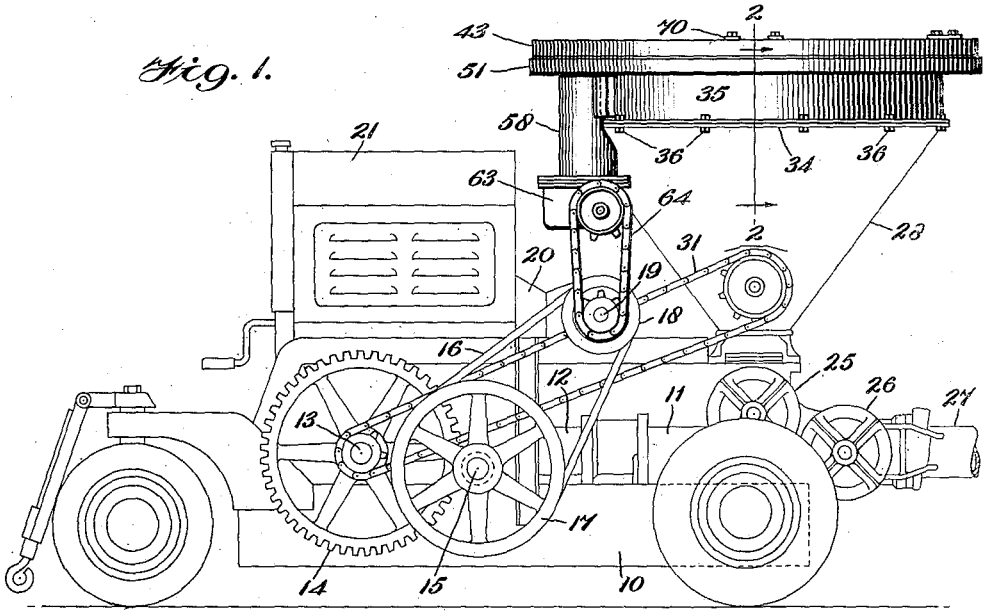
May 20, 1941. C. F. BALL 2,243,028

AGITATING ATTACHMENT FOR THE HOPPERS OF CONCRETE PUMPS

Filed July 26, 1939 3 Sheets-Sheet 1

Fig. 1.



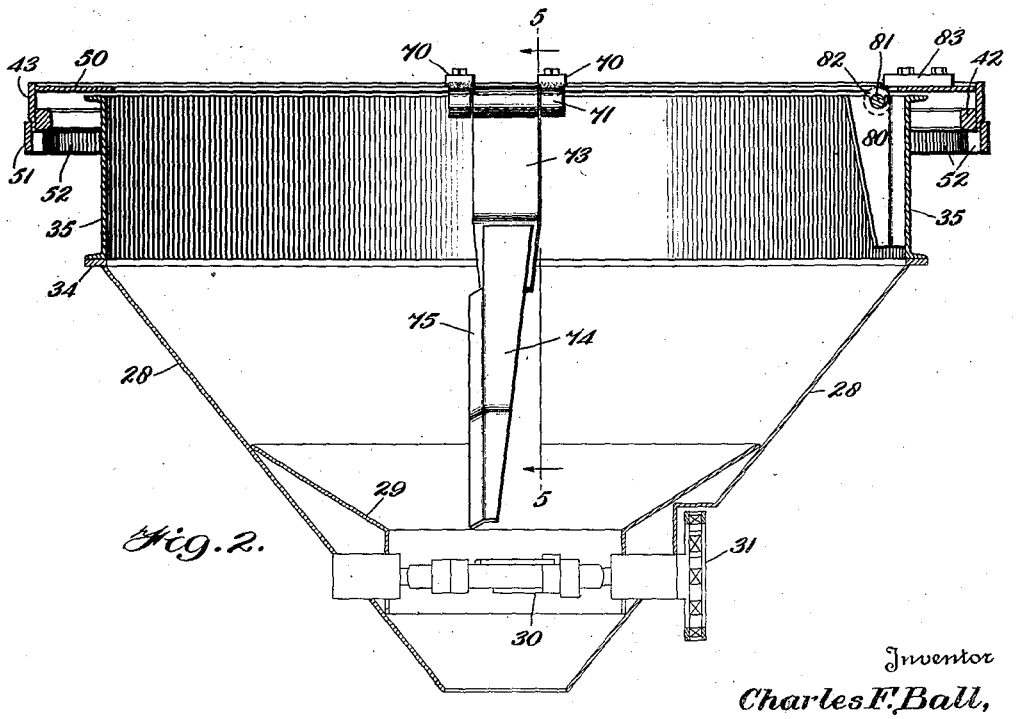




Fig. 2.

Inventor
Charles F. Ball,

By

Attorney

May 20, 1941. C. F. BALL 2,243,028

AGITATING ATTACHMENT FOR THE HOPPERS OF CONCRETE PUMPS

Filed July 26, 1939 3 Sheets-Sheet 2

Fig. 3.

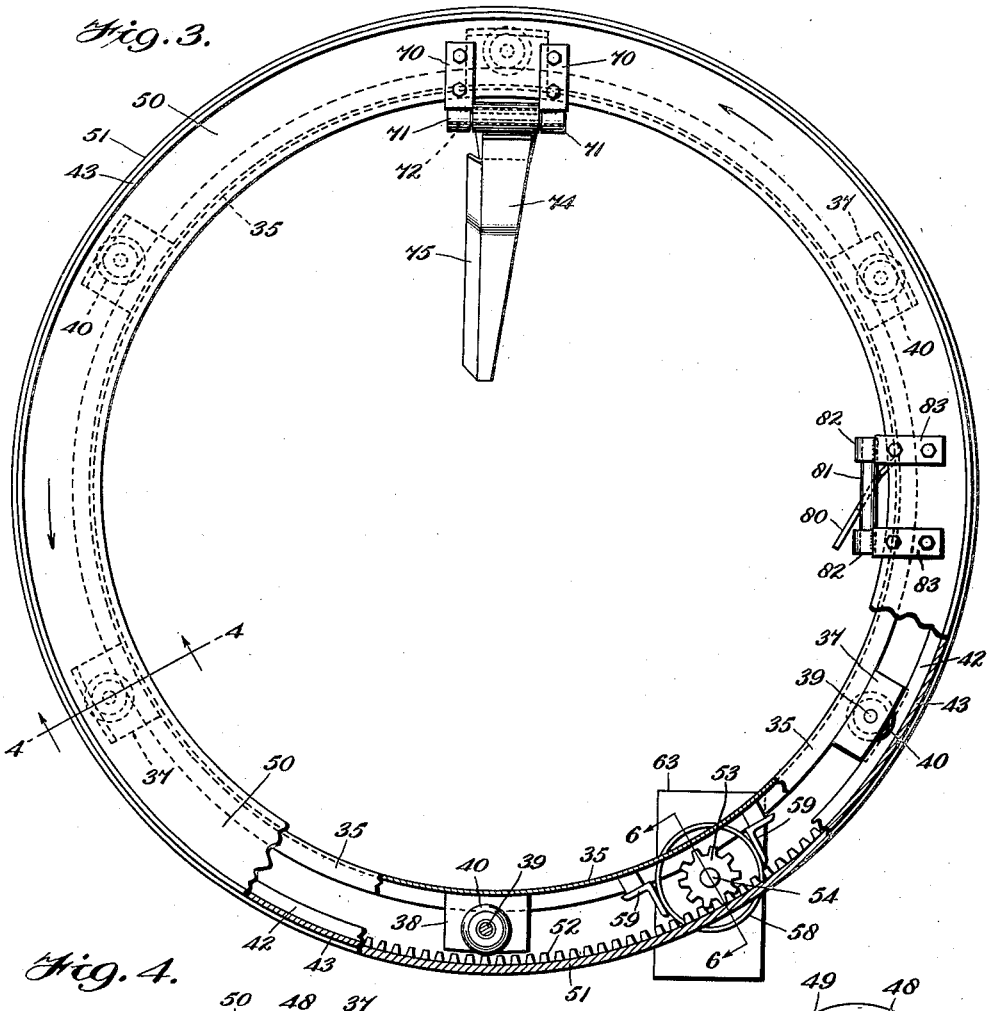
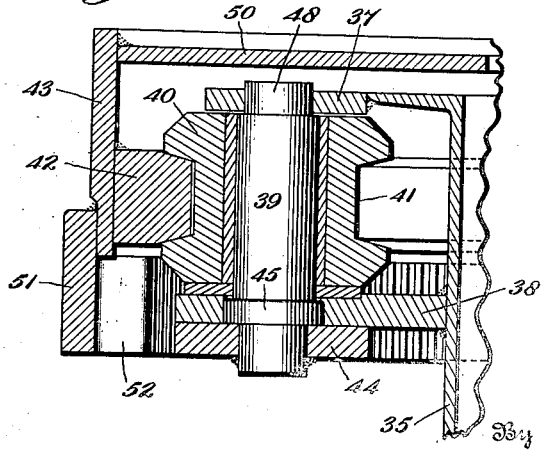



Fig. 4.



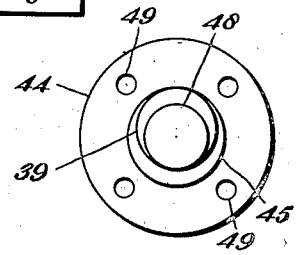




Fig. 8.

Inventor

Charles F. Ball,

By

Attorney

May 20, 1941. C. F. BALL 2,243,028

AGITATING ATTACHMENT FOR THE HOPPERS OF CONCRETE PUMPS

Filed July 26, 1939 3 Sheets-Sheet 3

Fig. 6.

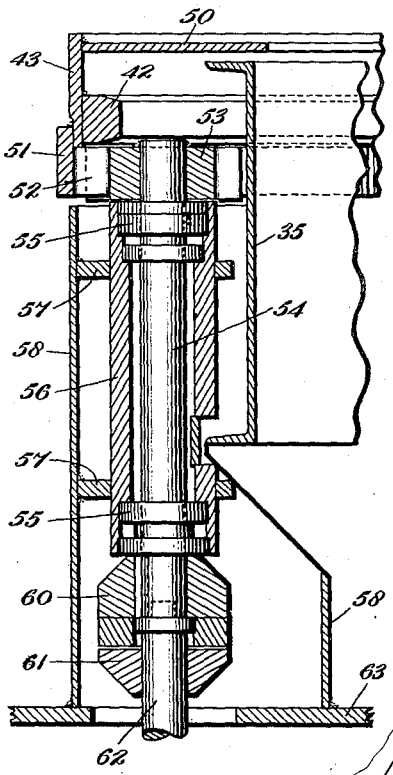
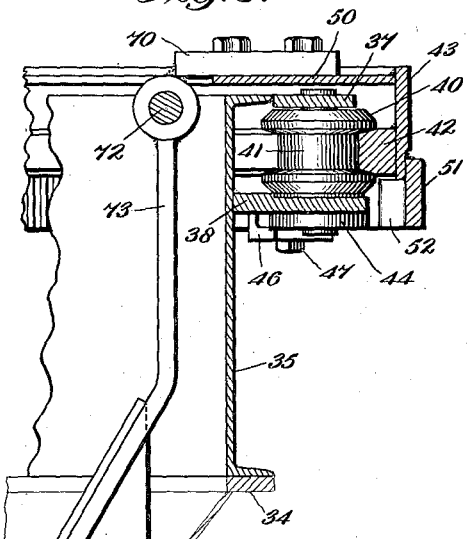



Fig. 5.



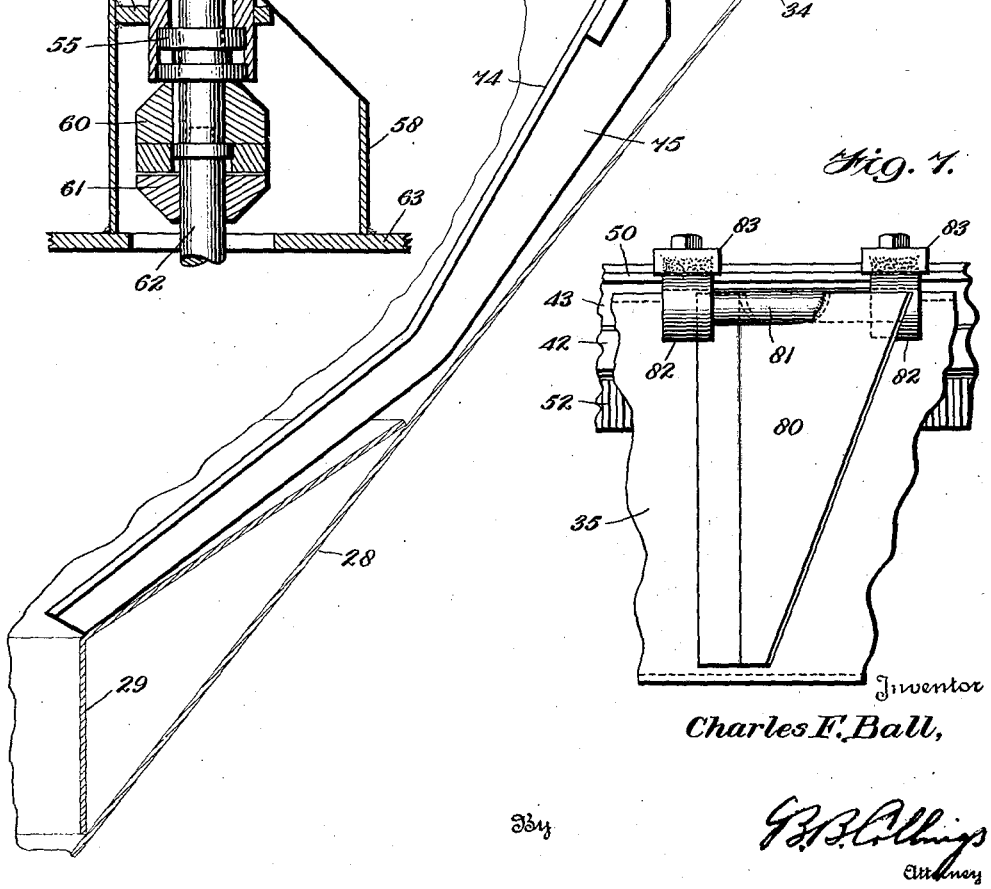




Fig. 7.




Inventor

Charles F. Ball,

By

Attorney

Patented May 20, 1941 2,243,028

# UNITED STATES PATENT OFFICE

2,243,028

## AGITATING ATTACHMENT FOR THE HOPPERS OF CONCRETE PUMPS

Charles F. Ball, Wauwatosa, Wis., assignor to Chain Belt Company, Milwaukee, Wis., a corporation of Wisconsin

Application July 26, 1939, Serial No. 286,635

4 Claims. (Cl. 259—173)

The invention relates to agitating attachments for the hoppers of concrete pumps, and has for one of its objects to provide a simple and relatively inexpensive structure to be manufactured and sold as an accessory unit which may be readily detachably secured to the hoppers of new pumps or those which are already in use. The unit is particularly adapted for easy and rapid attachment to and detachment from the supply hoppers of concrete pumps of the general type disclosed and claimed in the prior U. S. Patent No. 2,017,975 granted October 22, 1935, to Jacobus C. Kooyman, and in my prior U. S. Patent No. 2,062,200 granted November 24, 1936.

In feeding such pumps, the plastic mixture is usually intermittently deposited from a concrete mixer of either the stationary or transit type into a conical hopper having sufficient capacity to insure a continuous feed to the pump during intervals between such deposits. The hoppers ordinarily surmount the inlet valve of the pump and feed directly thereto by gravity.

It is well known that plastic concrete mixtures, particularly the wetter mixes, unless kept in motion have a marked tendency to segregate, i. e. for the heavier aggregates to work their way to the bottom, with the lighter aggregates and the binder "floating" above them. There is also a tendency toward mechanical binding or interlocking of the pieces of aggregate—as distinguished from setting resulting from chemical reactions in the binder—which retards or prevents flow of the mixture.

It frequently becomes necessary in large concrete placement operations to temporarily stop pumping while mixture remains in the hopper, as for example, to relocate the discharge end of the line, and it has therefore been found highly desirable to provide means for agitating the mixture in the hopper to prevent segregation and/or mechanical interlocking or binding of the aggregates during such period. It has also been found that when the pump is running, portions of the mixture in the conical hopper have a tendency to feed faster than other portions, thereby causing "channeling," with the result that the less active portions tend to become stagnant and harden.

The present invention has for one of its primary objects the provision of an agitating or re-mixing unit adapted to be readily detachably secured to these conical hoppers, which will effectively maintain the mixture in good working condition by preventing segregation, "channeling," and mechanical interlock of the aggregates.

It is also an object of the invention to provide apparatus of this character functioning adjacent the upper portions of the conical walls of the hopper to work the mixture in this location away from said walls and toward the center, thereby preventing stagnation and hardening of the mixture in this zone.

A still further object is to provide agitating apparatus of the type described which will not appreciably interfere with the deposit of the mixture into the hopper from the mixer.

With the above and other objects in view, which will appear as the description proceeds, the invention comprises the novel details of construction and combinations and arrangements of parts more fully hereinafter disclosed 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 one form of concrete pump constructed in accordance with the teachings of the above mentioned Kooyman and Ball patents, and having an agitating unit constructed in accordance with the present invention readily detachably secured to the supply hopper thereof;

Fig. 2 is an enlarged vertical sectional view through the agitating attachment and hopper, taken approximately on the plane indicated by the line 2—2 of Fig. 1, looking toward the right;

Fig. 3 is a top plan view, partly broken away and in section, of the agitating unit;

Fig. 4 is a still further enlarged detail sectional view, taken approximately on the plane indicated by the line 4—4 of Fig. 3, looking in the direction of the arrows;

Fig. 5 is an enlarged vertical sectional view, taken approximately on the plane indicated by the line 5—5 of Fig. 2, looking toward the left;

Fig. 6 is an enlarged fragmentary sectional view of the driving connections for the agitator, taken approximately on the plane indicated by the line 6—6 of Fig. 3, looking in the direction of the arrows;

Fig. 7 is a fragmentary elevational view of a scraper element which is preferably, although not necessarily, associated with the supporting member of the unit; and

Fig. 8 is a detail plan view of one of the pins which journal the rollers which support the rotatable annular structure of the apparatus.

Referring more particularly to Figure 1, the pump illustrated comprises a chassis 10 upon which is mounted a working cylinder 11 in which

a reciprocatory piston 12 is moved back and forth by crank mechanism, not shown, actuated by a crank shaft 13 which is driven by spur gearing 14 from a countershaft 15. The said countershaft in turn is driven by a V-belt drive 16 which passes around a pulley 17 carried by the countershaft 15 and receives power from a pulley 18 mounted upon a jack shaft 19 which is journalled in an extension of a housing 20. This housing contains a main clutch and suitable gearing for transmitting power to the jack shaft 19 from an internal combustion or other motor enclosed within a housing 21 mounted upon the pump frame.

The working cylinder 11 of the pump has associated with it an inlet valve 25 and an outlet valve 26, the latter of which discharges to a pipe line 27 through which the plastic concrete is conducted to the point of placement. The inlet valve 25 is surmounted by a supply hopper 28, which is usually of inverted conical form, which hopper feeds pre-mixed plastic concrete supplied thereto directly to the inlet passage of the valve 25 by gravity. The lower portion of the said hopper may be provided with a throat member 29 and an agitating mechanism 30, see Fig. 2, for preventing or breaking up stowage of the mixture in this zone, as fully set forth in my prior U. S. Patent No. 2,116,473, granted May 3, 1938. The said mechanism 30 may be driven by a chain drive 31 from the crank shaft 13, as clearly shown in Fig. 1.

The agitating attachment constituting the present invention comprises a supporting member 35 here shown as taking the form of an annulus of channel cross section. The lower flange of the said channel member is apertured at spaced points around the circumference for the reception of bolts 36 by means of which the unit may be readily detachably secured to the flange 34 of the hopper 28.

At spaced points around the circumference the upper flange of the channel member 35 has welded or otherwise rigidly secured to it a plurality of outwardly extending ears 37, while the web of the channel member has welded to it a corresponding series of ears 38, as will be clear from Figs. 4 and 5. Each pair of ears 37 and 38 receives a vertically extending pin 39 which serves as a journal for a roller 40, the circumference of which is grooved as at 41 for engagement with an annular track 42 which is welded or otherwise rigidly secured to the rotatable ring member 43. The pins 39 are retained in operative position in the ears 37 and 38 by means of discs 44 which underlie flanges 45 formed upon the lower portions of the pins, which discs are preferably welded or otherwise rigidly secured to the said lower portions, as indicated in Fig. 4. These pin assemblies are removably secured in place by means of angle clamping members 46 which are secured to the ears 38 by screws or bolts 47, see Fig. 5.

The upper ends of the pins 39 are preferably reduced, as indicated at 48, which reduced portions are co-axial with the enlarged flanges 45, while the body portions of the pins are eccentric with respect to the portions 45 and 48, as clearly shown in Fig. 8. Since the said portions 45 and 48 are rotatably mounted in the ears 38 and 37 respectively, it results that by turning the pin assembly in the said ears, the eccentric body portions of the pins which journal the rollers 40 may be caused to move the said rollers toward or away from the track 42, whereby to accommodate the parts to slight irregularities or tolerances in manufacture. The discs 44 may be provided with apertures 49 for the reception of a spanner wrench by means of which the adjustment may be made after loosening the clamps 46.

The upper portion of the ring 43 has welded or otherwise rigidly secured to it a horizontally extending annulus 50 which extends inwardly to overlie the track 42, rollers 40, ears 37 and the supporting member 35, which member 50 serves as a shield to protect the operating parts beneath it against an unintentional spilling of plastic concrete mixture upon them. The said annulus 50 also constitutes a support for the agitating arm or blade as well as for a scraper blade, as will appear more fully below.

The lower portion of the ring 43 has welded or otherwise rigidly secured to it an annular gear member 51 which is provided with internal gear teeth 52 which are arranged to be engaged by complementary teeth of a spur pinion 53 which is rigidly carried by the upper end of a vertically extending shaft 54, see Figs. 3 and 6. This said shaft 54 is journalled in suitable anti-friction or other bearings 55 mounted in a sleeve 56 which is supported by members 57 in a tubular housing 58, which housing is suitably connected to and supported by the annular channel member 35 by angle brackets 59. The shaft 54 carries at its lower end one member 60 of a suitable shaft coupling, the other member 61 of which is carried by axially alined shaft 62 which extends into a housing 63, see Fig. 1, which contains suitable reduction gearing, not shown. Power is supplied to said gearing by means of a chain drive 64 which receives power from the jack shaft 19. It thus results that since the shaft 19 is constantly operated the reduction gearing in the housing 63 will also be constantly operated and the shaft 54 and pinion 53 rotated to cause continuous rotation of the annular structure comprising the gear ring 51, annulus 43 and track 42 about the stationary supporting member 35.

A pair of spaced bracket members 70 is secured on the upper surface of the annulus 50 with their inner ends extending over the edge of the said annulus and provided with eyes 71 which receive a pin 72 upon which is pivotally hung a tongue 73. The lower end of the said tongue is angularly disposed as clearly indicated in Fig. 5, and has detachably or otherwise secured to it the agitating arm or member 74 which extends downwardly adjacent the inner surface of the conical hopper 28. When the said hopper is provided with the throat member 29 as above indicated, the lower end of the arm 74 is bent inwardly as indicated in said Fig. 5 to conform substantially to the contour of the hopper and throat, as will be readily understood. The arm 74 is preferably provided with an angularly disposed extension 75 which normally closely approaches the inner surfaces of the hopper 28 and throat member 29.

Since the agitating arm 74 is rigidly carried by the constantly rotating structure comprising the annulus 50, ring 43 and annular gear member 51, it follows that the said arm will be moved around within the hopper 28 and throat member 29 adjacent the inner surfaces thereof, and in so moving it will agitate, re-mix and prevent segregation of the constituents of the pre-mixed plastic concrete within the said hopper. Since it does not require much agitation to prevent segregation of the plastic concrete or channeling thereof, the rotation of the arm 74 and its associated

parts is quite slow, ranging from say 3 to 5 R. P. M.

It has been found from actual experience that if a plurality of arms such as 74 is employed they tend to move the concrete mass bodily within the hopper rather than to cut through it, and as a result agitation of the mixture sufficient to prevent segregation is not accomplished. It is therefore preferred to employ only a single arm 74, since it has been found that when this is done the inertia of the mass of concrete mixture together with its frictional resistance against the hopper surfaces is sufficient to prevent its being moved bodily and as a result the single arm 74 will move through the mass and produce the desired agitation.

In use the plastic mixture may be supplied to the hopper 28 to a level above the joint between the hopper and the annular member 35, and in order to prevent stagnation and/or channeling of the outer portions of the mixture within the said annular member, as well as to prevent continued adherence, setting and building up of the mixture upon the inner circumference of the said member, it is preferred to provide means arranged to constantly scrape the inner surface of the member 35 and to work such portions of the mixture inwardly toward the center.

As here shown this means comprises an angularly disposed scraper blade 80 which is welded or otherwise suitably secured to a pin 81 which is journalled in eyes 82 carried by spaced bracket members 83 which are secured to the upper surface of the annulus 50 in substantially the same manner as the bracket members 70 and preferably angularly spaced from the latter approximately 90° as will be clear from Figs. 2 and 3. One edge of this scraper member, as will be readily understood, contacts the inner circumference of the supporting channel 35 and as it is rotated by the annulus 50 it scrapes any adhering plastic mixture from the said channel member and tends to work it in toward the axis of the hopper.

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. An agitating attachment for concrete pumps for preventing segregation and channeling of pre-mixed plastic concrete mixtures in the fixed conical hoppers of such pumps, consisting of a unitary structure adapted to be readily detachably secured to the pump hopper, comprising an annular supporting member arranged to surmount the hopper and to be readily detachably secured thereto; an annular structure rotatably mounted by said supporting member; an agitating member pendulously carried by said rotatable annular structure, arranged to extend downwardly within the hopper in proximity to the inner surface thereof; and power driven means arranged to slowly rotate said annular structure to move said agitating member through the plastic mixture to prevent segregation of the constituents thereof.

2. An agitating attachment for concrete pumps for preventing segregation and channeling of pre-mixed plastic concrete mixtures in the fixed conical hoppers of such pumps, consisting of a unitary structure adapted to be readily detachably secured to the pump hopper, comprising an annular channel member arranged to surmount the hopper, one of the flanges thereof being provided with means for readily detachable securement to the upper edge of said hopper; a co-axial annular structure rotatably mounted upon said channel member; a single agitating arm carried by said rotatable annular structure, arranged to extend downwardly into the mixture within the hopper; and power driven means carried by said supporting member arranged to slowly rotate said annular structure to move said agitating arm through the plastic mixture to prevent channeling and segregation of the constituents thereof.

3. An agitating attachment for concrete pumps for preventing segregation and channeling of pre-mixed plastic concrete mixtures in the fixed hoppers of such pumps, consisting of a unitary structure adapted to be readily detachably secured to the pump hopper, comprising an annular supporting member arranged to surmount the hopper and be readily detachably secured thereto; a plurality of rollers carried by said supporting member; an annular structure having a track engaging said rollers to mount said structure for co-axial rotation relative to said supporting member; a single agitating arm pivotally carried by said rotatable annular structure, arranged to extend downwardly in proximity to the inner surface of the hopper; and power driven means mounted upon said supporting member arranged to slowly rotate said annular structure to move said agitating arm through the plastic mixture to prevent channeling and segregation of the constituents thereof.

4. An agitating attachment for concrete pumps for preventing segregation and channeling of pre-mixed plastic concrete mixtures in the fixed conical hoppers of such pumps, consisting of a unitary structure adapted to be readily detachably secured to the pump hopper, comprising an annular channel member arranged to vertically surmount the hopper and be readily detachably secured thereto by one of its flanges; an annular structure surrounding and overlying the upper portion of said channel member and mounted for co-axial rotation relative thereto; a single agitating arm pendulously carried by said rotatable annular structure, arranged to extend downwardly into the plastic mixture in the hopper in proximity to the inner surface of the latter; a scraper member carried by said rotatable annular structure arranged to scrape adhering plastic mixture from the inner periphery of said annular channel member and work it toward the axis of rotation; and power driven means mounted exteriorly on said channel member, arranged to slowly rotate said annular structure, scraper and agitating arm to move the latter through the plastic mixture and thereby prevent channeling and segregation of the constituents thereof.

CHARLES F. BALL.