

June 27, 1950

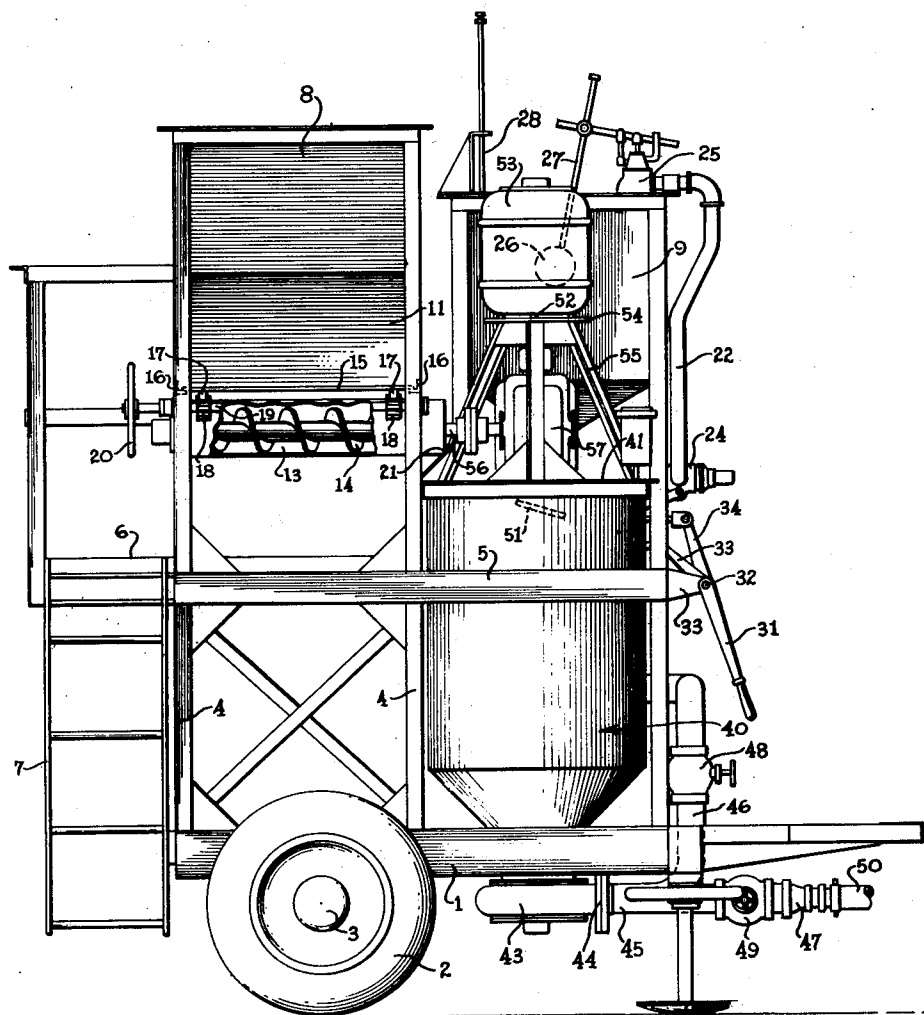
J. J. DUGAS
MIXING MACHINE

2,513,012

Filed Aug. 14, 1947

4 Sheets-Sheet 1

Fig. 1



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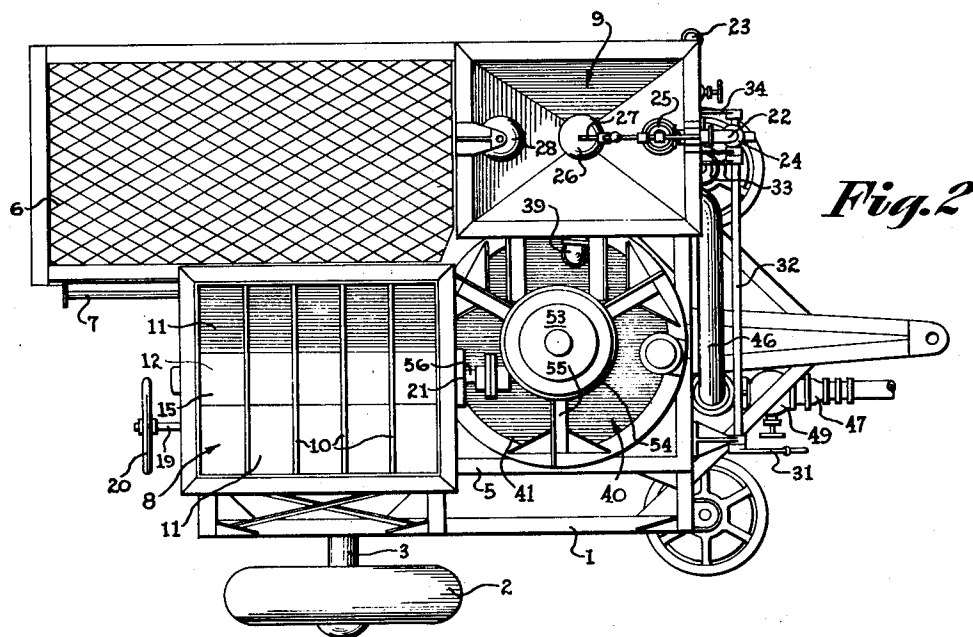


Fig. 2

Fig. 6

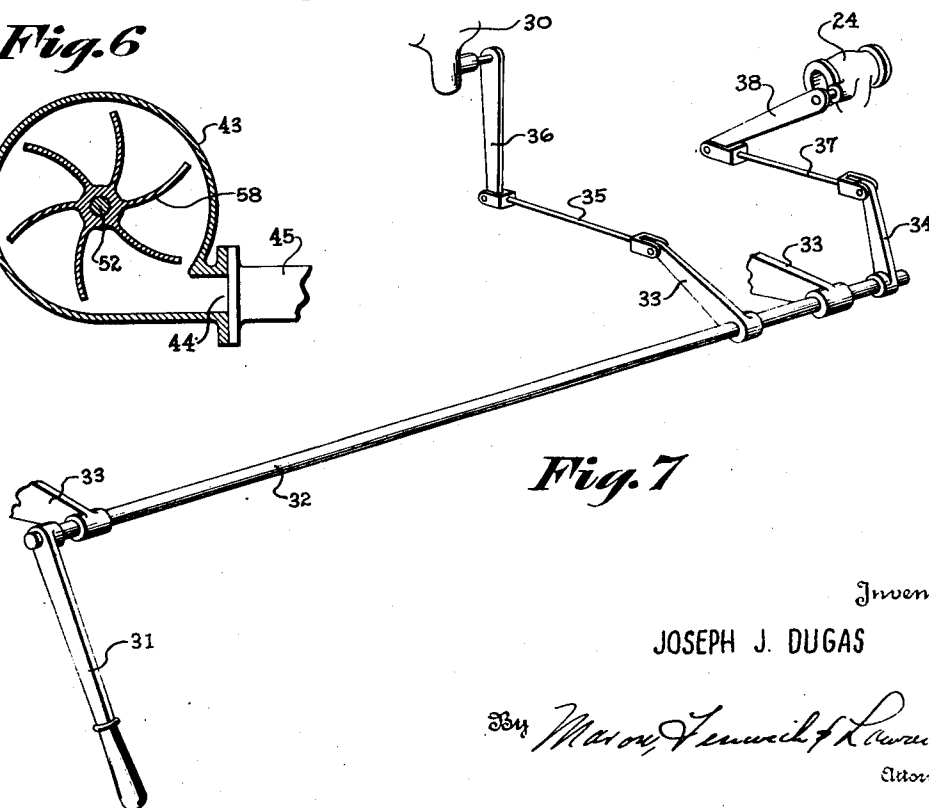
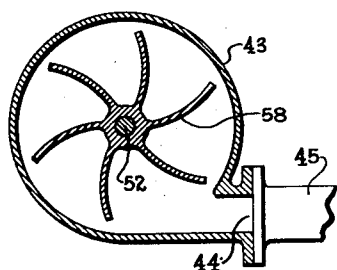


Fig. 7

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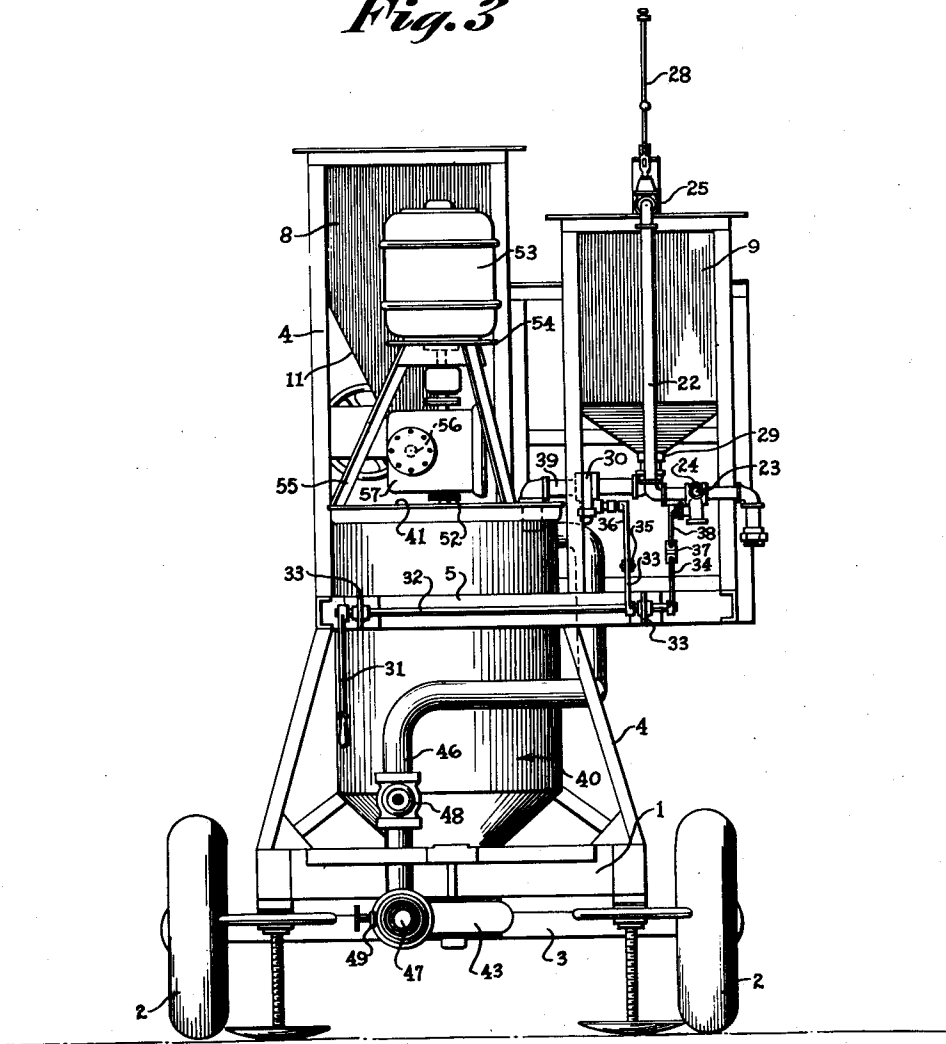
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Fig. 3



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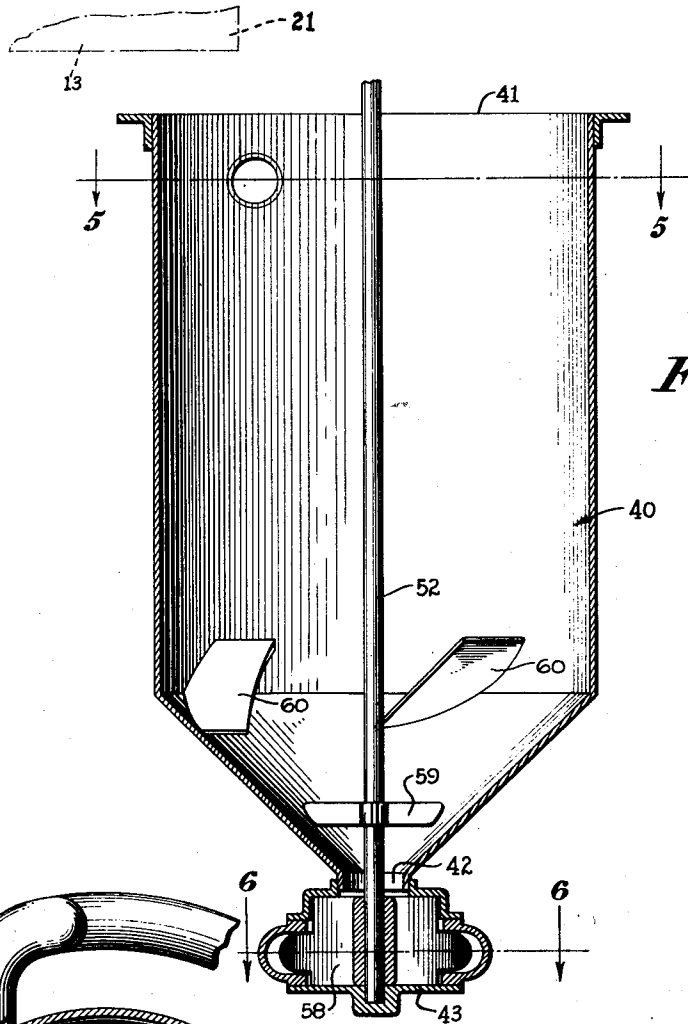


Fig. 4

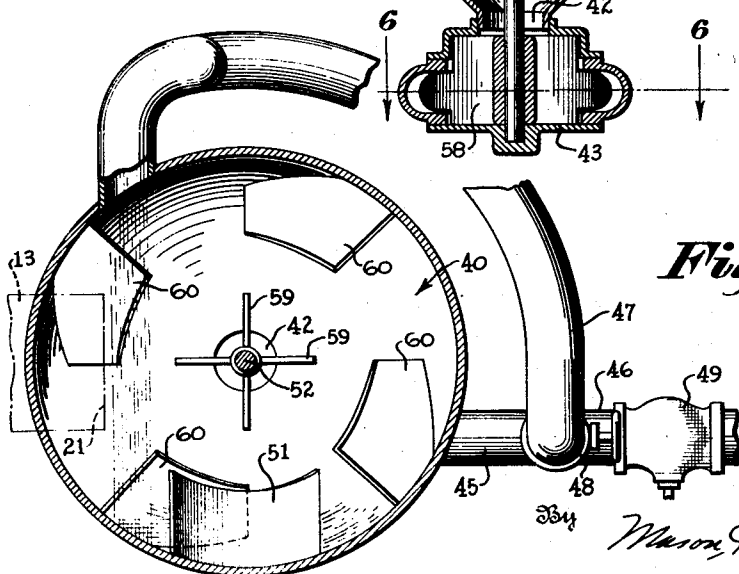


Fig. 5

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2,513,012

MIXING MACHINE

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5 Claims. (Cl. 259-161)

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This invention relates to mixing machines and more particularly to machines for mixing the ingredients of certain types of so-called "aerated" concrete.

In making the mix for "aerated" concrete, the ingredients must be subjected to a much more thorough mixing than is necessary for making ordinary concrete. In fact, a simple mixing will not suffice. They must be beaten with practically what amounts to a whipping action to obtain the desired results. It has been found by experiment that a more satisfactory mix is obtained if the dry ingredients are added slowly to the water during the mixing operation.

It is the object of the present invention to provide a mixing machine which, due to its construction, will submit the ingredients of the mix to a thorough and complete mixing action accompanied by beating.

Another object of the invention is to provide a machine which will feed the liquid in bulk and the dry ingredients to the liquid in small measured amounts during the mixing operation.

A further object of the invention is to provide a mixing machine in which a re-circulation of the mix is employed, with the dry ingredients being added directly into the incoming re-circulation stream.

A still further object is the provision of means to cause the re-circulation stream to set up a swirling motion as added agitation to more thoroughly mix the ingredients.

It is also an object to provide means to force the mix through the mixing tank so that all portions of the mix will receive equal action and none will be permitted to lie quiescent during the mixing operation.

It is also contemplated that a circulation pump will be employed, the pump being of such design that it will not only serve to circulate the mix but also as a mixing means.

Other objects of the invention will become apparent from the following detailed description of one practical embodiment of the invention when taken in conjunction with the drawings which accompany and form a part of this specification.

In the drawings:

Figure 1 is a side elevation of a mixing machine embodying the principle of the present invention;

Figure 2 is a top plan view thereof;

Figure 3 is an end elevation of the machine looking at the right hand end as viewed in Figure 1;

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Figure 4 is a vertical section through the mixing tank and circulation pump;

Figure 5 is a horizontal section through the mixing tank taken on the line 5-5 of Figure 4;

Figure 6 is a horizontal section through the circulation pump taken on line 6-6 of Figure 4; and

Figure 7 is a detailed view of the mechanism for controlling certain of the valves.

The machine disclosed in the drawings is a wheeled vehicle having mounted thereon storage tanks for receiving the liquid and the dry ingredients of the mix, and a tank in which these ingredients are mixed. Means are employed to circulate the mix so that each batch is passed through the mixing tank many times before it reaches the desired stage.

Referring to the drawings in detail, the machine comprises a frame 1 which is mounted upon a pair of wheels 2 supported on an axle 3 fastened to the frame by any suitable means. The unit is portable, and when not supported by its draw bar from a tractor or truck is maintained level by means of mushroom shaped screw feet at the forward end. Mounted upon the frame 1 are suitable vertical supporting members 4 to which are attached horizontal frame members 5 to provide a skeleton frame for supporting the various elements of the machine. As the machine is relatively large, the skeleton frame is divided so as to form lower and upper levels, with a suitable deck 6 on the upper level which may be reached by means of ladder 7 suspended from the frame. Supported by the skeleton frame on the upper level are a tank for dry ingredients 8 and a tank for liquid 9.

Tank 8 is in the form of a hopper and may be provided with a plurality of vertical partitions 10 separating the hopper into chambers of equal size which may form a convenient means for measuring the quantities of the different ingredients to be placed in the tank, such as cement and sand. The hopper is tapered at its lower end, the sides being inclined as at 11 forming a throat which terminates in an elongated outlet 12 at the bottom. Directly below the outlet 12 is a horizontal trough 13 in which is positioned a spiral conveyor 14 driven by means to be later described. A door 15 controls the outlet 12 and is slidably positioned beneath the outlet in the upper part of the trough 13. Suitable guides 16 are provided at either end of the outlet 12 to receive the ends of the door 15, and hold it in horizontal position in either its closed or open position. One or more racks 17 are at-

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tached to the underside of the door 15 and mesh with pinions 18 mounted at spaced points upon a control shaft 19. Shaft 19 is suitably journaled in bearings carried by the upright members 4, and is provided with an operating wheel 20, by means of which the shaft can be rotated to move the door to and from closed position. With the door closed, dry ingredients are placed in the hopper 8, enough of each ingredient being placed in the tank to fill the desired number of spaces between the partitions 10. At the proper time, wheel 20 is rotated to open door 15 and permit the ingredients to fall downward by gravity into the trough 13 where conveyor 14 moves them forward to the outlet end 21 of the trough 13.

Liquid tank 9 is supplied through pipe 22. Pipe 22 may be coupled, by means of a hose being placed on nipple 23, with a city water main or other source of water supply. Two valves are connected to pipe 22, one being a quick opening gate valve 24 which may conveniently carry the nipple 23, and the other a float controlled valve 25 connected to the outlet end of pipe 22 directly above the top of tank 9. Valve 25 is provided with a suitable float 26 connected to the valve by means of conventional linkage 27. A float gauge 28 may be provided so that the amount of water within the tank may be determined from the ground without the necessity for climbing to the upper level and looking into the tank. Tank 9 is also in the form of a hopper, having an outlet 29 in its bottom to which is connected a second quick opening gate valve 30.

Gate valves 24 and 30 are connected by means of linkage for simultaneous operation, the linkage being such that when one valve is open, the other will be closed. The linkage is controlled by means of a hand lever 31 connected to a shaft 32 supported in brackets 33 connected to one of the horizontal frame members 5. At the proper points along shaft 32 arms 33 and 34 are secured. Arm 33 is connected by means of a link 35 to the operating lever 36 of valve 30, and arm 34 is connected by means of link 37 to the operating arm 38 of valve 24. It will thus be evident that movement of the control handle 31 will cause simultaneous movement of the valves. When valve 30 is closed, valve 24 will be open permitting water to flow through pipe 22 and valve 25 into tank 9. As the water rises in the tank, it will lift float ball 26 causing valve 25 to close, shutting off the supply of water. This arrangement permits a definite control of the amount of water received within the tank for each batch of concrete to be mixed. When lever 31 is moved to open valve 30 to discharge the contents of the tank, valve 24 is closed preventing additional water from entering the tank. A pipe 39 may be attached to valve 30 to lead the supply of water to any desired point.

Supported by the framework of the lower level is a mixing tank 40 having its open upper end 41 positioned below the outlet end of trough 13 and the outlet end of pipe 39 so that the contents of both the dry ingredients hopper 8 and the liquid tank 9 may be emptied therein. Tank 40 is preferably cylindrical in shape throughout the greater portion of its length, and is provided with an inverted cone-shaped lower portion. The lower portion of the tank terminates in an outlet opening 42 which is directly connected to the inlet of a centrifugal pump 43. The outlet 44 of pump 43 is connected to a pipe line 45 which has two branches, 46 and 47. Branch 46, controlled by valve 48, is connected to the upper

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portion of tank 40 for re-circulation of the mix, and branch 47, controlled by valve 49, is connected to a suitable hose 50 used for carrying the mix to the forms for pouring. Pump 43 serves both to re-circulate the liquid through line 46 and to force the mix through line 47 to the forms.

As mentioned above, pipe line 46 is connected to the upper part of tank 40, and this connection is at such a point and the angle of the pipe leading into the connection is such that the stream of mix is directed horizontally across the tank 40, so that the stream impinges upon the far wall of the tank more or less tangentially, the wall of the tank serving to turn the stream to give it a swirling motion, the stream following the contour of the inner wall of the tank. The swirling motion described is in a horizontal plane but it is desired that the stream be deflected downwardly in the form of a spiral. For this purpose, a deflector 51 is angularly positioned against the side wall of the tank just beyond the point of impingement of the stream of mix. After the stream is turned by striking the wall of the tank, it will then strike the undersurface of the deflector 51 and be turned slightly in a downward direction, the component of the forces causing the stream to follow a downward spiral after leaving the deflector 51.

A drive shaft 52 passes vertically through the tank centrally thereof, and is coupled at its upper end to a motor 53. Motor 53 is fastened to a seat 54 supported by struts 55 from the rim of the tank 40. Shaft 56 of screw conveyor 14 is coupled to a speed reducer 57 which is also connected to the drive shaft 52. Thus, motor 53 drives shaft 52 and conveyor 14, the conveyor being driven at a much slower speed than shaft 52. The lower end of shaft 52 is connected to the impeller 58 of pump 43. Positioned on shaft 52 at a point near the bottom of the mixing tank 40 are flat mixing paddles 59 which rotate and beat the mix. Under ordinary circumstances the action of the paddles 59 would tend to stop the downward movement of the mix and to some extent lift it. To prevent this, a series of spiral baffles 60 are positioned in the conical lower portion of tank 40, the baffles being inclined downwardly and in the direction of the spiral movement of the re-circulating stream. Thus, when the mix arrives at the lower portion of the tank it strikes the spiral baffles and is deflected at a sharper angle downward giving sufficient added downward impetus to the stream to overcome the lifting tendency of the paddles so that the stream will continue downward through outlet 42 into the pump 43.

It will be noted from Figure 6 of the drawings that the impeller 58 of pump 43 is smaller than the inner dimensions of the pump housing so that a certain free annular space is provided beyond the ends of the impeller blades. This lowers the pump efficiency somewhat, but permits the pump to serve as an added mixing element, so that the mix is thoroughly beaten by rotation within the pump chamber before going out through the outlet 44.

It will be noted from the drawings that outlet 21 of trough 13 is positioned directly above the incoming re-circulation stream so that the trough empties into this stream and the dry ingredients are caught by the stream and carried along with it. The action of the conveyor 14 will cause the dry ingredients to be fed into this stream in a slow, continuous, measured amount so that the

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dry ingredients are fed evenly into the entire moving batch, preventing the possibility of caking or lumping.

In operation, handle 31 is moved to close outlet valve 30 at the bottom of liquid tank 9 and open inlet valve 24 in pipe line 22, permitting water from a suitable source to flow through pipe 22 and fill tank 9. As the water level rises in the tank float 26 will lift, closing valve 25 to cut off the flow of water when a predetermined measured quantity is in the tank. Dry ingredients are then dumped into hopper 8, sufficient bins defined by partitions 10 being filled in proportion to the batch to be mixed. Hand lever 31 is then moved to open valve 30 and close valve 24 permitting the water in tank 9 to flow into the mixing tank 40. Either before or after the water is emptied into the mixing tank, motor 53 may be started to begin the rotation of the screw conveyor 14, the paddles 59 within tank 40, and the centrifugal pump 43. During the mixing operation, valve 49 in pipe line 47 is closed and valve 48 in pipe line 46 is open. After the water is in the mixing tank and re-circulation is begun, hand wheel 20 is operated to open door 15 to permit the dry ingredients to fall in trough 13. Conveyor 14 will immediately begin to move these ingredients forward slowly so that they fall over the edge of the outlet end 21 of the trough 13 into the tank 40. As described above, outlet 21 of trough 13 is so positioned that the dry ingredients will fall into the incoming re-circulation stream and be carried by the stream. The incoming stream strikes the inner wall of tank 40 and is turned to begin a swirling motion which motion is deflected downwardly by deflector 51, causing the stream to follow a downwardly spiraling path. Near the bottom of the tank, the stream strikes the baffles 60 and is deflected downward at a sharper angle into the path of paddles 59 which subject the mix to a beating action. The mix then passes out of tank 40 into pump 43 where it receives a further mixing and beating before again being re-circulated through pipe 46. After all of the contents of hopper 8 have been emptied into the mixing tank and the entire batch is thoroughly mixed, certain chemicals or other ingredients are dropped into tank 40 and mixing continues for a desired time. Valve 49 is then opened and valve 48 closed and the mix is pumped through hose 50 for pouring into building forms. After the entire batch has been poured, the above operation is repeated. After all of the dry ingredients have been emptied from the hopper 8 but while the mixing still continues, door 15 may be closed and the ingredients for the next batch may be put in the hopper. At the same time, hand lever 31 may be moved to close valve 30 and open valve 24 to permit the tank to refill. In this way, no time will be lost between the mixing of separate batches.

While in the above there has been described one practical embodiment of the invention, it is to be understood that many changes may be made from the precise structure shown without departing from the scope of the invention as defined by the appended claims.

What is claimed is:

1. A mixing machine comprising, a cylindrical mixing tank having an inlet and an outlet, beater means within the tank, a return line from said outlet to a point adjacent said inlet, said line entering the side of the tank at such angle that a stream of mixture emerging from said line will strike the far side of the tank tangentially there-

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of to change the direction of travel of said stream, and a deflector crossing the plane of said line entering said tank and in the path of said stream after its direction change to turn the stream downwardly whereby the stream will follow a spiral course about the interior of the tank, and baffles in said tank adjacent and above said beater inclined in the direction of travel of said stream but at a steeper angle to further deflect the course of said stream downwardly into and through said beater, and means in said line to force mixture through said line.

2. A mixing machine comprising, a cylindrical mixing tank having an inlet and an outlet, beater means within the tank, a return line from said outlet to a point adjacent said inlet said line entering the side of the tank at such angle that a stream of mixture emerging from said line will strike the far side of the tank tangentially thereof, means in said line to force mixture through said line, and means for feeding dry ingredients to the tank, having an outlet positioned at a point directly above the stream of mixture emerging from said line whereby the dry ingredients are added to the mix in said stream.

3. A mixing machine comprising, a cylindrical mixing tank having an inlet and an outlet, beater means within the tank, a return line from said outlet to a point adjacent said inlet, said line entering the side of the tank at such angle that a stream of mixture emerging from said line will strike the far side of the tank tangentially thereof, and a hopper for dry ingredients having an outlet positioned at a point directly above the stream of mixture emerging from said line whereby the dry ingredients are added to the mix in said stream.

4. A mixing machine comprising, a cylindrical mixing tank having an inlet and an outlet, beater means within the tank, a return line from said outlet to a point adjacent said inlet said line entering the side of the tank at such angle that a stream of mixture emerging from said line will strike the far side of the tank tangentially thereof, means in said line to force mixture through said line, a hopper for dry ingredients having an outlet, a trough positioned to receive the dry ingredients from said hopper outlet, said trough having an outlet positioned directly over said stream emerging from said line, and means to move the dry ingredients in said trough to said trough outlet.

5. A mixing machine comprising, a cylindrical mixing tank having an inlet and an outlet, beater means within the tank, a return line from said outlet to a point adjacent said inlet, said line entering the side of the tank at such angle that a stream of mixture emerging from said line will strike the far side of the tank tangentially thereof to change the direction of travel of said stream, and a deflector in the plane of said line entering the side of said tank and in the path of said stream after its direction change to turn the stream downwardly whereby the stream will follow a spiral course about the interior of the tank, baffles in said tank adjacent said beater inclined in the direction of travel of said stream but at a steeper angle to further deflect the course of said stream downwardly into said beater, means in said line to force mixture through said line, a hopper for dry ingredients, and means connected to said hopper for feeding the dry ingredients to the mixing tank in measured quantities, the point of emergence of the dry ingredients from said feeding means being directly above said stream

between the point where said line enters said tank and said stream strikes the far side thereof, whereby the dry ingredients fall into the stream.
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