Oct. 26, 1937. R. S. WEIMER 2,096,773

DRAG BUCKET

Filed May 27, 1935 4 Sheets-Sheet 1

Fig. 1

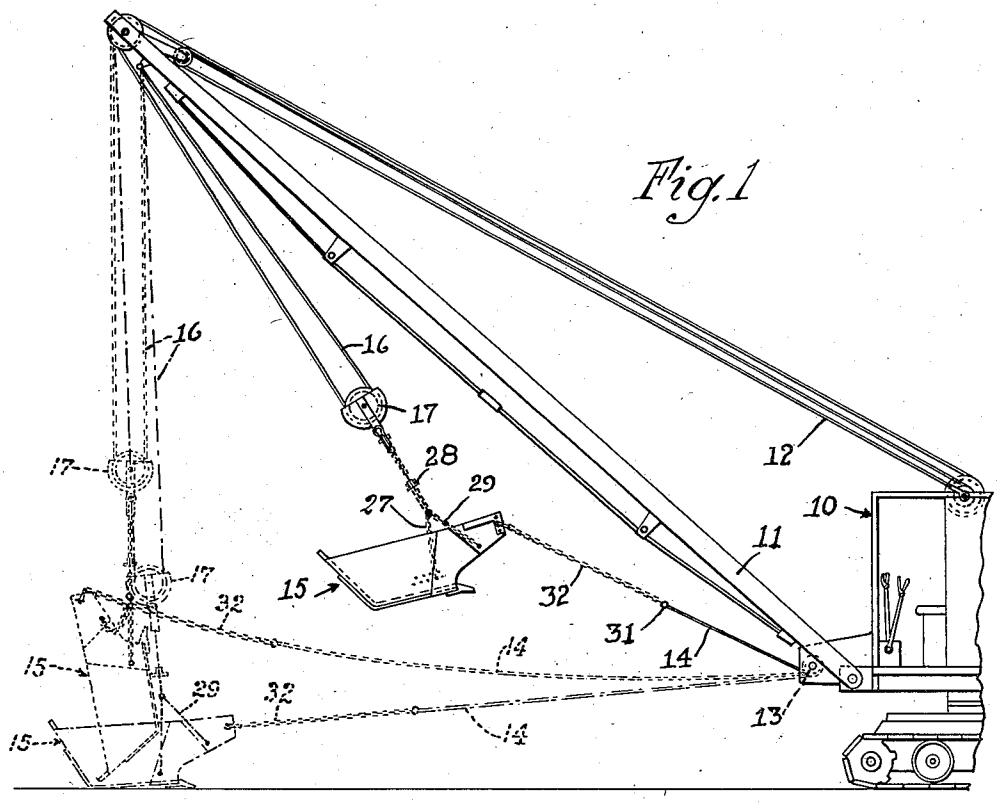
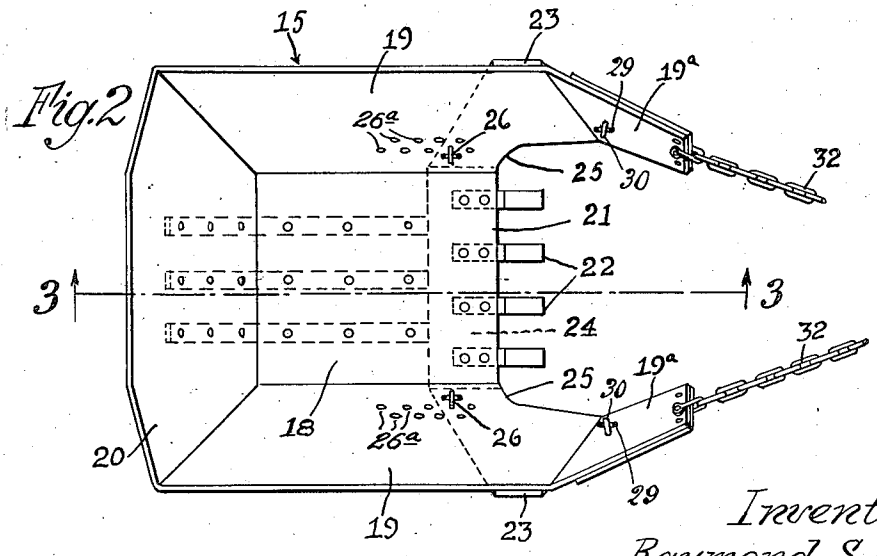


Fig. 2



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DRAG BUCKET

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Fig. 3

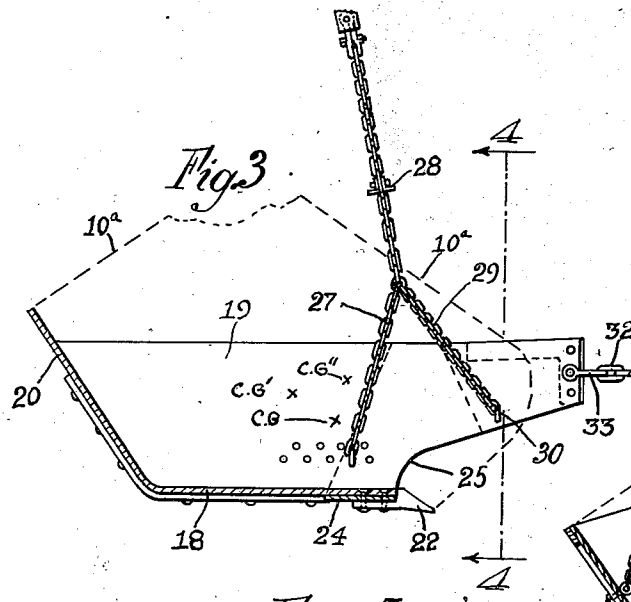


Fig. 4

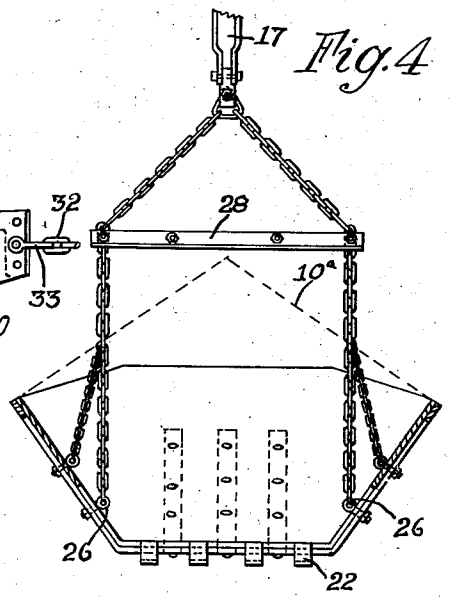


Fig. 5

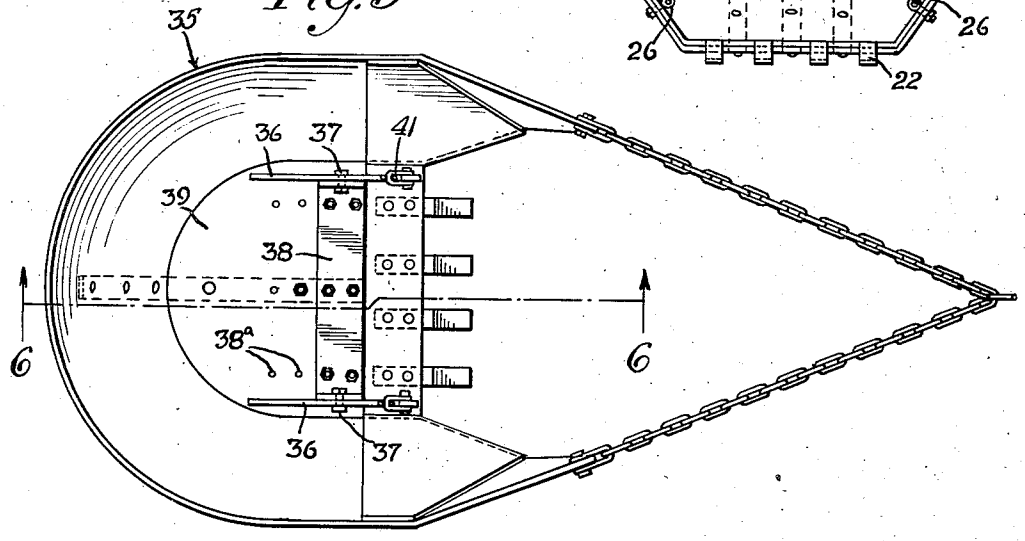
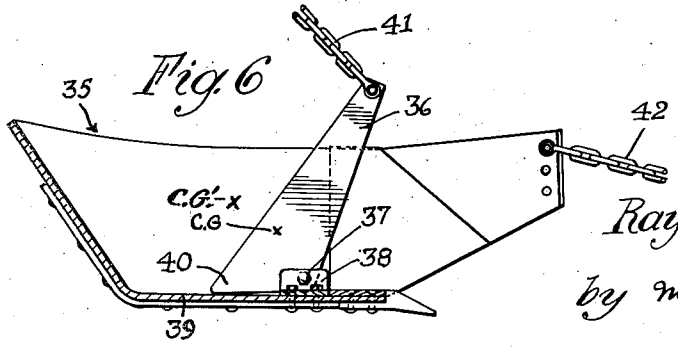


Fig. 6



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DRAG BUCKET

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Fig. 7

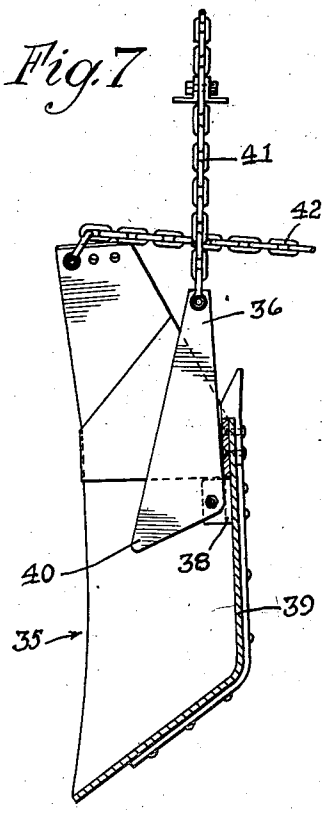


Fig. 9

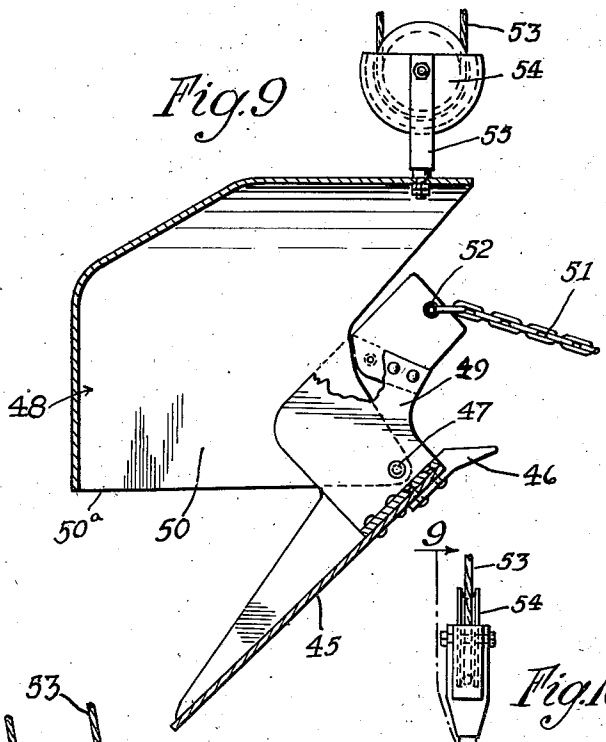
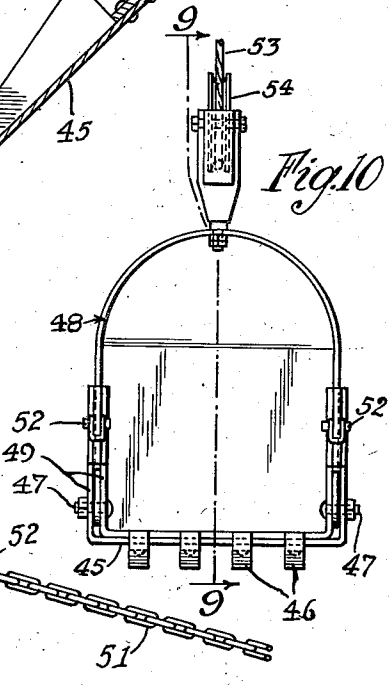


Fig. 10



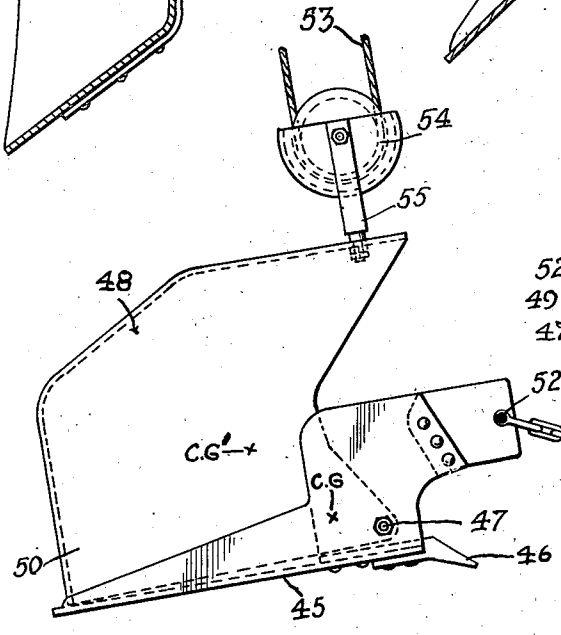


Fig. 8

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Fig. 11

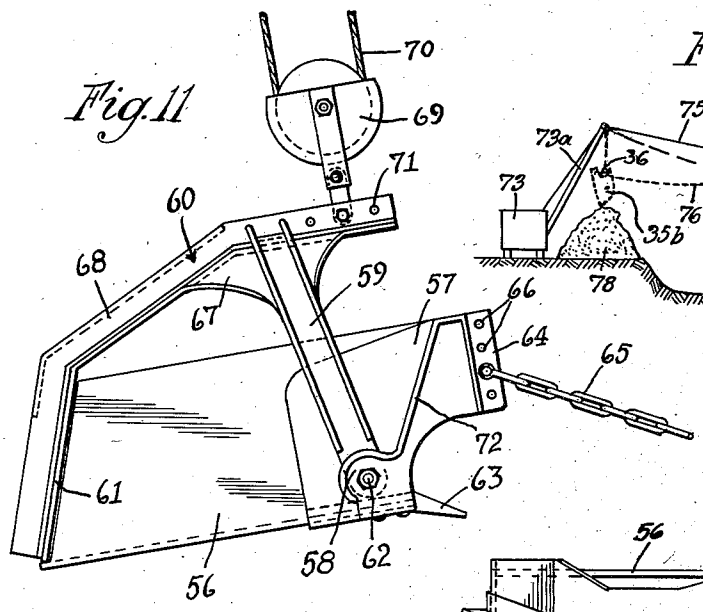


Fig. 14

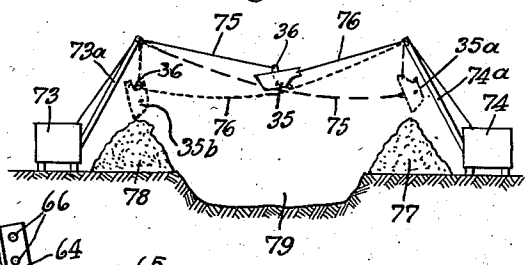


Fig. 12

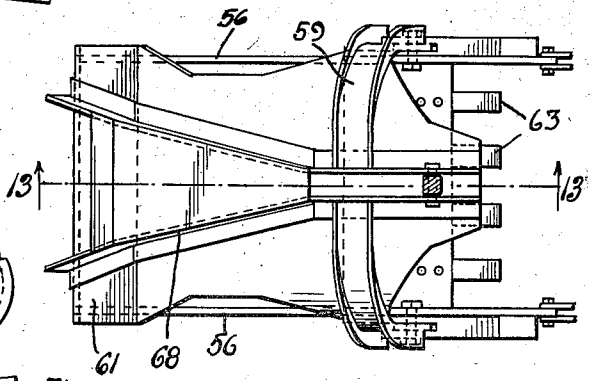
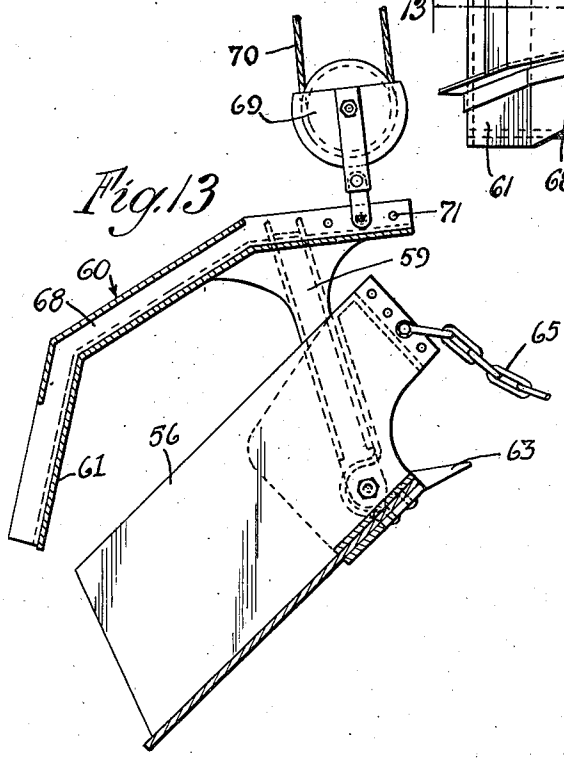


Fig. 13



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Patented Oct. 26, 1937

2,096,773

UNITED STATES PATENT OFFICE

2,096,773

DRAG BUCKET

Raymond Samuel Weimer, Wilmington, Ill.

Application May 27, 1935, Serial No. 23,618

10 Claims. (Cl. 37—135)

This invention relates to improvements in drag buckets.

One object of the invention is to provide a rearwardly dumping bucket which is held against dumping action during elevation and transportation to the point of discharge by tension applied thereto directly by the drag line, thereby eliminating the usual holding line and sheave arrangement of conventional drag line equipment.

In the use of conventional drag buckets the greater the load the greater must be the tension on the holding line to restrain dumping action of the bucket as it is elevated and moved to the point of discharge. The greater this tension on the holding line to restrain dumping, the more the bucket is drawn inwardly under the boom and hence the effective length of the boom is shortened. It is, therefore, a further object of the present invention to provide a bucket so supported that increase in the load in the forward portion of the bucket tends to stabilize it and necessitates less tension on the drag line to prevent tilting whereby the bucket can be elevated under or nearly under the point of the boom and quite or nearly the full length of the boom can be utilized in dumping the bucket at points more remote from the machine with less manipulation of the cables and with greater dispatch between loads.

A further object of certain forms of the invention is to provide a bucket having flaring walls which increase the load carrying capacity of the bucket without increasing its weight and which, because of such shape, offers greater resistance to deformation of the side walls, fills more readily due to lesser side friction, and carries greater proportionate heaped or overloads than the conventional buckets having vertical side walls and of the same rated capacity.

By flaring the walls of the bucket outwardly, its capacity is increased without increasing the height of the walls or increasing the width of the base and the cutting lip, and since a narrower cutting lip will dig more readily into hard materials under a given drag line tension, the improved bucket can be filled with greater facility than a conventional bucket under such unfavorable excavating conditions.

Since the improved bucket fills from the front and dumps from the rear, the material passes interruptedly through the bucket from front to rear and scours the bucket more effectively than a conventional bucket which both fills and dumps from the front. The flaring side walls, which offer less resistance to the filling action, also offer less resistance to the discharge of the material therefrom and hence the bucket dumps cleaner, especially with moist, clayey materials, than the conventional vertical walled buckets.

It is well known that as earthy materials are cut out or scooped from their original compact position, the particles thereof are loosened and consequently swell and occupy greater cubic space. This increase in volume generally is from fifteen to thirty percent of the original volume depending on the nature and condition of the material. As the cutting lip of the improved bucket breaks the material loose from its original position and moves under it, the material can swell outwardly and upwardly with less resistance from the side walls due to their inclination. The flow friction of the material is thus reduced and the bucket fills more readily than vertical walled buckets.

Other objects relate to various features of construction and arrangement of parts which will be apparent from a consideration of the following specification and accompanying drawings, wherein:

Figure 1 is a broken elevation of drag line apparatus embodying the present improvements.

Figure 2 is a top plan view of one form of the improved drag bucket.

Figure 3 is a vertical section taken on line 3—3 of Figure 2.

Figure 4 is a section taken on line 4—4 of Figure 3.

Figure 5 is a top plan view of a modified form of bucket.

Figure 6 is a sectional view taken on line 6—6 of Figure 5.

Figure 7 is a view similar to Figure 6, but showing the bucket in discharging position.

Figure 8 is a side elevation of a further modified form of the invention.

Figure 9 is a vertical sectional view taken on line 9—9 of Figure 10, but showing the bucket in discharging position.

Figure 10 is a front elevation of the bucket in closed position.

Figure 11 is a side elevation of another form of rearwardly dumping bucket.

Figure 12 is a top plan view thereof.

Figure 13 is a sectional view taken on line 13—13 Figure 12, but illustrating the bucket in dumping position.

Figure 14 illustrates diagrammatically another excavating apparatus employing the improved bucket.

In the drawings 10 indicates generally a con-

ventional swinging power derrick having a boom 11 raised and lowered by means of cables 12. A windlass 13 of any approved form operates a drag line 14. One form of the improved bucket, indicated generally by the numeral 15, is shown carried by the conventional hoist line 16 which operates over a sheave 17 in the usual manner.

The bucket 15 is shown as provided with a bottom 18, side walls 19 and a rear wall 20. These walls are shown as flaring outwardly at an angle of approximately 35 degrees from the vertical, which disposes them at right angles to the angle of repose of the surface of a heaped load, indicated by dotted lines 10a in Figures 3 and 4. This angularity of the side and rear walls is preferred for general use for reasons hereinafter mentioned, but as will be seen, such angularity is not essential to the attainment of certain advantages of the present improvements since a bucket having vertical side and rear walls may be employed, if desired.

The excavating lip 21 of the bucket is shown as provided with a number of teeth 22. The side walls 19 extend forwardly of the teeth as shown and have the forward portions 19a thereof turned inwardly into near parallelism with the line of force exerted thereon by the drag line 14 as shown in Figure 2.

Plates 23 and 24 are secured to the walls 19 and bottom 18 by welding at the edges and by intermediate rivets to stiffen the structure and take the wear at the excavating edge of the bucket. The lower edges of the forward portions of the side walls 19 are shown as being curved at 25 and constitute the cutting edges of the bucket side walls.

Secured to the walls 19 of the bucket are eye-bolts 26 to which the hoist members, such as chains 27, are attached. The hoist chains are held apart by a spreader bar 28 as shown in Figure 4, and at their upper ends are connected to the sheave 17 of the hoist cable 16.

Stop members 29 are attached at their lower ends to forward portions of the respective side walls 19 by means of eye-bolts 30 and at their upper ends to the hoist members 27, as illustrated.

The eyes 26 constitute the pivot members around which the bucket swings to and from dumping position. These pivot points are located below and slightly forward of the center of gravity of the empty bucket whereby the bucket tends to tilt rearwardly from the position shown in Figure 3. The center of gravity of the empty bucket is at approximately the point marked C. G. in said figure. The drag line 14 is branched at 31, each branch 32 being attached to one of the forward ends of the side walls as by means of a clevis 33 or the like. When tension is applied to the drag line 14 the tendency is to swing the bucket clockwise, as viewed in Figures 1 and 3, about the pivot points or eyes 26. The stop members 29 limit this clockwise movement of the bucket when it has reached the load carrying position shown in Figure 3.

The center of gravity of the illustrated bucket when normally loaded is to the rear of a vertical plane passing through the pivot points 26, for example, at point C. G.', and hence upon releasing the drag line the loaded bucket automatically tilts rearwardly to dump the load. As shown, the bucket preferably is provided with additional holes 26a for the eye-bolts 26 whereby the pivotal axis of the bucket can be shifted rearwardly of the point C. G. whereby the empty bucket will tend to remain in substantially horizontal position when tension on the drag line is released.

Due to the inclined side walls of the bucket in the modification illustrated, it can carry heaped loads which extend forwardly beyond the teeth 22. In loose, dry soils the bucket would not carry such loads, but in excavating clayey or other heavy or moist soils the bucket will carry a heaped load, the forward portion of which extends beyond the excavating lip of the bucket, since the inclined side walls 19 will sustain the forward portion of the load.

It will be seen that increasing the load in the forward portion of the bucket may result in the center of gravity of the loaded bucket being moved forwardly from the position C. G.' to possibly the position C. G.'' or even farther to the right as viewed in Figure 3.

As the center of gravity moves from point C. G.' toward the vertical plane of the pivot points 26, less tension on the drag line 14 will be required to retain the loaded bucket in substantially horizontal or load carrying position. Hence it will be apparent that a bucket loaded to the maximum may be picked up by the hoist line 16 approximately under the point of the boom as suggested by dash lines in Figure 1, since little or no tension on the drag line will be required to retain the bucket against dumping action. The tendency of such a forwardly placed load is to tend to tilt the bucket forwardly, but such movement will, of course, be limited by the stop members 29. These members also function to limit the forward tilting of the bucket when the drag line 14 is taken in by the windlass 13 to stabilize a normal load having its center of gravity to the rear of the pivot points 26.

In the event the center of gravity of the loaded bucket is positioned forwardly of a vertical plane passing through the points 26, the bucket will not be self dumping, in which case it will be necessary for the operator to dump it by a jerk on the drag line to shift the load rearwardly or by bumping it against the spoil pile, or load receiving vehicle, for example.

Where inclined walls are employed it is, of course, more satisfactory to attach the chains 27 and stop members 29 to the interior of the bucket. If vertical walls are employed, as in conventional buckets, the members 27 and 29 can be attached to the outside, if desired.

By inclining the walls, however, as described, additional advantages are obtained. As the teeth of the improved buckets, or any bucket for that matter, are drawn into the earth by the drag line, the soil is loosened not only directly above the teeth or excavating edge of the bucket, but also in an outwardly flaring angle. By inclining the sides of the bucket this loosened earth is scooped into the bucket and it is thus necessary to drag the bucket a shorter distance to obtain a load. The flow friction of the material with the side walls of the bucket is also reduced by virtue of their inclination which enables the initial portion of each load to flow more freely to the rear of the bucket whereby better distribution of the loads are attained.

Inclining the sides of the bucket from the vertical also strengthens the same against deformation from the stresses normally encountered in use. An additional advantage of the inclined walls is that the heaped-load capacity of the bucket is very substantially increased without increase in the weight of the bucket.

For example, if a bucket with vertical side and

rear walls has a normal level-load capacity of six cubic yards of loose earth or other granular material, it will carry a heaped load of approximately seven and one half yards of such material, the angle of repose of such material being about 55 degrees to the vertical. If the side and rear walls of such bucket are inclined 15 degrees to the vertical, it will carry a level load of slightly less than six and three fourths yards and a heaped load of approximately nine yards of the same material. If the walls should be further inclined to an angle of 35 degrees from the vertical, in which position the walls will be at an angle of 90 degrees to the angle of repose of the material, the bucket will carry a level load of slightly more than six and three fourths yards, and a heaped load of approximately eleven and one half yards. Inclining the walls to a greater extent reduces the heaped-load carrying capacity of the bucket. The maximum heaped load carrying capacity is attained by having the flared sides at a right angle to the angle of repose of heaped material. With loose earth materials this will position the side walls at approximately 35 degrees to the vertical, but where the nature of the material is such that the angle of repose is different from the example given, the walls may be given a compensating angle to enable the bucket to carry the greatest load.

The improved bucket having a wider mouth, due to the flaring side walls, loads more rapidly and it is not necessary to drag the bucket so great a distance to obtain a load, it being understood that operators frequently can swing the buckets beyond the point of the boom, or due to the nature of the terrain, the empty bucket may gravitate to positions beyond the end of the boom. Due to the fact that the greater the load the less is the tension required on the drag line to prevent rearward tipping of the bucket, it can be raised from the ground substantially under the point of the boom when loaded to the maximum and thus can be discharged at a point more remote from the machine, without unnecessarily elevating the load, than would be possible were it necessary to exert greater tension on the drag line to restrain dumping action and thus draw the bucket farther under the point of the boom. Not only can the improved bucket be operated with greater facility than a conventional forward dumping bucket, but it fills more readily and carries greater loads than a bucket having vertical walls but of the same rated capacity.

The form of the invention shown in Figures 5, 6 and 7 is similar in principle to that above described. The bucket is indicated generally by the numeral **35**, and preferably has inclined side and curved rear walls as shown in Figure 5. In this form of the bucket, however, the chains or flexible members **27** and **29** of the above described form have been eliminated and two combined hoisting and stop plates **36** substituted therefor. The plates are shown as being pivoted at **37** to the up-standing ends of a yoke **38** bolted to the bottom **39** of the bucket. These plates extend upwardly and to the right of the pivots **37** and also extend to the left of the pivots **37** as shown in Figure 6. The rear lower ends **40** of the plates contact with the bottom **39** of the bucket when the latter is in load carrying position.

The hoist lines **41** are attached to the upper ends of the plates **36** and the drag line **42** is attached to the forward ends of the side walls at points above the plane of the teeth. If the center of gravity of the unloaded bucket is at approximately the point marked C. G. in Figure 6, the tendency of the bucket will be to tilt counterclockwise to dumping position. Holes **38***a*, however, enable the yoke **38** to be moved rearwardly of the bucket, thus shifting its pivotal axis rearwardly for varying its tendency to tilt when empty or when carrying a normal or a heaped or abnormal load. Tension on the drag line **42** tends to swing the bucket clockwise about the pivots **37** until the bottom thereof contacts with the lower ends of the plates **36**. The plates thus constitute stops to limit the forward tilting of the bucket as do the stop chains **29** in the form above described. The chains **29**, however, are tension members while the plates **36** are compression members, the former extending to points forwardly of the pivotal axis and the latter to points at the rear thereof to restrain forward tilting of the bucket beyond load retaining position by tension exerted on the drag line for the purpose of stabilizing the bucket during elevation or transportation, or by a load the center of gravity of which is forward of the pivotal axis.

When the bucket has a normal load the center of gravity may, for example, be approximately at the point marked C. G.', that is, at a point in a vertical plane at the rear of the pivotal axis, and when the tension on the drag line **42** is released the bucket will, of course, tilt rearwardly to discharge the load.

By increasing the load in the forward portion of the bucket the center of gravity will move forwardly and may reach a point where the bucket tends to tilt forwardly. This tilting action is, however, restrained by the contact of the bottom **39** with the lower ends or stops **40** of the plates **36**. The bucket when so loaded can be elevated directly beneath the point of the boom, since no tension on the drag line will be required to hold it against tilting rearwardly. As will be seen, the pivotal axis of the bucket may be shifted rearwardly by changing the position of the yoke **38** as mentioned above whereby a normal load can be elevated under, or nearly under the point of the boom.

If the center of gravity of the loaded bucket is such that the bucket does not dump automatically when tension on the line **42** is released, it may be upset by swinging the bucket against the spoil pile or receiving container, or dumped by a jerk on the drag line which shifts the load rearwardly a distance sufficient to upset the bucket.

Normally, however, such excessive load would not be obtained in the usual operation of the bucket, but it will be appreciated that as the load approaches such maximum the tension on the drag line **42** which is necessary to hold the bucket in load carrying position during elevation and transporation to the point of discharge is reduced, and hence the elevation of the bucket closely under the point of the boom, as indicated by dash lines in Figure 1, instead of being drawn well under the boom, as indicated in full lines in said figure, is possible.

The bucket shown in Figures 8, 9 and 10 comprises a bottom **45** having digging teeth **46** at its forward edge or lip and is pivoted at **47** to a hood **48**. The bottom **45** is provided with double side walls **49** between which are disposed the side walls of the hood **48**. The pivots **47** pass through the double walls **49** and the side walls **50** of the hood in attaching the two members together.

The drag line **51** is attached to the pivoted bottom at a point **52** above and forwardly of the teeth

of the base as in the previously described embodiments of the invention.

The hoist line 53 passes around a sheave 54 which is secured by any suitable member 55 to the upper portion of the hood. When sufficient tension is applied on the drag line 51 with the bucket parts in the position shown in Figure 9, the bottom 45 will be moved into the hood closing position illustrated in Figures 8 and 10. When the bucket has been loaded by moving it through the soil by means of the drag line 51, it can be elevated by the hoist line 53 and held in closed position by maintaining proper tension on the drag line. The lower edges 50*a* of the side walls 50 of the hood constitute compression stop members which limit forward tilting of the base 45 beyond load sustaining position by tension exerted on the drag line or by a load which, due to its forwardly located center of gravity, tends to tilt the base forwardly.

With the center of gravity of the pivoted base at C. G. (see Figure 8) the bottom will swing to open position when tension on the drag line is released. If the center of gravity of a normally loaded bucket is at point C. G.', the load will be dumped automatically upon releasing tension on the drag line.

If a greater proportion of the load is carried farther forward in the bucket, the center of gravity of the load may be nearer the vertical plane of the pivots and hence less tension on the drag line will be required in retaining the base 45 in load sustaining position and the bucket can, therefore, be elevated more nearly under the point of the boom as in the previously described modifications of the invention.

An additional form of the improved bucket which has been found satisfactory in use is illustrated in Figures 11 to 13, inclusive. In this form of the invention the bucket has side walls 56 to the forward portions and to the bottom of which is attached a reinforcing member 57 having ears 58 spaced therefrom for accommodating the ends of the arms 59 which carry the hood 60, the rear portion 61 of which is arranged to close the open rear end of the bucket. The arms 59 are attached to the ears 58 by the pivot members 62.

The excavating teeth 63 are attached to the lip of the bucket and are positioned rearwardly of the forward ends 64 of the member 57 to which ends the drag line branches 65 are attached. A number of openings 66 are provided at the forward ends 64 for altering the points of attachment of the drag line for varying the depth of the cut of the bucket.

The hood 60 comprises a plate 67 which is reinforced by the beams or angle irons 68. The sheave 69, around which passes the hoist line 70, may be attached to the member 68 at any one of a series of openings 71. When tension is applied to the drag line 65 the bucket is swung clockwise about its pivot 62, as viewed in Figure 13, to move the bucket into the position shown in Figure 11.

When the bucket has been loaded in the usual manner sufficient tension is applied to the drag line to prevent counterclockwise movement of the bucket from the position illustrated in Figure 11 as the load is being elevated. It will thus be seen that the closure member 61 prevents loss of the load at the rear of the bucket during loading and transportation.

Upon releasing the drag line 65 the load will tilt the bucket to the discharging position shown in Figure 13. The side plates 57 may be provided with laterally extending ribs 72 which contact the adjacent edges of the arms 59 when the bucket has been swung counter-clockwise to the full discharging position shown in Figure 3.

Should the center of gravity of the load carried by the bucket be forwardly of a vertical plane passing through the pivotal axis of the bucket, the latter is restrained from tilting clockwise beyond load carrying position by the contact of the rear end of the bucket with the closure plate 61. The hood thus acts as a compression stop member to prevent forward tilting of the bucket beyond load carrying position when the load tends to tilt the bucket forwardly, as well as when the center of gravity of the load is to the rear of the pivotal axis and tension is applied to the drag line to retain the bucket in load carrying position as the bucket is being hoisted and transported to discharging position.

In each form of the buckets described, the material is discharged in a direction away from the machine, whereby the effective length of the boom is increased slightly as compared with buckets which dump toward the machine.

By flaring the walls of the buckets shown in Figures 1 to 7 inclusive, they fill more readily, thus requiring a shorter haul on the drag line, their carrying capacity is increased with no increase in weight of the bucket, and their ability to retain a greater proportion of the load at points forwardly of the pivotal supports is increased, which tends to stabilize the buckets, making it possible to elevate them under or nearly under the point of the boom and requiring less manipulation of the cables in elevating and discharging the buckets at points most remote from the machine.

While the improved bucket has been described in conjunction with conventional drag line equipment, it may be used also to advantage with the excavating apparatus illustrated diagrammatically in Figure 14. In this figure two boom supporting structures 73 and 74 are shown which are positioned on opposite sides of the area to be excavated. Over each boom 73*a* and 74*a* passes a line 75, 76 respectively, for attachment to one of the improved buckets. The form selected for illustration corresponds to the bucket 35 shown in Figures 5, 6 and 7. The line 75 is attached to the compression stop members 36*a* while the line 76 is attached to the forward end of the bucket. In other words, line 75 is the hoist line and 76 is the drag line.

The structures 73 and 74 are provided with cable windlasses, not shown, for hauling in the respective lines 75, 76. In the filling operation the cable 75 is slack and the bucket is hauled to the right by line 76 until the bucket is filled. The lines can then be tightened to elevate the bucket, and with both lines sufficiently taut, as shown in full lines, the bucket can be transported to a position adjacent the boom 74*a*.

Releasing the line 75 (as shown in dash lines) permits the bucket to swing and turn to the dumping position 35*a* shown in dotted lines at the right side of Figure 14, for discharging the load upon the spoil pile 77.

After the bucket has been loaded by hauling to the right, it may be elevated by applying tension to the lines as above described and by taking in line 75 and paying out line 76, the bucket can be moved to the left to a position adjacent the boom 73*a* whereupon releasing the line 76 (as suggested by the dotted line,) will cause the bucket to swing and tilt about its pivotal axis to the position 35*b* and discharge the load upon the spoil pile 78.

The mechanisms for taking in one line and paying out the other with sufficient tension thereon to retain the bucket in elevated position are well known and therefore are not shown.

Due to the fact that line **75** is attached to the stop members **36** at points above the point of attachment of the haul or drag line **76**, the tension on the two lines retains the bucket in load carrying position during transportation to either dumping position.

By the arrangement shown, the excavated material can be discharged on either of the two spoil piles on opposite sides of the excavation **79** without altering the position of the machines **73**, **74**. While line **76** is the haul line by means of which the bucket is loaded, the line **75**, which corresponds to the hoist line of the usual arrangement, is released to effect the dumping of the bucket upon the spoil pile **77**, while the haul line **76** is released to effect the discharge upon the spoil pile **78**, the bucket in each instance dumping from the rear.

By reversing the attachment of the two lines to the bucket, the line **75** will become the haul line and the bucket will fill when drawn to the left, the line **76** becoming the hoist line.

While I have shown and described certain embodiments of my improvements for the purpose of illustration, I do not wish to be restricted specifically thereto except as so limited by the appended claims.

I claim:

1. A rearwardly dumping bucket having pivotal supporting means located below and forwardly of the center of gravity of the normal load, said bucket being arranged for the attachment of a drag line to the forward end thereof at an elevation above the pivotal axis of the bucket whereby tension on said line resists rearward tilting of the bucket, and tension stop means resisting forward tilting of the bucket beyond load carrying position by said drag line or by a load the center of gravity of which is located forwardly of a vertical plane through the pivotal axis of the bucket.

2. A rearwardly dumping bucket having pivotal supporting means located below and forwardly of the center of gravity of the normal load, said bucket being arranged for the attachment of a drag line to the forward end thereof at an elevation above the pivotal axis of the bucket whereby tension on said line resists rearward tilting of the bucket, and compression stop means within the bucket and arranged to engage the base thereof for resisting forward tilting of the bucket beyond load carrying position by said drag line or by a load the center of gravity of which is located forwardly of a vertical plane through the pivotal axis of the bucket.

3. A rearwardly dumping bucket having a hoist line attaching means pivotally secured thereto at opposite points located below and forwardly of the center of gravity of a normal load whereby the bucket tends to tilt rearwardly to dumping position, a drag line attached to the forward end of the bucket at points above the pivotal axis thereof whereby tension exerted on said line resists rearward tilting movement of the bucket to dumping position, and stop members connected to said hoist means and to forward portions of the bucket for limiting forward tilting action of said bucket by said drag line at load sustaining position.

4. A rearwardly dumping bucket provided with side and rear walls, a hoist line attaching means pivotally secured to the interior of the bucket on an axis disposed below and forwardly of the center of gravity of a normal load whereby the load tends to tilt the bucket into position for discharge over said rear wall, means for attaching a haul line to said bucket at points disposed forwardly of and above said pivotal axis whereby tension can be exerted on said line to restrain rearward tilting of the bucket and stop members engaging said hoist line attaching means inwardly of said side walls and engaging portions of the bucket remote from said pivotal axis to restrain forward tilting action of the bucket beyond load carrying position.

5. A rearwardly dumping bucket provided with side walls and an outwardly flaring rear wall, pivot means for attaching a hoist line to the bucket at points forwardly of and below the center of gravity of a normal load whereby the load tends to tilt the bucket sufficiently rearwardly to discharge the load over said rear wall, means for attaching a haul line to the forward end of the bucket at an elevation above the pivotal axis of the bucket whereby tension can be applied to said line to restrain such rearward tilting action and stop means disposed inwardly of said side walls and extending from said hoist line attaching means toward one end of the bucket and into engagement therewith for restraining forward tilting action of the bucket beyond load carrying position.

6. A rearwardly dumping drag bucket provided with side walls and an outwardly flared rear wall, hoist line attaching means secured to the interior of the bucket at points below and forwardly of the center of gravity of a normal load whereby the bucket tends to tilt rearwardly and discharge the load over said rear wall, means for attaching a haul line to the bucket at points above and forwardly of the pivotal axis of the bucket for restraining rearward dumping movement of the bucket, and flexible stop means secured to said hoist line attaching means and to forward portions of the bucket for preventing forward tilting action of the bucket beyond load carrying position.

7. A rearwardly dumping bucket provided with flaring side walls, a rear wall over which the load is discharged, and a bottom having an excavating lip at the forward edge thereof, hoist line attaching means pivotally secured to the bucket at points forwardly of and below the center of gravity of a normal load whereby the bucket tends to tilt rearwardly, stop means carried by the bucket for restraining forward tilting action thereof beyond load carrying position, and haul line attaching means at the forward end of the bucket located above the pivotal axis thereof for restraining rearward tilting action of the bucket, said flaring side walls extending forwardly of said excavating lip for sustaining portions of the load forwardly of the pivotal axis whereby less tension on the drag line is required to resist rearward tilting action of the loaded bucket during elevation and transportation thereof.

8. A rearwardly dumping bucket having a hoist attaching means pivotally secured thereto at opposite points located below and forwardly of the center of gravity of a normal load whereby the bucket tends to tilt rearwardly to dumping position, drag means attached to the forward end of the bucket at points above the pivotal axis thereof whereby tension exerted on said drag means resists rearward tilting movement of the bucket to dumping position, and flexible means extending

from adjacent the forward end of the bucket to said hoist attaching means for limiting forward tilting action of the bucket by said drag means at load sustaining position.

9. A rearwardly dumping bucket having a hoist attaching means pivotally secured thereto at opposite points located below and forwardly of the center of gravity of a normal load whereby the bucket tends to tilt rearwardly to dumping position, drag means attached to the forward end of the bucket at points above the pivotal axis thereof whereby tension exerted on said drag means resists rearward tilting movement of the bucket to dumping position, and flexible means attached to the hoist means and extending forwardly therefrom and arranged to limit forward tilting action of the bucket by said drag means at load sustaining position.

10. A rearwardly dumping bucket having a pivotal axis so disposed with respect to a normal load that the bucket tends to tilt rearwardly, said bucket being provided with an excavating lip, a rear wall over which the load is discharged when the bucket is moved to dumping position, and outwardly flaring side walls projecting forwardly of said excavating lip for sustaining portions of a load forwardly of the pivotal axis to reduce the tendency of the bucket to tilt rearwardly.

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