Sept. 16, 1947. G. DAVIS 2,427,351

MATERIAL HANDLING APPARATUS

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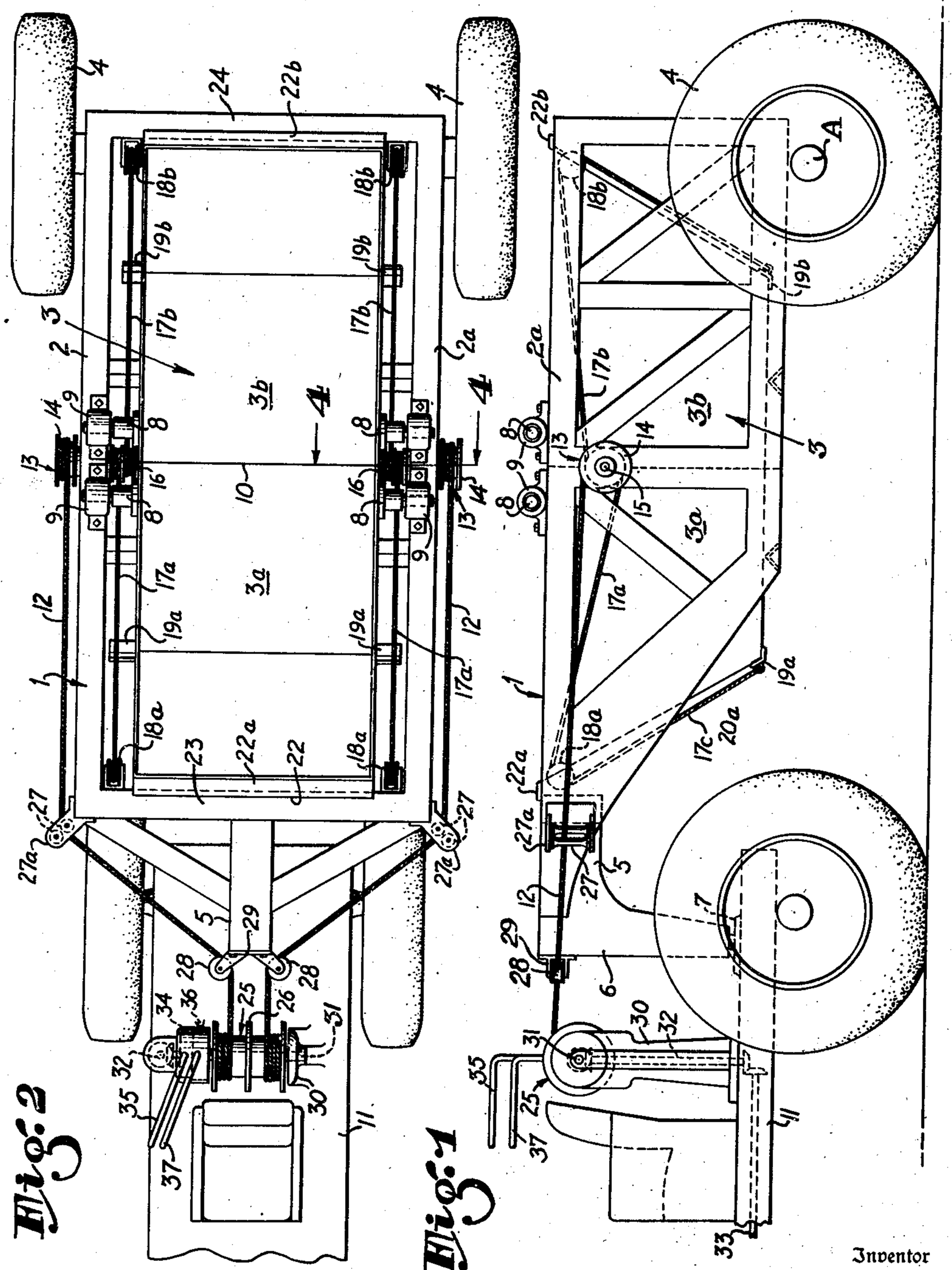

Fig. 2

Fig. 1

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Fig. 3

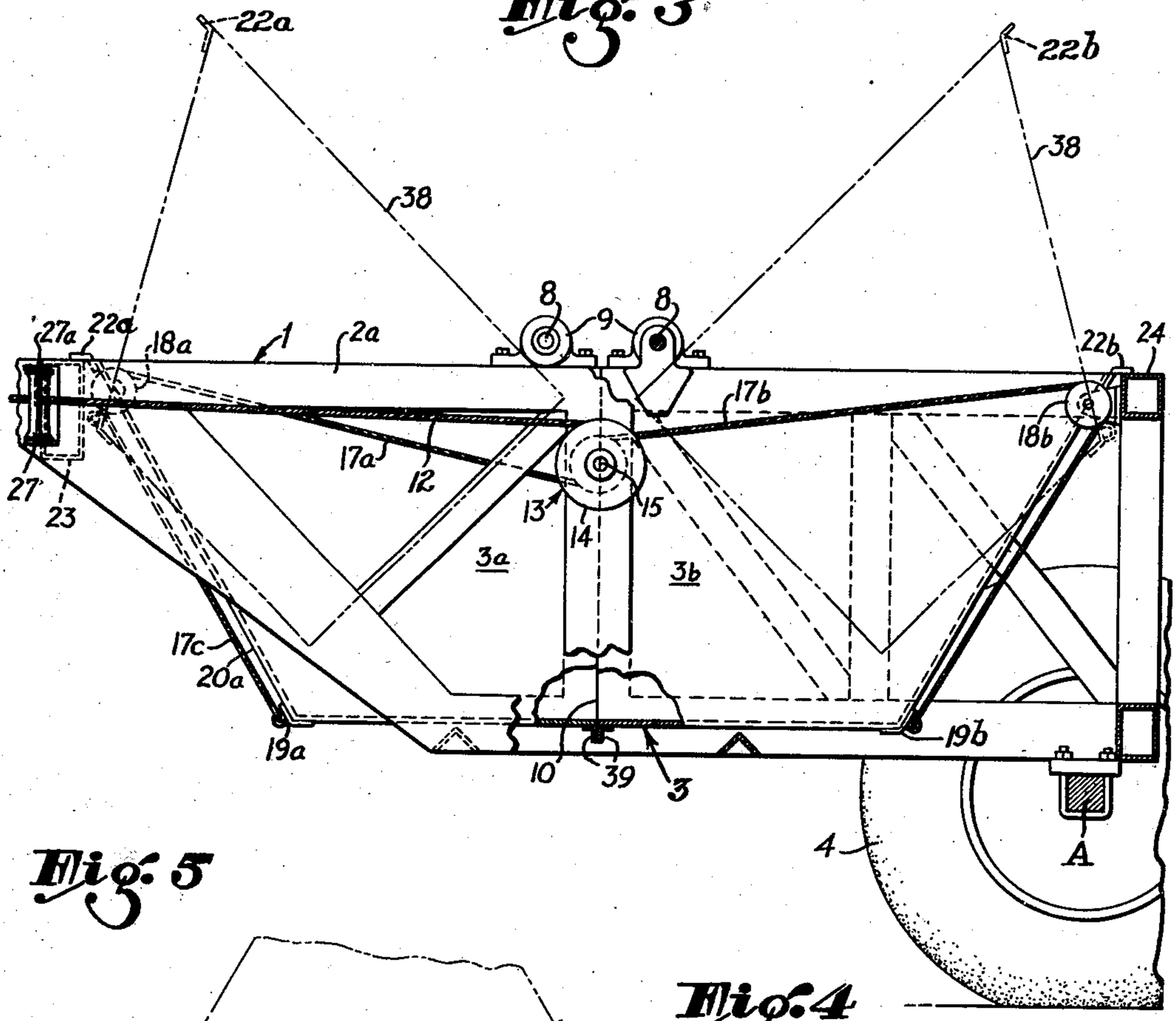


Fig. 5

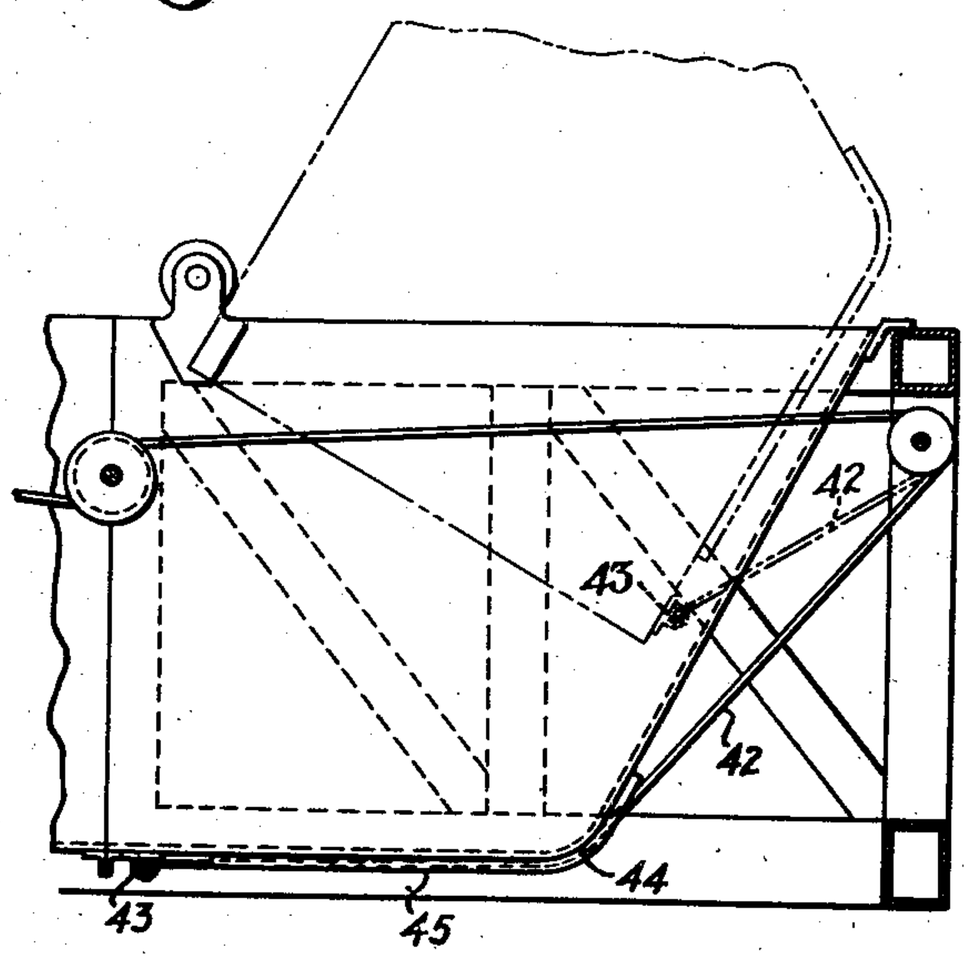
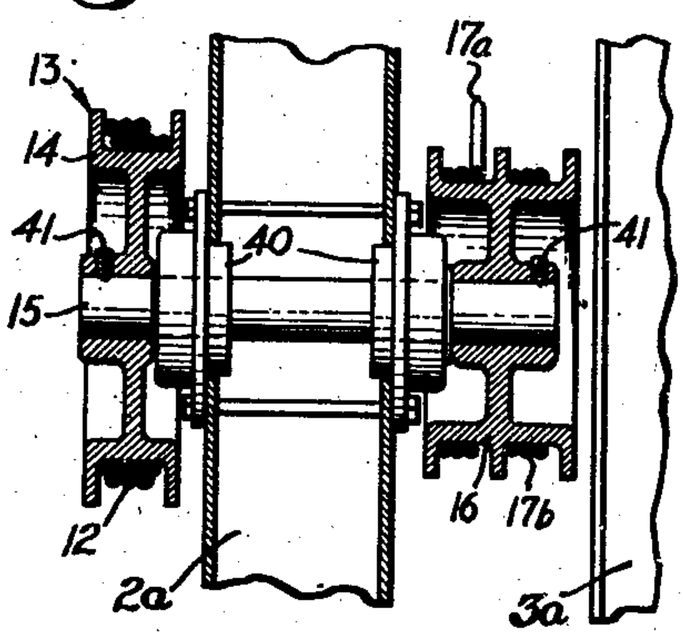


Fig. 4



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MATERIAL HANDLING APPARATUS

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Fig. 6

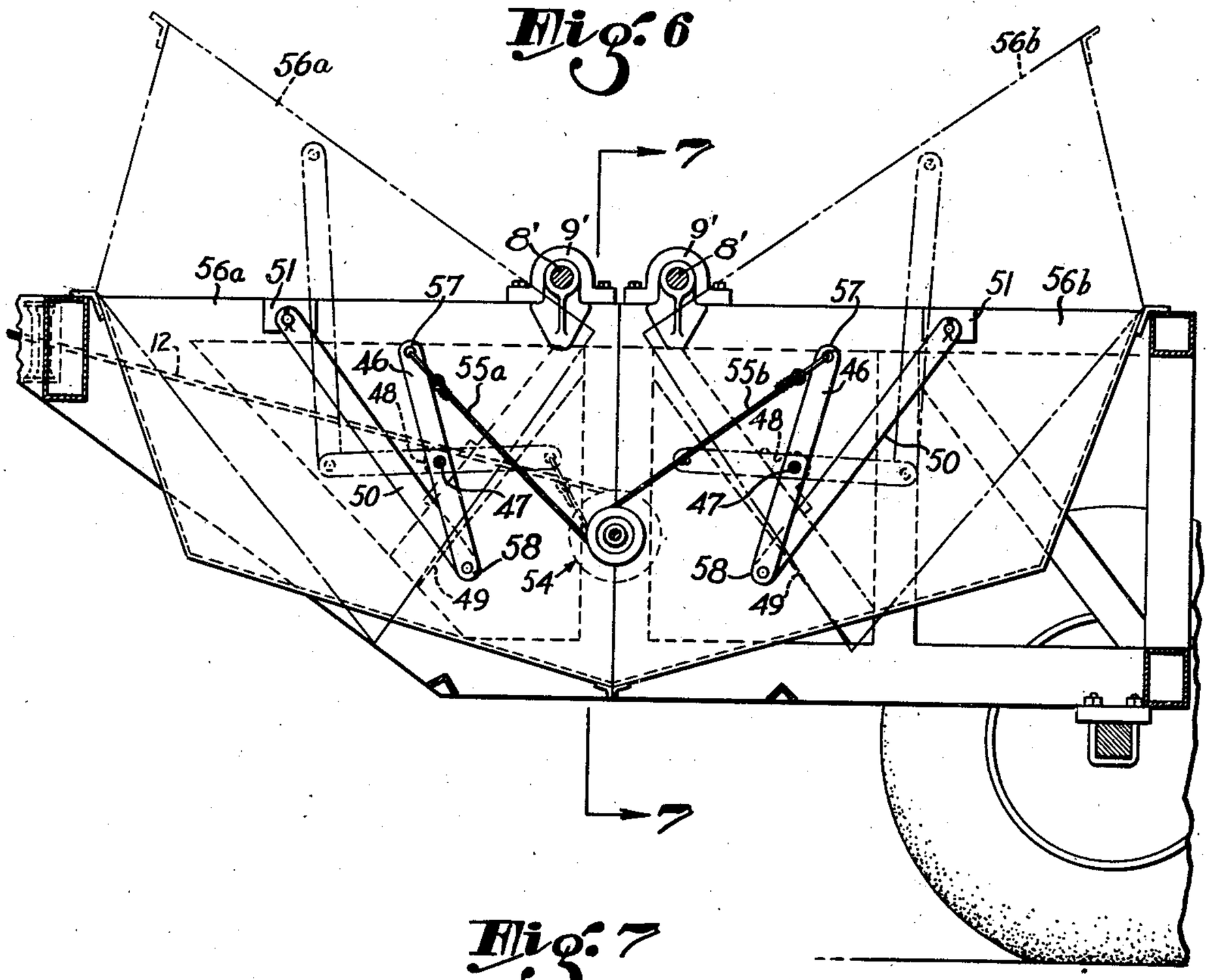
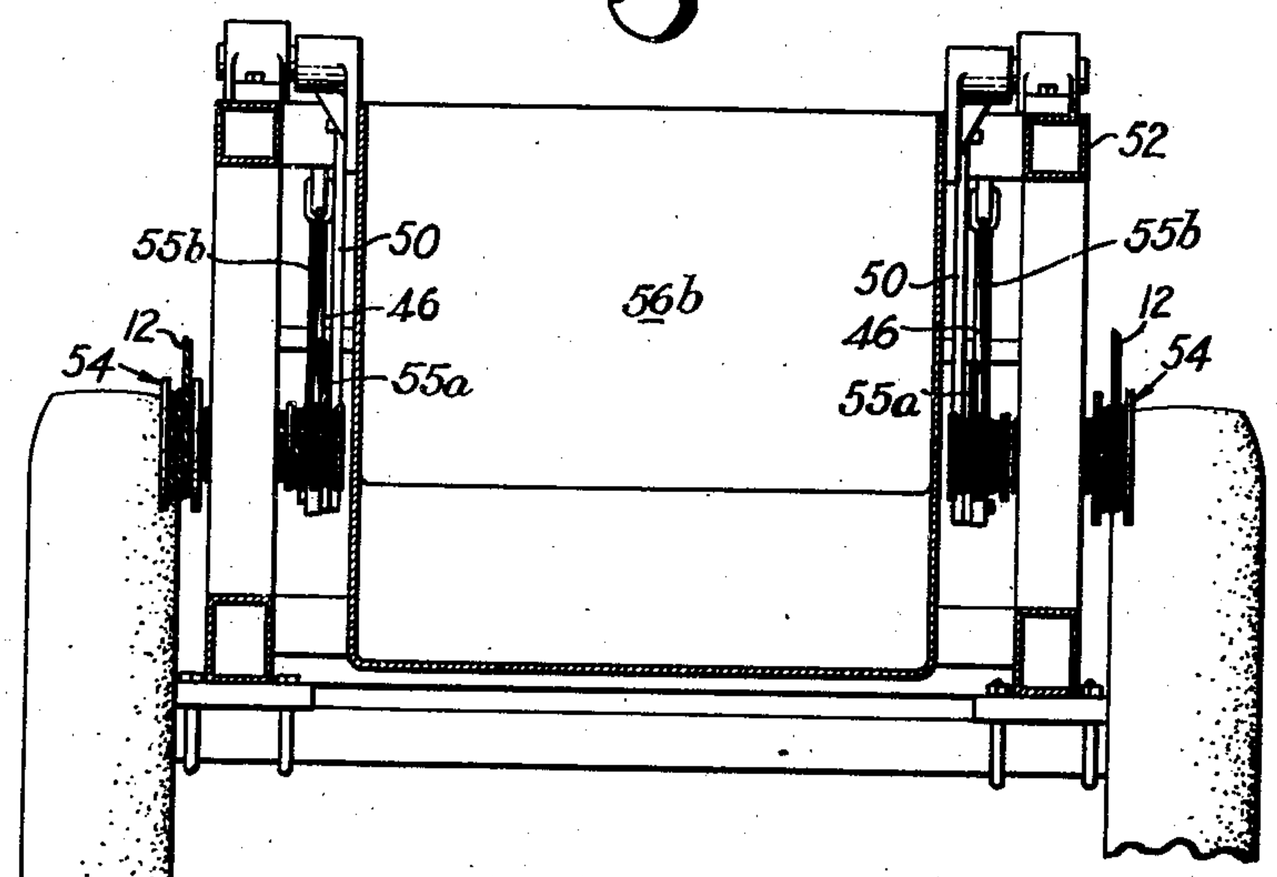


Fig. 7



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UNITED STATES PATENT OFFICE

2,427,351

MATERIAL HANDLING APPARATUS

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Application April 10, 1944, Serial No. 530,311

7 Claims. (Cl. 298—30)

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This invention relates to material handling apparatus for transporting and dumping various materials such, for example, as earth, ore, concrete, crushed rock, gravel, etc.

In various kinds of industrial operations, such for example as making earth fills, it is common practice to employ dump wagons or the like in which the bottom is divided along a line extending longitudinally along the center of the vehicle, thus forming sections adapted to swing downwardly and outwardly toward each side of the vehicle when the load is dumped. This of course causes the material to be deposited in a long mound resembling a windrow. The bottom sections commonly open by gravity, being restrained by suitable latches. Thus, when unlatched, there is no control over the dumping operation, and the entire load is discharged rapidly. With such an arrangement, the load must be all dumped at one time, and any spreading or distribution thereof which may be desired must be accomplished in succeeding operations requiring additional equipment. After dumping, the sections of the bottom hang down on opposite sides of the deposited load, making it necessary to move the vehicle straight ahead, or back, at least the full length of the deposited load, to position such bottom sections clear of the load before they can be closed again. Further, any substantial deviation from such straight movement until the bottom sections are clear of the load is apt to bend or break such sections, and require repairs thereto.

It is an object of this invention to provide apparatus, for transporting and dumping a load, which is arranged to provide a discharge opening extending transversely of the direction of advancing movement of the apparatus.

It is another object of this invention to provide such apparatus having means for positively controlling the rate at which the dumping of the load occurs during the dumping operation, as well as making it possible to dump a portion only of the load. In this way the material may be spread as desired, minimizing the subsequent use of bull dozers or similar equipment to do the primary spreading prior to the use of maintainers or graders.

It is another object of this invention to provide such apparatus wherein the load carrying means comprises complementary members adapted to engage each other or close to retain the load.

It is another object of this invention to provide such apparatus wherein the weight of the load serves to urge the load carrying members to load retaining position, means being provided

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for applying power to move said members apart to load discharging position.

It is another object of this invention to provide such apparatus wherein the apparatus for controlling the movement of the load carrying members may be operated to cause said members to "drop" or "slam" to closed position to jar loose from the members any part of the load adhering thereto, such as might occur when handling sticky or muddy materials.

It is another object of this invention to provide such apparatus wherein the carrying means comprises complementary members pivotally supported on a wheeled vehicle for independent movement respectively about an axis which extends parallel with the axis of the vehicle wheels.

It is still another object of this invention to provide apparatus for accomplishing any or all of the foregoing objects which is adapted for installation in a wheeled vehicle capable of ready attachment to a truck or tractor for towing thereby.

It is a still further object of this invention to provide a novel frame for mounting the load carrying members of such apparatus on the vehicle, which is capable of effectively supporting the weight of the load.

This invention possesses many other advantages and has other objects which may be made more easily apparent from a consideration of several embodiments of the invention. For this purpose there are shown a number of forms in the drawings accompanying and forming part of the present specification. These forms will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

In the drawings:

Figure 1 is a side elevation of a vehicle or the like embodying the present invention, showing the forward end of the vehicle supported on the rear-end of a truck or tractor, the forward portion of which is broken away;

Figure 2 is a plan view of the structure shown in Figure 1;

Figure 3 is a side elevation of the body of the vehicle on an enlarged scale, with certain parts broken away and shown in section;

Figure 4 is a fragmentary vertical section, on an enlarged scale taken on the line 4—4 of Figure 2;

Figure 5 is a fragmentary side elevation, similar

to Figure 3 but illustrating a modified form of the invention;

Figure 6 is a side elevation similar to Figure 3 but illustrating another modified form of the invention; and

Figure 7 is a vertical transverse section taken substantially on line 7—7 of Figure 6.

Referring particularly to Figure 3, it will be seen that the apparatus comprises a load carrying body 3 formed as a container or receptacle for holding a desired material such as earth, or crushed rock for example. The body 3 comprises a pair of complementary members 3—*a* and 3—*b* which are supported for pivotal movement with respect to each other between a position where they engage each other or close and cooperate to retain the load, or a position in which they are separated or open and allow the load to be discharged through the opening thus formed between them. The body 3 is thus seen to have a load retaining and a load dumping function quite similar to those of a clam shell bucket, the complementary members 3—*a* and 3—*b* corresponding to the halves of such a bucket. It is of course not contemplated that these members cooperate to pick up a load at any time, the body 3 being loaded from above after closing in all cases.

The pivotal supports for the members 3—*a* and 3—*b* are so positioned that the weight of the members as well as any load therein always urges the members toward closed position, and mechanism is provided for swinging the members 3—*a* and 3—*b* apart as desired, thus controlling the rate at which the load is discharged as well as making it possible to discharge only a desired portion of the load. These pivotal supports are so placed that substantially all parts of the members 3—*a* and 3—*b* swing upwardly as the members move from closed position. Thus, when used in connection with a wheeled vehicle the discharged load beneath the body 3 does not interfere with the returning of members 3—*a* and 3—*b* to closed position at any time desired, or with movement of the vehicle. Further, these pivots extend transversely of the vehicle, or substantially parallel with the axes of the wheels, so that the opening formed by movement of the members 3—*a* and 3—*b* from closed position extends across the vehicle, giving a much better disposition of the load as it is dumped and simplifying, or even eliminating at least some of, the subsequent operations.

Referring in detail to that form of the invention exemplified in Figures 1 to 3, a frame 1 is provided including two side members 2 and 2—*a* between which the load carrying members or bucket sections 3—*a* and 3—*b* are supported. The rear end of the frame 1 is shown as mounted on wheels 4. If desired, forward wheels may also be provided under the frame 1, but the frame is preferably constructed at its forward end with an adapter frame 5 that includes a downwardly extending post 6 provided at its lower end with any common type of standard equipment enabling it to be attached to a fifth wheel construction 7 appropriately mounted on the rear end of a truck or tractor 11. Such fifth wheel construction 7 is quite commonly used for enabling tractors or trucks to be connected to trailers having rear wheels only.

Preferably, the bucket sections are supported to swing in a front and rear direction on one or more axes extending transversely with respect to the normal direction of travel of the

vehicle including the frame 1. For this purpose, each bucket section 3—*a* or 3—*b* has trunnions 8 attached to its opposite sides, which in turn are received in bearings 9. In the present instance these bearings 9 are secured to the upper side of each of the frame members 2, 2—*a*, at a point about midway between their ends to adequately support the weight of the bucket sections 3—*a* and 3—*b*, and transmit it to the wheels 4 and the adapter frame 5. The frame members 2 and 2—*a* are made in the form of bridge trusses, whereby excessive weight in these members is avoided.

As previously mentioned, the load carrying members or bucket sections 3—*a* and 3—*b* are designed to come together or close to form the load carrying body 3. In the present instance, the forward edges 10 of the bucket section meet on a substantially vertical plane located about midway between the bearings 9 carried on each frame member 2 or 2—*a* (see Figure 3). The trunnions 8 are positioned quite closely to the forward edges 10 of the respective bucket sections 3—*a* and 3—*b*. Due to this manner of hanging the bucket sections it is evident that the action of gravity tends to swing them down to their closed position, and any load in the bucket section 3—*a*, 3—*b* operates to assist in holding them closed. For swinging the bucket sections 3—*a*, 3—*b* up and apart on their trunnions to dumping position to discharge the load, power from the truck or towing vehicle 11 may be employed through the agency of two main driving cables 12, extending rearwardly from the truck 11 and respectively along opposite sides of the frame 1.

As clearly shown in Figure 2, the rear end of each of these cables 12 is connected to a winding mechanism 13 including an operating drum 14 about which the rear portion of the operating cable 12 is adapted to wrap. Each drum 14 is fixed on a drum shaft 15 rotatably supported by the frame member 2 or 2—*a* as the case may be, and carrying a winding drum 16. Each drum 16 (see Figures 1 and 2) has two bucket operating cables 17—*a* and 17—*b* attached thereon and wound in opposite directions. Each cable 17—*a* extends forwardly of the frame 1 and over a guide sheave 18—*a* that is attached on the inner side of the adjacent frame member 2 or 2—*a*, from which it passes downwardly in an inclined run 17—*c*, the end of the cable 17—*a* being attached to a bar 19—*a* on the lower forward edge of the forward bucket section 3—*a*.

Each of the bucket operating cables 17—*b* is similarly guided and passes around the sheave 18—*b*, and thence downwardly to a bar 19—*b* on the lower rear edge of the rear bucket section 3—*b*.

In the closed position of the bucket sections 3—*a* and 3—*b*, flanges 22—*a* and 22—*b* at their upper edges, rest on the cross members 23 and 24 of the frame 1. This takes all the weight off the bucket cables 17—*a* and 17—*b*, and in addition has the effect of supporting a considerable part of the weight of the load carrying body 3 as well as any load therein, on the side members 2 and 2—*a* near their ends and points of support respectively on the axle A of the rear wheels 4 and the fifth wheel arrangement 7 on the frame of the truck 11. Thus, while the vehicle is moving on a roadway in its loaded condition, the load is not concentrated on the trunnions 8 and the center portions of the side members 2 and 2—*a*. Even when the vehicle is dump-

ing the load, a substantial part of the load is supported by the bucket cables which impart this strain to the bearings of the sheaves 18—*a* and 18—*b*. In this way excessive loading of the side members 2 and 2—*a* is avoided.

Any preferred form of apparatus may be provided for controlling the cables 12 thereby controlling the dumping of the load from the body 3. For example, it may include a horizontal twin section drum 25, the two sections being separated by a circumferential flange 26. The cables 12 are guided forward through long twin pulleys 27 of the vertical roller type, mounted in corner brackets 27—*a* bolted or welded to the forward corners of the frame 1, and from the corner brackets the cables 12 pass inwardly to and about the guide pulleys or sheaves 28 supported on a common bracket 29, from which the cables pass to the drum 25.

The drum 25 is secured on a shaft 31 which is rotatably supported by a pair of columns, one of which is indicated at 30, mounted on the frame of the tractor or truck 11. The shaft 31 is driven through appropriate gearing and a friction clutch 34 of any standard form, by a countershaft 32 housed in one of the columns 30 and driven in turn by a power take-off shaft 33 on the tractor 11. A clutch lever 35 is provided for controlling the clutch 34 to optionally raise the bucket sections 3—*a* and 3—*b* to dump their load. The weight of these bucket sections is effective to return them downwardly to closed position, and to control such downward movement the shaft 31 is provided with appropriate brake mechanism 36 operated by the brake lever 37. This enables the bucket sections to be held in partially open condition when it is desired to distribute the load over a considerable area while advancing the vehicle.

Should the bucket sections fail to dump the entire load, as when handling muddy or sticky material, the power can be applied to raise them, whereupon, if the clutch is suddenly released, the bucket sections will swing down rapidly and come together with a substantial shock, thereby jarring loose any clinging portion of the load which can then be readily discharged by again opening the bucket sections. However, since the bucket sections are arranged to swing upwardly so as to steeply incline their bottoms as indicated by the dotted lines 38 in Figure 3, such procedure will rarely be necessary.

Angle iron lips 39 may be welded along the meeting edges of the bottoms of the bucket sections, to prevent battering of these edges with resultant leak openings, in case broken stone or heavy rubble is being handled.

One of the possible detail constructions for the winding mechanisms 13 is illustrated in Figure 4, in which the drum shaft 15 is shown as supported in suitable bearings 40 mounted on the frame member 2—*a*. The drums 14 and 16 can be secured on the shaft 15 by any suitable means such as set screws 41.

If it is desired to give the bucket sections a higher dumping angle, this can be accomplished by using a longer operating cable such as the cable 42 (see Figure 5), in place of the cable 17—*a* or 17—*b*, the end of which is carried down under and along the bottom of each bucket section to an anchor eye 43 adjacent the meeting edges of the sections. In this case it is advantageous to avoid forming a sharp angle at the junction of the side wall and bottom of the bucket, as bending the cable constantly at this point might cause it to wear rapidly. Accordingly, a large radius is provided at this point as indicated at 44; and a guide bar 45, formed of a channel or angle bar with a downwardly directed leg, may be suitably secured along the adjacent portion of the bucket section to receive the cable.

Figures 6 and 7 illustrate a modified construction in which the use of the guide pulleys or sheaves 18—*a* and 18—*b* is avoided. A pair of winding mechanisms 54 substantially identical with the winding mechanisms 13 in the first described form are provided, and are arranged to be operated by cables 12 as before. The cables 55—*a* and 55—*b* extending in opposite directions from the mechanisms 54 at opposite sides of the frame 1 serve to operate the bucket sections 56—*a* and 56—*b*. However, in this case those ends of the bucket cables 55—*a* and 55—*b* remote from the winding mechanisms, are attached respectively to one end, as 57, of the levers 46, fulcrumed intermediate their ends on stub-shafts 47 mounted in bearings 48 on diagonal members 49 of the adjacent frame member of the vehicle. Links 50 operatively connect the other ends, as 58, of the levers 46, with brackets 51 secured to the sides of the buckets 56—*a* and 56—*b* adjacent their upper edge. Operation of the winding mechanisms 54 by means of the cables 12 from the position of Figure 6, causes the cables 55—*a* and 55—*b* to be wound upon the winding mechanisms 54, swinging the levers 46 and bucket sections 56—*a* and 56—*b* to the dumping position indicated by the broken lines.

I claim:

1. In material handling equipment, a frame having a pair of spaced side members supported adjacent their ends, a pair of bucket sections supported on said members intermediate the ends thereof for movement therebetween, said bucket sections being movable between a position where they cooperate to retain a load and a position where they discharge the load, means for controlling the movement of said bucket sections, and flanges on the bucket sections transmitting a portion of the weight of each bucket section when in load retaining position, directly to the adjacent end portion of the frame.

2. In material handling equipment, a frame having a pair of spaced side members supported adjacent their ends, a pair of bucket sections supported on said members intermediate the ends thereof, the bucket sections being pivotally mounted for movement between a position where they cooperate to retain a load and a position where they discharge the load, means for controlling the movement of said bucket sections, means transmitting a portion of the weight of each bucket section directly to the adjacent end portion of the frame when said bucket sections are in load retaining position, and means whereby the control means serves to transmit a portion of the weight of each bucket section directly to said adjacent end portion of the frame upon movement of said bucket section from load retaining position by said control means.

3. In material handling equipment, a load carrying body comprising a pair of complementary load carrying members supported for movement toward and away from each other, said members when together cooperating to retain a load and when apart causing the load to be discharged between them, means supporting said members arranged and constructed so that the weight of the members urges the members toward load retaining position, means including

a flexible cable wound upon a spooling drum for moving said members apart to load discharging positions, and drive means including a releasable clutch for driving the drum, said clutch being selectively operable to render said moving means inactive at any point in the movement of said members, said moving means when inactive permitting said members to drop by gravity toward load retaining positions and to meet with a jarring blow to loosen any part of the load adhering thereto, whereby to facilitate discharge of the loosened material upon movement of said members to load discharging positions.

4. In material handling equipment, a mobile frame, a load carrying body comprising a pair of complementary load carrying members, means pivotally mounting said members on said frame for movement toward and away from each other, said members having faces adapted to engage each other, said members when said faces are in engagement cooperating to retain a load and when said faces are apart causing the load to be discharged between the faces, said pivotal support for each member being adjacent the face thereof, whereby the weight of said members urges said faces toward each other, and means including a flexible cable wound upon a spooling drum for controlling the movement of said members, drive means including a releasable clutch for driving the drum, said clutch being selectively operable at any point in the movement of said members to allow them to drop freely by gravity so that their faces engage with jarring contact, whereby to facilitate discharge of the load upon subsequent movement of the members apart.

5. In material handling equipment, a mobile frame having a pair of side members extending in the direction of normal travel of said frame, a pair of load carrying members, means pivotally supporting each of said load carrying members on said side members for movement therebetween about a substantially horizontal axis, said load carrying members being movable from a closed position where they cooperate to retain a load to an open position where they discharge the load, said supporting means being so located and arranged that the weight of said load carrying members urges them toward load retaining position, and selectively operable means controlling the movement of said members between closed and open position, said means including a flexible cable wound upon a spooling drum, drive means for the drum including a releasable clutch adapted to permit said members to drop by gravity into jarring contact to

closed position in order to facilitate a subsequent discharge of the load.

6. In a device of the class described, the combination of an elongated mobile frame, a pair of complementary bucket members pivotally supported transversely of the frame, said buckets normally moving to closed position under gravity and adapted to support a load of material when in closed position, said bucket members having abutting faces adapted to engage each other in confronting relation when in closed position, and being adapted to be moved apart to permit the discharge of material therefrom between said faces, power operated means, including a pair of flexible cables each operatively connected to one of the bucket members for moving the bucket members from closed position to any desired partially open position for spreading the material transversely of the frame, and means for maintaining the bucket members in said desired partially open position, both of said means being releasable to enable said bucket members to swing closed by gravity to engage said faces in jarring contact to loosen any material adhering to the interior of the bucket members.

7. In a device of the class described, the combination of an elongated mobile frame, a pair of complementary bucket members adapted to retain a load of material, said bucket members having abutting faces adapted to engage each other in confronting relation when in load retaining position, and being adapted to be moved apart to permit the discharge of material therefrom between said faces, trunnions supporting each bucket member transversely on the frame, supplementary supporting means on said bucket members remote from said trunnions adapted to transmit a portion of the weight of the loaded bucket members when in closed, load retaining position directly to the frame, means for moving the bucket members from closed position to any desired partially open position for spreading the material transversely of the frame, and means for maintaining the bucket members in said partially open position.

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