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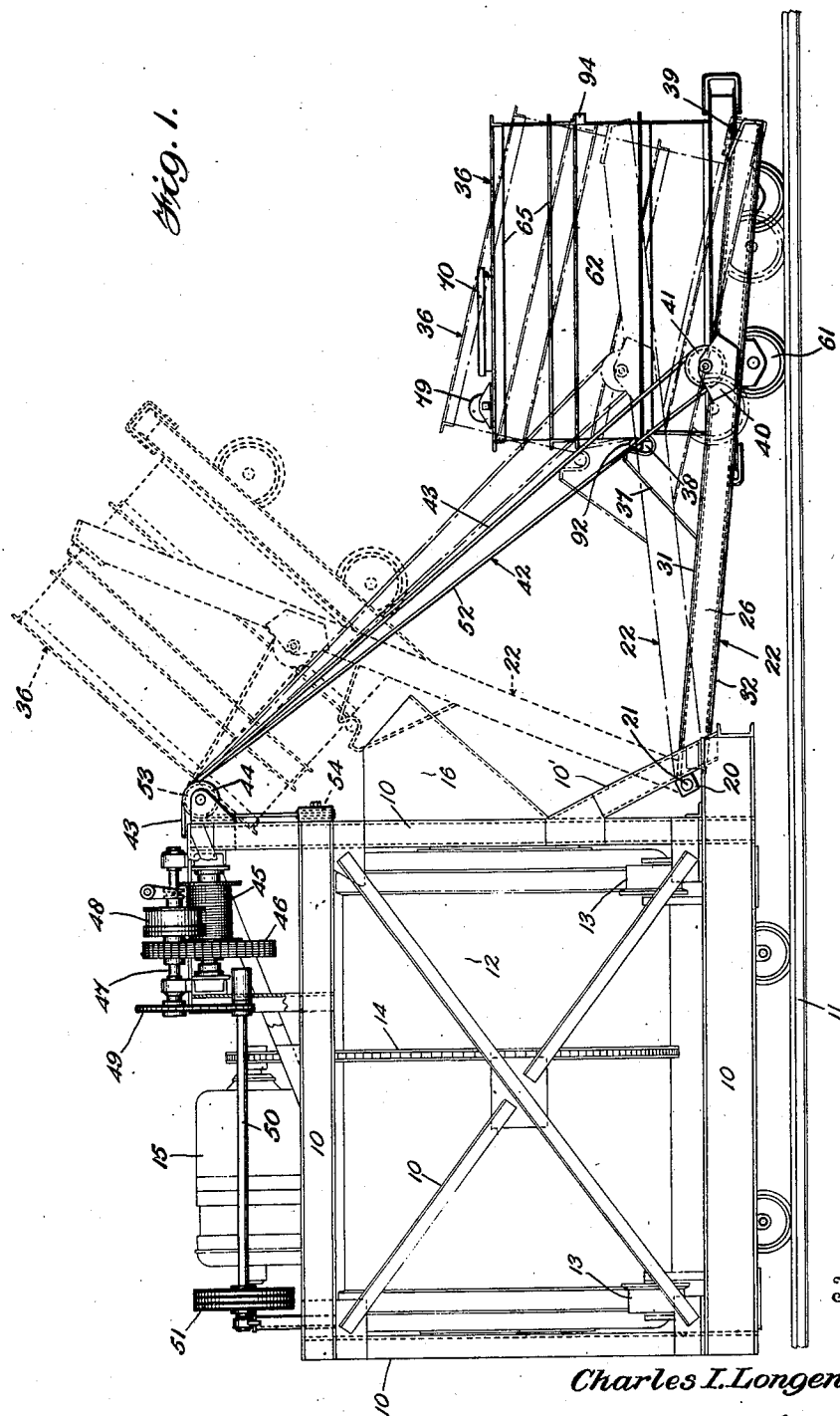
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2,314,647

BATCH CHARGING APPARATUS FOR CONCRETE MIXERS

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3 Sheets-Sheet 1



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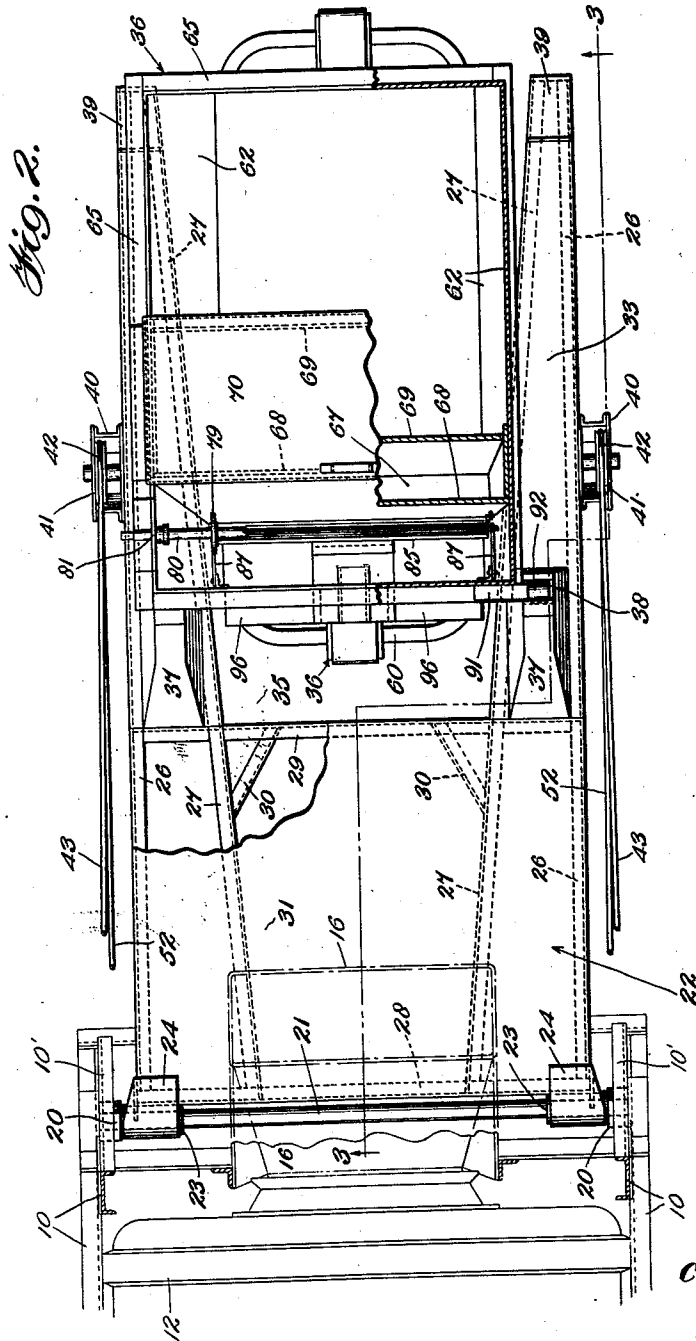
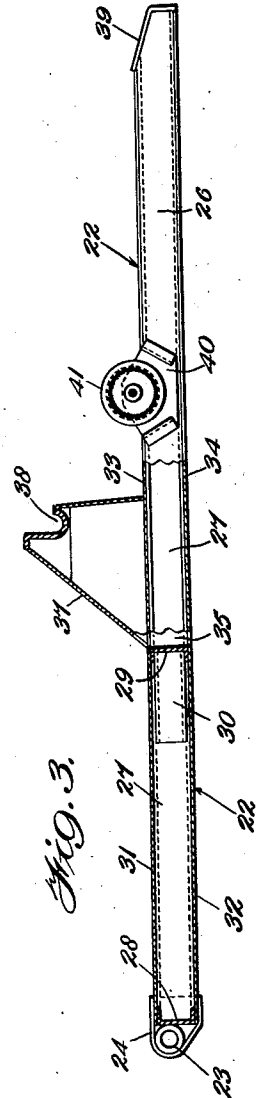
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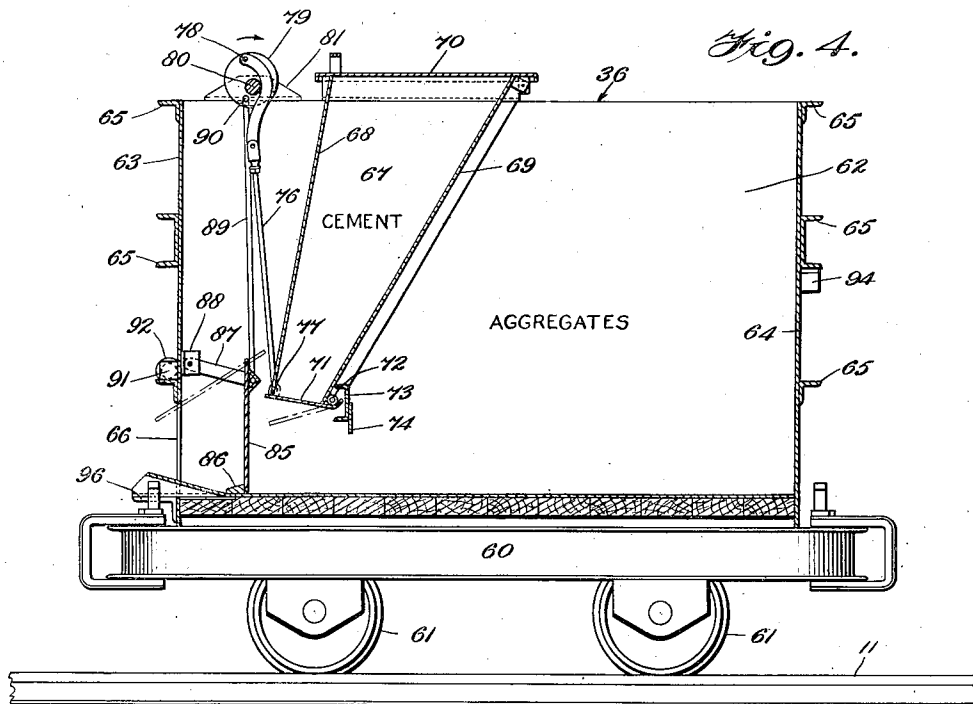
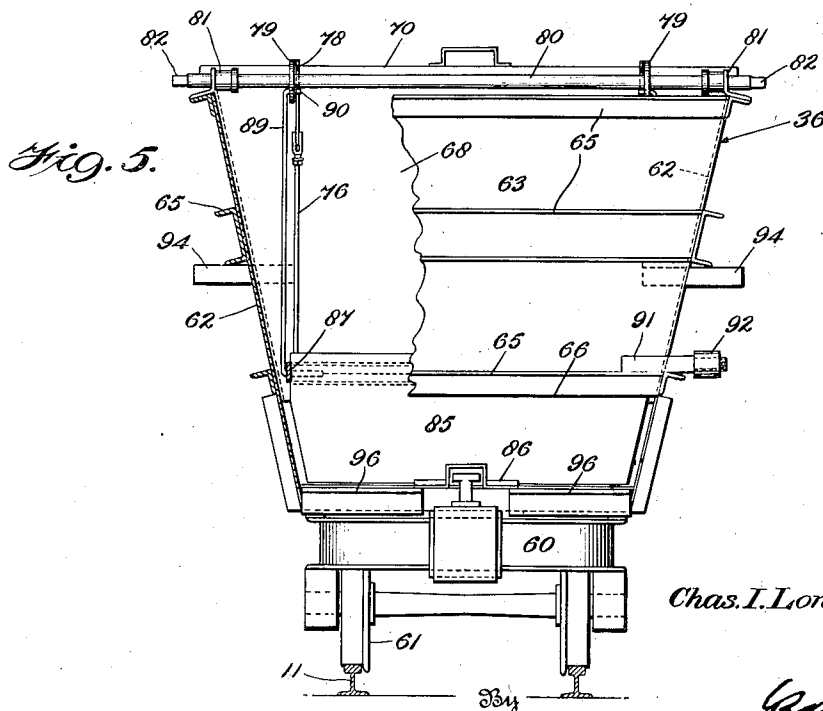
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BATCH CHARGING APPARATUS FOR CONCRETE MIXERS

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,314,647

BATCH CHARGING APPARATUS FOR
CONCRETE MIXERS

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corporation of Wisconsin

Application March 5, 1941, Serial No. 381,909

9 Claims. (Cl. 214—130)

The invention relates to batch charging apparatus for concrete mixers, and more especially for mixers operating in close quarters, as in tunnels, and in one aspect is a further development of the inventive idea embodied in prior U. S. Patent No. 2,135,440, granted November 1, 1938, on an application filed by Charles F. Ball and myself.

In that patent there is disclosed a special type of apparatus which has been developed to facilitate the lining of tunnel and like bores with plastic concrete, such apparatus comprising a concrete batch mixing drum, a receiving and reconditioning drum or receptacle for the mixed concrete, a pressure concrete pump, and suitable discharge piping, all serially mounted upon a frame or chassis arranged for traverse through the bore on rails laid upon the floor thereof. The solid materials for the concrete, i. e. the aggregates and the cement, are brought to the mixer in batch cars comprising bodies removably mounted upon trucks also running upon the rails in the tunnel bore, there being a jack-knife connection between the bodies and trucks permitting of their separation but insuring proper positioning when again brought together. In this form of apparatus when a loaded car approached the mixer a forward portion of its body engaged a pair of power driven oscillatory arms, while hoisting cables were attached to more rearward parts of the car body, whereby upon co-ordinated movements of the cables and arms the body was elevated from the truck and tilted to discharge the batch or batches of aggregates and cement into the mixing drum. After discharge, gravitational action was permitted to return the body to the truck, it being restrained and guided during such movement by the cables, arms, and jack-knife connection to its proper position upon the truck, whereupon the empty car was removed, a loaded car brought into place and the operation repeated.

In the present development, the car bodies are not separable from their trucks, but on the other hand the entire car is elevated and tilted to discharge its contents into the mixer drum by a modified form of arm structure which sequentially engages the car body at forward and rearward points. The hoisting cables, instead of being temporarily attached to and then detached from the car bodies, are permanently rove through sheaves carried by the arm structure so that they act upon it rather than upon the cars directly. The arrangement is further such that in elevating a car one end is raised somewhat

before its other end, so that the car is tipped slightly, whereupon it is bodily elevated in this position relative to the arm and tilted forwardly to discharge its contents into the mixer drum. In the form here shown, the arm structure first engages elements mounted at the forward end of the car, and subsequently elements mounted at the rearward end, so that the car is initially tipped backwards, before being bodily elevated; but in some cases it may be desirable to reverse the engagement, i. e. to have the arm engage the rearward elements first so as to initially tip the car forwardly. With the arrangement shown, however, upon lowering the car after discharge, its rearward wheels contact the rails first and further lowering of the arm to bring the forward wheels into rail engagement imparts a push to the car which starts it along the track, tending to clear the latter for entrance of the succeeding loaded car.

The initial tilting of the car previous to its bodily elevation also enables the proper load-discharge angle to be attained by the car upon such elevation while keeping the total height of the apparatus within the limits imposed by tunnel construction.

One exemplification of the invention is illustrated in the accompanying drawings forming a part of this specification, wherein like reference characters designate like parts in all the views, and in which:

Figure 1 is a side elevational view, partly broken away, of the fundamental elements of the mixer portion of a tunnel lining apparatus of the character described in the said prior Patent No. 2,135,440, such apparatus being equipped with one form of batch charging mechanism constructed and arranged in accordance with the present invention;

Fig. 2 is an enlarged plan view, partly broken away and in section of the charging apparatus illustrated in Fig. 1;

Fig. 3 is a longitudinal sectional elevational view of the elevating arm per se, taken approximately on the plane indicated by the line 3—3 of Fig. 2, looking in the direction of the arrows;

Fig. 4 is a longitudinal sectional elevational view through one of the batch cars; and

Fig. 5 is an end elevational view, partly broken away and in section, of the parts shown in Fig. 4, as viewed from the left of said figure.

Referring more particularly to Figure 1 of the drawings, the portion of the tunnel lining equipment shown which is common to this application

and the said prior patent comprises a framework 10 which may be suitably mounted for traverse upon rails 11 which may be laid upon the floor of the tunnel bore. Within the said framework a mixing drum 12 is mounted upon rollers 13 for rotation about a longitudinal horizontal axis, being power driven as by a chain and sprocket drive 14 from an electric motor or other suitable source of power 15. A charging chute 16 is also preferably provided for receiving the solid concrete-making materials from the batch cars and properly conducting them to the interior of the drum 12 through the charging opening of the latter.

At the charging end of the frame 10, i. e. the right hand end as viewed in Figs. 1 and 2, a transversely spaced pair of frame members 10' is each provided with a block 20 which blocks receive the ends of a transversely extending shaft or rod 21 upon which a fabricated arm structure 22 is mounted by sleeves or bushings 23 and strap members 24, best shown in Figs. 2 and 3. In the form here shown for purposes of this disclosure, the arm structure 22 comprises outer longitudinally extending channels 26 and inner longitudinal channels 27, the latter of which may be somewhat angularly disposed to converge toward the channels 26 at the outer end of the arm, substantially as illustrated in Fig. 2. The inner end portions of the channels 26 and 27 are transversely spaced and connected by transverse channels 28 and 29, with diagonal bracing channels 30 being employed at suitable points if necessary or desirable. All the channels are welded or otherwise rigidly connected at their intersections, and upper and lower plates 31 and 32 are preferably rigidly secured to the webs of the various channels in the rectangular area defined by the side channels 26 and the transverse channels 28 and 29, as will be clear from Figs. 2 and 3. These plates not only add strength to the structure, but also present flat clear outer surfaces which facilitate the removal of aggregates and cement which may unavoidably spill upon the structure.

Upper and lower plates 33 and 34 are also preferably secured to the webs of each pair of outer and intermediate channels 26 and 27, extending longitudinally from the plates 31 and 32 to the outer end portions of the said channels, but the area defined by the intermediate channels 27, the transverse channel 29, and the outer end of the structure is left clear to provide a space 35 into which the batch cars 36 may be received, as indicated in Figs. 1 and 2. To each side of the inner end of this space 35 a pedestal structure 37 is built up on the plates 33, which pedestals are provided with the sockets 38 for the reception of an element of the batch cars 36, as will presently appear; and the extreme outer ends of the bifurcated portion of the arm structure are preferably provided with wear plates 39 for engagement with other elements of the batch cars, as will also be more fully explained below.

To the outer face of each channel 26 a housing 40 is secured, in which is mounted a pulley or sheave 41 about which a hoisting cable 42 is rove. Various modes of rigging the cable may be employed, but it is preferred to use one which will automatically equalize the strains imposed upon it at each side of the arm structure. From each sheave 41, one bight 43 of the cable extends upwardly over a sheave 44 mounted on the frame 10, and thence to a horizontal sheave

(not shown but mounted on a top horizontal member of the frame 10) from whence it extends transversely inwardly of the machine to a winding drum 45. This drum may be driven in any suitable manner from the motor 15, as for example, by means of a silent chain drive 46 from a countershaft 47 through a clutch and brake device 48. The countershaft 47 may be driven through a chain and sprocket drive 49 from a jack shaft 50, which in turn may be driven from the motor 15 through a belt drive 51.

The bights 52 of the cable 42 extend from each sheave 41 to a sheave 53 mounted adjacent each sheave 44, from whence they extend downwardly to a sheave 54 on the frame 10 and then inwardly to the center line of the machine where they join. The respective end portions of the cable are wound upon the drum 45 in such directions that when the latter turns in one direction they will both be wound thereon, while reverse motion of the drum will serve to unwind both end portions.

The batch cars 36 are best shown in detail in Figs. 2, 4 and 5 and comprise a sill structure 60 mounted upon wheels 61 for movement upon the track rails 11. A body surmounts and is rigidly secured to the sill structure 60, which body may comprise downwardly converging side walls 62 and vertical parallel end walls 63, 64, which walls may conveniently be of sheet metal provided with suitable external reinforcing members in the form of angles and channels 65 surrounding and rigidly secured to the said walls substantially as shown. The body is open at the top for charging at a batching plant or otherwise, and the lower portion of the end wall 63 is provided with a discharge opening 66.

Within the body a compartment 67 may be provided for the cement, since the aggregates, such as sand and gravel or crushed stone, are frequently damp and it is desirable to keep the cement segregated therefrom until the materials are charged into the mixing drum. The compartment 67 as shown extends the full width of the car body, being formed by front and rear downwardly converging sheet metal walls 68 and 69. The top of the compartment may be normally closed by a hinged cover 70, while its bottom throat or opening is controlled by a door 71 hinged as at 72 adjacent a transverse channel member 73, which, with a strip member 74 secured thereto, serves as a baffle to deflect the aggregates in the main chamber of the body and insure a space immediately below the door 71 into which the latter may be swung, as indicated in broken lines in Fig. 4. The movements of the door 71 are controlled by links 76 the lower ends of which are secured thereto as at 77, while their upper ends are eccentrically secured as at 78 to disks 79 carried by a transversely extending shaft 80, journaled in brackets 81 at opposite sides of the body. The parts are preferably so constructed and arranged that when the parts are in the positions illustrated in Fig. 4 the pivotal connection 78 is to the left or forward of the plane extending between the axis of shaft 80 and the lower connections 77, whereby a toggle lock is secured which will retain the parts in the positions shown. However, upon movement of the said shaft in a clockwise direction as indicated by the arrow in Fig. 4, by means of a wrench or detachable crank (not shown) applied to a squared end 82 of the shaft, the toggle will be broken and the door 71 permitted to drop as indicated in broken lines,

whereby the cement in compartment 67 may be discharged.

Discharge of the aggregates, and also of the cement, through the opening 66 in the front wall 63 of the car body, is controlled by a gate 85, here shown as a plate extending substantially completely across the interior of the body and spaced somewhat rearwardly from the said opening 66. The lower edge portion of this gate normally engages behind a stop member 86 while its upper portion is supported or guided by vertically oscillatable arms 87 carried by brackets 88 secured to the front wall 63. Links 89 extend upwardly from the connection between the gate 85 and arms 87, the upper ends of which links are also eccentrically connected to the respective disks 79 as at 90. It thus results that the clockwise movement of the said disks above referred to also lifts the gate 85 to disengage its lower edge portion from the stop member 86, whereupon, with the car in the dotted line position shown in Fig. 1, gravitational action and/or the pressure of the aggregates behind the gate will swing the latter to approximately the broken line position shown in Fig. 4, permitting discharge of the contents of the car body through the discharge opening 66.

The forward wall 63 of the car body is provided at each side with a transversely projecting member 91 upon which may be journaled a roller 92. These parts are so positioned that as the batch car moves into the space 35 in the arm structure 22, the rollers 92 will be brought into position to be received in the sockets 38 of pedestal structures 37 as the arm structure is raised. The downward movements of the arm structure 22 are preferably limited in any appropriate manner as to so position the pedestals 37 that the rollers 92 will engage the upwardly extended forward wall of the sockets 38, thereby stopping the car in proper position for subsequent seating of the rollers in the sockets as the arm is raised.

The rear wall 64 of the car body is also provided with laterally projecting members 94 which are so positioned as to be engaged by the wear plates 39 of the arm as the latter is raised, as indicated in Fig. 1. Angle members 95 or their equivalents are preferably located along the forward wall 63 below the discharge opening 66 to span or bridge the space between the said wall and the mouth of the charging chute 16, when the car is in the elevated dotted line position of Fig. 1, and thereby substantially eliminate spilling of the materials during transfer from the car to the chute.

The mode of operation will be readily understood by reference to Fig. 1. With the arm structure 22 lowered to the full line position shown in said figure, a batch car 36 is moved upon the rails 11 into the space 35 in said arm structure until the rollers 92 engage the upwardly extending forward leg of the socket member 38. If the clutch 48 be now engaged to rotate the winding drum 45, the cable 42 will begin to raise the arm structure 22 about the axis of shaft 21, thereby seating the rollers 92 in the sockets 38. Further upward movement of the arm structure will then raise the forward end of the car, tilting the latter backwardly until the position illustrated in dot and dash lines is reached, at which point the wear plates 39 will contact the projecting members 94 at the rear of the car.

This relative position between car and arm structure will then be maintained during further

movement of the arm about its pivots and the car will be bodily elevated and tilted forwardly to the position illustrated in dotted lines. If a wrench or crank be now applied to the squared end 82 of shaft 80, and the latter together with its disks 79 moved to break the toggle lock above described, the door 71 of the cement compartment 67 will open, permitting the cement to be discharged therefrom, and at the same time the links 89 will raise the gate 85 to disengage its lower edge from the stop 86, whereupon the said gate will swing about its pivotal connections with the arms 87 by gravitational action and/or the pressure of the aggregates in the car body behind it, freeing the said materials for discharge through the opening 66 into the charging chute 16 of the mixer unit.

When the discharge of the materials from the car is completed, release of the clutch-brake device 48 will permit the arm and car to be lowered by gravity, first to the broken line position at which point the rear wheels 61 of the car re-engage the rails 11, and then to the full line position at which the forward wheels reach the said rails. As the rollers 92 of the car body disengage the sockets 38, the extended forward leg of the socket members imparts a rearward push to the rollers and car which starts the latter along the rails in a direction away from the mixer, thus tending to clear the track for the reception of the next loaded car.

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 to the above disclosure except as may be required by the claims.

What is claimed is:

1. Apparatus for charging batches of materials into an elevated charging opening of a mixing drum or the like, comprising an arm structure mounted for vertical swinging movements adjacent said charging opening; means for elevating said arm structure; and a mobile batch-carrying vehicle having means sequentially engageable by said arm structure as it is elevated, whereby an initial engagement between the arm and vehicle will produce a tilting of the latter and a subsequent engagement between the two will cause the vehicle to be bodily elevated in a predetermined relationship to the arm and moved to a position to discharge its contents through said charging opening.

2. Apparatus for charging batches of materials into an elevated charging opening of a mixing drum or the like, comprising an arm structure mounted for vertical swinging movements adjacent said charging opening; means for elevating said arm structure; and a mobile batch-carrying vehicle having elements at its opposite end portions disposed for sequential engagement by said arm structure as it is elevated, whereby an initial engagement between the arm and the elements at one end of the vehicle will produce a tilting of the latter and a subsequent engagement between the arm and the elements at the other end of the vehicle will cause the vehicle to be bodily elevated in a maintained predetermined relationship to the arm and moved to a position to discharge its contents through said charging opening.

3. Apparatus for elevating a mobile batch-carrying vehicle to discharge its contents into an

elevated charging opening of a mixing drum or the like, comprising an arm structure mounted for vertical swinging movements adjacent said charging opening; means upon said arm structure for sequentially engaging spaced portions of a mobile batch-carrying vehicle co-operatively positioned relative to the arm structure; and means for elevating said arm structure to cause said sequential engagements, whereby the first engagement of the arm-carried means with a vehicle portion will produce a tilting of the vehicle, and a subsequent engagement of the arm-carried means with a vehicle portion, through continued upward movement of the arm, will cause the vehicle to be bodily elevated in a predetermined relationship to the arm and moved to a position to discharge its contents through said charging opening.

4. Apparatus for elevating a mobile batch-carrying vehicle to discharge its contents into an elevated charging opening of a mixing drum or the like, comprising an arm structure mounted for vertical swinging movements adjacent said charging opening; means upon said arm structure for sequentially engaging spaced elements disposed at the opposite end portions of a mobile batch-carrying vehicle co-operatively positioned relative to the arm structure; and means for elevating said arm structure to cause said sequential engagements, whereby the first engagement of the arm-carried means with a vehicle element at the forward end will produce a rearward tilting of the vehicle, and a subsequent engagement of the arm-carried means with a vehicle element at the rearward end, through continued upward movement of the arm, will cause the vehicle to be bodily elevated in a predetermined relationship to the arm and moved to a position to discharge its contents through said charging opening.

5. Apparatus for elevating a mobile batch-carrying vehicle to discharge its contents into an elevated charging opening of a mixing drum or the like, which vehicle is provided with longitudinally spaced engageable members, said apparatus comprising an arm structure mounted for vertical swinging movements adjacent said charging opening; means for elevating said arm structure; socketed means carried by said arm structure for engagement with one of said vehicle-carried members; and additional means carried by said arm structure for engagement with the other of said vehicle-carried members; the said vehicle-carried members and the respective means on the arm structure being so positioned that elevation of the arm will produce sequential engagement between the respective means thereon and their companion vehicle-carried members, whereby the vehicle will be first tilted longitudinally and subsequently bodily elevated, in a maintained predetermined relationship to the arm, to a position in which its contents may be discharged through said charging opening.

6. Apparatus for elevating a mobile batch-carrying vehicle to discharge its contents into an elevated charging opening of a mixing drum or the like, said vehicle having engageable members at opposite ends thereof, said apparatus comprising an arm structure mounted for vertical swinging movements adjacent said charging opening; means for elevating said arm structure; socketed means intermediate the ends of said arm structure for engagement with the members at one end of said vehicle; and means at the outer end

portion of the arm structure for engagement with the members at the other end of the vehicle; the engageable members on the vehicle and the respective means on the arm structure for engaging therewith being so positioned that at the beginning of the elevation of the arm structure the socketed means on the arm will engage with the members at the forward end of the vehicle and thereby tilt the latter rearwardly, subsequent to which the means at the outer end of the arm will engage the members at the rearward end of the vehicle, whereafter continued elevation of the arm will bodily elevate the vehicle while maintaining its position relative to the arm, to a position in which its contents may be discharged through said charging opening.

7. Apparatus for elevating a mobile batch-carrying vehicle to discharge its contents into an elevated charging opening of a mixing drum or the like, said vehicle having laterally projecting members at opposite ends thereof, said apparatus comprising an arm structure mounted for swinging movements toward and from said charging opening and being bifurcated at its outer end to provide a space for the reception of the batch-carrying vehicle; socketed means at each side of said arm structure adjacent the inner end of said vehicle-receiving space, for engagement with the laterally projecting members at the forward end of the vehicle; means at the outer end of the bifurcated portion of the arm structure for engagement with the laterally projecting members at the rearward end of the vehicle; and means for swinging said arm structure toward said charging opening, whereby to first cause said socketed means to engage its companion vehicle-carried members and tilt the vehicle rearwardly, and to subsequently cause engagement between the means at the outer end of the arm and their companion vehicle-carried members, after which continued elevation of the arm will raise the vehicle, while maintaining its position relative to the arm, to a position in which its contents may be discharged into the drum through said charging opening.

8. In concrete mixing apparatus having a mixing receptacle provided with an elevated charging opening, the combination of means for temporarily engaging with a mobile batch-carrying vehicle, means for elevating said engaging means and vehicle to discharge the contents of the vehicle into the mixing receptacle through said charging opening, and then lowering said vehicle and engaging means, and means operable at the conclusion of the lowering operation for imparting substantially horizontal motion to the vehicle in a direction away from the mixing apparatus.

9. Apparatus for raising and lowering mobile batch-carrying vehicles whereby to discharge their contents into a mixing drum having an elevated charging opening, said apparatus comprising an arm structure mounted for swinging movements adjacent said charging opening; means for raising and lowering said arm structure; and means carried by said structure, engageable with a mobile batch-carrying vehicle co-operatively positioned relative thereto, for tilting said vehicle rearwardly as said arm structure is raised, and for imparting substantially horizontal motion to said vehicle in a direction away from the mixing at approximately the conclusion of the lowering of the arm.

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