June 19, 1951 E. O. MARTINSON 2,557,358

CONCRETE MIXING PLANT

Filed June 5, 1946 2 Sheets-Sheet 1

Fig. 1

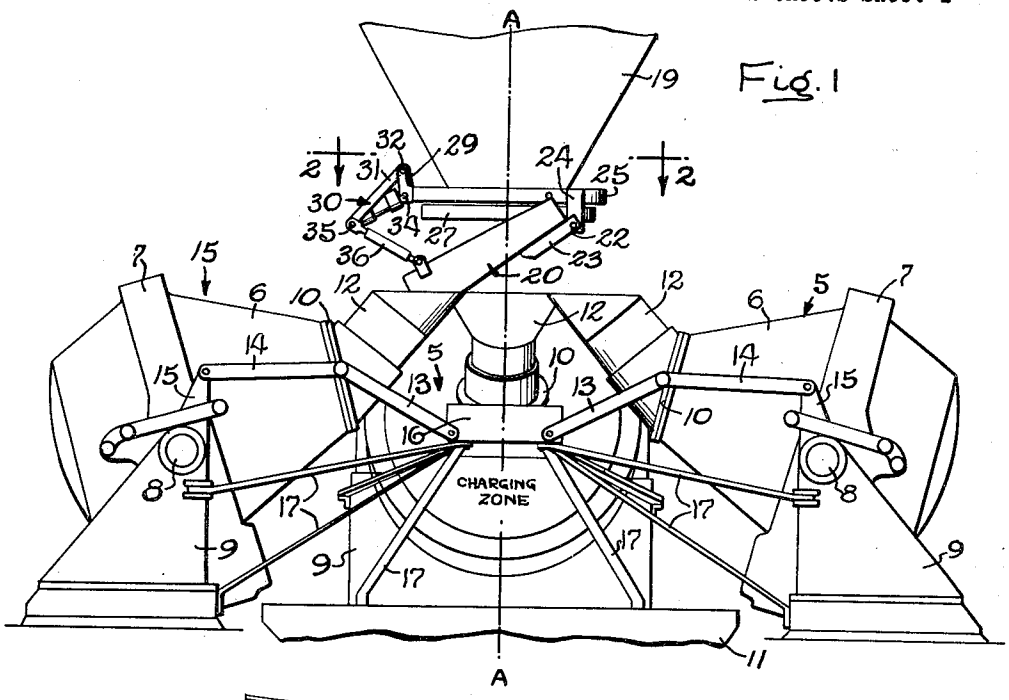
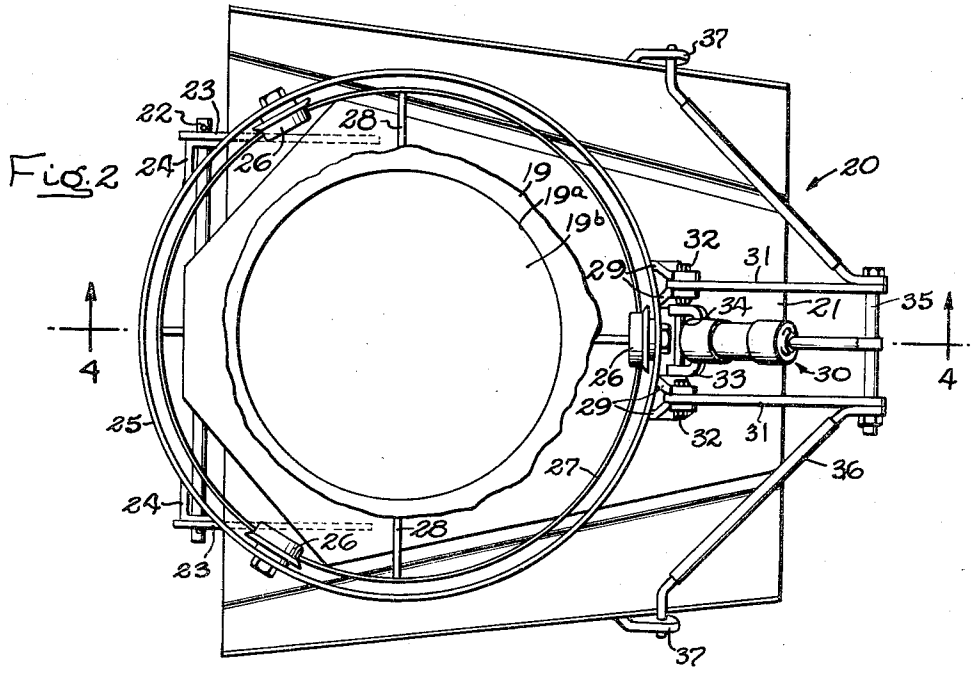



Fig. 2




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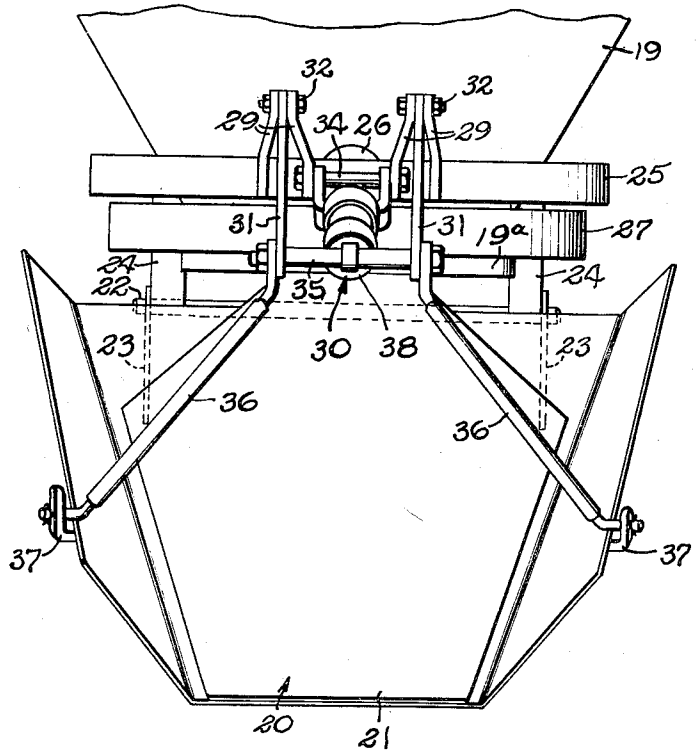
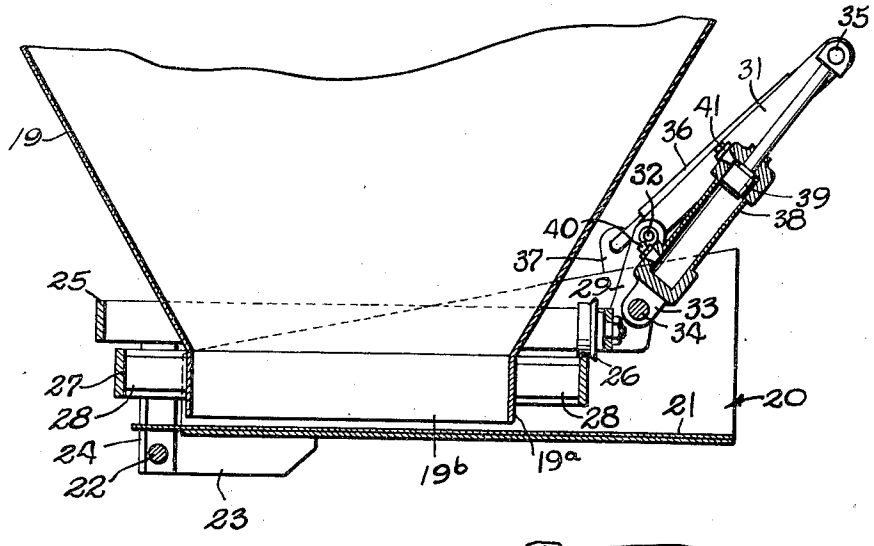



Fig. 3

Fig. 4




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Patented June 19, 1951 2,557,358

# UNITED STATES PATENT OFFICE

2,557,358

## CONCRETE MIXING PLANT

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Application June 5, 1946, Serial No. 674,573

11 Claims. (Cl. 259—152)

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The present invention pertains to concrete mixing plants or apparatus and to aggregate charging mechanisms for use therein.

One general aim of the present invention is to afford a plant of minimum overall height and complexity and in which aggregates can be quickly and effectively chuted by gravity from a single collecting hopper to any selected one of a battery of mixers.

Another object is to provide a collecting hopper having a novel chute arrangement such that a single chute serves both as a closure and as a selective direction dispatching chute.

Still another object is to provide a hopper and chute arrangement of the general character indicated above, together with a novel power actuating set-up therefor which is simple and rugged in construction and serves with a minimum of applied force to hold the chute securely in closed position.

A further object is to provide a novel power actuator and link arrangement for moving a member to which it may be connected, such arrangement constituting in the present instance a subcombination of the mechanism illustrated and being utilized to shift the combination dispatching and closure chute.

Further objects and advantages of the invention will become apparent as the following description proceeds, taken in connection with the accompanying drawings in which:

Figure 1 is a front elevation of a concentric zone mixing plant embodying the present invention, only three of the four mixers contemplated being shown and the fourth, which would be the one nearest the observer, being omitted to make plain the arrangement of the centrally located parts.

Fig. 2 is an enlarged transverse sectional view taken substantially along the line 2—2 in Fig. 1.

Fig. 3 is an end elevation of the mechanism appearing in Fig. 2 but with the chute in its lowered or discharge position rather than in the closed position which it occupies in Fig. 2.

Fig. 4 is a vertical sectional view taken substantially along the line 4—4 in Fig. 2.

While the invention is susceptible of various modifications and alternative constructions, I have shown in the drawings and will herein describe in detail the preferred embodiment, but it is to be understood that I do not thereby intend to limit the invention to the specific form disclosed, but intended to cover all modifications and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

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Referring more particularly to the exemplary embodiment of the invention herein illustrated, it will be seen (Fig. 1) that the installation shown comprises a plurality or battery of mixers 5 disposed in a common horizontal plane and all facing inwardly toward the vertical central axis A—A of a central space or "charging zone." The mixers have been shown as equally spaced with respect to each other, being located at intervals of about ninety degrees about the axis A—A, since four mixers are contemplated for the present plant. The mixers themselves may be of conventional and well known form, each comprising a mixing drum 6 revolubly mounted in a cradle 7 while is tiltable on trunnions 8 journalled on a base 9. The mixers have been shown as being of the tilting variety of front-charged, front-discharged type, and have in their inner or forward ends circular openings 10 through which aggregates are charged preparatory to mixing, and later discharged from the drum after mixing. During charging and mixing the drums 6 occupy the generally upwardly tilted position shown in Fig. 1 and during discharge they are tilted downwardly about their trunnions 8 so that their contents will slide out by gravity into a receiving hopper 11 located beneath the "charging zone."

Suitable snout chutes 12 are provided at the charging openings 10 for each of the mixers 5. These snout chutes are supported and actuated by pairs of links 13, 14 pivoted together and to the snout chutes at their adjacent ends. The outer ends of the links 14 are pivoted to arms 15 rigid with the cradles 7 while the inner ends of the other links 13 are pivoted to a central head 16 supported by struts 17. As any one of the mixer drums 6 is rocked forwardly and downwardly on its trunnions 8, the associated links 13, 14 are thus scissored toward each other, lifting the associated snout chute 12 free of the drum so that the latter may be canted downwardly for discharge into the receiving hopper 11.

Above the "charging zone" is a collecting hopper 19 of inverted cone shape and which is substantially coaxial with the axis A—A. Aggregates, such as sand, gravel, rock and cobbles, are dumped into this collecting hopper 19 by suitable weigh batchers (not shown) or the like together with dry cement suitably proportioned for the concrete mix. Such materials are thereafter dispatched from the collecting hopper 19 to a selected one of the mixers 5 by a novel chute arrangement which will next be described. This chute arrangement is adapted not only for such

selective dispatching of the aggregates but also to serve as a closure for the open bottom of the hopper 19 and thus retain materials in it when desired.

As to the combination closure and dispatching chute arrangement provided in the lower end of the collecting hopper 19, it will be seen that in the illustrative embodiment such arrangement includes a sheet metal chute 20 of generally channel shape or form. It is tapered longitudinally toward the outer end (see Figs. 2 and 3) and has a flat bottom wall overlaid by a reinforcing plate 21.

The chute 20 is pivoted adjacent one end on a transverse bar 22 to swing between a generally horizontal closed position shown in Figs. 2 and 4 and a downwardly inclined open or discharge position shown in Figs. 1 and 3. In the present instance bracket arms 23 are rigidly welded to the underside of the chute 20 and are pivotally supported on a rod 22. The latter is in turn supported by depending brackets 24 welded to an annular supporting ring or carriage 25. The ring 25 encircles the lower end portion of the receiving hopper 19 in spaced relation to it and is supported by three rollers 26 (Fig. 2) on an annular track 27 which also encircles the lower end portion of the hopper. The track 27 is rigidly fixed to the hopper by brackets 28 extending radially outwardly from the cylindrical lower end 19a of the hopper. The ring or carriage 25 is thus supported to turn concentrically with the hopper axis and in a generally horizontal plane, the carriage and the chute 20 moving as a unit so that the latter may be shifted into any selected position radially of the axis A—A for discharge into a corresponding one of the snout chutes 12. As shown in Fig. 1, the dispatch chute 20 is so dimensioned that when it is lowered for discharge, the lower end is nestingly received in the upper end of the snout chute providing an overlap which prevents spilling or leakage. Raising the chute 20 enables it to clear the snout chute for bodily rotation into alignment with an adjacent mixer.

Raising and lowering of the chute 20 is preferably accomplished by means of a power actuator. In the present instance the power actuating arrangement comprises a generally triangular linkage arrangement (see Fig. 1), one fixed leg of the triangle being constituted by generally upright brackets or supports 29 rigid with the supporting ring 25, and two movable legs of the triangle being constituted, respectively, by a piston and cylinder type actuator unit 30 and arms or links 31. The inner ends of the arms 31 are pivoted at 32 to the upper ends of the brackets 29 while the inner end of the actuator unit 30 has fixed to it a yoke 33 pivoted on a pin 34 extending between the lower ends of the brackets 29. On the other hand, the outer ends of the arms 31 and actuator unit 30 are pivotally connected by a transverse pin 35. Links 36 are pivotally connected at their outer ends to the pin 35 and at their lower ends to the bracket 37 on the chute 20, suspending the outer end portion of the latter from the triangular assembly.

The fluid actuator 30 is of the piston and cylinder type and comprises (see Fig. 4) a cylinder 38 and piston 39 slidable within the cylinder for longitudinal extension and contraction of the unit. Upon the admission of pressure fluid (e. g. compressed air) to the cylinder 38 through port 40, and exhausting of fluid through port 41, the piston 39 is thrust to its distended position shown in Fig. 4. Such increase in the length of the lower movable side or leg of the triangle heretofore noted causes the arms 31 to be swung upwardly from the position of Fig. 1 to that of Fig. 4. The chute 20 is accordingly swung upwardly to the substantially horizontal position shown in Fig. 4 where it closes the opening 19b in the lower end of the collecting hopper 19. In such position the wall of the chute 20 closely underlies the lower end of the hopper, preventing escape of the hopper contents. A small space between the chute and lower end of the hopper, as shown in Fig. 4, is permissible to afford maximum tolerance in dimensioning of the parts. It is permissible since aggregates will lodge in any such small space, preventing any substantial amount of aggregates from actually discharging from the chute when it is horizontal. Exhausting pressure fluid from the port 40 and supplying fluid through the port 41 causes the piston 30 to be retracted within the cylinder 38, thus swinging the arms 31 downwardly and lowering the chute 20 to its downwardly inclined discharge position shown in Figs. 1 and 3. A flexible cover or the like (not shown) may be provided over the outwardly projecting portion of the chute, if desired, to prevent escape of dust as aggregate runs down the chute.

It is to be observed that, when the chute 20 is in its closed position shown in Figs. 2 and 4, a large part of the gravity load imposed on the chute 20 by the contents of the hopper 19 is transmitted by the linkage 36, 30, 31 as a thrust on the pivots 32, 34, thereby minimizing the downwardly acting torque on the supporting linkage which must be resisted by the actuator 30. In other words, the load on the chute is in effect divided into two components, only one of which applies a downward torque on the chute, the other acting in compression on the links 31 and unit 30, the drop links or arms 36 being substantially in parallelism with 30 and 31.

The operation of the plant disclosed will in general be clear from the foregoing. By way of brief resume it may be noted that, in the normal cycle of operation, the carriage 25 is turned to bring the chute 20 into alinement with the snout chute 12 of a selected one of the mixers 5. Suitably proportioned batches of aggregates and dry cement are dumped into the collecting hopper 19 with the chute 20 either in its closed or discharge position as may be desired. In the event that it is desired to collect the entire charge in the receiving hopper prior to chuting it into the mixer, the chute 20 is held in its upper or closed position during filling of its receiving hopper. Then the piston 39 is retracted within the cylinder 38 to lower the chute 20 into its discharge position, whereupon the collecting hopper 19 discharges by way of the chute 20 into the snout chute 12 and thence into the mixer drum 36. Because of the sharp angles of inclination afforded for the chutes 20 and 12, the gravity discharge of the material is extremely rapid. After the hopper 19 has been emptied, the actuator 30 is distended to raise the chute 20 and the carriage 25 turned to bring the chute 20 into alinement with the snout chute of the next mixer to be charged. The charging of such mixer is then carried out in the same manner described and while the mixing of concrete is going forward in the previously charged mixer. After mixing is completed in any of the mixers 5, it is tilted downwardly to discharge position and dumps its contents into the receiving hopper 11. The latter

directs the mix into a conveyor, truck or other desired receiver (not shown).

I claim as my invention:

1. In a concentric zone mixing plant, the combination of a battery of concrete mixers clustered about a central charging zone and all having openings therein for both charging and discharging facing inward toward said zone, an aggregate collecting hopper of inverted generally conical form terminating in a bottom opening and located above said zone substantially coaxially therewith, an annular track encircling the lower end of said hopper and substantially concentric therewith, an annular carriage mounted by rollers on said concentric track for movement about the same, a combined closure and discharge chute pivoted at one end on said carriage to swing from a generally horizontal position in which it lies beneath and closes said hopper opening to a downwardly and outwardly inclined discharge position beneath said opening for gravity dispatch of the hopper contents, said chute and said carriage being rotatable in a generally horizontal plane as a rigid unit which is selectively positionable for discharge of the hopper contents into any one of said mixers, and power actuated means for moving said chute between its open and closed positions.

2. In a concentric zone mixing plant, the combination of a plurality of concrete mixers angularly spaced about a central mixing zone and all having openings therein for both charging and discharging facing inward toward said zone, an aggregate collecting hopper having an opening in its lower end and located above said zone substantially coaxially therewith, a chute, and means for supporting said chute for vertical swinging movement between a position in which it extends generally horizontally across said opening and a discharge position in which it is inclined downwardly and outwardly beneath said opening, said means also being adapted to support said chute in different angular positions about the vertical center line of said opening for gravity chuting of aggregates from said hopper into corresponding ones of said mixers.

3. In an aggregate charging mechanism for a battery of concrete mixers or the like, the combination of an aggregate collecting hopper of inverted generally conical form terminating in a bottom opening, an annular track encircling the lower end of said hopper and substantially concentric therewith, a horizontally rotatable carriage mounted by rollers on said concentric track for movement about the same, and a wide shallow channel mounted on said carriage for horizontal rotary movement as a unit therewith, and pivotal attaching means disposed between said carriage and one end of said channel permitting the latter to swing from a generally horizontal position in which it closes said hopper opening to a downwardly and outwardly inclined discharge position beneath said opening for gravity chuting of the hopper contents.

4. In an aggregate charging mechanism for a plurality of concrete mixers or the like, the combination of an aggregate collecting hopper having an opening in its lower end, a chute member disposed beneath said opening, and means supporting said member for vertical swinging movement between a position in which it extends generally horizontally across said opening and a discharge position in which it is inclined downwardly and outwardly beneath said opening, said means also being adapted to support said chute member for movement into various selected angular positions about the vertical center line of said opening for gravity chuting of aggregates from said hopper.

5. In an aggregate charging mechanism for a battery of mixers in a concetric zone mixing plant or the like, the combination of a collecting hopper having an opening in its lower end, a carriage, means supporting said carriage for generally horizontal rotary movement in an annular path encircling the lower portion of said hopper and substantially concentric therewith, a chute, means pivoting one end of said chute on said carriage at a point laterally offset from said opening for swinging of said chute between a generally horizontal closed position in which the chute extends across said opening blocking the same and a downwardly inclined discharge position, the position of said chute radially of the hopper axis being variable by rotating said carriage about said axis, an arm pivoted at its inner end on said carriage to swing generally vertically about a pivot point located on the side of said carriage opposite the pivotal connection to the latter of said chute, means suspending said chute from the outer portion of said arm for movement of said chute into closed position when said arm extends generally upwardly and outwardly and into discharge position when said arm is swung into downwardly extending position, and a longitudinally extensible piston and cylinder type fluid actuator unit pivotally connected at one end to said carriage at a point on the latter spaced beneath the pivotal connection of said arm to said carriage, said actuator being pivotally connected at its other end to the outer portion of said arm.

6. In an aggregate charging mechanism for a concrete mixer or the like, the combination of a collecting hopper having an opening in its lower end, a chute, means pivoting one end portion of said chute at a point laterally offset from said opening to swing between a generally horizontal closed position in which said chute extends across and blocks said opening and a downwardly and outwardly inclined discharge position for gravity chuting of the hopper contents, an arm pivoted at its inner end to swing generally vertically and located at the side of said hopper opposite said pivot means for said chute, and power actuated means for swinging said arm between a lowered position wherein said arm extends downwardly and a raised position wherein said arm extends generally upwardly and outwardly, the closed and discharge positions of said chute corresponding respectively to the raised and lowered positions of said arm, and means pivotally suspending the other end portion of said chute from the outer portion of said arm, the latter being adapted to resist by means of an axial compressive thrust a substantial component of the gravity load on said chute in closed position.

7. In an aggregate charging mechanism for a concrete mixer or the like, the combination of a collecting hopper having an opening in its lower end, a carriage disposed in concentric relation with the lower end of said hopper and mounted for concentric rotary movement with respect thereto, a chute, means pivoting one end portion of said chute to said carriage at a point laterally offset from said opening to swing between a generally horizontal closed position in which said chute extends across and blocks said opening and a downwardly and outwardly inclined discharge

position for gravity chuting of the hopper contents, a generally upright support in said carriage located on the side of said hopper diametrically opposite the point of pivotal connection of said chute to said carriage, an arm, a longitudinally extensible piston and cylinder type fluid actuator unit pivotally connected to said support and to said arm to constitute therewith a triangular assembly in which said support forms a stationary fixed side and said arm and said unit constitute movable sides of respectively fixed and variable length, said arm and said unit being pivoted to said support at vertically spaced points, and means for suspending said chute from one of said movable sides of said triangular assembly.

8. In a mixing plant having a hopper for gravity discharge of aggregate from a bottom discharge opening, a combined closure and discharge chute construction comprising, in subcombination, an actuator support, a chute member pivoted at one end on said actuator support for vertical swinging movement between a closed position in which it extends generally horizontally across said opening and a discharge position in which it is inclined downwardly and outwardly beneath said opening for gravity chuting of aggregates, an arm pivoted to said support and extending outwardly therefrom for vertical swinging movement, a link pivoted to the outer end of said arm and extending inwardly and downwardly for pivotal connection to the discharge end of said chute member, and a fluid actuator connected at its inner end to the actuator support below said arm and connected at its outer end to the region of juncture of said arm and said link so that upon expansion of said actuator said arm is swung upwardly into an upraised position accompanied by upward movement of the link and closure of the chute member connected thereto, said arm and said link being of such lengths relative to one another so that the arm is subjected to a substantially pure compressive load in its upraised position.

9. In a concentric zone mixing plant, the combination of a battery of four concrete mixers spaced at 90 degree intervals about a central mixing zone and all having openings therein for both charging and discharging facing inward towards that zone, an aggregate collecting hopper having an opening in its lower end and located above said zone substantially coaxially therewith, a chute transversely arranged below the opening in said hopper, means carrying a horizontal shaft for mounting the chute for swinging movement from a position in which it extends generally horizontally across said opening into discharging relation in which it is inclined downwardly and outwardly beneath said opening, said means permitting bodily rotation of the chute about a vertical axis in said zone so that the chute may be positioned in angularly spaced discharge positions for gravity chuting of aggregates from said hopper into a selected one of said mixers.

10. In a concentric zone mixing plant, the combination of a battery of four concrete mixers spaced at 90 degree intervals about a central mixing zone and all having openings therein for both charging and discharging facing inward towards that zone, an aggregate collecting hopper having an opening in its lower end and located above said zone substantially coaxially therewith, a chute transversely arranged below the opening in said hopper, a carrier for said chute, means for mounting said carrier for bodily rotation of the chute about an axis concentric with the opening in said hopper and between angularly spaced discharge positions in which it is aligned with a selected mixer, pivot means including a horizontal shaft mounted on said carrier for mounting said chute for swinging movement from a position in which it extends generally horizontally across said opening into discharging relation in which it is inclined downwardly and outwardly beneath said opening, and a power actuator mounted on said carrier for swinging said chute downwardly for gravity chuting of aggregates from said hopper into the selected one of said mixers.

11. In a concentric zone mixing plant, the combination of a battery of four concrete mixers spaced at 90 degree intervals about a central mixing zone and all having openings therein for both charging and discharging facing inward towards that zone, upwardly facing snout chutes on each of said mixers respectively, an aggregate collecting hopper having an opening in its lower end and located above said zone substantially coaxially therewith, a dispatch chute extending crosswise below the opening in said hopper, a carrier for said chute, means for mounting said carrier for bodily rotation of the chute about an axis concentric with the opening in said hopper and between angularly spaced discharge positions in which it is aligned with the snout chute of a selected mixer, the dispatch chute being so dimensioned that it overlaps the snout chute with which it is aligned, horizontal pivot means on said carrier for mounting said dispatch chute for swinging movement from an upraised position in which said dispatch chute clears said snout chutes into lowered relation in which the dispatch chute is nestingly received in the aligned snout chute and inclined downwardly and outwardly for gravity chuting of aggregates from said hopper into the selected one of said mixers.

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