

March 25, 1952

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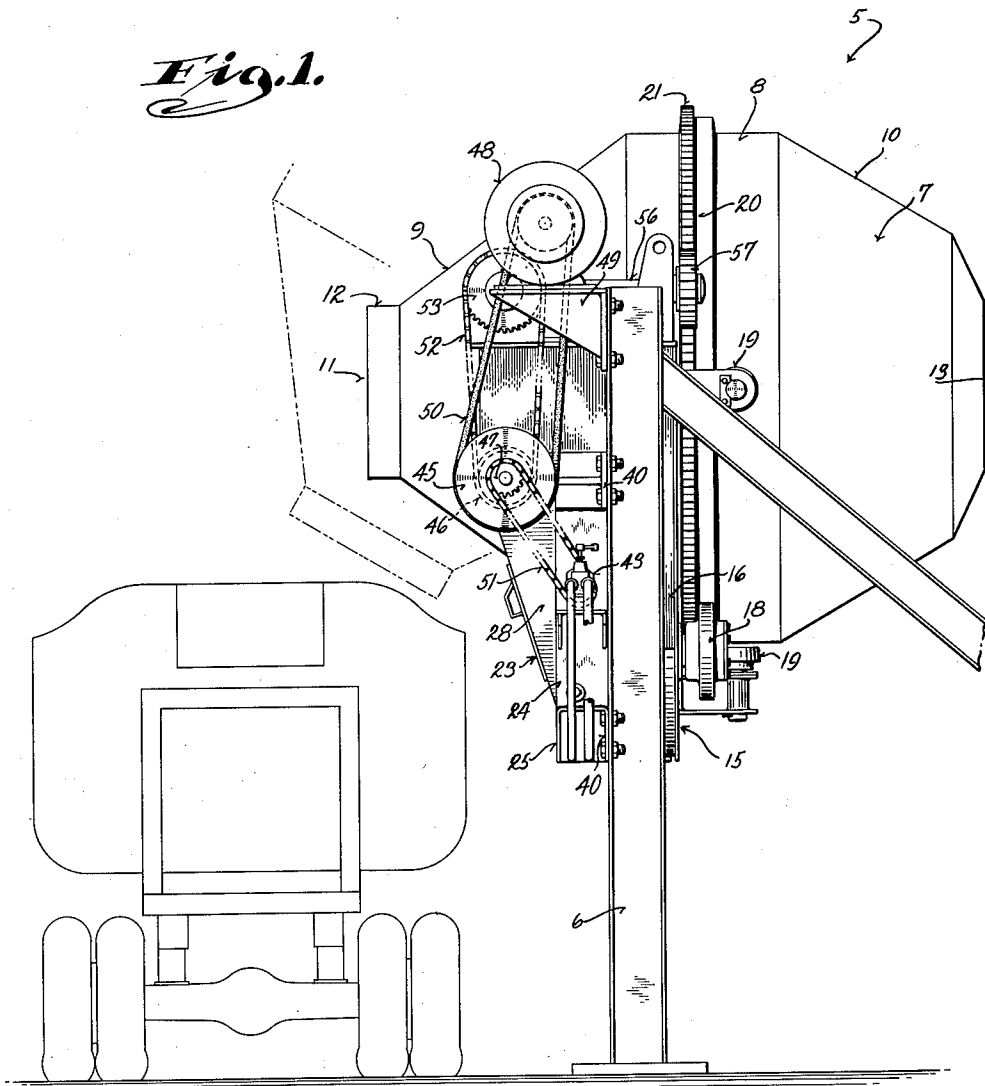
2,590,438

CONCRETE MIXING APPARATUS

Filed Feb. 27, 1950

4 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

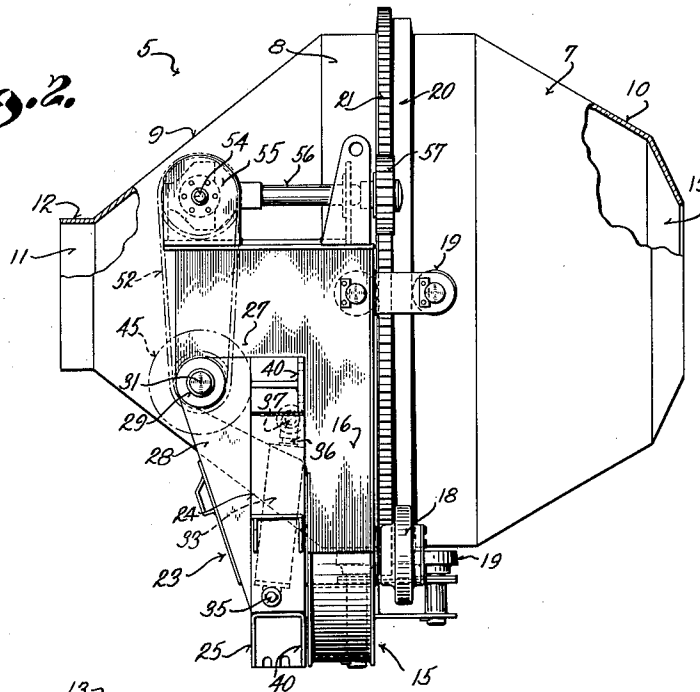
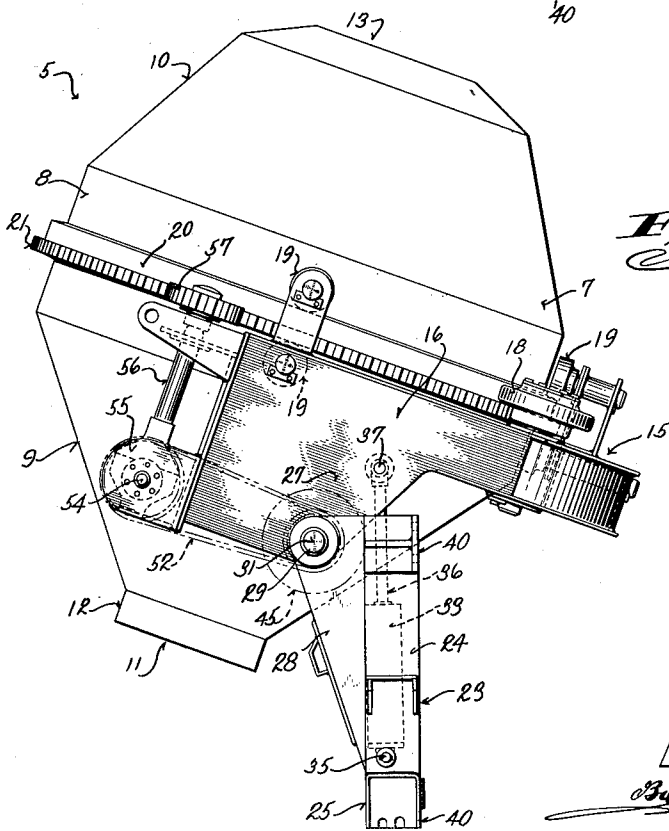


Fig. 3.



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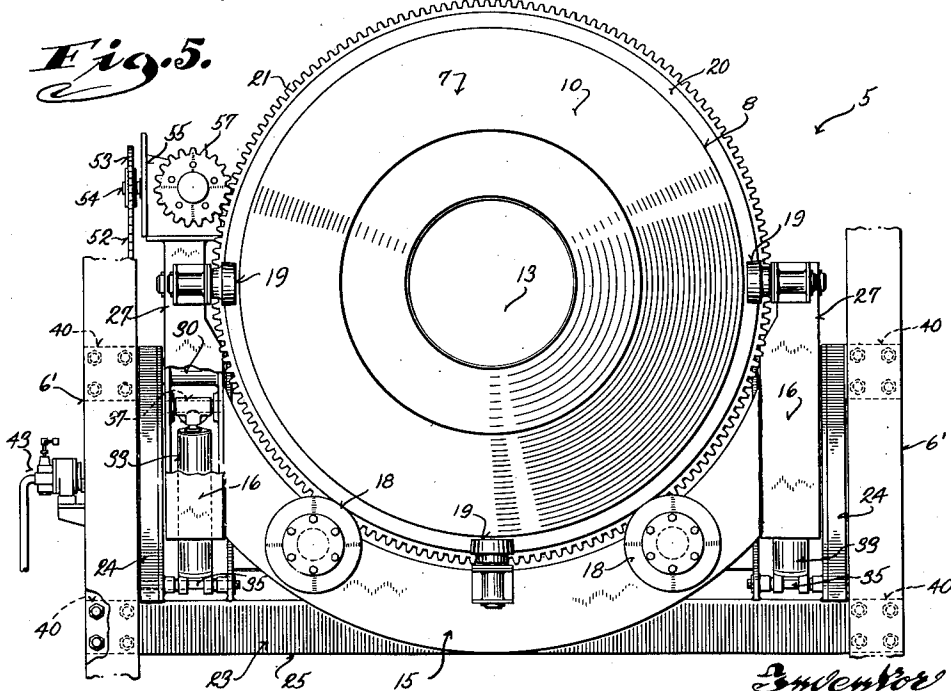
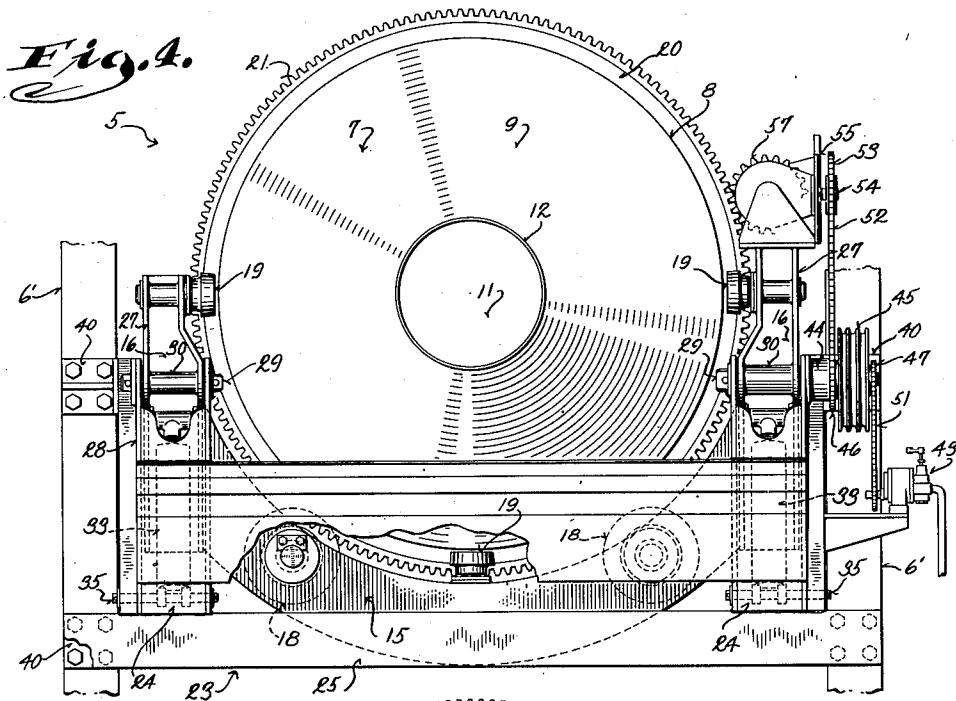
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4 Sheets-Sheet 3



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CONCRETE MIXING APPARATUS

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Fig. 7.

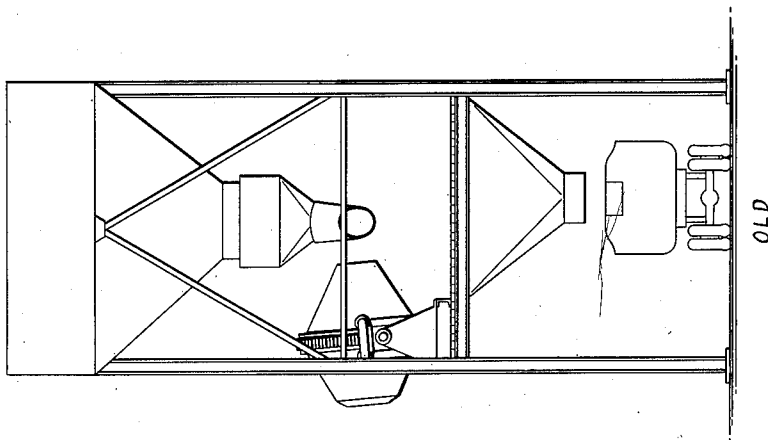


Fig. 6.

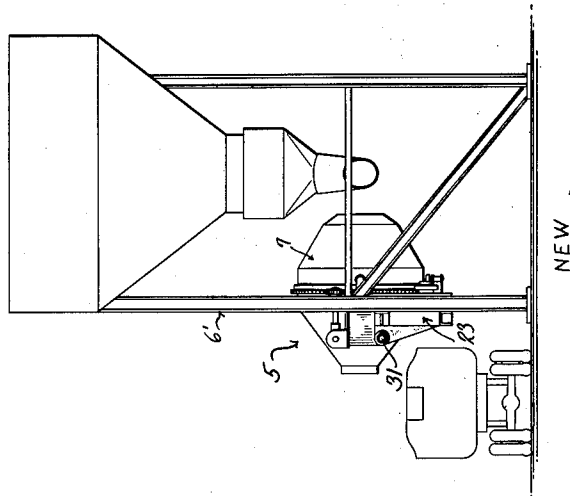
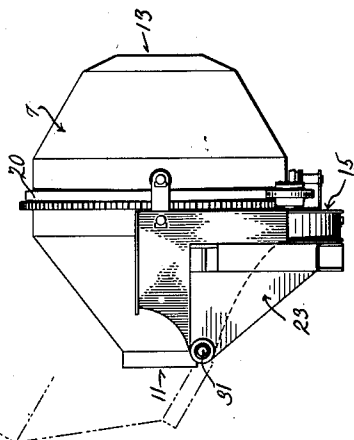


Fig. 8.



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UNITED STATES PATENT OFFICE

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CONCRETE MIXING APPARATUS

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Application February 27, 1950, Serial No. 146,452

11 Claims. (Cl. 259-161)

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This invention relates generally to mixing apparatus for concrete and the like and refers more particularly to mixing apparatus embodying a rotatable mixing drum of the type which must be tilted to effect discharge of its contents through a coaxial discharge opening in one end of the drum.

In mixing apparatus of this type it is customary to support the mixing drum on a cradle for rotation relative thereto and for bodily tilting motion with the cradle in a direction to dispose the discharge end of the drum lowermost and thus enable the contents of the drum to be emptied.

Heretofore in mixing apparatus of this type the mixing drum was always mounted to tilt about an axis intermediate the ends of the drum and remote from its discharge end so that the latter was caused to swing downwardly a considerable distance and through an arc of substantial radius to carry the drum from a normal mixing position to a discharging position with its discharge end lowermost. This arrangement of the tilting axis with respect to the drum thus caused the drum contents to be shifted quite rapidly toward the discharge end of the drum during tilting of the drum out of its mixing position, with the result that the concrete "spouted" a considerable distance out of the discharge end of the drum during discharge.

Because of this characteristic discharge of past tilt type concrete mixers it was often necessary to employ relatively long troughs to receive the concrete spewed out of the drum during discharge; and it will be apparent that little or no control of the discharging concrete could be obtained. Moreover in mixing plants employing more than one concrete mixer the mixer drums usually had to be arranged with their discharge ends grouped about a common central receiving hopper of sufficient size to catch the concrete spewing out of the discharge ends of the drums during discharge of their contents.

Not only was the conventional location of the tilting axis (with respect to the mixer drum) responsible for uncontrolled discharge of concrete from the mixer drums, but it also necessitated placement of the drums at high enough elevations so as to accommodate either a stationary receiving hopper beneath their discharge ends, or troughs by which the concrete was conducted to the receiving means on trucks used to haul concrete from the mixing plant to the point of use. In mixing plants where the mixing drums discharged into a receiving hopper the mixing drums and receiving hoppers therefor had to be mounted

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at a high enough elevation to accommodate the receiving means of trucks and the like beneath the receiving hopper which usually was suspended from the customary mixer floor upon which the mixers were mounted. This height problem, of course, was aggravated by the necessity of providing clearance for the downward travel of the discharge end of the mixing drums to discharge their contents.

With these objections in mind it is one of the main objects of this invention to achieve controlled discharge of concrete from a rotatable mixing drum of the tilt type here in question, to obviate the need for a collecting hopper or chutes which tend to induce segregation of the concrete discharged thereinto.

According to the present invention, this object is achieved by supporting the rotatable mixer drum for tilting motion about a horizontal axis which passes closely adjacent to the discharge end of the drum so as to minimize or even eliminate downward travel of the discharge end of the drum during discharge of its contents. This disposition of the tilt axis relative to the drum minimizes forward shifting of the drum contents toward its discharge end during tilting of the drum out of a mixing position; and enables the concrete to flow smoothly over the lower edge or lip of the discharge opening without spewing or spouting as was customary in the past.

Another advantage of thus locating the tilting axis of the drum with respect to its discharge end is that virtually the entire weight of the drum and its contents is concentrated at a location a substantial distance inwardly of the discharge end of the drum; and the vertical projection of the combined centers of gravity of the drum and its contents will never cross the tilting axis during discharge of the drum contents. By reason of this fact it is possible for the first time to use single acting hydraulic cylinders to tilt the drum out of its mixing position, the drum returning to its mixing position by its own weight.

Most important of all, however, is the fact that since the discharge end of the drum has little or no downward travel when tilted out of its mixing position the drum may be mounted upon supports at a minimum elevation, or high enough only to clear the top of transit trucks and the like into which the drum may discharge directly.

It is another object of this invention to provide a rotatable tilt type mixing drum of the character described wherein the drum is mounted

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on a tilting cradle for bodily tilting motion therewith, and the cradle is in turn pivotally supported on a girder-like subframe which may be attached to a pair of upright supporting columns to not only mount the mixing drum on the columns at an elevation above the ground but to also effect reinforcing of said supporting columns.

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

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

Figure 1 is a side elevational view of the mixing apparatus of this invention showing its installation on an easily moved supporting structure, and with the drum arranged to discharge directly into the body of a transit truck;

Figure 2 is a side elevational view of the mixing apparatus removed from its supporting columns, the drum occupying its normal mixing position and having portions broken away and shown in section;

Figure 3 is a view similar to Figure 2 but showing the drum tilted to a discharging position;

Figure 4 is a front elevational view of the mixing apparatus seen in Figure 2, looking at the discharge end of the drum, but showing the apparatus mounted on and supported by a pair of upright columns of a mixing plant;

Figure 5 is a rear elevational view similar to Figure 4 but looking at the charging end of the drum;

Figures 6 and 7 are more or less diagrammatic views comparing the height of the mixing apparatus of this invention to those of past apparatus when used on a batching plant; and

Figure 8 is a view similar to Figure 2 but showing the mixing drum mounted for tilting motion about a horizontal axis directly adjacent to the lip of the discharge opening in the front extremity of the drum.

Referring now more particularly to the accompanying drawings in which like numerals indicate like parts, the numeral 5 generally designates the mixing apparatus of this invention, which in Figure 1 is shown as being supported by and between a pair of upright columns 6 forming part of an easily moved supporting structure for the mixing apparatus. The apparatus includes a mixing drum 7 preferably having a cylindrical wall 8 comprising the medial section of the drum, and substantially frusto conical walls 9 and 10 at the front and rear of the drum, respectively, each having its large diameter end joined to the medial section 8.

At its forward extremity the front end section 9 has a coaxial discharge opening 11 therein defined by a substantially narrow cylindrical pouring lip 12; and the extremity of the rear section is also provided with an opening 13 through which materials to be mixed may be charged into the drum.

The drum 7 is rotatably mounted on a substantially crescent or U-shaped cradle 15 pass-

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ing under the cylindrical medial section 8 of the drum with its legs 16 extending upwardly along the opposite sides of the drum. Free rotation of the drum relative to the cradle may be accomplished in a conventional manner, but in the present case the drum rests upon relatively large rollers 18 journaled on the lower closed end of the cradle. In addition, a plurality of pairs of auxiliary rollers 19 are carried by the cradle for engagement with the opposite sides of an annular flange 20 fixed to and encircling the exterior of the medial section 8 of the drum. The ring gear 21, by which the drum is adapted to be rotated, is also fixed to the flange 20.

In the present case each of the legs 16 is provided with a pair of auxiliary rollers 19, and a third pair of such rollers is mounted on the cradle directly beneath the drum. Needless to say, the rollers 18 and 19 cooperate with one another to freely rotatably support the drum on the cradle and to constrain the drum to bodily tilting motion with the cradle upon a subframe 23 ahead of the cradle and which supports not only the cradle but carries the weight of the drum as well.

The supporting frame or subframe 23 may be considered generally as being U-shaped, in that it has spaced upright legs 24 and a girder-like bottom piece 25 joined to the lower ends of its legs. Hence, it will be seen that the supporting structure for the drum comprises a pair of substantially U-shaped frames disposed in side by side substantially overlapping relation with the subframe 23 in front of the cradle and with the legs of the subframe extending upwardly in front of the legs on the cradle.

The legs 24 of the subframe are substantially channel-shaped in cross section and have their open sides facing rearwardly to be closed by the legs of the cradle in the position of the frames seen in Figures 2 and 5.

At their upper end portions the legs 16 of the cradle, which are likewise substantially channel-shaped in cross section, have extensions 27 integral with their flanged sides and passing forwardly between the flanges on the upper end portions of the legs 24 on the subframe. These extensions 27 project forwardly a distance beyond the legs of the subframe and terminate closely adjacent to the discharge end of the drum.

The upper end portions of the legs 24 of the subframe likewise have their side flanges extended forwardly, as at 28, and these extensions embrace the extensions 27 of the cradle legs. The extensions 27 and 28 are pivotally connected together at each side of the drum as by means of a pivot pin 29 fixed to the extensions 28 of the subframe and passing through a sleeve 30 fixed to and extending between the extensions 27 on the legs of the cradle.

The pins 29, of course, are coaxial with one another and support the cradle for tilting motion about a horizontal axis, indicated by the numeral 31 in Figures 2 and 3, which is perpendicular to the axis of rotation of the mixing drum and located a distance forwardly of the subframe 23 and closely adjacent to the discharge end of the drum. The axis 31 preferably is on a level substantially corresponding to that of the lower edge of the ring 12 defining the discharge opening in the front of the drum in the mixing position of the drum seen in Figure 2, and relatively close to the forward extremity of the drum.

Hence, substantially all portions of the drum and cradle are located rearwardly of the tilt axis

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31, and the weight of the cradle and drum can be utilized to return the drum to its mixing position seen in Figure 2 from a discharging position such as illustrated in Figure 3. The horizontal mixing position of the drum, of course, is defined by the engagement of the crescent-shaped closed end portion of the cradle with the rear of the transverse girder-like part 25 on the subframe.

The extreme forward location of the pivot axis 31 about which the cradle and drum tilt is one of the most important features of the present invention. Because of this disposition of the tilt axis there is little or no tendency for the contents of the drum to suddenly surge forwardly during tilting of the drum out of its mixing position as was the case with past types of tilting mixers. Instead, forward shifting of the contents is minimized and its motion is almost entirely upward during the tilting operation. This results from the fact that the center of gravity of the load or contents of the drum will be considerably beneath the level of the tilt axis in the mixing position of the drum seen in Figure 2 as well as a considerable distance rearwardly of the tilt axis.

It will also be noted that with the disposition of the tilt axis described, a controlled pouring action of the contents is achieved which may be compared to the manner in which water issues from a glass into the mouth of a person drinking from the glass. In each case the lip over which the contents pours is held at a more or less fixed level while the opposite end of the receptacle is elevated to induce discharge of the contents. Thus there is no tendency for the contents to spurt forwardly out of the discharge end of the drum while the latter is being tilted to a discharging position. The drum contents is, in fact, elevated along the upwardly sloping walls of the front section 9 of the drum to initiate discharge of the drum contents and to cause the contents to pour smoothly out of the opening 11 in the front end of the drum.

The cradle is adapted to be tilted in a counterclockwise direction, as seen in Figure 2, to carry the drum out of mixing position to a discharging position such as indicated in Figure 3. Such tilting of the cradle is accomplished by means of a pair of upright hydraulic cylinders 33 each received in the pocket formed by one of the legs 24 of the subframe 23.

The lower ends of the cylinders are anchored to the legs of the subframe by cross pins 35 extending transversely between the flanges of the legs and providing pivotal supports about which the cylinders may swing backwardly and forwardly on axes parallel to the tilt axis 31 of the drum. The cylinders 33 have their rams 36 projecting upwardly and pivotally joined to the forward extensions 27 on the cradle by cross pins 37 which are anchored in the extensions of the cradle legs in a manner similar to the lower cross pins 35.

The points of connection between the rams and the cradle, of course, lie a distance rearwardly of the tilt axis 31 at all times and are so disposed with respect to the tilt axis as to remain substantially in vertical alignment with the legs 24 of the subframe in all positions of the mixing drum.

Another highly important advantage of the present invention resides in the fact that the extreme forward location of the tilt axis 31 enables the use of single acting hydraulic cylinders. In other words, the cylinders 33 need only be em-

ployed to elevate the rear portion of the mixing drum to accomplish discharge of its contents. The combined center of gravity of the drum and the cradle upon which it is mounted will always lie rearwardly of the vertical plane containing the tilt axis 31, so that the drum will be returned to its mixing position by gravity.

In this connection it should be pointed out that the lower crescent-shaped portion of the cradle which encircles the widest part of the mixing drum adds sufficient weight and leverage to the drum in its discharging position seen in Figure 3 as to overbalance the weight of the portions of the drum lying forwardly of the tilt axis 31 so that at no time will the vertical projection of the combined centers of gravity of the drum and cradle cross forwardly over the tilting axis 31.

While the supporting or subframe 23 may be employed to mount the mixing drum in any desired location as, for instance, upon the customary mixing floor of a batching plant, it may also be used to great advantage in a manner now about to be described.

The subframe 23 preferably is provided with a number of attaching flanges 40 by which it may be secured to a pair of upright columns 6 as seen in Figure 1, or two adjacent columns 6' such as are usually employed in a conventional batching plant for the support of aggregate and batching hoppers and the like. One of these attaching flanges 40 projects outwardly from the upper extremity of each of the legs 24 of the subframe. The attaching flanges at the lower portions of the subframe may conveniently comprise the ends of the girder-like crosspiece 25 connecting the lower ends of the legs of the subframe. All of the flanges, of course, lie in a common plane parallel to the tilt axis 31.

Since all of the flanges 40 extend laterally outwardly of the legs of the cradle, it will be readily apparent that the mixing apparatus may be attached as a unit to the upright columns 6 or 6' with the cradle and mixing drum carried thereby disposed between the columns; and with the forward or discharge end of the mixing drum extending a distance to one side of the vertical plane of the columns. As seen in Figure 6, the discharge end of the drum will project a distance outwardly of the group of columns supporting the aggregate and batching hoppers of the mixing plant. When so attached the subframe 23 rigidly joins the two adjacent columns to which it is secured to provide reinforcing for them, thereby reducing the number of reinforcing beams or girders such as are conventionally employed in mixing plants.

Because of the controlled pouring which is achieved with the mixing apparatus of this invention it is possible to arrange the apparatus for discharge of the drum contents directly into transporting means, such as the body of a transit truck as seen in Figure 1 without requiring lengthy troughs or other receiving equipment interposed between the discharge end of the drum and the truck. It will also be noted that the mixing apparatus need not be mounted at a relatively great height above ground level, but that it may be attached to supporting columns with the discharge end of the drum closely adjacent to the top of the truck body or other receiving means into which the drum is to discharge. Consequently, a desirably high discharge of the drum contents is achieved without the necessity of locating the mixing apparatus at excessive heights. The lowest possible location of the mixing ap-

paratus of this invention is obtained when the tilting axis 31 is located directly adjacent to the lower lip of the discharge opening 11 of the mixing drum as shown in Figure 8. In this instance discharge of the drum contents is accomplished by upward tilting of the rear portions of the drum about the lowermost point of the forward extremity of the drum, and there is no downward swinging of any portion of the drum below the level of the tilt axis during tilting to discharge its contents.

The mixing apparatus of this invention is particularly well adapted for installation on a trailer or even a truck because of the high discharge of materials from the drum without the need for mounting the apparatus high up on the trailer or truck. Also, because of the fact the mixing drum may be located at minimum height, the charging of materials into the rear end of the drum is greatly facilitated.

According to this invention, one of the tilt pins 29 provides in effect a power take-off shaft by which rotation may be transmitted to the mixing drum and to an oil pump 43 supplying the hydraulic cylinders 33. For this purpose the said tilt pin is extended outwardly away from the mixing drum a distance beyond the outer side of the leg of the subframe in which it is fixed to have a sleeve 44 rotatably journaled thereon.

Fixed on the sleeve 44 is a multiple V-belt pulley 45, and inner and outer sprockets 46 and 47 at opposite sides of the pulley 45. This pulley is adapted to be connected with a prime mover such as a motor 48 which may be conveniently mounted on a bracket 49 fixed to the front side of one of the supporting columns for the mixing apparatus and above the pulley 45.

The motor shaft is likewise provided with a suitable multiple V-belt pulley which is drivingly connected with the pulley 45 through V-belts 50 trained about both pulleys. The location of the prime mover in this case is purely illustrative, as any desirable location would be satisfactory.

The outer sprocket 47 is adapted to drive the oil pump 43 and is connectable with a sprocket (not shown) on the oil pump by means of a chain 51. The oil pump, of course, is suitably mounted on the subframe or other stationary supporting structure for the drum.

A chain 52 drivingly connects the inner sprocket 46 with a sprocket 53 fixed on a stub shaft 54. The stub shaft is journaled in suitable brackets carried by an upwardly projecting structure 55 on the adjacent forward extension of the leg of the cradle, and the shaft 54 is located substantially directly above and parallel to the tilting axis 31 in the mixing position of the drum.

Also carried by the structure 55 is a pinion shaft 56 journaled for rotation on an axis parallel to the drum axis and intersecting the axis of the stub shaft 54. At its rear end the pinion shaft 56 has a drive pinion 57 fixed thereon to mesh with the ring gear on the drum, and at its forward end the pinion shaft is drivingly connected by bevel gears (not shown) with the sprocket shaft 54.

Hence, upon rotation of the pulley 45 by a suitable source of torque the drive is transmitted to the pinion 57 to rotate the drum on its axis; and the oil pump is driven in the manner described. It is important to note that while the source of torque (an electric motor or an internal combustion engine) is adapted to be mounted

on a stationary part of the supporting structure, the remaining elements of the drive transmission to the drum and the oil pump are tiltable with the cradle and drum without in anywise disrupting the drive thereto. Also, since the pulley 45 is mounted for rotation on the tilting axis, it will be apparent that its axis will always remain the same distance from the axis of the driving shaft on the prime mover regardless of the position of the mixing drum.

From the foregoing description together with the accompanying drawings, it will be readily apparent to those skilled in the art that the mixing apparatus of this invention is highly advantageous from the standpoint that it not only provides for controlled discharge of the contents of the mixing drum, but that it adapts itself exceptionally well for installation at minimum height above ground level and in a manner such as to reinforce the supporting columns to which it may be attached.

What I claim as my invention is:

1. In a mixing machine: a mixing drum having a substantially cylindrical medial section and substantially frusto-conical front and rear end sections coaxial with said medial section, the front section having a restricted opening at its forward extremity through which the contents of the drum may discharge; a substantially U-shaped cradle embracing the cylindrical medial section of the drum and upon which the drum is rotatably mounted; extensions on the legs of the cradle projecting forwardly along opposite sides of said front section of the drum toward the discharge end thereof; and pivot defining means on the forward extremities of said extensions to provide for pivotally supporting the cradle for tilting motion about an axis near to but crosswise of the drum axis and closely adjacent to the discharge opening in said front section of the drum.

2. In a mixing machine: a pair of substantially U-shaped frames disposed in side by side overlapping relation, one in front of the other, and with their legs extending upwardly; means on the front frame for anchoring the same to a stationary support; cooperating means on the upper end portions of the legs of the frames pivotally connecting the frames together and providing for tilting motion of the rear frame toward and from the front frame about a horizontal axis crosswise of the legs of the front frame but spaced a distance forwardly of the front frame; a mixer drum having a discharge opening at one end; and means mounting the drum on said rear frame between the legs thereof for rotation on an axis crosswise of said pivot axis, and with its discharge end projecting forwardly between the legs of the front frame and near said pivot axis, said mounting means constraining the drum to tilt with the rear frame out of a normal mixing position to a discharge position in which the discharge end of the drum is lowermost.

3. In a mixing machine: a pair of elongated frames disposed in side by side overlapping relation, one in front of the other; means on the front frame for anchoring the same to stationary supporting means; cooperating means on said frames pivotally connecting the frames together and providing for tilting motion of the rear frame about a horizontal axis extending lengthwise of the frames but spaced a distance forwardly of the front frame; a mixer drum having a discharge opening at one end; and means mounting

the drum on said rear frame for rotation relative thereto about an axis lying in a plane perpendicular to the pivot axis of the rear frame and for tilting motion with the rear frame to enable the drum to be tilted from a mixing position to a discharge position, said last named means mounting the drum on the rear frame with the discharge end of the drum projecting forwardly of said front frame and terminating closely adjacent to the pivot axis of the rear frame.

4. In a mixing machine: a pair of elongated frames disposed in side by side overlapping relation, one in front of the other, means on the front frame for anchoring the same to stationary supporting means; cooperating means on said frames pivotally connecting the frames together and providing for tilting motion of the rear frame about a horizontal axis extending lengthwise of the frames but spaced a distance forwardly of the front frame; a mixer drum having a discharge opening at one end; and means mounting the drum on said rear frame with the discharge end of the drum closely adjacent to said pivot axis and with the major portion of the drum rearwardly of said front frame, said means constraining the drum to tilting motion with the rear frame while providing for rotation of the drum relative to the rear frame about an axis crosswise of the pivot axis of the rear frame.

5. In a mixing plant the combination with a plurality of upright spaced apart supporting columns grouped about a common center and adapted to support aggregate and batching hoppers and the like, of a tilting type mixing drum having a discharge opening at one end, and means mounting the drum on the plant between two adjacent supporting columns thereof with the discharge end of the drum projecting outwardly away from said center and beyond the plane containing said two columns, said mounting means including cradle means supporting the drum intermediate its ends for tilting motion with the cradle and for rotation on an axis lying intermediate said two columns and passing through the plane thereof, and means supporting the cradle means on said supporting columns for tilting motion about a horizontal axis parallel to said plane but spaced a distance outwardly thereof and closely adjacent to the discharge end of the drum and near the axis of rotation of the drum.

6. In a concrete mixing plant: spaced upright supporting columns; a reinforcing member extending transversely between said columns and joined thereto so as to rigidly connect the columns; a rotatable mixing drum of the tilting type having a discharge opening at one end; and means carried by said transverse member to support the mixing drum for rotary motion about an axis crosswise of said transverse member with the drum between said columns and its discharge end projecting a distance beyond one side of the transverse member, said last named means mounting the drum for tilting motion about a horizontal axis closely adjacent to the discharge end of the drum but spaced from and parallel to said side of the transverse member.

7. The concrete mixing plant set forth in claim 6 wherein the means for rotatably and tiltably supporting the mixing drum comprises a substantially U-shaped cradle adjacent to said transverse member having its opposite legs embracing the drum and disposed adjacent to the upright supporting columns; and a pivotal connection between the transverse member and said legs of the

cradle providing for tilting of the cradle about a horizontal axis crosswise of the axis of rotation of the drum and closely adjacent to the discharge end of the drum.

8. In a mixing machine: a pair of substantially U-shaped frames disposed in side by side overlapping relation, one in front of the other, and with their legs extending upwardly, the legs of the front frame defining upright pockets opening toward and closed by the legs of the rear frame; cooperating means on the upper end portions of the legs of said frames pivotally connecting the frames together and providing for tilting motion of the rear frame rearwardly away from the front frame about a horizontal axis crosswise of the legs of the front frame and spaced a distance forwardly of said front frame; a mixer drum having a discharge opening at one end; means mounting the drum on said rear frame between the legs thereof for rotation on an axis crosswise of said pivot axis and with its discharge end projecting forwardly between and beyond the legs of the front frame to terminate near said pivot axis, said mounting means constraining the drum to tilt with the rear frame out of a mixing position it occupies in the side by side disposition of the frames, to a discharge position upon tilting of the rear frame rearwardly away from the front frame; and tilt mechanism confined in each of the pockets defined by the legs of the front frame and connected between the front frame and the rear frame to apply tilting force to the latter at a location thereon spaced a distance rearwardly of the pivot axis of the rear frame.

9. Mixing apparatus of the character described, comprising: a mixing drum having a ring gear fixed to its exterior; a cradle upon which the drum is rotatably mounted; fixed coaxial pivot pins upon which the cradle is supported for tilting motion about a horizontal axis; a sleeve encircling one of said pivot pins and rotatably journaled thereon; a drive pulley fixed on said sleeve and connectable with a prime mover; a stub shaft carried by the cradle for rotation on an axis spaced from said tilting axis but parallel thereto; means drivingly connecting said stub shaft with the sleeve; a pinion shaft extending between said stub shaft and the ring gear and carried by the cradle for rotation on an axis crosswise of the tilt axis; means drivingly connecting said stub and pinion shafts; and a pinion on said pinion shaft meshing with the ring gear.

10. In a mixing machine: a substantially U-shaped cradle; a mixing drum having a discharge opening at one end; means rotatably mounting the drum on the cradle with the cradle embracing the medial portion of the drum and with the axis of the drum transverse to the plane of the cradle; a supporting structure including a pair of upright members disposed in a common plane; and means pivotally mounting the cradle on said upright members with the cradle substantially spanning the same, whereby the drum may be carried toward and from a discharge position in which its axis is tilted at an acute angle to the horizontal, said cradle mounting means disposing the pivot axis of the cradle ahead of the planes of the cradle and of the upright members and near the discharge opening in the drum so that swinging motion of the cradle tilts the drum about an axis transverse to its rotational axis and closely adjacent thereto and near the discharge opening in the drum.

11. In a mixing machine: a mixing drum hav-

ing an opening at its forward extremity through which the contents of the drum may discharge; a substantially U-shaped cradle embracing the medial portion of the drum and upon which the drum is rotatably mounted; extensions on the legs of the cradle spaced above the bight of the U and projecting forwardly along opposite sides of the drum to have portions disposed adjacent to the discharge end thereof; a pair of fixed upright members; and means pivotally connecting said portions of the extensions with said upright members to pivotally support the cradle for tilting motion about an axis near to but crosswise of the drum axis and closely adjacent to the discharge opening in said front section of the drum.

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