

April 7, 1959

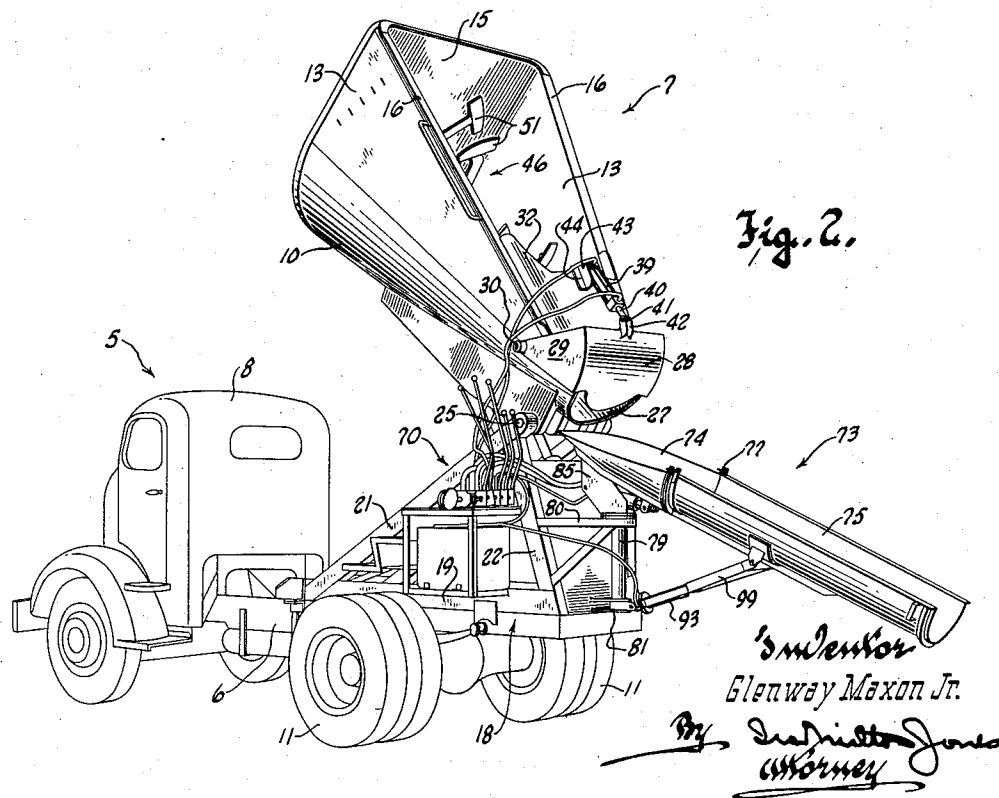
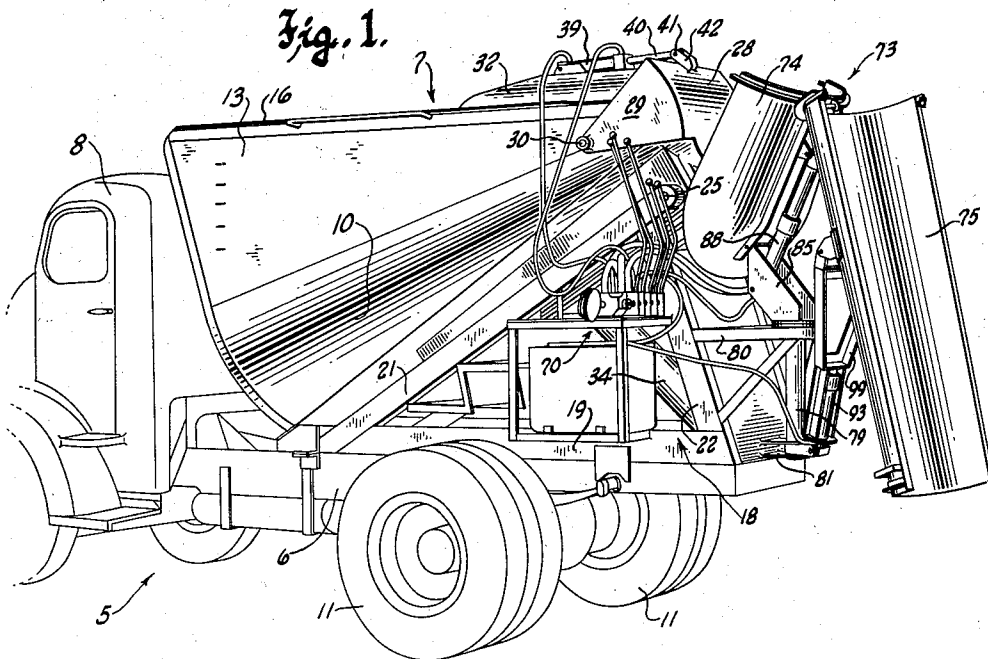
G. MAXON, JR

2,880,977

DUMP TRUCK FOR CONCRETE AND OTHER SEMI-LIQUID MATERIALS

Filed Oct. 29, 1956

5 Sheets-Sheet 1



April 7, 1959

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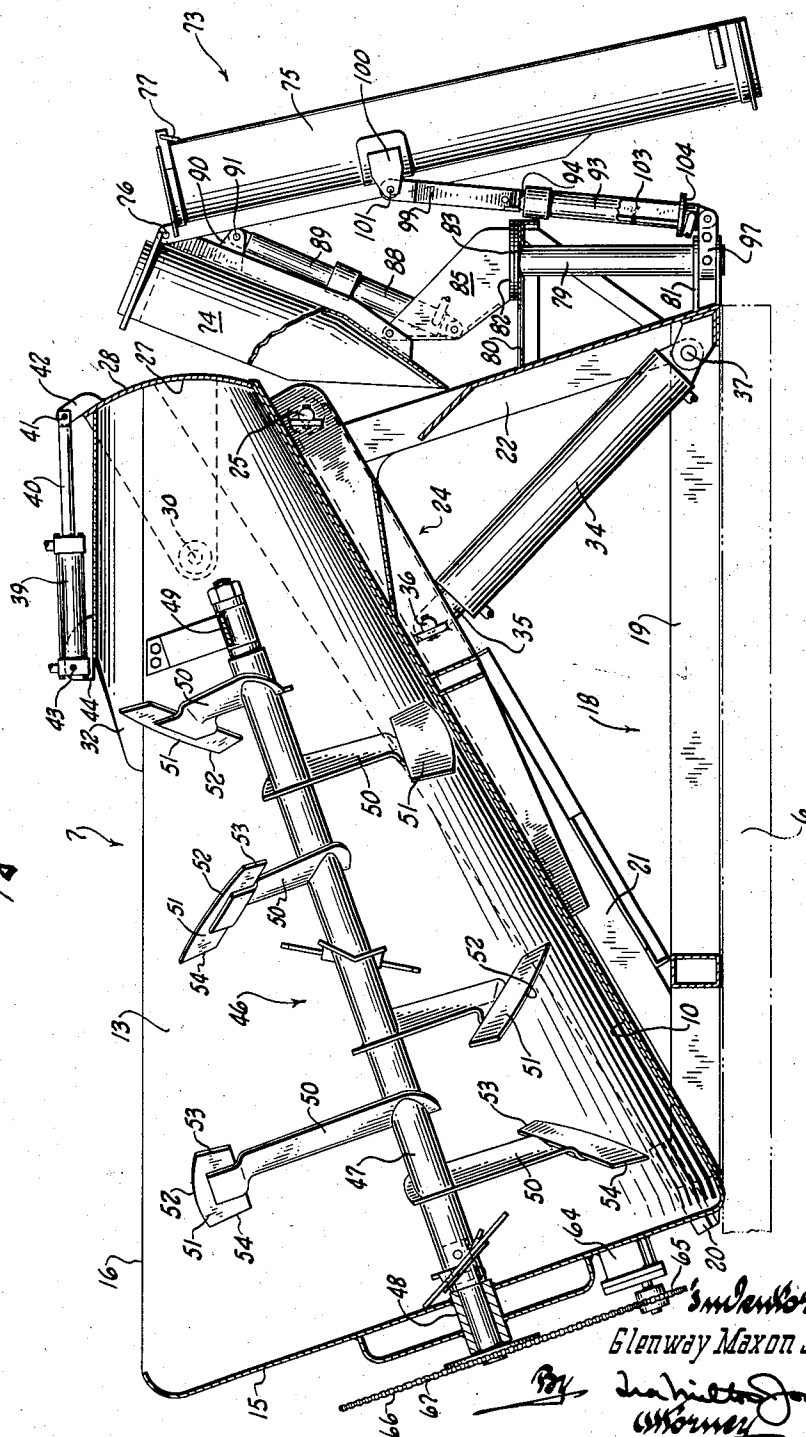
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DUMP TRUCK FOR CONCRETE AND OTHER SEMI-LIQUID MATERIALS

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5 Sheets-Sheet 2

Fig. 3.



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DUMP TRUCK FOR CONCRETE AND OTHER SEMI-LIQUID MATERIALS

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5 Sheets-Sheet 3

Fig. 4.

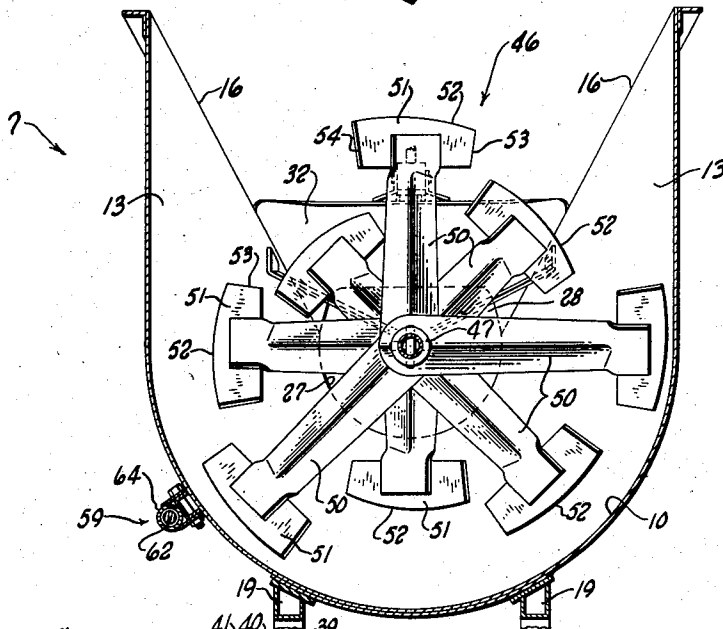


Fig. 5.

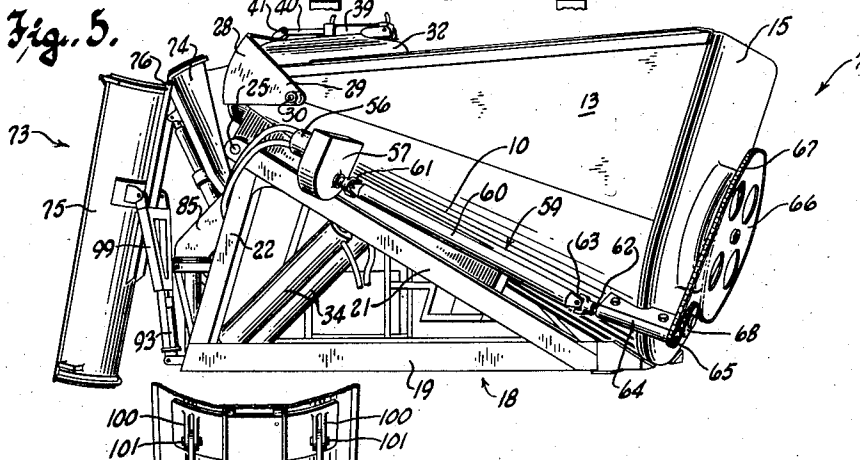
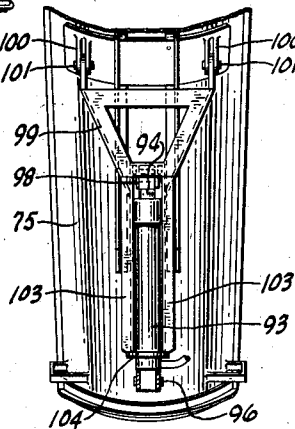


Fig. 9.



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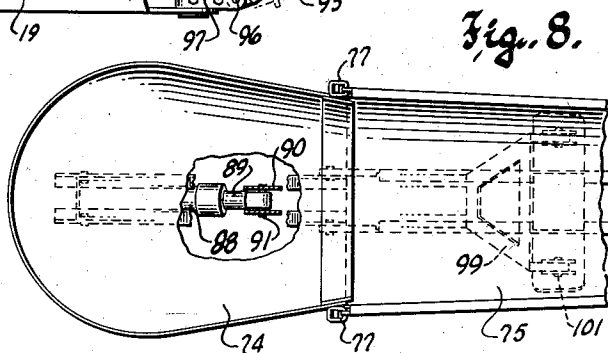
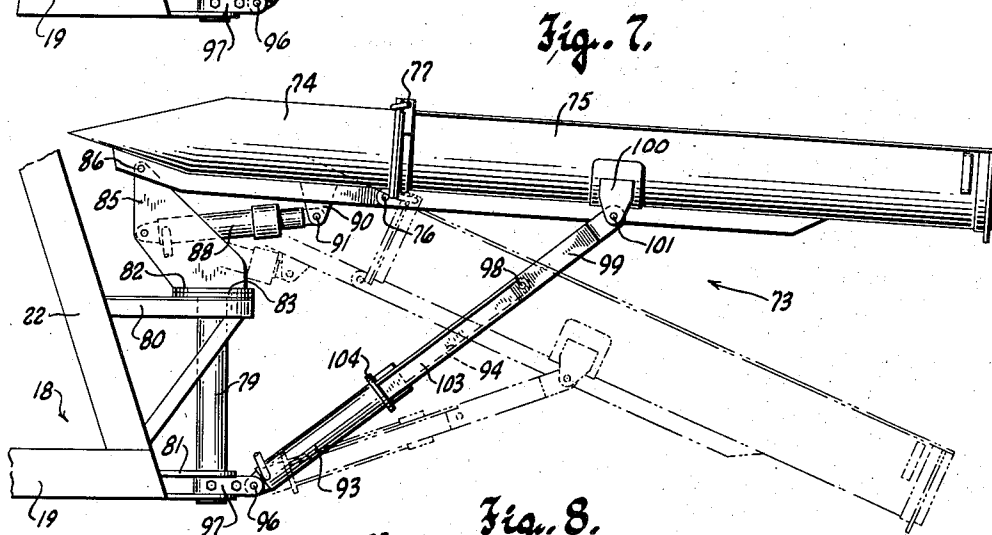
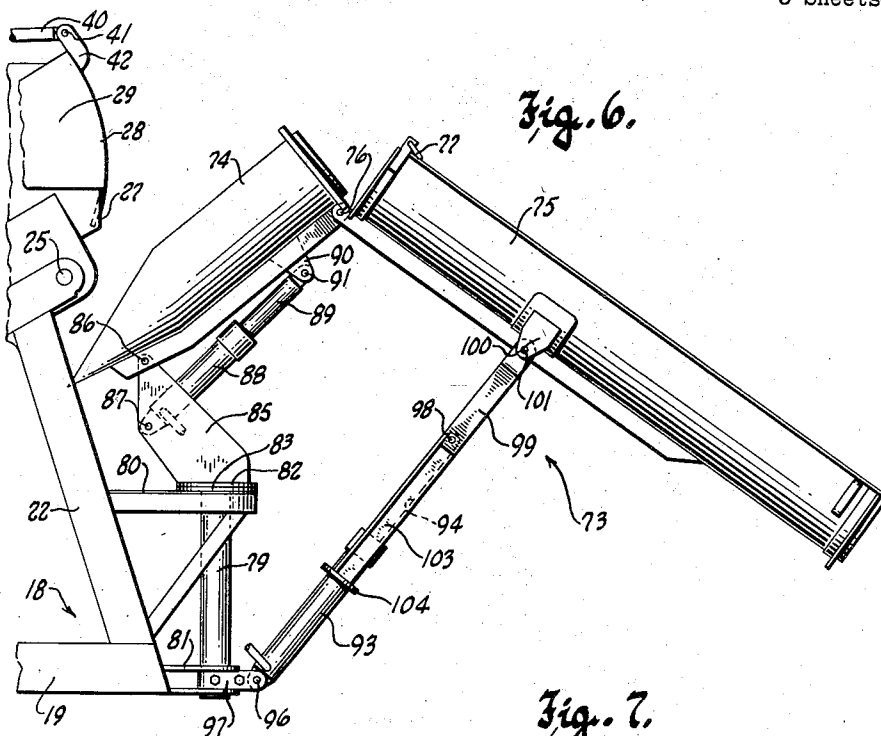
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DUMP TRUCK FOR CONCRETE AND OTHER SEMI-LIQUID MATERIALS

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5 Sheets-Sheet 4



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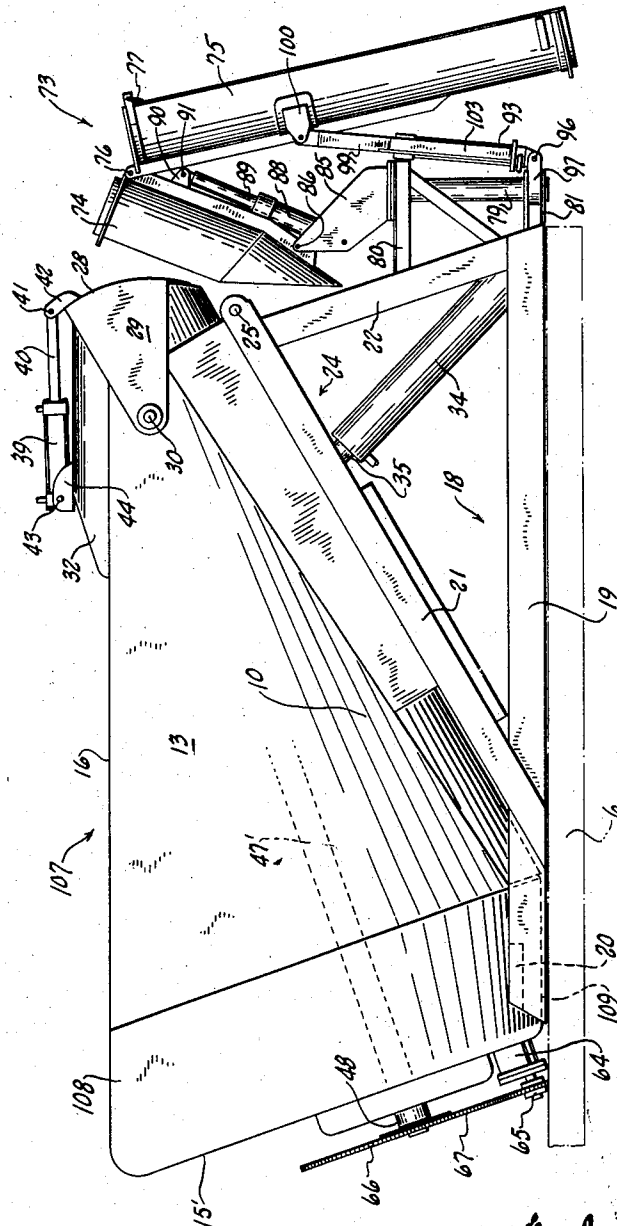
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DUMP TRUCK FOR CONCRETE AND OTHER SEMI-LIQUID MATERIALS

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Fig. 10.



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DUMP TRUCK FOR CONCRETE AND OTHER SEMI-LIQUID MATERIALS

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Application October 29, 1956, Serial No. 618,746

7 Claims. (Cl. 259—171)

This invention relates to dump trucks and has more particular reference to dump trucks of the type having tiltably mounted rear discharge bodies with open tops, useful for the transportation of freshly mixed concrete from a central mixing plant to a point of use.

Dump trucks with bodies of this general type are featured in Patents No. 2,465,899 and No. 2,674,489 issued to Glenway Maxon, Jr. on March 29, 1949, and April 6, 1954, respectively. While dump trucks having such bodies are low in cost and maintenance and are generally advantageous from the standpoint of facilitating speedy loading and discharging as well as cleaning of the body, they nevertheless fail to entirely solve one serious problem incidental to the hauling of freshly mixed concrete and similar semi-liquid materials.

This problem refers to the stratification and/or segregation of the aggregates of the mixture transported in the body which always occurs during transit but which is most pronounced during travel of the truck over rough or bumpy roads. As is well known such segregation is characterized by the heavier aggregates settling to the bottom of the body with the more liquid materials rising to the surface of the body contents. It was almost inevitable, therefore, that when freshly mixed concrete was transported a distance by such dump trucks the mixture contained in the body, when discharged, was seriously lacking in uniformity.

With this objection to conventional concrete dump trucks in mind, it is an object of the present invention to provide a dump truck of the character described featuring a rear discharge tilting body having agitator means therein which can be operated before the contents of the body is discharged to effect remixing and restoration of the contents to a uniform mixture, to thus overcome all of the effects of segregation or stratification.

More specifically, it is an object of this invention to provide a dump truck body for hauling such semi-liquid materials as freshly mixed concrete, which body features a rounded bottom having an upwardly and rearwardly sloping portion of substantial length which diminishes in radius toward a discharge opening at the upper rear end portion of the body, and wherein the agitator means comprises an elongated shaft journaled inside the body for rotation on an axis concentric to the rounded bottom of the body and having blade means thereon arranged to substantially closely sweep along the rounded interior surfaces of the body during rotation of the shaft.

Still another object of this invention resides in the provision of a rear discharge dump truck body of the character described wherein the upwardly and rearwardly slanting rounded bottom wall portion of the body provides in effect the rear wall over which materials flow during discharge from the body, and wherein the agitator means in the body may be employed to facilitate and control the discharge of the body contents upon rotation of the agitator in one direction when the body is in a tilted discharging position.

A further object of this invention resides in the pro-

vision of a dump truck of the character described having hydraulically operated agitator, discharge gate, and collapsible chute means adapted to be supplied with fluid under pressure from a single hydraulic pump driven from the power take-off shaft of the truck engine.

In this respect it will be appreciated that it is one of the main objects of this invention to provide for agitation and mixing of the body contents prior to discharge thereof, without entailing the use of an auxiliary engine on the truck such as has been conventional in the past; but in view of the fact that the power which can be obtained from the power take-off shaft of the truck engine is limited, it is a further object of this invention to provide blade means on the agitator shaft so constructed and arranged that only a minimum amount of force is required to drive them through the heavier and drier aggregates which tend to settle to the bottom of the body.

In this connection it is a more specific object of the invention to provide an agitator for a dump truck body of the character described comprising an elongated shaft having a series of radial arms fixed thereto at locations spaced along its length and with axially adjacent arms so angularly offset with relation to one another that at any one instant during rotation of the shaft only a small percentage of the arms will be passing through the heavier and drier aggregates along the bottom of the body.

Still another object of this invention resides in the provision of a rear discharge tilt body dump truck of the character described wherein the agitator shaft projects through the front wall of the body to be drivingly connected with a fluid motor mounted on one exterior side of the body, through a propeller shaft extending lengthwise along said side of the body to the front thereof.

With these and other objects in view which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the here-indisclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate two complete examples of the physical embodiments of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a perspective view showing part of the rear and one side of a dump truck for hauling freshly mixed concrete and embodying the principles of this invention;

Figure 2 is a perspective view similar to Figure 1, but illustrating the body and the chute structure in the positions they may occupy during discharge of the body contents;

Figure 3 is a view partly in side elevation and partly in section showing the body per se and the sub-frame upon which the body is mounted, and illustrating the power operated chute structure in a collapsed or transit position at the rear of the body;

Figure 4 is a cross sectional view through the body per se taken at its forward end and looking rearwardly therein;

Figure 5 is a perspective view of the body per se, its supporting frame, and chute structure, viewing the same from the side opposite that seen in Figures 1 and 2;

Figure 6 is a fragmentary elevational view showing the chute structure in a state of partial collapse;

Figure 7 is a view similar to Figure 6 but illustrating the chute structure fully extended and in two different tilted positions with respect to horizontal;

Figure 8 is a plan view of the chute structure shown in Figure 7 with portions thereof broken away and shown in section;

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Figure 9 is a view showing the underside of the longer of the two sections which comprise the discharge chute; and

Figure 10 is a side elevational view of a slightly modified body.

Referring now more particularly to the accompanying drawings, in which like reference characters have been applied to like parts throughout the several views, the numeral 5 generally designates a truck having a horizontal frame or chassis 6 upon which the dump body 7 of this invention is mounted. The body, of course, is disposed wholly rearwardly of the cab 8 of the truck and over the rear portion of the chassis.

One of the main characteristics of the body is that it is provided with a conically surfaced bottom portion 10, which slopes upwardly and rearwardly toward the discharge end of the body, and which has its large end foremost and its small end rearmost and projecting a short distance beyond the rear wheels 11 of the truck. The rounded or conically surfaced bottom portion 10 of the body has a radius which diminishes uniformly toward the rear of the body, and since the body is provided with opposite sides 13 which are formed as upright extensions of the rounded bottom portion of the body, the side walls 13 also converge toward the rear of the body so that when viewed in side elevation, the body has the appearance of a truncated cone. Both the bottom portion and the upright sides 13 of the body are joined to a front wall 15 on the body which, though normal to the axis of the conically surfaced bottom, may be considered as being substantially upright. The front wall 15 actually slopes upwardly and forwardly from the extreme bottom of the body and terminates in a plane containing the upper edges 16 of the side walls, and which plane, it will be noted, is horizontal in the transit position of the body seen in Figure 3.

The body 7 is carried by a sub-frame 18 which seats on the rear portion of the chassis 6 and may be secured thereto in any desired manner. The sub-frame is substantially triangular in outline when viewed from the side (see Figures 1 and 3). It has a horizontal base consisting of transversely spaced longitudinal beams 19 having laterally opposite seat forming members 20 fixed to their forward ends to receive and support the front end of the body. Connected to the base beams adjacent to forward apex of the triangular sub-frame are opposite rearwardly extending beams 21 which slope upwardly and rearwardly along the bottom portion of the body to the rear thereof. The rear portions of these beams connect with and are supported by struts 22.

Mounted between the upwardly and rearwardly sloping beams 21 is a cantilever supporting structure, generally designated 24, secured to the slanting bottom of the body, and having its rear end portion pivotally mounted on a transverse pin 25 carried by the sub-frame adjacent to the upper apex thereof. The body is thus pivotally carried by the sub-frame for tilting motion out of a normal or transit position such as shown in Figure 3, in which the upper edges 16 of the body side walls are substantially horizontal and the rounded or conically surfaced bottom 10 of the body slopes upwardly and rearwardly over the pivot pin 25.

It should be noted that substantially the entire top of the body is open, and that at its rear, the body has a discharge opening 27 which is normally closed by a gate 28. The gate 28 is carried by a pair of arms 29 which embrace the rear end portion of the body and have their forward end portions pivotally connected thereto as at 30 so that the gate may be swung up and down about a transverse axis disposed at a level a short distance below the upper edges 16 of the side walls.

As seen best in Figures 2 and 3, the small rear end of the body is more or less funnel shaped by reason of the fact that it has a hood 32 connected across the upper edges of the side walls and secured thereto as by weld-

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ing. With the construction described, therefore, the height of the discharge opening 27 in the upper rear of the body is equal to the space between the rear edge of the hood 32 and the rear of the extreme bottom portion of the body, while the width of the discharge opening is equal to the diameter of the small end of the rounded bottom portion 10.

The body 13 may be tilted in a clockwise direction out of its normal transit position seen in Figure 3 to a discharge position, as indicated for example in Figure 2, by means of a hydraulic operator which in the present case comprises a pair of double acting hydraulic cylinders 34 connected between the lower rear apex of the sub-frame and the middle portion of the cantilever supporting structure 24 on the bottom of the body.

Each of the hydraulic cylinders has an extensible plunger or ram 35, the outer end of which is pivotally connected as at 36 with the supporting structure 24 on the bottom of the body at a location a distance forwardly of the tilt axis 25. The closed end of each cylinder is connected to the sub-frame by means of a transverse pivot pin 37.

Discharge of the body contents, of course, requires extension of the rams of the hydraulic operators 34 for the body, but discharge cannot take place until the gate 28 is swung in a counterclockwise direction about its pivots 30 to uncover the discharge opening 27. According to the present invention the discharge gate is also power operated, being controlled by a hydraulic operator comprising a hydraulic cylinder 39 substantially horizontally overlying the top of the hood 32 with its ram 40 extending rearwardly to have its outer end portion received between and pivotally connected as at 41 to a pair of upstanding ears 42 fixed to the upper edge portion of the gate. The closed forward end of the cylinder is pivotally connected as at 43 with a pair of upstanding flanges 44 fixed to the top of the hood and between which the forward end portion of the cylinder is received.

The hydraulic cylinder or operator 39 is also preferably of the double acting type so that the gate is both opened and closed as a consequence of the flow of hydraulic fluid into one end or the other of the cylinder.

One of the main features of the body of this invention is that it is provided with an agitator generally designated 46 mounted inside the body and by which the body contents may be acted upon prior to their discharge at the point of use to overcome the effects of segregation or stratification which may have taken place during transit. The agitator 46 comprises an elongated shaft 47 having its front end portion projecting through the front wall 15 of the body and rotatably journaled in a bearing 48 carried by the front wall, and having its rear end portion rotatably received in a bearing 49 carried by the body side walls a short distance forwardly of the discharge end of the body. Preferably the bearings 48 and 49 mount the agitator shaft for rotation on an axis which is concentric with the rounded or conically surfaced bottom portion 10 of the body and with the rear of the agitator shaft extending almost as far back as the pivot axis 30 for the discharge gate.

Carried by the agitator shaft to rotate therewith are blade means comprising a series of radial arms 50, each carrying a paddle 51 on its outer end. The inner ends of the arms 50 are fixed to the shaft at locations substantially equi-distant from one another along the length of the shaft, and with adjacent arms angularly offset a predetermined distance for a purpose to be discussed shortly. The arms 50 are all of different lengths with the arm closest to the front wall 15 of the body having the greatest length and the arm disposed closest to the bearing 49 at the rear of the shaft having the shortest length. The arms 50 intermediate the foremost and rearmost arms diminish uniformly in length to the rear of the shaft so as to assure that the convex outer edges 52 of the paddles will sweep substantially closely along the

rounded interior surface of the bottom 10 of the body during rotation of the agitator shaft.

Also for a purpose to be discussed later, it will be noted that the paddles are inclined with respect to an adjacent plane which is normal to the axis of the agitator shaft, in the same directions and at the same angles, so that when the shaft is rotated in a direction such that the rearmost edges 53 of the paddles trail their foremost edges 54, the material in the body acted upon by the paddles is urged toward the rear of the body.

Referring to Figure 4, in which the agitator shaft is seen in cross section from a point ahead of its foremost arm 50, and assuming that the agitator shaft is rotated in a counterclockwise direction, it will be noted that for the series of 8 agitator arms shown by way of illustration, each of the arms leads the rearwardly adjacent arm by an angle of approximately 135°. While this exact angular displacement between rearwardly adjacent arms is not critical, it is highly desirable when the agitator shaft is provided with a series of 8 arms, for the reason that it minimizes the number of paddles which at any one instant during rotation of the agitator shaft are passing through zones in the bottom portion of the body at which the heaviest and driest aggregates tend to accumulate. As seen in Figure 4, therefore, only three of the 8 paddles on the outer ends of the agitator arms are in positions at which they encounter and act upon the drier and heavier aggregates, while the remaining arms and paddles are either entirely above the surface of the body contents or are immersed in only the more liquid portions of the body contents.

This arrangement of the agitator arms and their paddles makes it possible to rotate the agitator shaft and drive the paddles through the body contents with a minimum of effort, and according to the present invention makes it possible to employ a hydraulic motor 56 which may be supplied with hydraulic fluid under pressure from a pump, not shown, driven from the power take-off shaft of the truck engine, not shown. Consequently, this obviates the need for a separate and costly auxiliary engine such as ordinarily provided in conventional transit mixers for the purpose of effecting agitation and mixing of the concrete prior to its discharge at a point of use.

Though the amount of power which is available at the power take-off shaft of the truck engine is limited and seldom exceeds about 15 horsepower, this small amount of power is more than adequate for the purpose of this invention, partly by reason of the fact the fluid motor is adapted to drive the agitator shaft through reduction gearing mounted in a gear case 57 on the exterior of the body, but primarily due to the arrangement of blade means on the agitator shaft.

Referring now to Figure 5, it will be noted that both the fluid motor 56 and the gear case 57 are fixed to the curved exterior of the body, preferably but not necessarily near the rear thereof where their weights do not add appreciably to the effort which must be expended by the hydraulic cylinders 34 in lifting the body. The fluid motor drives a propeller shaft 59 disposed along the exterior of the body and extending lengthwise fore and aft of the body substantially parallel to its curved bottom surface. The propeller shaft comprises a long shaft section 60 having one end drivingly connecting with the transmission gearing through a universal joint 61, and a short section 62 disposed endwise forwardly of the longer section and drivingly connected therewith by means of a second universal joint 63.

The shorter section of the propeller shaft is journaled in a bearing 64 for rotation on an axis parallel to that of the agitator shaft, and its forward end projects from the bearing 64 and has a sprocket 65 fixed thereto, transversely opposite a large diameter sprocket 66 on the projecting forward end of the agitator shaft. These sprockets are drivingly connected by means of a chain 67 having

its lower stretch trained over an idler sprocket 68, as seen in Figure 5.

While the primary function of the agitator 46 is to effect remixing of the aggregates in freshly mixed concrete to overcome any segregation thereof before discharge of the concrete to a point of use, the agitator is also quite valuable in facilitating and controlling the discharge of the body contents through the opening 27 at the rear of the body when the gate 28 is either partially or fully raised. According to this invention it has been found highly advantageous when discharging of the body contents is to be effected, to only partially tilt the body to a discharge position at which its slanting bottom wall is substantially horizontal. While the body is held in this position the discharge gate 28 is opened to the desired degree, and the agitator is rotated in the counterclockwise direction as seen in Figure 4 so that the inclined paddles 51 on the outer ends of the agitator arms will cause the body contents to move rearwardly toward and through the discharge opening.

It will be understood, of course, that in transit trucks of the type here under consideration, a throttle control for the truck engine may be provided adjacent to the rear of the truck where an operator is normally stationed to control the discharge of the body contents. Consequently, the operator may either speed or slow the discharge of the material from the body while the gate is maintained in a given open position merely by regulation of the throttle of the truck engine to thereby cause the hydraulic pump and the fluid motor for the agitator to rotate the agitator at a correspondingly faster or slower rate.

Inasmuch as the hydraulic operator or cylinder 39 governing the opening and closing of the discharge gate 28 is also connected with the hydraulic pump through a suitable control valve, the operator may manipulate its valve to also effect whatever adjustment of the gate opening is desired to either speed or slow up the discharge of materials from the body.

Control valves mounted in a bank 70 on the rear of the sub-frame so as to be easily accessible to an operator are provided to effect control of the cylinders governing raising and lowering of the body, raising and lowering of the gate 28, and starting and stopping of the agitator.

Cooperating with the agitator and gate to achieve greater control over the discharge of materials to the point of use than was heretofore possible is a power operated collapsible chute structure 73. The chute structure is carried by the sub-frame 18 at the rear thereof and comprises short and long troughlike chute sections 74 and 75, respectively, endwise connected together by a hinge pin 76 for relative swinging motion about a transverse axis adjacent to the bottoms of the troughlike sections. The hinge pin, of course, provides for swinging motion of the chute sections from a collapsed transit position such as seen in Figures 1 and 3 to an extended operating position such as seen in Figures 2 and 7.

In their extended positions the sections align endwise and form one continuous trough to receive the materials issuing from the rear of the dump body and direct them to the point of use. In the collapsed position of the chute structure, the bottoms of the trough-like sections are disposed substantially back to back and the hinge connection between them is uppermost. Latch devices 77 carried by the sections at their hingedly connected ends hold them in aligning extended positions such as seen in Figures 2 and 7, but these latch devices are readily releasable to enable collapsing of the sections for transit.

The chute structure is supported by a post 79 carried by spaced upper and lower rearwardly projecting bearing brackets 80 and 81 on the rear of the sub-frame 18, beneath the discharge opening in the rear of the dump body. At its top the post has a flange or disc 82 fixed thereto and seating on a wear plate 83 on the upper bracket 80, and these brackets, of course, are provided

with suitable bearings in which the post is journaled for back and forth rotary motion about a vertical axis spaced a short distance to the rear of the discharge end of the dump body.

Secured to the disc 82 on the top of the post and projecting upwardly at an angle to its axis, is a bracket 85. The forward end portion of the shorter or receiving chute section 74 is pivotally mounted on the upper end of this bracket by means of a pin 86, parallel to the hinge pin 76. Consequently, the outwardly extending rear end portion of the short chute section may swing up and down about the axis of the pin 86, and it may also swivel bodily back and forth with the post 79, about the vertical axis of the latter.

Also supported by the bracket 85 for pivotal motion about the horizontal axis of a pin 87 parallel to but spaced a short distance beneath the pin 86, is the closed end of a single acting hydraulic cylinder 88 having a plunger or ram 89 projecting from its opposite end. The extremity of the ram is received between and pivotally connected to a pair of downwardly extending lugs 90 on the bottom of the shorter trough section by means of a pin 91 parallel to but spaced a short distance forwardly of the pin 76 by which the chute sections are hingedly connected. The hydraulic cylinder and its ram, therefore, in effect provide an extensible and retractable link connecting the outer end portion of the shorter chute section with the bracket 85 on the swivel post, with the link disposed under and nearly parallel to the bottom of the chute section.

The hydraulic cylinder 88 is adapted to be supplied with fluid under pressure from the same pump which supplies the fluid motor for the agitator, the body lift cylinders 34, and the gate cylinder 39, at the dictation of a manually operable control valve comprising one of the valves in the bank 70 thereof seen in Figures 1 and 2.

When fluid under pressure is delivered into the closed end of the cylinder 88 it effects extension of the ram 89 and causes the shorter chute section to be swung upwardly in a counterclockwise direction as viewed in Figures 3, 6 and 7. When hydraulic fluid is allowed to exhaust from the cylinder, the ram 89 thereof is retracted under the weight of the outer end portion of the shorter chute section, combined with the weight of the longer chute section 75 hingedly connected thereto. Such retraction of the ram, of course, results in clockwise swinging motion of the shorter chute section about its pin 86, toward an operating or extended position such as seen in Figures 2 and 7.

Connected between the lower end of the pivot post 79 and the bottom portion of the longer chute section 75 intermediate the ends of the latter is a second single acting hydraulic cylinder 93 having an extensible ram 94. The cylinder 93 is likewise supplied with fluid under pressure from the single hydraulic pump on the truck at the dictation of a manually operable control valve comprising one of the valves of the group 70 thereof at the rear of the truck; and together with its ram this cylinder constitutes a second extensible and retractable link for the chute structure.

The closed end of the cylinder 93 is pivotally supported on a pin 96 carried by a clamp 97 suitably fixed to the lower end portion of the swivel post, it being understood that the axis of the pin 96 is parallel to those of the hinge pins 76, 86, and 87 previously described. The outer end of the ram 94 of the cylinder is secured as at 98 to an elongated ram extension 99 at a point intermediate the ends of the latter, and the extension in turn has its outer end pivotally connected by pins 101 to brackets 100 projecting downwardly from the longer chute section at opposite side portions thereof. The pins 101, of course, are disposed on a common transverse axis parallel to that of the hinge pin 76 by which the chute sections are connected.

The ram extension 99 comprises a pair of opposite arms

103 which embrace the ram 94 and have their inner ends secured to an annulus 104 which encircles and slides freely along the cylinder 93 so as to guide and reinforce the ram during its extending and retracting movement. Because of the ram extension, therefore, the ram 94 of the cylinder 93 is not subjected to bending forces under the influence of the weight of the longer chute section such as would otherwise occur if the ram were connected directly to the longer chute section.

The extending and collapsing motions of the two hingedly connected chute sections 74 and 75 are easily governed by the operator through suitable manipulation of the control valves for the cylinders 88 and 93. Thus, to effect extension of the chute to an operating position such as seen in Figures 2 and 7, from its collapsed or transit position seen in Figures 1 and 3, the operator may first actuate the control valve for the lower cylinder 93 to effect extension of its ram a short distance, and either at the same time or directly thereafter, the operator may actuate the control valve for the upper cylinder 88 to effect exhaust of the hydraulic fluid therefrom. Thereupon, under the influence of the combined weights of the chute sections 74 and 75, the section 74 swings downwardly in the clockwise direction (Figure 6) and causes the longer chute section 75 to swing in the counterclockwise direction toward alignment with the shorter chute section. If the ram of the lower cylinder 93 is extended only a relatively short distance the two chute sections will become aligned and assume an angular position such as seen in construction lines in Figure 7, at which the discharge chute slants downwardly and rearwardly away from the discharge end of the dump body at a substantial inclination with respect to horizontal, and at which position materials discharging thereinto from the dump body may flow substantially quickly to the point of use. If desired, however, the entire chute structure may be swung to any of several positions more nearly horizontal, one of which is shown in solid lines in Figure 7, to slow and control the rate at which materials flow along the chute structure to the point of use. This is accomplished merely by effecting whatever further extension of the ram of the lower hydraulic cylinder 93 is desired.

In this manner, it will be appreciated that the chute structure cooperates not only with the discharge gate, but also with the agitator in the dump body to control the discharge of materials from the body. It further enables the operator of the dump truck to almost immediately stop the discharge of materials to the point of use by the substantially simultaneous actions of closing the discharge gate and elevating the chute structure toward a position close to horizontal, without necessarily stopping the agitator in the dump body. Likewise when a speedy discharge of materials to the point of use is desired, the operator may retract the ram of the lower cylinder 93 to place the chute structure in a position of steeper incline such as indicated in construction lines in Figure 7, open the discharge gate 28 to a greater extent, and by advancing the auxiliary throttle for the truck engine speed up the rotation of the agitator in the dump body.

With the unique cooperation possible between the elements governing discharge of materials from the body, namely, the agitator, the discharge gate, and the chute structure, an extremely wide range of control is afforded for the discharge of materials from the dump body, covering extremely slow discharge to very rapid discharge. By way of example, an entire four-yard load of freshly mixed concrete may be placed in barely over one-half minute. In this latter respect particularly, it will be appreciated that for the faster rates of discharge, the operator will cause the hydraulic lift cylinders 34 for the dump body to tilt the same to a greater height, thus promoting gravity flow of materials rearwardly in the body.

While the dump body illustrated in Figures 1 through

5 is provided with a rounded or conically surfaced bottom the radius of which diminishes uniformly from the extreme front to the rear of the body, it may also be constructed as shown in Figure 10, particularly in instances where larger capacity bodies are desired. As therein shown the rear portion 107 of the body is substantially like that previously described (when viewed in side elevation), but the body has a forward extension 108 which is likewise provided with a conically surfaced bottom 109. The radius of the bottom portion 109, however, diminishes uniformly toward the front wall 15' of the body.

The body shown in Figure 10, therefore, may be considered as having opposing frusto-conical bottom surfaces, with the large diameter ends thereof abutting and secured to one another, and their small diameter ends at the fore and aft ends of the body. In this case also, it will be noted that while the bottom of the rear portion 107 of the body slopes upwardly and rearwardly as it did in the first embodiment described hereinbefore, the bottom of the forward section 108 is disposed horizontally in the transit position of the body.

It is important, however, that the two frusto-conical bottom portions of the body be fixed together in coaxial relationship so that a single straight agitator shaft 47' may be provided for the body with its forward end projecting through the front wall 15' at the small diameter end of the forward body section 108. In this case, however, the agitator arms will diminish in length from the junction between the two body portions 107 and 108 toward the front wall 15', but their paddles will sweep substantially closely along the curved or rounded bottom portions of the front body portion during rotation of the agitator shaft.

From the foregoing description taken together with the accompanying drawings, it will be readily apparent to those skilled in the art that this invention provides an improved dump body which is especially well suited for the hauling and discharging of freshly mixed concrete or other semi-liquid materials; that the provision of an agitator in the body completely solves the problem of segregation or stratification of the body contents during transit by enabling the contents to be remixed prior to and even during the discharge of the contents from the body; and that exceptional good control over the rate of discharge of the contents is provided through the unique cooperation of the agitator, the discharge gate, and the power operated collapsible chute structure.

What is claimed as my invention is:

1. A power operated chute structure for receiving and placing semi-liquid materials such as concrete, characterized by: a chute support mounted for swiveling motion about a vertical axis; a receiving chute section having inner and outer end portions; means connecting the inner end portion of the receiving chute section to the chute support for bodily swiveling motion therewith and for swinging motion relative to the chute support, about a horizontal axis spaced from the vertical axis of the chute support, and which horizontal axis extends transversely of the receiving chute section, between an operative receiving position inclined downwardly toward its outer end and an inoperative substantially upright position at which its outer end is uppermost; a discharge chute section; means hingedly connecting one end of the discharge chute section to the outer end of the receiving chute section for swinging motion of the discharge chute section about an axis parallel to said horizontal axis and disposed adjacent to the bottoms of the chute sections, whereby said chute sections are capable of relative hinging motion from an operative position at which the sections align endwise and form one continuous downwardly inclined trough-like chute, to a collapsed position at which the chute sections are disposed with their bottoms defining an acute angle and opposing one another, and their hinge connection

is uppermost; a hydraulic cylinder pivotally connected between the chute support and the receiving chute section for swinging the latter upwardly about its pivotal connection with the chute support on the power stroke of the cylinder; and another hydraulic cylinder pivotally connected between the chute support and said discharge chute section for swinging the same upwardly about its hinge connection with the receiving chute section on the power stroke of said other cylinder, and providing for adjustment of the angle of inclination of the trough-like chute defined by the sections when the same are aligned.

2. A power operated chute structure for receiving and placing semi-liquid materials such as concrete, characterized by: a chute support mounted for swiveling about a vertical axis; a receiving chute section having inner and outer end portions; means connecting the inner end portion of the receiving chute section to the chute support for bodily swiveling motion therewith and for swinging motion relative to the chute support, about a horizontal axis which extends transversely of the receiving chute section, between an operative receiving position inclined downwardly toward its outer end and an inoperative substantially upright position at which its outer end is uppermost; a discharge chute section; means hingedly connecting one end of the discharge chute section to the outer end of the receiving chute section for swinging motion of the discharge chute section about an axis parallel to said horizontal axis and disposed adjacent to the bottoms of the chute sections, whereby said chute sections are capable of relative hinging motion from an operative position at which the sections align endwise and form one continuous downwardly inclined trough-like chute, to a collapsed position at which the chute sections are disposed with their bottoms defining an acute angle and opposing one another, and their hinge connection is uppermost; power operated means pivotally connected between the chute support and the receiving chute section for swinging the latter upwardly about its pivotal connection with the chute support; and other power operated means pivotally connected between the chute support and said discharge chute section for swinging the same upwardly about its hinge connection with the receiving chute section, and providing for adjustment of the angle of inclination of the trough-like chute defined by the sections when the same are aligned.

3. In a dump truck for hauling and facilitating the discharge of semi-liquid mixtures such as concrete: a chassis; a dump body pivotally supported on the chassis for tilting discharging motion about a transverse axis adjacent to the rear of the body and at a high level a substantial distance above the chassis, said body having a rearwardly facing discharge opening at its rear extremity with the lower edge of said opening disposed adjacent to the tilt axis, said body being characterized by a front wall, elongated opposite side wall portions which converge rearwardly from locations adjacent to the front wall and terminate at the discharge opening with the rear end of said side wall portions defining the opposite side edges of said opening, and a rounded substantially conically shaped bottom section joining said side wall portions and converging upwardly and rearwardly from a location adjacent to the front wall to said discharge opening with the rear end of said bottom section defining the lower edge portions of the discharge opening over which materials in the body must pass as they discharge from the body; an elongated agitator shaft inside the body rotatably supported thereby for rotation on a fixed axis substantially concentric to the conically shaped bottom section, with its forward end projecting through a medial zone of said front wall and its axis passing through an upper central zone of the discharge opening; a series of arms carried by and projecting outwardly from the agitator shaft at axially and circum-

ferentially spaced locations thereon; inclined blade members on the outer ends of the arms arranged to substantially closely sweep along the curved interior surface of said bottom section during rotation of the agitator shaft, for urging materials in the body rearwardly along the bottom thereof and out of the discharge opening at the rear of the body during rotation of the agitator shaft in one direction; and drive means on the truck, externally of the body, connecting with the forwardly projecting end of the agitator shaft, for transmitting rotation thereto.

4. A truck body for hauling mixed concrete or other semi-liquid materials, and of the type which has an open top and tilts about an axis adjacent to its rear to a discharge position with its forward end elevated so as to effect rearward discharge of its contents through an opening at its upper rear end, characterized by: a substantially upright front wall, and rearwardly convergent side walls which terminate at and define opposite side edge portions of said discharge opening, the lower portions of said side walls being joined by a rounded substantially conically surfaced bottom which slants upwardly and rearwardly to terminate at the discharge opening and in effect provides the rear wall of the body and the lower edge portions of the discharge opening over which materials in the body pass as they flow out of the body; the provision of means on the rear portion of said bottom providing for pivotally mounting the body for tilting motion about a transverse axis located closely adjacent to the lower edge of the discharge opening; and by the provision of a rotatable agitator inside the body comprising an elongated shaft, supported by the body for rotation on an axis fixed with respect to the body and coaxial with the conically surfaced bottom of the body, and axially and circumferentially spaced inclined blade members carried by said shaft and arranged to sweep along the curved interior of the bottom in substantially close proximity thereto during rotation of the agitator shaft in one direction.

5. In a mixing type dump truck for transporting concrete and other semi-liquid mixtures, the combination of: a body having a discharge port at its rear end; means supporting the body on the truck for tilting discharging motion about a transverse axis closely adjacent to the lower edge of said discharge port; a chute support mounted on the rear of the truck for turning motion about a fixed vertical axis lying in a plane spaced rearwardly from and parallel to the tilt axis of the body; means providing an elongated chute carried by the chute support, said chute comprising a receiving chute section pivotally mounted upon the chute support to turn bodily therewith and to tilt relative thereto about a horizontal axis located a short distance beneath the body tilt axis and which in one position of the chute support is parallel to the body tilt axis and substantially medially between the body tilt axis and said plane containing the axis about which the chute support turns, said receiving chute section being tiltable from an operative receiving position with a portion thereof maintained directly beneath the discharge port in the body in any tilted position of the body or in any angular position of the chute support, to a transit position extending lengthwise upwardly directly behind the rear of the body and into the space occupied by the rear end portion of the body when it is in a tilted discharging position, said chute including a discharge chute section hingedly connected at one end to that end of the receiving chute section which is uppermost in the transit position thereof and capable of being disposed in back to back relation to the receiving chute section when the latter is in said transit position, and of being aligned endwise with the receiving chute section in the receiving position of the latter.

6. A dump truck for hauling mixed concrete or other semi-liquid materials, and of the type having a body provided with an open top and which tilts about an axis

adjacent to the rear of the truck to a discharge position with its forward end elevated so as to effect a discharge of its contents through a rearwardly facing opening at its upper rear end, said body being characterized by: a substantially upright front wall and upright rearwardly convergent elongated side walls, the lower portions of which are joined by a rounded substantially conically surfaced elongated bottom which slants upwardly and rearwardly, the rear extremities of said bottom and the body sides defining the discharge opening and said bottom in effect providing the rear wall of the body over which materials in the body flow to reach said discharge opening; the provision of an upright frame structure on the rear of the truck having bearing means at its upper portion mounting the body for tilting discharging motion about a transverse axis closely adjacent to the lower edge of said discharge opening; an agitator inside the body comprising an elongated shaft, means on front and rear portions of the body journaling the shaft for rotation with its longitudinal axis substantially lengthwise above and in fixed concentric relation to the conically surfaced bottom of the body, and axially and circumferentially spaced blade means on said shaft arranged to sweep along adjacent surfaces of the curved interior of the bottom in substantially close proximity thereto during rotation of the agitator shaft.

7. A folding chute structure for receiving and placing semi-liquid materials such as concrete, characterized by: a chute support mounted for swiveling motion about a vertical axis; a receiving chute section having inner and outer end portions; means connecting the inner end portion of the receiving chute section to the chute support for bodily swiveling motion therewith and for swinging motion relative to the chute support, about a horizontal axis spaced from the vertical axis of the chute support and which horizontal axis extends transversely of the receiving chute section, between an operative receiving position inclined downwardly toward its outer end and an inoperative substantially upright position at which its outer end is uppermost; a discharge chute section; means hingedly connecting one end of the discharge chute section to the outer end of the receiving chute section for swinging motion of the discharge chute section about an axis parallel to said horizontal axis and disposed adjacent to the bottoms of the chute sections whereby said chute sections are capable of relative hinging motion from an operative position at which the sections align endwise and form one continuous downwardly inclined trough-like chute, to a collapsed position at which the chute sections are disposed with their bottoms defining an acute angle and opposing one another, and their hinge connection is uppermost; means connected between the chute support and the receiving chute section to provide for swinging the latter upwardly about its pivotal connection with the chute support; and other means connected between the chute support and said discharge chute section to provide for swinging the same upwardly about its hinge connection with the receiving chute section, and providing for adjustment of the angle of inclination of the trough-like chute defined by the sections when the same are aligned.

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