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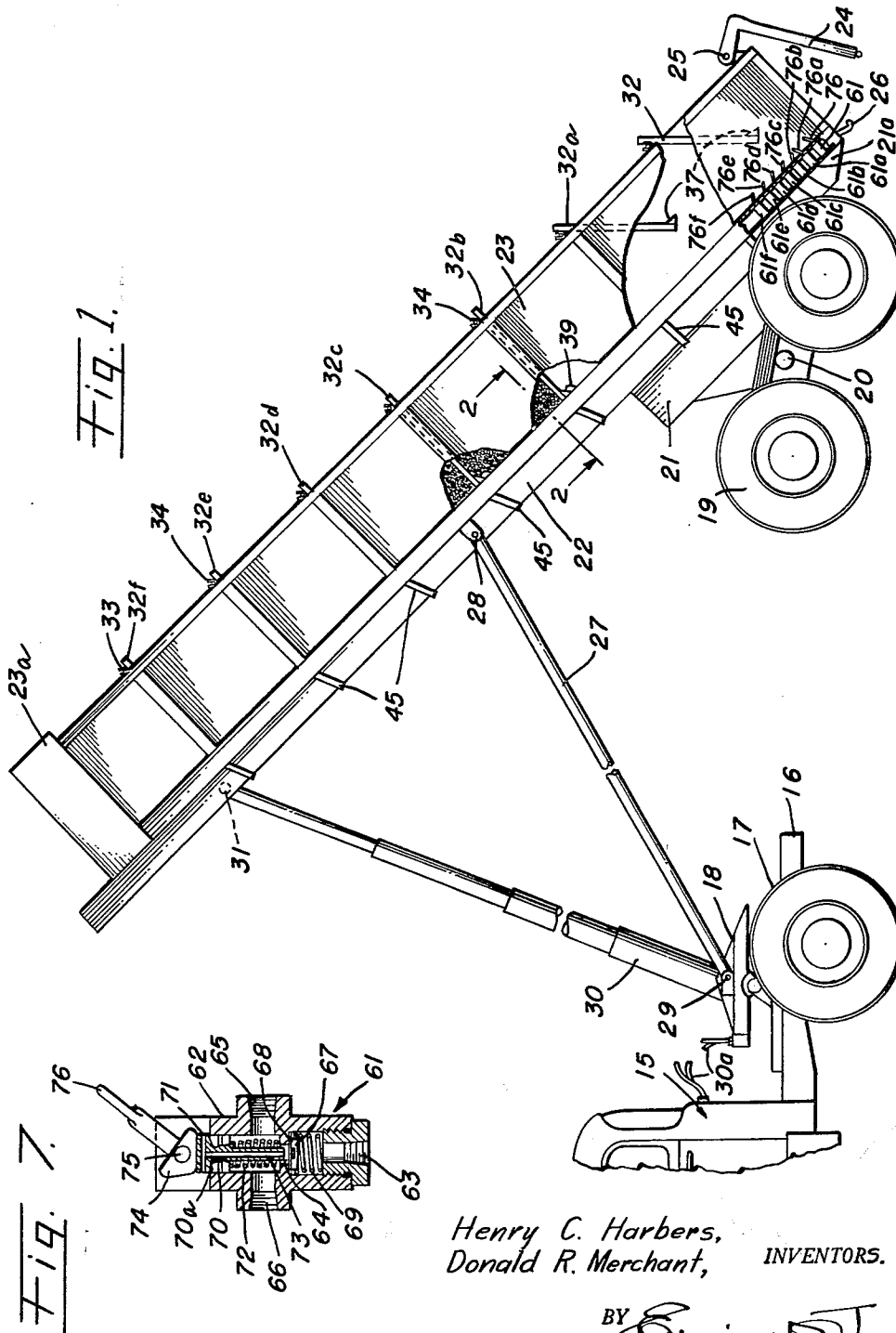
H. C. HARBERS ET AL

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TILTING DUMPING VEHICLE PLURAL GATE LATCH OPERATING MECHANISM

Filed May 17, 1957

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Henry C. Harbers,
Donald R. Merchant, INVENTORS.

BY *Ernie Jones*
Attorney

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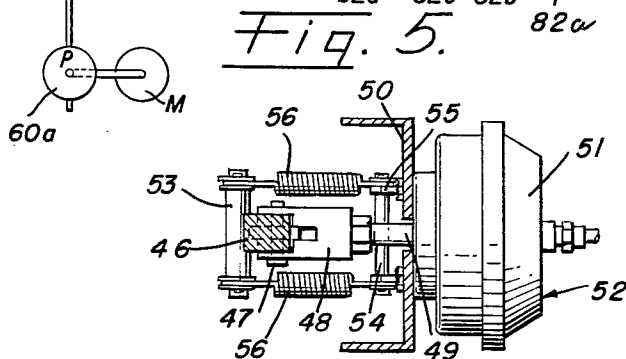
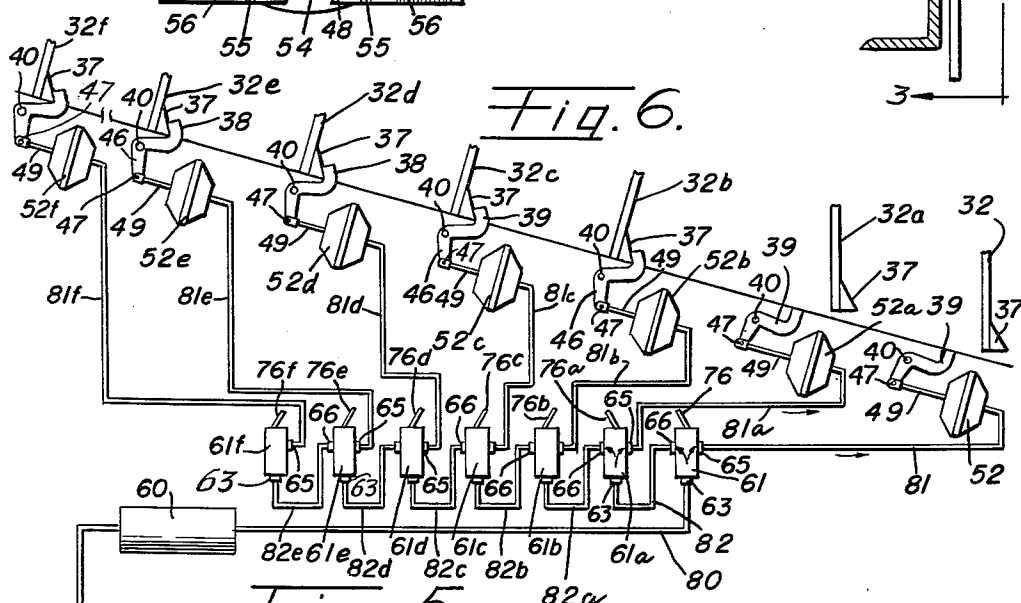
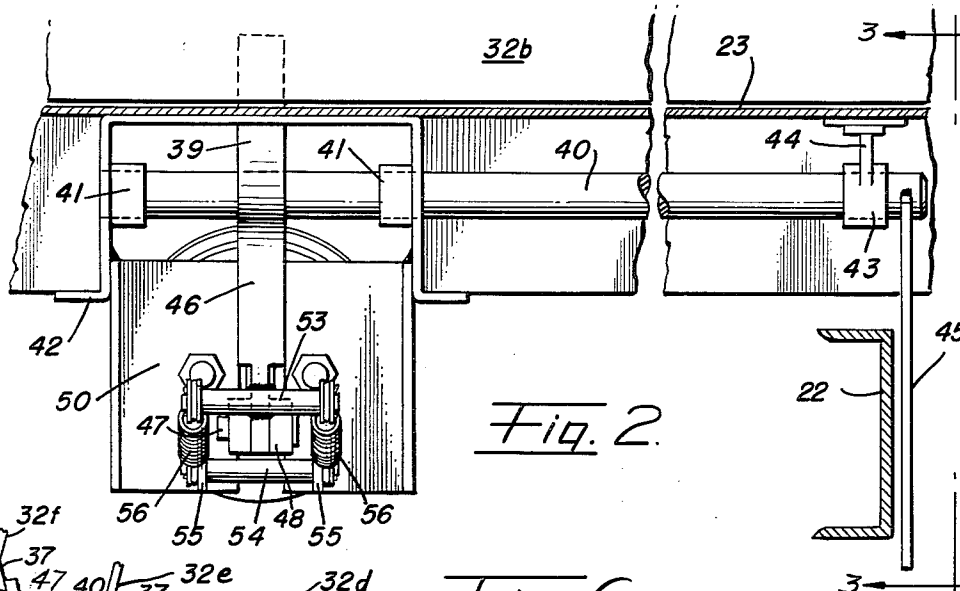
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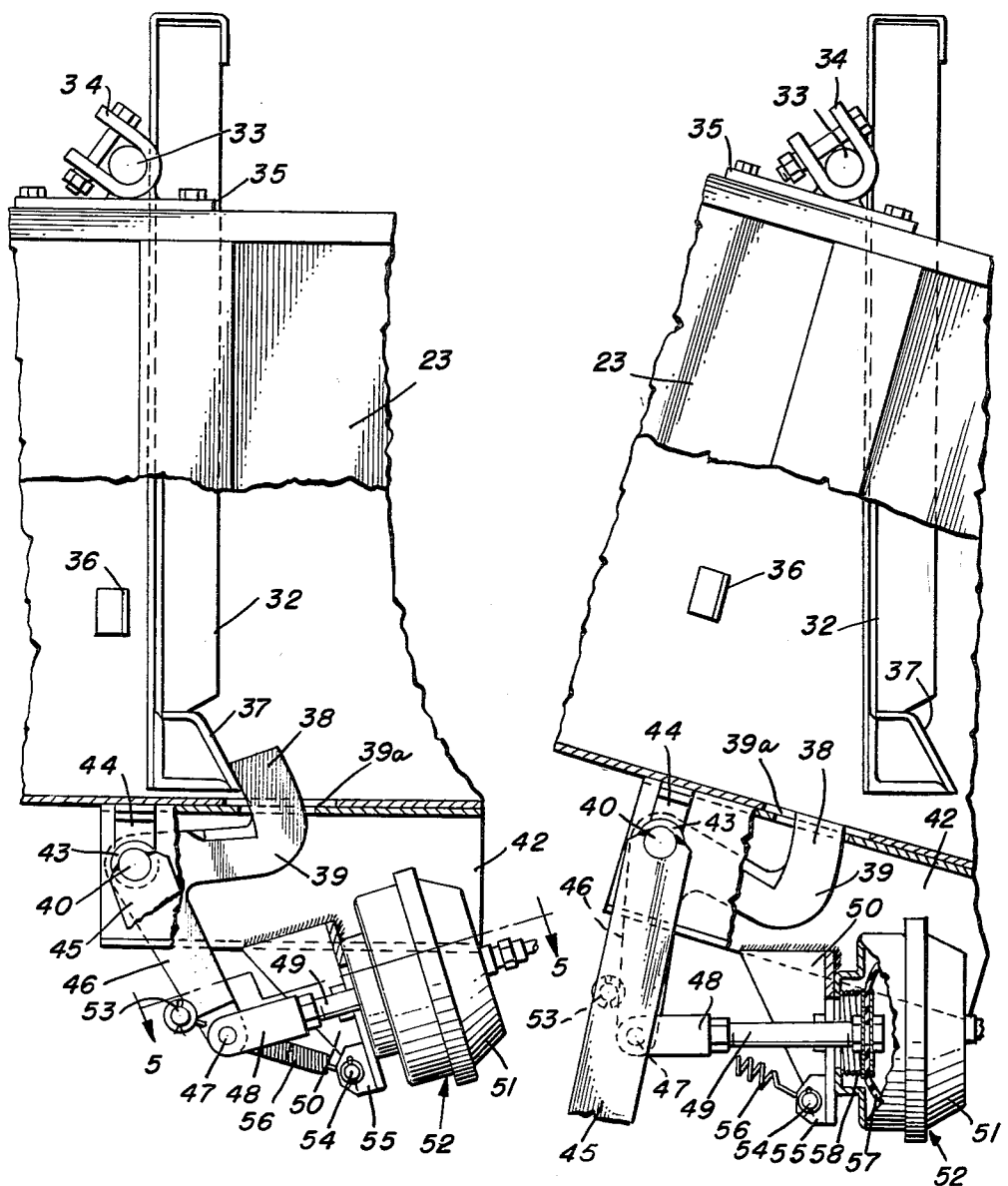
Henry C. Harbers,
Donald R. Merchant,
INVENTORS.

BY *Edwin D. Jones*
Attorney

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Fig. 4.



Henry C. Harbers,
Donald R. Merchant, INVENTORS.

BY *Ernest D. Ball*
Attorney

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TILTING DUMPING VEHICLE PLURAL GATE LATCH OPERATING MECHANISM

Henry C. Harbers, Pasadena, and Donald R. Merchant, Glendale, Calif., assignors, by mesne assignments, to Challenge-Cook Bros., Incorporated, Los Angeles, Calif., a corporation of California

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14 Claims. (Cl. 298—8)

Our invention relates to dump trucks of the type in which the dump body is designed more particularly, although not necessarily, for transporting dry, pre-mixed materials for making concrete, to a site to be paved, and when tilted, to dump the materials into a concrete mixer supported for progressive movement over a concrete form by a track-laying type of vehicle, to mix, wet and pour the concrete into the form as the vehicle moves along the latter.

Dump bodies of this character are provided with a plurality of gates spaced one from the other along the length of the body and between any two of which is confined a batch of dry and pre-mixed concrete. Hence, such gates are referred to in the art as batch gates, and normally they are latched in closed position individually to maintain the batches therebetween for transport. By opening the batch gates successively from the rear to the front end of the dump body when the latter is in dumping position, causes the batches to be discharged from the rear end of the body successively. In practice, the dump truck follows the concrete mixer carrying vehicle to pour the batches into the mixer as needed and as the vehicle advances over the concrete form. The amount of concrete materials constituting any one batch is usually commensurate with the capacity of the drum of the mixer, and thus after one batch is delivered to the drum, then mixed and poured from the drum into the form, another batch from the dump body is discharged into the drum upon opening the next gate above and so on until all the batches have been discharged.

Heretofore the batch gates have been manually unlatched individually and independently one of the other, through the provision of various means, such as individual ropes adapted to be pulled by the operator while standing on the ground at one side of the dump truck, but relatched in closed position only by the gates themselves as they swing, under the action of gravity, to closed position as the dump body is restored to horizontal position. This gate unlatching means, as well as the others, has been found undesirable for a number of reasons. One is that since it permits unlatching of any one gate independently of the others there is no assurance that the gates will be unlatched in predetermined sequence as necessary to effect discharge of the batches individually and successively from the rear end to the front end of the dump body. Another reason is that since there is no means for positively relatching the gates, one or more of the gates may remain unlatched when the dump body is restored to horizontal position. Thus when the dump body is reloaded the concrete materials between any two adjacent gates are free when the body is moved to dumping position to flow between the pair of gates next below, thereby increasing the amount of that particular batch beyond the capacity of the mixing drum. Thus the materials cannot be discharged in batches of predetermined amounts for a concrete mixer of a corresponding capacity.

It is a purpose of our invention to provide mechanisms for operating batch-gate latches in a manner to positively latch and unlatch the gates, and also to visibly indicate to the operator the open and closed positions of the gate so that at all times he is apprised of which gates are open or closed.

It is also a purpose of our invention to provide control means for the latch-operating mechanisms, whereby they can be individually operated only in a predetermined sequence such that the batch gates are unlatched successively from the rearmost to the foremost in respect to their series arrangement lengthwise of the dump body, thereby effecting discharge of the materials from the body when tilted in the prescribed batches successively as and when required.

A further purpose of our invention is to provide latch-operating mechanisms including elements responsive to fluid under pressure from a common source for effecting individual operation of the mechanisms to move the latches to gate-latching positions, and wherein manually operated valves are provided for controlling the supply of fluid individually to the elements, in a manner such that as to effect and compel operation of the mechanisms in a predetermined order which produces unlatching of the batch gates beginning with the rearmost to the foremost of the series and not otherwise.

We will describe only one form of batch gate latch-operating mechanisms for dump trucks and control means therefor, and will then point out the novel features thereof in the claims.

In the drawings:

FIG. 1 is a view showing in side elevation one form of batch gate latch-operating mechanisms and control means therefor embodying my invention, in association with one form of dump truck.

FIG. 2 is an enlarged fragmentary transverse sectional view taken on the line 2—2 of FIG. 1.

FIG. 3 is a side elevational view partly broken away and taken substantially on the line 3—3 of FIG. 2, and showing the batch gate closed and latched.

FIG. 4 is a view similar to FIG. 3 showing the batch gate open and unlatched.

FIG. 5 is a sectional view taken on the line 5—5 of FIG. 3.

FIG. 6 is a view showing diagrammatically the batch gates, the latches, the latch-operating mechanisms, and the air pressure system for actuating the mechanisms.

FIG. 7 is a detail vertical sectional view of one of the control valves of the system.

Referring more particularly to the drawings, in FIG. 1 is shown a dump truck comprising a truck generally indicated at 15 which is self-powered and of the type commonly used in connection with semi-trailers. This truck includes a frame 16 supported in part by a wheel assembly 17 and on which is a fifth wheel 18. A rear wheel assembly 19 is pivotally connected by trunnions 20 to a support 21 for the rear end of a frame 22 for a dump body 23 having a bottom wall and side walls with a tail gate 24 pivoted as at 25 to the side walls at the rear end of the dump body 23 and adapted to be releasably secured in closed position by a latch 26. A pair of draft links 27 are pivotally connected as at 28 to the frame 22, and as at 29 to the fifth wheel 18. A hydraulic jack 30 of the telescopic type is pivotally connected to the fifth wheel 18 and to the frame 22 as at 31.

It will be understood that to tilt the dump body 23 from the horizontal position to the inclined position, such as shown in FIG. 1, hydraulic fluid under pressure is supplied to the lower end of the jack 30 from a suitable source located in the cab of the truck, through conduits 30a, causing the parts of the jack to be extended. Under the action of the draft links 27 the wheel assemblies 17 and 19 are caused to approach each other allowing the dump body to swing upwardly about the pivot 20 to dumping position.

Within the dump body 23 are a series of batch gates 32 hingedly mounted on the inner side walls of the body at regularly spaced intervals along the length thereof,

the two end-most gates being similarly spaced in relation to the front wall 23a of the body, and tail gate 24. These batch gates have, in FIG. 6, been designated 32, 32a, 32b, 32c, 32d, 32e and 32f beginning with the rearmost gate to the foremost of the series to facilitate describing later herein the operation of the invention.

Each batch gate 32-32f inclusive may be of the construction shown in FIG. 3, and it is mounted for pivotal movement to occupy the closed position shown in FIG. 3, and in the open position shown in FIG. 4, by means of stub shafts 33 fixed to the upper end of the gate at the forward side thereof so as to be rotatable in clevises 34 welded to plates 35 secured to the top edges of the dump body. Stops 36 are formed on the sides of the body 23 at locations to prevent swinging movement of the gate past closed position to an appreciable extent.

At the bottom edge and to the rear side of each gate is fixed a keeper 37 which may have the inclined form shown for engagement by the bill 38 of a latch 39 for securing the gate in closed position. The latch 39 is fixed at one end to a shaft 40 extending crosswise beneath the dump body 23 and journaled in two bearings 41 formed in an inverted U-shaped frame 42 welded to the bottom wall on the underside of the body, and a third bearing 43 formed on a hanger 44 secured to the underside of the body. A handle arm 45 is fixed to the shaft 40 adjacent the bearing 43 and to the outer side of one of the side beams of the frame 22.

Through rotation of the shaft 40 in one direction or the other the latch 39 can be moved upwardly or downwardly through openings 39a in frame 42 and the bottom wall of dump body 23, to engage or disengage the keeper 38.

The latch-operating mechanism for each batch gate 32-32f inclusive includes the shaft 40 and an arm 46 which is an extension of the latch 39. To the free end of the arm 46 is pivoted, by means of a pin 47, a bifurcated connection 48 secured to one end of a rod 49. The other end of the rod 49 extends through a suitable opening in a bracket 50, and then through an opening in a casing 51 of a diaphragm unit 52. The casing 51 is secured to the bracket 50 and the latter, in turn, is welded to the frame 42.

To facilitate describing later herein the operation of the invention, the diaphragm units of the several mechanisms have been individually designated in FIG. 6 from 52-52f inclusive to correspond to the designations for the batch gates.

A cross pin 53 is welded to the arm 46 adjacent the pivot 47, and a second pin 54 is mounted in ears 55 of the bracket 50. A pair of coiled contractile springs 56 connect the pins 53 and 54 for urging the arm 46 to the position shown in FIG. 3 wherein the latch 39 is in gate-latching position.

Contained within the casing 51 is a diaphragm 57 to which the adjacent end of the rod 49 is secured. A coiled expansible spring 58 is interposed between the diaphragm 57 and that side of the casing 51 secured to the bracket 50.

While the spring 58 aids the springs 56 in urging the latch 39 to gate-latching position, it is primarily designed to maintain the rod 49 centered in its movement with respect to the diaphragm 57, and also to insure return of the diaphragm to non-flexed position once it is relieved of fluid pressure at the other side thereof.

For actuating the diaphragm units 52, 52a, 52b, 52c, 52d, 52e and 52f to operate the mechanisms for moving of latch 39 to gate-releasing position and in a manner such that the operator is compelled to effect their operation successively, but, of course, intermittently beginning with the lower or rearmost gate and ending with the upper or foremost gate, the pneumatic system shown in FIG. 6 is provided.

This system comprises a tank 60 in which air under pressure is stored from an air pump 60a operated by a

motor M. By conduits to be described later herein air under pressure can be supplied to all of the diaphragm units 52-52f inclusive through two-way control valves 61, 61a, 61b, 61c, 61d, 61e and 61f, one for each of the diaphragm units. All of the valves are mounted in a casing 21a secured on one side of the frame 21 adjacent the rear end thereof, and with the operating levers for the valves projecting from the casing for convenient actuation by the operator while standing at one side of the rear wheel assembly 19.

Each valve 61, 61a, 61b, 61c, 61d, 61e and 61f is of the conventional construction shown in FIG. 7 wherein it will be seen that it comprises a body 62 formed with an inlet passage 63 leading through a port 64 to lateral passages 65 and 66. A valve 67 having a sealing disc 68, is urged upwardly to close the port 64 by a spring 69.

In the valve body above the passages is mounted a plunger 70 urged upwardly to expose bleed ports 71 therein, by a spring 72 surrounding a stem 73 which is tubular so as to interiorly communicate with a bore 70a of the plunger, and the latter in turn with the bleed ports. A cam 74 is pivoted as at 75 on the top of the body 62, and through a handle or lever 76 the cam can be turned to the right to depress the plunger and open the valve 67 against the tension of the spring 69, or to the left to allow the plunger to rise under the action of the spring 72 permitting the valve to close and placing the bleed ports 71 in communication with atmosphere.

In FIG. 6, the levers for the respective valves have been designated 76, 76a, 76b, 76c, 76d, 76e and 76f.

For supplying air under pressure from the tank 60 to the individual diaphragm units 52-52f inclusive under control of the respective valves 61, 61a, 61b, 61c, 61d, 61e and 61f, a conduit 80 connects the tank 60 to inlet passage 63 of the valve 61. A second conduit 81 connects passage 65 of the valve 61 with the casing of the unit 52. Connected to passage 65 of valve 61 is one end of a conduit 82, the other end being connected to inlet passage 63 of the next valve 61a. The passage 65 of valve 61a is connected to the casing of diaphragm unit 52a by a conduit 81a.

From the preceding description, it should be clear that the other valves 61b, 61c, 61d, 61e and 61f are connected to valve 61a, and to each other in the same manner as described in connection with valves 61 and 61a, and that they are connected to the diaphragm units 52b, 52c, 52d, 52e and 52f by conduits in the same manner as described in connection with unit 52a. Reference numerals with exponents corresponding to the units 52b, 52c, 52d, 52e and 52f have been employed to designate these conduits.

The operation of the invention is as follows:

To ready the dump truck for transporting of concrete materials to the job site for dumping of the same in batches into a concrete mixer, the dump body 23 is adjusted to occupy a horizontal position, the tail gate 24 latched in closed position, and the batch gates 32-32f inclusive all secured in closed position by the latches 39 through movement of all of the valves 61-61f inclusive to closed position causing any air under pressure previously supplied to any of the diaphragm units to be exhausted to atmosphere through bleed ports 71 thus permitting springs 56 to move the latches to keeper-engaging position.

Upon the dump truck reaching the job site, the dump body is first raised to tilted position through operation of the jack 30, and then tail gate 24 is unlatched allowing the batch of material between the tail gate and the batch gate 32 to be dumped into the concrete mixer.

To dump that batch of material between the gates 32 and 32a, the valve 61 is opened through movement of the lever 76, thereby causing air under pressure from tank 60 to be supplied to conduit 80, thence through passages 63 and 65 of valve 61, into the conduit 81, and finally to casing 51 of unit 52. This results in actuation of diaphragm 57 to move latch 39 to disengage keeper 37 of gate 32. Upon release of gate 32 the batch of material

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between it and gate 32a, will gravitate from the dump body.

To dump the batch of material between gates 32a and 32b, valve 61a is opened, and with valve 61 remaining in open position, air under pressure from tank 61 can be supplied to the diaphragm of unit 52a for moving the respective latch 39 to release the gate 32a, through conduit 80, passages 63 and 66 of valve 61 into and through conduit 82 to passage 63 of valve 61a from whence, through passage 65 and conduit 81a, air is supplied to the casing of unit 52a.

It will be evident from the preceding description that the other gates of the series can be unlatched through opening of their respective valves to permit discharge of the other batches of material from therebetween, so that ultimately all batches can be dumped from the rear end of the dump body. It is important to note that the several valves 61-61f inclusive are so connected by the conduits to each other, to the tank, and to the diaphragm units, that in order to supply air under pressure to all of the units to unlatch all of the batch gates, such air must pass progressively through all of the valves beginning with the valve 61 and ending with the valve 61f. Manifestly, therefore, an operator is compelled to open the valves in this prescribed order which, of course, in turn effects unlatching of the gates successively from the rearmost to the foremost of the series as intended by our invention, and as necessary to effect dumping of the batches of material in a successive order from the dump body.

Once all batches of material have been dumped in the manner above described, the dump body is restored to horizontal position causing all batch gates to swing to closed position. By the operator now closing all of the valves 61, 61a, 61b, 61c, 61d, 61e, 61f, by pivoting the operating handles 76, 76a, 76b, 76c, 76d, 76e, 76f to their initial positions, the units 52-52f, inclusive, are exhausted of air under pressure through the vent passages 70a, 71, thereby allowing the springs 56 to contract and rotate the shaft 40 so as to move the latches 39 into engagement with the keepers 37 and thus secure the batch gates in closed position. With all gates now latched in closed position the dump body is readied for reloading with the materials at the source of supply, and the division of the materials into batches by the gates.

As fixed to each shaft 40, each arm 45 provides a dual purpose. It can be used as a handle to manually turn the shaft for moving the latch 39 to latch or release the batch gate should the mechanism fail in its intended function, or as an indicator to the operator of whether the latch is in gate-latching or unlatching position.

Although we have herein shown and described only one form of batch gate latch-operating mechanisms for dump trucks and control means therefor embodying our invention, it is to be understood that various changes and modifications may be made therein without departing from the spirit of the invention and the spirit and scope of the appended claims.

What we claim is:

1. In a vehicle of the type having a tilting dump body formed with a bottom wall and side walls including a plurality of independently supported pivoting gates thereacross and spaced from one another; the improvement comprising: gate latch operating mechanism for each of said gates including a shaft mounted on one of said dump body walls adjacent the plane of the gate when in its closed position, a latch connected to said shaft and movable through an opening formed in one of said walls into and out of locking engagement with an edge of an associated one of said gates, yieldable spring means connected to said latch for actuating said latch in a direction to latch said gate closed, and fluid-actuated means connected to said latch for moving the latch in the other direction and against the action of said spring to unlock said latch thereby releasing the gate for movement to its open position.

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2. In a vehicle of the type having a tilting dump body formed with a bottom and side walls including a plurality of independently supported pivoting gates thereacross and spaced from one another; the improvement comprising: gate latch operating mechanism for each of said gates including a shaft mounted transversely on said dump body bottom adjacent the plane of the gate when in its closed position, a latch connected to said shaft and moveable through an opening formed in said bottom into and out of locking engagement with an edge of an associated one of said gates, yieldable spring means connected to said latch for actuating said latch in a direction to latch said gate closed, and fluid-actuated means connected to said latch for moving the latch in the other direction and against the action of said spring to unlock said latch thereby releasing the gate for movement to its open position.

3. In a power-driven vehicle of the type having a dump body formed with a bottom and side walls including a plurality of independently supported pivoting batch gates thereacross and spaced from one another lengthwise of said dump body; that improvement which comprises, batch gate latch operating mechanism for each of said gates including a shaft mounted transversely beneath said dump body bottom adjacent the plane of the gate when in its closed position, a latch fixed to said shaft movable through an opening formed in said bottom into and out of locking engagement with an edge of an associated one of said batch gates as the shaft is rotated in one direction or the other, a crank arm fixed to the shaft, yieldable spring means connected to said arm for rotating said shaft in a direction to latch said gate closed, and pneumatically-actuated means connected to said arm for rotating the shaft in the other direction and against the action of said spring to unlock said latch thereby to release the gate for movement to its open batch-releasing position.

4. The subject matter defined in claim 3 characterized in the provision of a member fixed to said shaft and visible from the side of said dump body and effective to indicate the rotational position of said shaft and whether said latch is in its gate-locking or gate-releasing position.

5. In a dump truck of the type employed in transporting a plurality of batches of material separated by batch gates pivotally supported along their upper edges transversely of the truck body and normally latched closed and operable when released and the truck body is inclined upwardly to open and allow the single batch of material therebehind to discharge by gravity; that improvement which comprises a separate latch operator operatively associated with each one of said batch gates, and means for activating said latch operators sequentially only in a single predetermined order beginning with the rearmost one of said gates and including means for positively preventing operation of said gates in any other than said single predetermined order.

6. In a dump truck as defined in claim 5 characterized in that said latch operators include power driven means for moving the same away from the closed positions thereof to release said batch gates.

7. In a dump truck as defined in claim 6 characterized in that said power driven means is responsive to fluid pressure, and means for supplying pressurized fluid to said means for activating said power driven latch operators.

8. In a dump truck of the type employed in transporting a plurality of batches of material separated by batch gates pivotally supported along their upper edges transversely of the truck body and normally latched closed and operable when released and the truck body is inclined upwardly to open and allow the single batch of material therebehind to discharge by gravity; that improvement which comprises a separate fluid pressure actuated latch operator for each of said batch gates, a separate control governing the supply of pressurized fluid to an associated one of

said latch operators including means for conditioning a predetermined one only of said latch operators for the next gate opening movement whereby the batch behind the gate must be the next one to be released.

9. In a dump truck of the type employed in transporting a plurality of batches of material separated by batch gates pivotally supported along their upper edges transversely of the truck body and normally latched closed and operable when released and the truck body is inclined upwardly to open and allow the single batch of material therebehind to discharge by gravity; that improvement which comprises a separate manually activated latch operator mechanism for each of said batch gates, said mechanism including means operatively interconnecting the same and effective to prevent said batch gates from opening except by the unlatching thereof in predetermined sequential order even though the manual operator inadvertently tries to operate said latch operator mechanisms in a different sequence.

10. In a dump truck as defined in claim 9 characterized in that said latch operator mechanisms each include a manual control member located at a common operator control station.

11. In a dump truck as defined in claim 10 characterized in that said manual control members are arranged in a row and in the same sequence among themselves as are the batch gates controlled thereby to facilitate the activation of said control members in the desired sequence.

12. In a dump truck of the type employed in transporting a plurality of batches of material separated by batch gates pivotally supported along their upper edges transversely of the truck body and normally latched closed and operable when released and the truck body is inclined upwardly to open and allow the single batch of material therebehind to discharge by gravity; that improvement which comprises a latch mechanism for holding each of said batch gates selectively locked against opening including means normally biasing said latch mechanism to its gate locking position, a fluid operated power unit operatively connected to each latch mechanism to move the latter to its unlocked position, and means connecting said power units to a source of pressurized fluid through a series connection including separate control valve means for each of said latch mechanisms, said control valve means being operable when opened in sequence beginning with the valve means closest to the source of pressurized fluid to admit fluid simultaneously to the power unit of a first latch mechanism and to the valve means controlling the operation of the next one of said latch mechanisms whereby it is impossible to obtain a supply of pressurized fluid for said separate mechanisms unless said valve means are operated sequentially in a predetermined order.

13. In a dump truck having a rear end dump body provided therein with a plurality of transverse batch gates spaced apart lengthwise of said body, said gates being individually pivoted transversely and horizontally on said body to occupy closed position or open position according as said body occupies load-carrying position or load-dumping position; individual latches for latching said gates positively in closed position, said latches movably mounted on said body to occupy gate-latching and gate-releasing positions; means connected to said body and to said latches for individually urging said latches to gate-latching position; individual fluid-pressure-actuated mechanisms, one

for each of said latches mounted on said body and connected to said latches for moving the latter to gate-releasing positions against the action of said urging means, each of said mechanisms including a fluid-pressure-responsive unit connected to the respective latch; a source of fluid pressure; conduits connecting said source to all of said units; valves in the conduits manually operable to control the supply of fluid pressure from said source to said units, the conduits being so connected to said unit, said source and said valves that the valves can be operated to supply fluid pressure from said source to said units only in a predetermined sequence.

14. In a dump truck having a rear-end dump body provided therein with batch gates in a series extending lengthwise of said body, said gates individually pivoted horizontally on said body and transversely along the length thereof to occupy a closed position perpendicular to the bottom of said body when the latter is horizontal, and an open position at an oblique angle to said bottom when the latter is inclined to a body-dumping position; individual latches for latching said gates in closed position, said latches pivotally mounted on and at the lower side of said body bottom to occupy gate-latching and gate-releasing positions; springs connected to said body and to said latches for individually urging said latches to gate-latching position; fluid-pressure-actuated means, one for each of said latches, mounted on and at the lower side of said body bottom and so connected to the respective latch as to move the same when actuated to gate-releasing positions against the action of the respective spring; a source of fluid pressure; conduits connecting all of said means to said source; and valve means in the conduits manually operable to supply fluid pressure from said source to said means to move said latches to gate-releasing positions only in a predetermined sequence beginning with the lowermost gate of the series and ending with the uppermost gate when said body is in dumping position.

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