated in its third position through a predetermined arc from its upright attitude and has then been shifted at the end of said arcuate movement to its second position, said shoulder means locking the bail against rotation that would return it to its upright attitude, thereby permitting the bucket to be dumped by lifting the bail.

2. A safety dumping bucket according to claim 1, in which the first retaining means includes a first plate member having an arcuate edge portion concentric with the adjacent trunnion for receiving the pin when bail and bucket are upright and the bail is in its first position.

3. A safety dumping bucket according to claim 2, in which the first plate member is mounted on the bucket and its arcuate edge portion is convex, and in which the pin is mounted on the bail above the slot therein.

4. A safety dumping bucket according to claim 2, in which the second retaining means includes a second plate member having a second arcuate edge portion concentric with the adjacent trunnion and opposed to but spaced from the first arcuate edge portion of the first plate member by a distance greater than the diameter of the pin, the second arcuate edge portion being provided with a notch opening towards and directly opposed to the notch on the first plate member for receiving the pin when bail and bucket are upright and the bail is in its second position, the opposed arcuate edges of the two plate members defining an arcuate passage through which the pin can move when the bail is rotated in its third position about the trunnions.

5. A safety dumping bucket according to claim 4, in which the second plate member is mounted on the bucket and its arcuate edge portion is concave and in which the pin is mounted on the bail above the slot therein.

6. A safety dumping bucket comprising a bucket having two opposed side walls, a trunnion mounted on each

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wall and extending outwardly therefrom in axial alignment with the other trunnion, a bail member of generally inverted U-shape having a slot adjacent each of its ends for receiving the trunnions to permit the bail to be rotated and to have limited radial movement relative to the trunnions, a pin mounted on one of said members adjacent a trunnion and extending towards the other member, retaining and guiding means mounted on the other member for engaging the pin and locking the bail in certain positions against rotation about the trunnions and for manipulating the bail to dump the bucket, said means including rigid and opposed edge means defining an arcuate passage of predetermined length that is concentric with said trunnion and through which the pin is adapted to pass when the bail is rotated about the trunnions, one edge that defines this passage being provided with a notch for receiving the pin when bail and bucket are upright and the bucket is supporting the weight of the bail, the other edge of the passage being provided with a second notch opposed to the first notch for receiving the pin when bail and bucket are upright and the bail is supporting the weight of the bucket, each notch when engaged by the pin preventing rotation of the bail relative to the bucket, one of said edge means also defining a shoulder that extends generally radially of the trunnion for engaging the pin when the bail has been turned from its vertical position through a substantial arc relative to the bucket and has then been shifted radially outward of the trun-

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nion, the shoulder preventing rotation of the bail relative to the bucket in a direction that would return it to a vertical position, thereby permitting the bucket to be dumped by lifting the bail.

7. A safety dumping bucket according to claim 6 that also includes a second shoulder defined by the second of said edge means and extending radially of the trunnion opposite an end of the passage and opposed to but radially inward of the first shoulder for engaging the pin and supporting the bail when the bail is at a substantial angle to the vertical.

8. A safety dumping bucket according to claim 6 that also includes stop means in the form of a shoulder extending radially of the trunnion and opposed to the first shoulder for engaging the pin and limiting further rotation of the bail about the trunnions.

9. A safety dumping bucket according to claim 6, in which the pin is mounted on the bail adjacent the slot therein.

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