F. H. WILLIAMS.

CRANE HOOK GRAB BUCKET.

APPLICATION FILED DEC. 8, 1919.

1,400,922.

Patented Dec. 20, 1921.

4 SHEETS—SHEET 1.

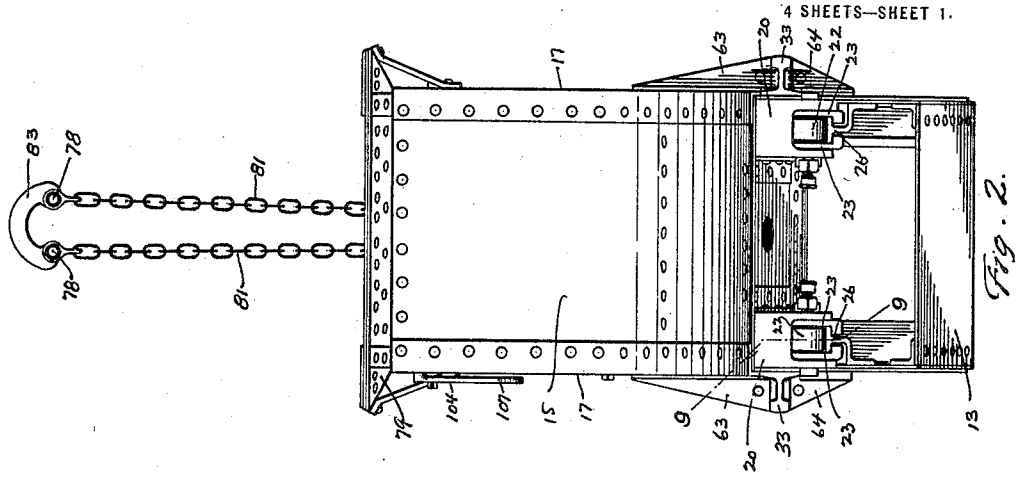


Fig. 2.

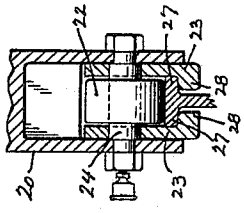


Fig. 10.

Fig. 1.

Fig. 9.

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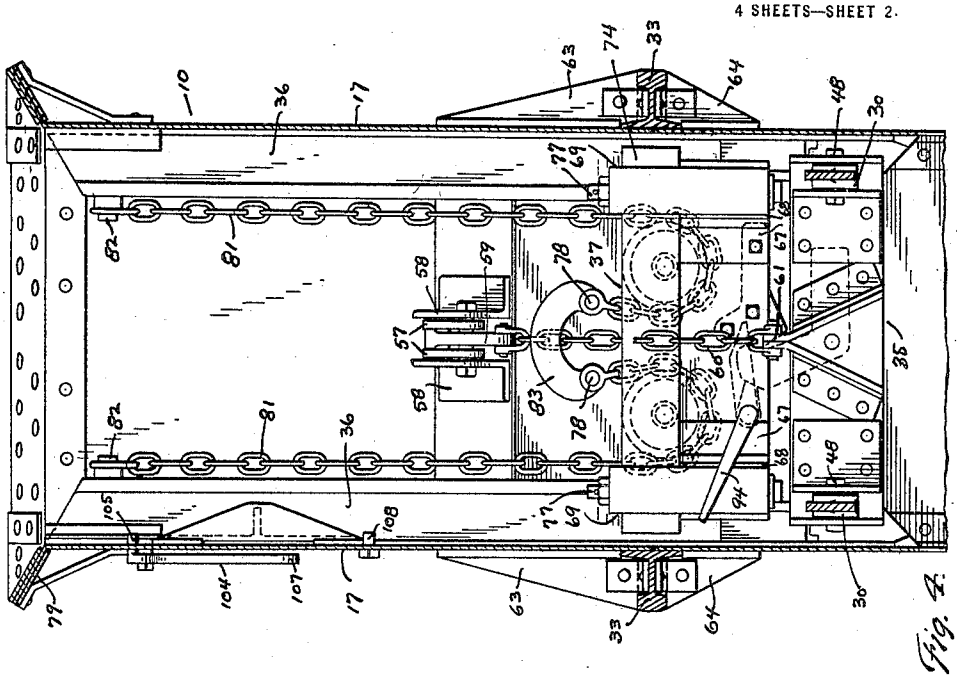


Fig. 2.

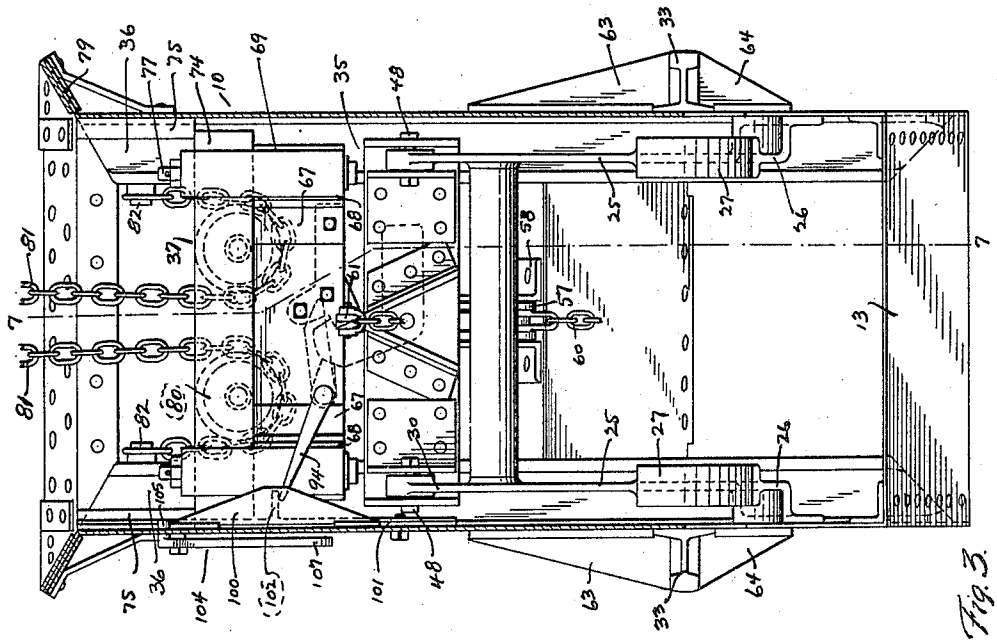


Fig. 3.

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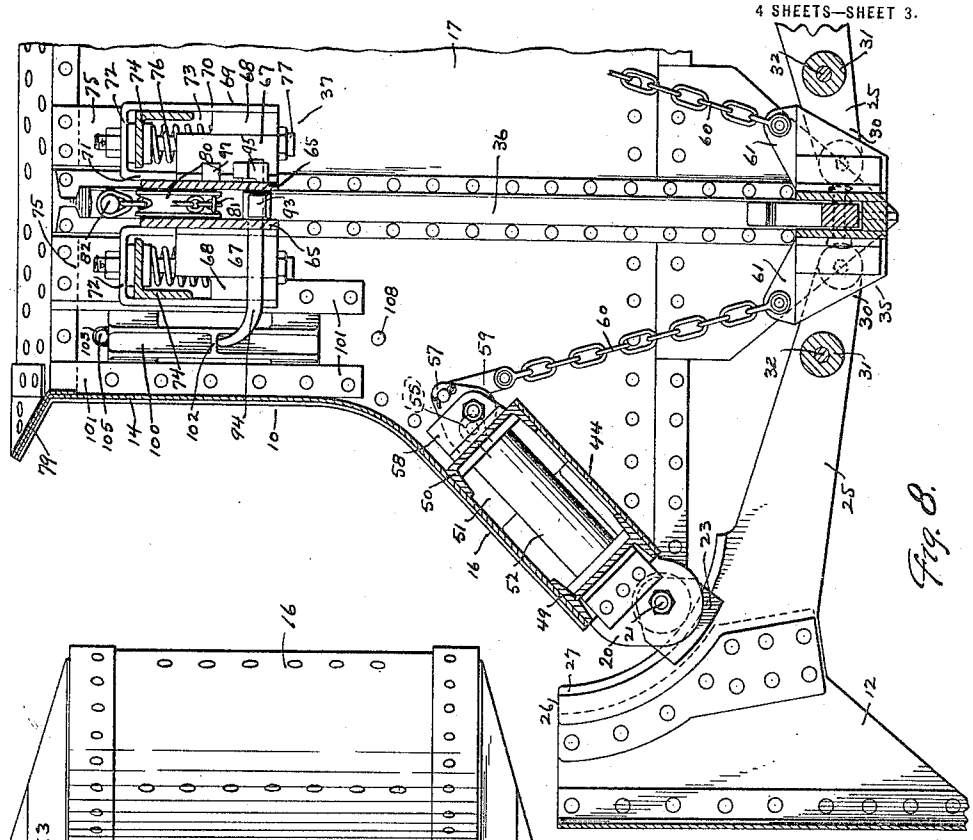


Fig. 8.

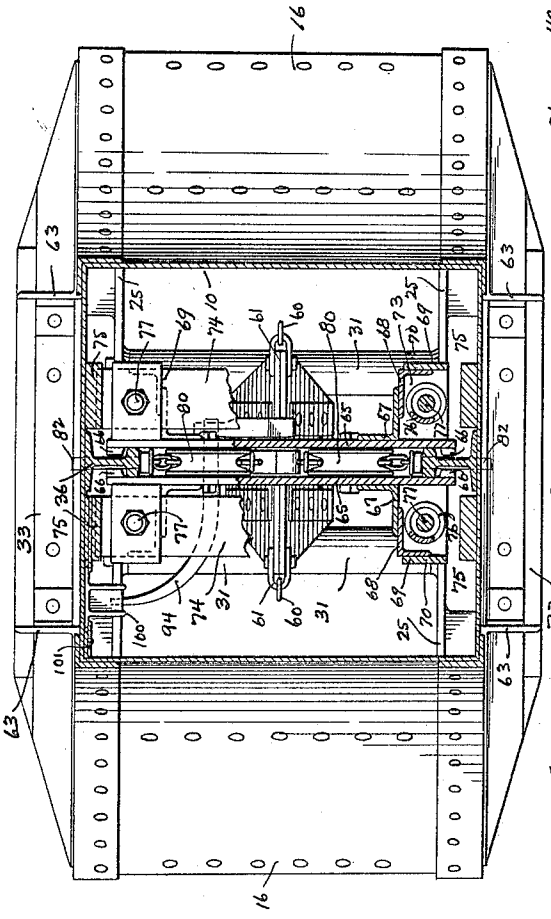


Fig. 5.

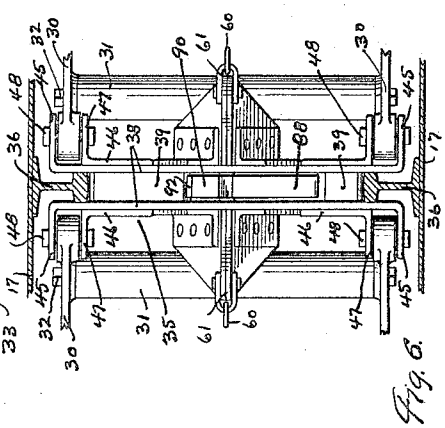


Fig. 6.

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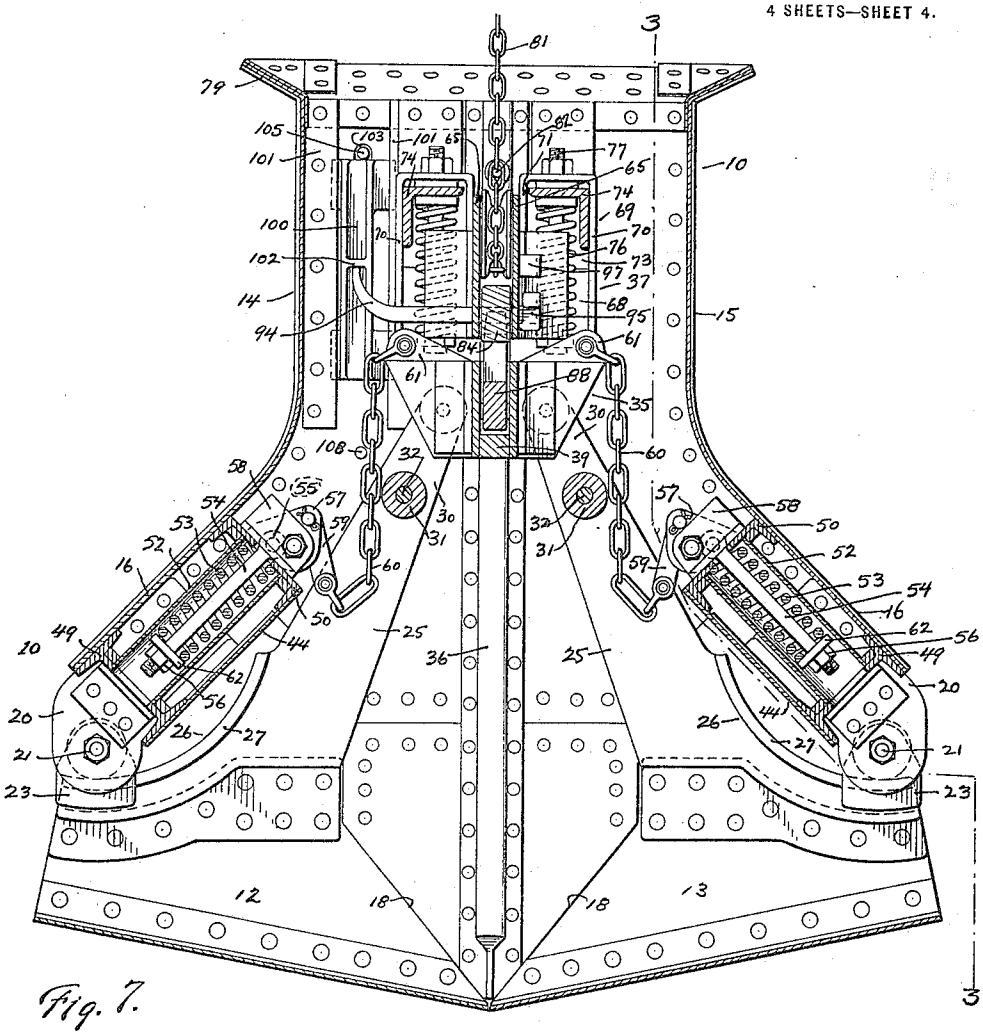


Fig. 7.

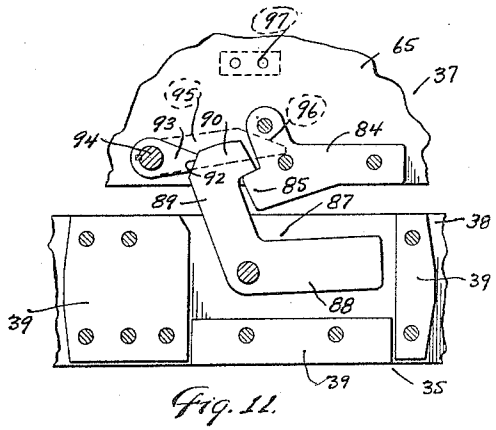


Fig. 11.

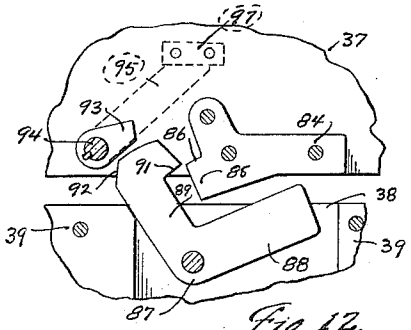


Fig. 12.

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UNITED STATES PATENT OFFICE.

FRANK H. WILLIAMS, OF BUFFALO, NEW YORK.

CRANE-HOOK GRAB-BUCKET.

1,400,922. Specification of Letters Patent. Patented Dec. 20, 1921.

Application filed December 8, 1919. Serial No. 343,305.

To all whom it may concern:

Be it known that I, FRANK H. WILLIAMS, a citizen of the United States of America, and a resident of the city of Buffalo, county of Erie, and State of New York, have invented certain new and useful Improvements in Crane-Hook Grab-Buckets, of which the following is a full, clear, and exact description.

The principal objects of my invention have been to provide a bucket which may be operated from the hook of any crane or other hoisting device without any additional connection with the hoist mechanism of the crane or device; to provide a bucket of compact design having minimum head room or distance between the bottom of the bucket and the hook of the operating crane; and to provide a bucket having both automatic and hand tripping means for opening the bucket.

Another object has been to provide a bucket so designed that the hand tripping means will be ineffective except when the bucket is closed or near its closed position. If the bucket segments are held open by any large objects they will be set against hand tripping and thus the bucket will be protected from severe shocks.

A further object has been to provide spring stops for the bucket when it is being closed and also for the segments when they reach the limit of their open positions, thus absorbing the shock incident to the opening and closing of the bucket.

The segments of my bucket are arranged to have rolling contact with the body of the bucket, when the bucket is digging, thereby greatly reducing the friction and consequently the power required to operate the bucket.

My bucket is provided with a funnel-shaped top so as to permit the easy and sure ingress of the hoist block. The bucket has very few projecting parts to catch on objects adjacent to which it may be operated, suitable deflecting means being provided to efficiently ward off shocks to the horizontal projecting, reinforcing members of the body.

The above objects and advantages have been accomplished by the device shown in the accompanying drawings, of which:

Figure 1 is a side elevation of my bucket in its closed position.

Fig. 2 is a front elevation thereof.

Fig. 3 is an enlarged, sectional elevation of the bucket in its closed position and is taken on line 3—3 of Fig. 7.

Fig. 4 is a similar view, with the bucket segments open and the cross-heads in their lowermost positions, taken on line 4—4 of Fig. 1.

Fig. 5 is a plan view of the bucket in its closed position with portions broken away, showing the lower cross-head.

Fig. 6 is a fragmentary, plan view, showing the lower cross-head.

Fig. 7 is an enlarged, sectional elevation taken on line 7—7 of Fig. 3, showing the bucket in its closed position.

Fig. 8 is a fragmentary view, similar to Fig. 7, but with the one bucket segment shown in its open position and with the upper cross-head in its uppermost position.

Fig. 9 is an enlarged, fragmentary, sectional view showing the rolling support for each bucket segment, taken on line 9—9 of Fig. 2.

Fig. 10 is a fragmentary, sectional view taken on line 10—10 of Fig. 7.

Fig. 11 is an enlarged view of the tripping mechanism with the parts in engaged positions.

Fig. 12 is a similar view, showing the parts in their disengaged positions.

My bucket comprises a body 10 and bucket segments 12 and 13. The upper part of the body is preferably of rectangular shape and the sides 14 and 15 thereof are provided with flared lower portions 16, whereby the proper spread for the segments is provided for. The sides 17 of the body project downwardly in between the cutaway vertical edges 18 of the bucket segments, so as to completely close the lower part of the bucket when the segments are in their closed positions. By providing the cutaway edges at the working side of the segments, great digging efficiency is obtained. 33 are horizontal reinforcing members which extend across each of the sides 17 of the bucket and terminate at the flaring ends 16. These members stiffen the bucket body across its greatest span, and, deflecting members 63 and 64 are provided on opposite sides of the reinforcing members so as to prevent them from catching or striking objects adjacent to which the bucket is operated.

To each corner of the flared lower portions 16 of the body is secured a hinge member 20. A hinge pin 21 passes through each

of these members and has pivotally mounted thereon a roller 22 and a hanger member 23 at each side of the roller. A bearing sleeve 24 is preferably arranged around the pin and passes through the roller and hangers. To each of the bucket segments is secured a closing arm 25 provided with a T-shaped track 26 having projecting flanges 27 for engagement with the roller 22 and the hangers 23. The track portion of the closing arm is preferably curved so as to impart the proper motion to the bucket segment. The hangers 23 are each provided with an inwardly projecting lip 28, and these lips engage with the under side of the track flanges 27 and thereby support the bucket segments. The hangers are also provided with inwardly projecting lugs 29, which engage with the upper surface of the track 26 and act as scrapers to keep the track clean. The upper end 30 of each of these closing arms is pivotally connected with the lower cross-head 35 of my device. 31 are separators which are placed between the closing arms 25 of the bucket segments, near their upper ends. These separators are held in position by a bolt 32 and are of such a weight as to insure the full opening of the bucket segments when the lower cross-head is moving to its lowermost position.

36 are cross-head guides, one of each of which is secured to each inner face of the sides 17 of the bucket body. These guides are preferably made of standard rail sections and are arranged vertically, extending from the top of the body to the bottom of the portions of the sides 17 which extend between the cutaway portions of the bucket segments. The lower cross-head 35 and the upper cross-head 37 are slidably mounted upon the guides 36.

The lower cross-head, shown in Fig. 6 comprises two plates 38, one arranged on each side of the guides 36, and having suitable separators 39 arranged between them. The outer ends 45 of each of these plates are bent outwardly at right angles, and an angle plate 46 is arranged with its outwardly extending leg 47 in parallel relation with each of the ends 45 of the plate 38. Each adjacent leg 47 and end 45 are perforated and a pivot pin or bolt 48 is passed through the registering apertures, thus providing pivotal connections for the upper ends 30 of the closing arms 25.

So as to cushion the shock of the lower cross-head and to stop the same in its downward movement, I provide a spring stop or a shock absorber at each side of the bucket. Extending across and secured to each flared end 16 of the bucket body are preferably an I-beam 49, and a channel iron 50, spaced at some distance from each other and connected by a plate 44. Thus a recess 51 is formed in which punchings or other suitable material may be placed to increase the weight of the bucket. This arrangement provides a very stiff body and a suitable support for the spring stops or shock absorbers. For convenience, I will describe but one of these spring stops and its connected parts. Each of the spring stops preferably comprises a cylinder 52, suitably held between the I-beam 49 and channel iron 50, and having a spring 53 arranged centrally within the cylinder. A bolt 54, having an eye 55, passes through the channel iron and the center of the spring 53 and has a washer 62 and nut 56 secured to its lower end, which, when adjusted, bear against the lower end of the spring. A bell-crank lever 57 is pivotally mounted on the upper face of each of the channel irons by means of the angle plates 58. The eye 55 of the bolt 54 is pivotally secured to one end of this bell-crank lever, and a link 59 is secured to the outer end thereof. A chain 60 is secured at one end to the outer end of the link 59 and at the other end to a connection 61, secured to the lower cross-head and formed preferably as shown in Figs. 4, 5 and 6. It will be obvious that the chains 60 are of such a length that the springs 53 will be placed under compression when the lower cross-head has reached the lower limit of its predetermined travel.

The upper cross-head 37 (see Figs. 5, 7 and 8) comprises two plates 65, disposed in parallel relation and suitably secured together with interposed separators (not shown), whereby the plates are held at a predetermined distance from each other. These plates engage with the guides 36 and their outer ends extend beyond the heads of the tracks. A guide lug 66 is secured on the inner faces of each of the extended ends, and these lugs engage with the under sides of the heads of each of the guides, whereby the cross-head is held centrally during its travel. Two angle-irons 67 and 68, arranged in Z-shaped relation, are secured near each end of each of the plates 65. A plate 69, of substantially inverted U-shape is secured at its side 70 to the outer leg of each of the angles 68. The side 71 of each of these plates is arranged adjacent and secured to the plates 65, with the top 72 of each disposed over the pocket 73 formed by the angle-iron structure just described. An angle-iron stop member 74 is arranged at each side of the cross-head and within the two inverted U-shaped plates 69 secured to each of the cross-head plates 65. Each of these stop members is thus arranged in the upper ends of the pockets 73 and their ends are extended so as to engage with the stops 75 carried by the side plates 17 of the body. The stops 75 are so positioned that the angle-iron stop members 74 will engage therewith when the segments of the bucket have

reached their closed positions. The angles 68 are cut away as shown in Fig. 8, so as to permit the stop members 74 to have a slight vertical motion with respect to the inverted U-shaped plate 69. Mounted within each of the pockets 73 is a helical spring 76 having its upper end engaging with the end of the angle-iron stop member 74. 77 is a bolt passing up through each of the springs 76, the end of the stop member 74 and top 72 of the plate 69, where it is provided with a suitable nut. The head of each of the bolts engages with the bottom of each of the springs 76, whereby the springs are held under compression within the pockets 73 and serve to press the stop member 74 upwardly. When the upper cross-head is moved to its uppermost position, as in lifting the bucket when dumped or when tripping the bucket, the impact of the angle-iron stop member 74, as it strikes the steps 75 will be taken by the springs 76 and thus absorb the shock. Rotatably mounted between the plates 65 of the upper cross-head are chain sheaves 80. A hoisting chain 81 is passed beneath each of the sheaves 80 and has one end secured to the upper end of one of the tracks 36 by means of a pin 82. The other end of the chain passes upwardly and is attached to a hoist yoke 83. This yoke is of curved shape, having its radius preferably struck from a center in a plane which passes through the center of the pivot pins 78 securing the upper ends of the chains 81 to the yoke. This insures an even pull on the chains, no matter what position the crane hook may assume relative to the hoist yoke 83. The upper end 79 of the body 10 is made flaring or funnel-shaped, so as to stiffen the body 10 of the bucket and also provide a guide to facilitate the entrance into the body of the bucket of the hoist yoke 83 and the hook of the operating crane when the upper cross-head is being lowered.

My bucket is provided with suitable latching means for connecting the upper and lower cross-heads and comprises: a hoist hanger 84, secured centrally between and near the lower edges of the plates 65 of the upper cross-head. This hanger is provided with an arm 85, having an inclined shoulder 86. A hoist hook 87 is pivotally mounted between the plates 38 of the lower cross-head and in registering position with the hoist hanger 84. This hoist hook has a weighted arm 88 and an upwardly extending arm 89, having a hook 90 formed at its upper end. The hook 90 has a surface 91 which assumes substantially the same inclination as the shoulder 86, when these surfaces are in engagement. The weighted arm 88 keeps the hook 90 normally in engagement with the shoulder 86. A surface 92 is provided on the rear side of the hook 90 and a trip dog 93 is engageable with this surface. The trip dog is rigidly mounted upon a trip lever 94, rotatably carried by the upper cross-head. A counterweight 95, rigidly mounted upon the trip lever 94, keeps the trip dog 93 normally in an engageable position with the surface 92. The angle, between the surface of the shoulder 86 and a horizontal plane, is slightly greater than the angle of repose of the engaging surfaces; and when the trip dog 93 is in engagement with the surface 92 of the hoist hook, the surfaces 91 and 86 will be kept in locking engagement. The outer end of the counterweight 95 is provided with an angular surface 96, which is engageable with a stop 97, carried by one of the plates 65 of the upper cross-head, whereby the rotation of the trip lever 94 is limited.

100 is a trip weight which is slidably mounted within suitable ways 101, carried by one of the plates 17 of the body (see Figs. 5, 7 and 8). The body of this weight is preferably U-shape in cross-section and provided with a central partition or wall 102. The outer end of the trip lever 94 is curved as shown in these figures and is arranged to engage with the wall 102 of the trip weight. This trip weight is so proportioned that it is not heavy enough to disengage the trip dog 93 from the surface 92 while the chains 81 are carrying the closing or hoisting load, but is sufficiently heavy to trip the device when the bucket is rested upon the material and the chains are relieved from this load. A slot 103 is arranged through one of the walls 17 and adjacent the upper end of the trip weight when the same is in its uppermost position. 104 is a hand trip lever, which is pivotally attached to the side plate 17 having the slot and is provided with an inwardly extending lug 105. This lug is engageable with the upper surface of the trip weight 100 whereby the same is moved downwardly when the hand trip rope 106, attached to the arm 107 of the hand trip lever is pulled. A stop pin 108 is carried by the side 17 of the bucket and in the path of travel of the trip weight 100.

When my bucket is to be opened from the position shown in Fig. 7, the hand trip rope 106 is pulled which will move the trip weight 100 downwardly and thus disengage the trip dog 93 from the surface 92. As hereinbefore stated the angle between the horizontal plane and each of the engaging surfaces 91 and 86 being slightly greater than the angle of repose, the weight of the lower cross-head and adjacent parts will be sufficient to disengage the hook 90 from the shoulder 86 and thereby allow the lower cross-head to fall to its lowermost position and thus open the bucket segments 12 and

13. As the lower cross-head is reaching its lowermost position the chains 60 will exert a pull upon the bell-crank levers 57 and thus compress the springs 53 and absorb the shock of the falling parts. The bucket is now lowered upon the material which it is to handle; and, after the weight of the bucket has been taken by the material, a further lowering of the hoist hook 83 will allow the upper cross-head 37 to move downwardly to a position where it will meet the lower cross-head 35. As the upper cross-head moves downwardly the trip weight 100 will also be allowed to fall until its lower edge engages with the stop pin 108. After the trip weight 100 has reached the stop pin 108, the trip lever 94 will be disengaged from the weight, and the counterweight 95, carried by the trip lever, will move the trip dog 93 to the position shown in Fig. 11. As the upper cross-head reaches the lower end of its travel, the hook 90 will slide past the arm 85 of the hoist hanger 84, and will become engaged with the shoulder 86 of the hoist hanger when it is opposite the shoulder. During this movement the trip dog 93 will be raised and will fall into engagement with the surface 92 when the hook 90 has engaged with the surface 86 and prevent the hook from becoming disengaged from the shoulder until released by the trip weight 100 or the action of the trip lever 104. The hoist yoke 83 is now drawn upwardly which will move both cross-heads upwardly upon the guides 36 until the bucket segments 12 and 13 have reached their closed positions. During the upward movement of the cross-heads, the curved end of the trip will again engage with the trip weight 100 and carry it upwardly to the position shown in Fig. 7. As hereinbefore stated, the weight of this trip weight 100 is not sufficient to disengage the trip dog 93 from the surface 92 when there is a pull between the cross-heads.

If desired, the bucket may now be tripped by hand by pulling on the hand trip rope 106. This will move the trip weight 100 downwardly and perform the same functions as hereinbefore described, thus releasing the lower cross-head as hereinbefore described. However, my bucket is designed to be automatically tripped, and it is preferably lowered to the surface where its contents are to be emptied and its weight taken by this surface. When it is so rested the pull between the cross-heads is released and this allows the trip weight 100 to disengage the trip dog 93 from the surface 92, so that when the bucket is again elevated the latch hook 90 will disengage itself from the shoulder 86 and allow the lower cross-head to fall downwardly and dump the contents of the bucket.

It sometimes happens that large stones or boulders become lodged between the edges of the bucket segments, thus preventing the segments from fully closing. If the bucket is tripped when in this position, the upper cross-head will necessarily move upwardly through a considerable distance before reaching the stops 75 and the bucket and its load will consequently fall through twice this distance before opening begins, thereby producing a serious shock upon the entire bucket and hoisting means. It is obvious that the greater this distance, the greater will be the shock. When the bucket is incompletely closed by lump material between the edges of the segments, the bucket cannot be hand tripped due to the upper cross-head being below the limit of movement of the hand tripping means. When in this position the bucket will be automatically tripped by means for the counterweight 100, when it is lowered, so that its weight is taken by the material being handled, as hereinbefore described, thus allowing the upper cross-head to move slowly up to its stops 75 without producing any excessive shock to the bucket. The limited movement of the lug 105 of the trip arm 104 limits the height of the upper cross-head at which hand tripping may be performed and consequently limits the shock on the stops to an amount which may be taken care of by means of shock absorbing parts of practical size.

It should be understood that a slot formed in each of the closing arms may be advantageously used in place of the track 26 and substantially the same results obtained, and that, likewise, other forms of slidable connection secured to the segments may be used, but the form herein shown and described is the preferred form. Instead of the weight 100, I may use any other suitable means, such as a door arranged in the side of the body for maintaining a constant pressure on the trip lever which is sufficient to trip the means connecting the cross-heads when the tension between them is released. These and other modifications of the details herein shown and described may be made without departing from the spirit of my invention or the scope of the appended claims; and I do not therefore wish to be limited to the exact embodiment herein shown and described, the form hereinbefore described being merely a preferred embodiment thereof.

Having thus described my invention, what I claim is:

1. A grab bucket comprising a body, bucket segments, tracks carried by each bucket segment, and bucket segment supporting means carried by the lower corners of the body for slidable engagement with the tracks of the segments.

2. A grab bucket comprising a body, bucket segments, curved tracks carried by each bucket segment, and means carried by the lower corners of the body for slidable engagement with the tracks of the segments.

3. A grab bucket comprising a body, an upper, movable cross-head, a lower, movable cross-head, means for engaging the cross-heads, bucket segments, each provided with closing arms pivotally connected to the lower cross-head, tracks carried by each bucket segment, and bucket segment supporting means carried by the body for slidable engagement with the tracks of the segments.

4. A grab bucket comprising a body, an upper, movable cross-head, a lower, movable cross-head, means for engaging the cross-heads, bucket segments, each provided with closing arms pivotally connected to the lower cross-head, curved tracks carried by each bucket segment, and bucket segment supporting means carried by the body for slidable engagement with the tracks of the segments.

5. A grab bucket comprising a body, bucket segments, tracks carried by each bucket segment, and segment hangers pivotally carried by the body and engageable with the tracks of the segments.

6. A grab bucket comprising a body, bucket segments, tracks carried by each bucket segment, and a roller carried by the body for engagement with each of the tracks.

7. A grab bucket comprising a body, bucket segments, tracks carried by each bucket segment, segment hangers pivotally carried by the body and engageable with the tracks of the segments, and a roller carried by the body for engagement with each of the tracks.

8. A grab bucket comprising a body, an upper cross-head, a lower cross-head, means for engaging the cross-heads, bucket segments, each provided with closing arms pivotally connected to the lower cross-head, tracks secured to each bucket segment, hangers pivotally carried by the body and engageable with the tracks of the segments, and a roller carried by the body for each of the tracks.

9. A grab bucket comprising a body, guides carried by the body, a cross-head slidably mounted on the guides, bucket segments pivotally united to the cross-head and slidably supported by the body, and stops carried by the body, said stops being connected with the cross-head for limiting the downward movement of the cross-head.

10. A grab bucket comprising a body, guides carried by the body, a cross-head slidably mounted on the guides, bucket segments pivotally united to the cross-head and slidably supported by the body, and spring stops carried by the body, said stops being connected with the cross-head for limiting the downward movement of the cross-head.

11. A grab bucket comprising a body, guides carried by the body, a cross-head slidably mounted on the guides, bucket segments pivotally united to the cross-head and slidably supported by the body, stops carried by the body, and flexible connections between the stops and the cross-head for limiting the downward movement of the cross-head.

12. A grab bucket comprising a body, guides carried by the body, a cross-head slidably mounted on the guides, bucket segments pivotally united to the cross-head and slidably supported by the body, resilient stops carried by the body and flexible connections between the stops and the cross-head for limiting the downward movement of the cross-head.

13. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted on the guides, means for connecting the cross-heads, bucket segments pivotally united to the lower cross-head and slidably supported by the body, and resilient stops carried by the body, said stops being connected with the lower cross-head for limiting the downward movement of the lower cross-head.

14. A grab bucket comprising a body, bucket segments having their adjacent side edges cut away and sloping back from the vertical center-line of the bucket, the body being provided with downwardly projecting portions, filling the spaces between the cut away adjacent edges of the segments, tracks carried by each bucket segment, and means carried by the body for slidable engagement with the tracks of the segments.

15. A grab bucket comprising a body, guides carried by the body, a cross-head slidably mounted on the guides, bucket segments pivotally united to the cross-head and slidably supported by the body, and straight girder connections between the outer, lower corners of the body.

16. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted on the guides, means connecting the cross-heads, and bucket segments pivotally united to the lower cross-head and slidably supported by the body, the body being centrally open, whereby the hook of the tackle can be lowered to the lowermost position of the upper cross-head.

17. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted on the guides, means connecting the cross-heads, and bucket segments pivotally united to the lower cross-head and

slidably supported by the body, the body being formed with a funnel shaped top, whereby the body structure is strengthened and the tackle hook guided into the interior of the body.

18. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted on the guides, bucket segments, latching means for connecting the cross-heads, comprising a hoist hanger, a hoist hook engageable with the hanger, the hanger and the hook having engaging surfaces so inclined that they will separate under tension, and means for maintaining these surfaces in engagement.

19. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted on the guides, bucket segments, latching means for connecting the cross-heads, comprising a hoist hanger, a hoist hook engageable with the hanger, a trip dog engageable with the hook for holding it in its engaged position, and pressure means carried by the body for moving the trip dog out of engagement with the hoist hook when the tension between the cross-heads is released.

20. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted on the guides, bucket segments, latching means for connecting the cross-heads, comprising a hoist hanger, a hoist hook engageable with the hanger, a trip lever, a trip dog carried by the trip lever and engageable with the hook for holding it in its engaged position, and pressure means engageable with the trip lever for moving the trip dog out of engagement with the hoist hook when the tension between the cross-heads is released.

21. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted on the guides, bucket segments, latching means for connecting the cross-heads, comprising a hoist hanger, a hoist hook engageable with the hanger, a trip dog engageable with the hook for holding it in its engaged position, and means carried by the body for maintaining a constant pressure on the trip dog, whereby the latching means will be tripped when the tension between the cross-heads is released.

22. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted in the guides, bucket segments, latching means for connecting the cross-heads, and manually actuated tripping means, engageable with the latching means and comprising pressure means carried by the body, a hand trip lever pivotally mounted on the body and engageable with the pressure means when such means are in their upper position, whereby the bucket may be manually tripped only when the segments are near their closed positions.

23. A grab bucket comprising a body, guides carried by the body, an upper cross-head, a lower cross-head, each slidably mounted on the guides, bucket segments, latching means for connecting the cross-heads, comprising a hoist hanger, a hoist hook engageable with the hanger, a trip dog engageable with the hook for holding it in its engaged position, pressure means carried by the body for moving the trip dog out of engagement with the hoist hook when the tension between the cross-heads is released, and manually operated means for actuating the latching means.

In testimony whereof, I have hereunto signed my name.

FRANK H. WILLIAMS.