CHARGING APPARATUS FOR CONCRETE MIXERS AND THE LIKE

Inventors
Chas. I. Longenecker
Chas. F. Ball

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C. I. LONGENECKER ET AL

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The invention relates to conveying and charging apparatus for concrete mixers or agitators, and for purposes of disclosure it has been illustrated in the accompanying drawings, and will be herein described in connection with a tunnel lining machine of the type disclosed and claimed in our co-pending application filed December 16, 1933, Serial No. 54,774, entitled Apparatus for lining tunnels and similar conduits with plastic concrete mixtures, of which the present application is a division.

The mixing or agitating receptacle of the concrete mixing apparatus embodied in the tunnel lining machine of the said prior application is provided with an end charging opening through which the concrete materials are introduced into the receptacle, which opening may have a charging hopper or chute associated with it, and the present invention has for one of its objects to provide means for conveying the materials from a more or less distant source of supply to a point adjacent the mixing receptacle, where they may be caused to discharge their contents into said hopper or chute for transfer into the mixing or agitating receptacle.

A further object of the invention is to provide a conveying and charging means as just recited, comprising mobile vehicles provided with partitioned bodies which, upon arrival at a point adjacent the mixer, may be engaged by means associated with the latter by which the said bodies may be elevated from the vehicle chassis or truck and moved to an inclined position in co-operative relation with the hopper or chute, whereby the materials may be fed to the latter by gravity.

A still further object of the invention is to provide novel means for elevating said vehicle bodies, said means being preferably arranged to move one end of the body faster and farther than the other end so that the body may be inclined to provide the gravity discharge above mentioned.

With the above and other objects in view which will appear as the description proceeds, the invention consists in the novel details of construction, and combinations and arrangements of parts, more fully hereinafter described and particularly pointed out in the appended claims.

Referring to the accompanying drawings forming a part of this specification in which like reference characters designate like parts in all the views:—

Figure 1 is a side elevational view of a tunnel lining machine constructed in accordance with the disclosures of our said parent application, with one of the supply vehicles being illustrated in the position it assumes immediately prior to having its body raised to discharge its contents into the supply hopper of the mixer;

Fig. 2 is an enlarged longitudinal sectional elevational view through the feed end of the tunnel lining machine, the primary mixing or agitating receptacle thereof being partly broken away, and showing the body of the supply vehicle raised from its truck or chassis and inclined to its discharging position by the elevating and inclining means associated with the lining machine;

Fig. 3 is a view similar to Fig. 2, but showing the immediately adjacent portion of the tunnel lining machine, with the fluid pressure motor and connections for actuating the supply-vehicle raising and lowering mechanism;

Fig. 4 is an end elevational view of the intake end of the lining machine, showing the feed chute or hopper for the mixing receptacle, and portions of the supply-vehicle elevating and lowering mechanism;

Fig. 5 is an enlarged sectional elevational view of the spiral cable wheel or sheave constituting an element of the vehicle body elevating and lowering mechanism, taken approximately on the plane indicated by the line 5—5 of Fig. 4, looking in the direction of the arrows;

Fig. 6 is a vertical sectional view through the wheel or sheave shown in Fig. 5, taken approximately on the plane indicated by the line 6—6 of the said figure; and

Fig. 7 is a side elevational view, partly broken away, of another of the cable wheels or sheaves constituting a portion of the vehicle body raising and lowering mechanism.

Referring more particularly to the said drawings, the apparatus comprises a framework 15, which may include the spaced longitudinal sills 16, transverse members 17, uprights 18 and upper longitudina members 19, all of which are, or may be, formed from channels, angles, or other suitable structural shapes. The said frame is preferably mounted upon suitable trucks 20 having flanged wheels 21 adapted to run upon tracks 22 which may be laid upon the floor of the tunnel bore. The rearward truck 20 is preferably provided with a driving motor 25 mounted upon a suitable supporting platform and provided with a sprocket 27 around which passes a chain 28 which also engages a sprocket rigid with the axle of the truck 20.

As best shown in Figs. 1, 2 and 4, at the other end of the framework 15 there is provided a mixing receptacle or drum 35 which is mounted for rotation upon the said frame by suitable
rollers 36, which engage annular bands or trackways 37 carried by the drum. The exterior of the drum is provided with sprocket teeth 38 which are engaged by a sprocket chain 39 which also passes about a sprocket 40 carried by the shaft 41 of a suitable electric or other motor 42 mounted upon the framework above the drum 35. The drum is provided with a charging opening 45 which has associated with it a charging hopper or chute 46, the said drum being also provided with a discharge opening 47 having a movable discharge chute 48 pivotally mounted as at 49 for movement into and out of the drum through the said opening where the mixed concrete may be transferred from the drum to the secondary mixing or conditioning receptacle, as will appear more fully below. The interior of the mixing drum 35 is provided with suitable mixing blades 50 and discharging buckets 51, the latter of which are arranged to deposit the mixed material into the discharge chute 48 when the latter is moved to a discharging position inside the drum. The movements of said discharge chute are preferably occasioned by a power discharge mechanism 52 which is, or may be, substantially the construction described and claimed in the prior United States patent to Samuel Shafer, Jr., No. 1,415,411, granted May 3, 1922. The said power discharge mechanism may be driven by means of the chain and sprocket drive 53 from the motor 42 which drives the mixing receptacle 35, and may actuate the discharge chute 48 through the pitman 54 and crank arm 55 in substantially the same manner as that set forth in the said Shafer patent.

Referring more particularly to Figs. 1 and 3, the concrete mixture as it is discharged from the agitating receptacle 35 flows from the discharge chute 48 thereof into a conditioning and storage drum or receptacle 60 which is mounted on suitable runners 61 and 62 for rotation about a horizontal axis which is in a somewhat higher plane than the axis of receptacle 35. Said receptacle 60 preferably has an enlarged inlet end which is provided with a plurality of charging scoops or blades 63, only one of which is illustrated in Fig. 3, and at its discharge end the drum is provided with a plurality of discharge buckets 64. Intermediate these sets of scoops and buckets the drum may be provided with a plurality of spiral mixing blades 65 which serve to agitate and re-mix the concrete mixture within the receptacle, thereby preventing segregation of its constituents and continuously keeping it in completely mixed condition and ready for use at all times. The said storage and conditioning receptacle 60 is adapted to be rotated by means of an electric or other suitable motor 66 mounted upon the frame and which drives the said receptacle through chain and sprocket or other suitable drive 67.

The discharge end of the storage receptacle enters a stationary chest 70 which is preferably mounted upon the intake valve 71 of a pressure pump 72 which is adapted for the handling of plastic concrete mixtures. As here shown this pump is mounted directly below the conditioning and storage receptacle 60 and is of the type generally described and claimed in the prior U. S. patent of Jacobus C. Kooyman, granted October 22, 1935, No. 2,017,975. The said pump may be briefly described as comprising a pressure cylinder 73 in which a piston reciprocates to draw the plastic mixture thereinto from the chest 70 through the inlet valve 71 and upon the pressure stroke to force the mixture out through the outlet valve 74 through the discharge conduit 75. The said pump is driven by means of a belt or chain drive 76 from an electric or other motor 77 mounted upon the frame, and the inlet valve 71 and outlet valve 74 are respectively actuated by the oscillatory rocker members 78 and 79 respectively through the medium of valve rods indicated diagrammatically at 80 and 81 respectively.

As will be readily understood from the drawings, the mechanism thus far described is mounted upon the frame comparatively close to the ground, and in order that the concrete mixture, after it leaves the pump 72, may be deposited in the tunnel forms and more particularly in the arch portions of such forms, the discharge conduit 75 turns upwardly and is supported by a boom structure 82 which may be pivotally mounted as at 83 to the frame 15 and maintained in definite angular relation by means of the guides or braces 84. The latter may be adjustable in order that the angularity of the boom structure 82 may be varied in order to change the height of discharge of the conduit 75 within certain 25 limits.

As above stated, it is preferred to supply the raw materials, or the pre-mixed concrete, to the mixing receptacle 35 by means of mobile vehicles such for example as those illustrated in Figs. 1 and 2, as here shown such vehicles may comprise a truck 109 having wheels 110 arranged to run upon the rails 22 and being surmounted by a frame 108 which serves as a support for the vehicle body 104, which may be provided with the trippeable partitions 104' dividing it into a plurality of compartments. The longitudinal sill members 105 of the said body are secured to the frame 102 by means of pivoted links 106 and 107 which serve to guide the raising and lowering movements of the body; and as will be clear from these figures the said sills at the forward end thereof are notched as at 108 for engagement with sleeves or collars 109 which are journaled upon a shaft 118, which is rigid with a shaft 112 journaled in suitable bearings 113 rigidly secured to the frame 15. The shaft 112 has rigidly secured to one end thereof a sprocket wheel 115 about which passes a sprocket chain 116 extended upwardly to and around a sprocket 117 carried by a transverse shaft 118 journaled in suitable bearings 119 rigidly mounted upon the end uprights 18 and upper longitudinals 19 of the frame work, as will be clear from Figs. 1, 2 and 4. This shaft 118 carries at either end a sheave or cable wheel 120 the periphery of which is grooved as at 121 to receive the cable 122. The upper end of the said cable is passed through an opening 123 formed in the rim of the wheel 120, and is securely fastened by means of a clamping bolt 124 to the said wheel 120. The lower ends of the cables 122 are provided with suitable eyes or other readily attachable and detachable fastenings 125 which may be engaged with or disengaged from pins or studs 126 rigidly carried at each side of the bodies 104 of the material supply vehicles as here shown.

The parts are so constructed and arranged that as the shaft 118 is rotated the cables 122 will be wound upon the wheels 120 thereby elevating the rear end of the vehicle bodies 104 and at the same time, through the chain and sprocket drive 118, 116 and 117 between the shafts 118 and 112, the arms 111 will be swung through an arc by reason of which the shaft 118 through the engagement 75
of its collars or sleeves 108 with notches or recesses 109 of the body sills 105 will cause the forward end of the vehicle body to also be elevated, but not such a great extent as that caused by the cables 123 with respect to the rear end of the body. In other words the body will be moved from one position illustrated in Fig. 1 to that shown in Fig. 2 wherein it occupies a slanted position in cooperative relation to the charging hopper 46 of the mixing receptacle 35 so that when the discharge gate 136 of the vehicle body 104 is opened the batches of materials contained in several compartments of the said body may be successively discharged by gravity as the partitions 104' are tripped and slide directly into the hopper 46, from which they will pass into the interior of the mixing receptacle 35. After the final batch has been thus discharged, the body can be restored to its initial position upon which it can be restored to its initial position upon which its frame 103 through reverse movement of the shaft 118. The arms 111, being rigid, not only serve to elevate the forward end of the container as they swing upwardly but also guide the container discharge opening into accurate register with the receptacle charging opening, and thus prevent spilling of the materials during transfer.

For actuating the shaft 118 there is provided thereon a spiral bull wheel 135 best shown in Figs. 4, 5 and 6 the periphery of which is grooved at 136 for the reception of the cable 137. One end of this cable as it leaves the inner end of the spiral is gripped and rigidly secured by a clamping member 138 carried by the wheel 135 as best shown in Figs. 5 and 6, while the other end of the cable is secured as at 142 to rigid strap members 143 which support a fluid pressure cylinder 144, see Fig. 3. A piston is reciprocable within this cylinder and is provided with a piston rod 145 having at its outer end frame 146 in which is journaled the sheave 141. It results from this construction, that as fluid under pressure is admitted to the right hand end of the cylinder 144 the piston and piston rod will be forced outwardly from the position shown in Fig. 1 to that shown in Fig. 3, thereby imparting motion to the upper run of cable 137 and through it to wheel 125 and shaft 118 to produce the raising movements of the vehicle body above described. Likewise, upon expansion of the fluid from the cylinder 144 the piston and piston rod will be permitted to move in the opposite direction whereupon the shaft 118 will be rotated in reverse direction and the vehicle body returned to its initial position.

Upon occasion, as for example at the conclusion of the pumping operation, it is desirable or necessary to break the line 75 at the pump outlet, and in order to prevent loss of that part of the mixture which is in the inclined portion of pipe 75, and which will tend to flow backwards under the action of gravity when the line is broken, a stop valve 148 is preferably provided, which is or may be of a construction similar to that disclosed and claimed in the prior co-pending application of John C. Merwin and Rudolph F. Lindow, filed November 18, 1933, Serial No. 698,716, entitled Valve for controlling plastic concrete mixtures now Patent No. 2,102,571, dated December 14, 1937. A receptacle 150 is provided, supported on legs 151 and having a cover 152.

While one form of the invention has been illustrated and described it is obvious that those skilled in the art may vary the details of construction as well as the precise arrangement of parts without departing from the spirit of the invention, and therefore it is not wished to be limited by the above disclosure except as may be required by the claims.

We claim:
1. In charging mechanism for a receptacle provided with an elevated charging opening, a mobile container arranged to be moved over the ground and to from a point adjacent said receptacle, said container being provided with a discharge opening normally in a plane below said receptacle opening; power actuated means adjacent said receptacle readily engageable with and disengageable from said container, arranged to elevate and guide the container discharging opening to a complementary position relative to said receptacle opening; and separate power actuated means readily engageable with and disengageable from said container at a point spaced from the engagement point of said first named means, arranged to elevate and swing the container about its engagement point with said first named means to tilt the container and cause gravity discharge of its contents into said receptacle opening.

2. In charging mechanism for a receptacle provided with an elevated charging opening, a mobile container arranged to be moved over the ground to and from a point adjacent said receptacle, said container being provided with a discharge opening normally in a plane below said receptacle opening; oscillatory power actuated means adjacent said receptacle arranged to automatically engage and disengage a portion of said container adjacent its opening, and to elevate and swing said container opening about the axis of oscillation to a position complementary to said receptacle opening; and separate power actuated means readily attachable to and detachable from said container, arranged to bodily elevate the container and swing it about its point of engagement with said first named means to thereby tilt the container toward the receptacle and cause gravity discharge of its contents into the receptacle opening.

3. In charging mechanism for a receptacle having a charging opening, the combination of a swinging member mounted adjacent said receptacle opening; a mobile material container arranged to be moved toward and from said receptacle, said container having a portion readily engageable with and disengageable from said swinging member at a point removed from its axis of oscillation; draft means readily engageable with and disengageable from another portion of said container; and means for separately actuating said draft means and said swinging member to bodily elevate the container and swing it about its point of engagement with said swinging member to thereby tilt the container toward said receptacle and cause gravity discharge of its contents into the receptacle opening.

4. In charging mechanism for a concrete mixing or agitating receptacle having a charging opening, the combination of an oscillatory member adjacent said receptacle; a mobile container for concrete materials arranged to be moved toward and from said receptacle, said container having a notch provided pivotally engageable with and disengageable from said oscillatory member; draft means readily engageable with and disengageable from a portion of said container spaced from said notched portion; and
means for actuating said draft means and said oscillatory member at different angular velocities to bodily elevate and tilt said container toward said charging opening.

5. In charging apparatus for a concrete mixing or agitating receptacle having a charging opening, the combination of an oscillatory arm mounted adjacent said receptacle; a mobile container for concrete materials arranged to be moved toward and from said receptacle, said container having a notched portion at one end readily pivotally engageable with said arm as the container approaches the receptacle; a draft cable readily attachable to and detachable from said container at a point spaced from said notched end portion; means for simultaneously actuating said cable and arm to bodily raise said container; and connections between said cable and arm for causing the latter to be moved at a lesser angular velocity than the former, whereby said container will be tilted as it is raised and may discharge its contents into said charging opening by gravity action.

6. In charging apparatus for a concrete mixing or agitating receptacle having a charging opening, the combination of an oscillatory arm mounted adjacent said receptacle; a mobile container for concrete materials arranged to be moved toward and from said receptacle, said container having means readily pivotally engageable with and disengageable from said arm; a draft cable readily attachable to and detachable from said container at a point removed from said engaging means; a sheave upon which said cable may be wound; means for driving said sheave; a driving wheel rotatable with said sheave; a driven wheel rigid with said oscillatory arm; and driving connections between said wheels whereby said arm will be oscillated as said cable is wound upon and unwound from said sheave.

7. In charging apparatus for a concrete mixing or agitating receptacle having a charging opening, the combination of an oscillatory arm mounted adjacent said receptacle; a mobile container for concrete materials arranged to be moved toward and from said receptacle, said container having means readily pivotally engageable and disengageable from said arm; a draft cable readily attachable to and detachable from said container at a point removed from said engaging means; a sheave upon which said cable may be wound; means for driving said sheave at a varying rate of speed; and speed reducing chain and sprocket connections between said sheave and oscillatory arm for moving the latter simultaneously with said draft cable but at a slower speed.

8. A charging vehicle for concrete mixers and the like, comprising a mobile frame; and a bodily movable material container mounted on said frame for raising and lowering movements relative thereto, said container having means readily engageable with and disengageable from separate simultaneously operable elevation and tilting instrumentalities associated with the concrete mixer, there also being jack-knife connections between said container and frame arranged to guide its raising and lowering movements.

CHARLES I. LONGENECKER.
CHARLES F. BALL.