May 1, 1945. C. F. BALL ET AL 2,374,970

APPARATUS FOR SUPPLYING WATER TO CONCRETE MIXERS

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Fig. 1.

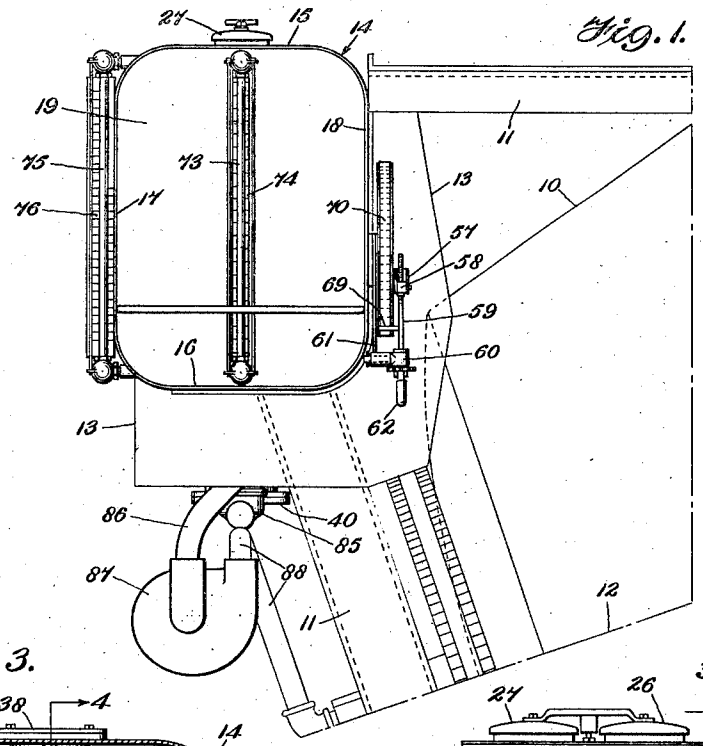

Fig. 3.

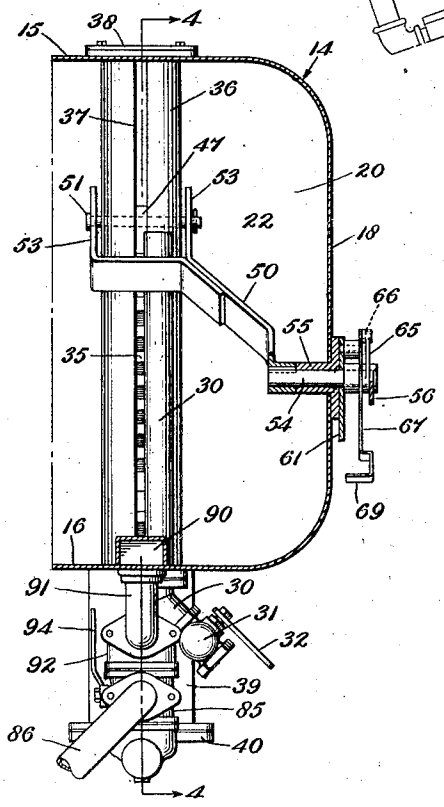

Fig. 2.

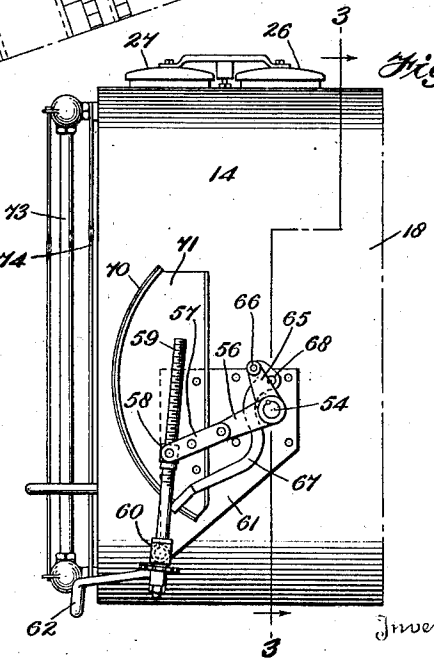

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Fig. 6.

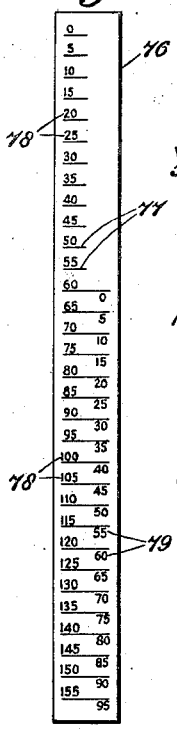


Fig. 4.

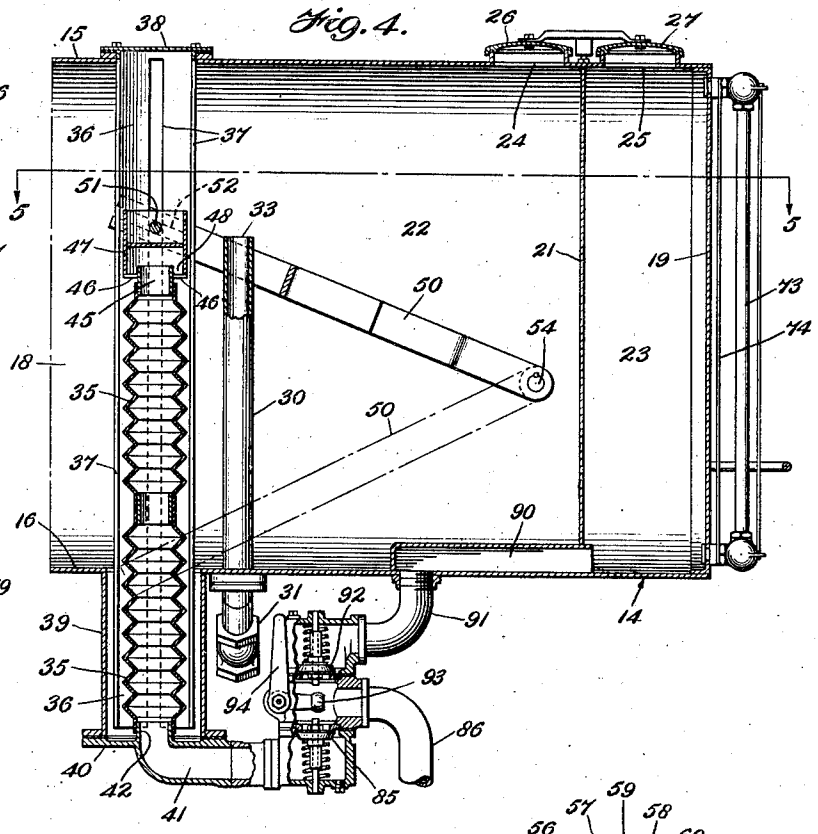


Fig. 7.

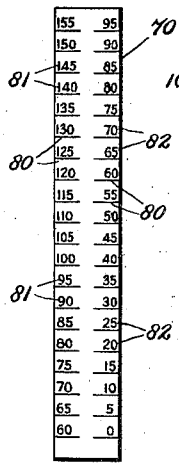
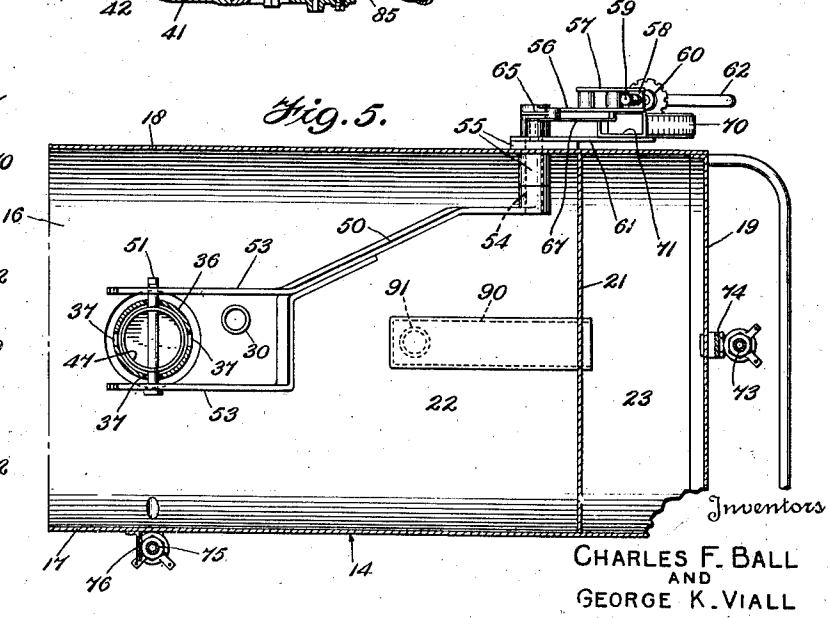


Fig. 5.



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APPARATUS FOR SUPPLYING WATER TO CONCRETE MIXERS

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Application April 7, 1942, Serial No. 438,040

2 Claims. (Cl. 222—434)

The invention relates to concrete mixers, and more particularly to apparatus for supplying water to the mixing receptacles thereof, and has for one of its objects the provision of mechanism of this character which is of relatively simple yet durable construction, and which will be extremely accurate and efficient over a wide range in measuring and supplying any required quantity of water for a batch of concrete.

While adaptable in principle to mixers of various types it is especially applicable to mobile mixers of the truck-mounted type, and for purposes of disclosure it will be here described in connection with such a mixer. It is common practice in such mixers to provide a water-carrying tank having two compartments, in the main or larger one of which the water necessary for the production of the batch of concrete is carried, while the smaller compartment contains an additional quantity of water to be introduced into the mixing receptacle after the mixed batch has been discharged, for the purpose of flushing or washing out the said receptacle. The discharge from the two compartments is generally controlled by separate valves whereby the water in each may be transferred in whole or in part to the mixing receptacle at the volition of the operator, and the main compartment at least is usually provided with means which can be adjusted to variably predetermine the quantity of water which will be discharged therefrom when its discharge valve is opened. In some cases the flow of water from the water tank compartments is solely by gravity, while in others a centrifugal or other power driven pump is introduced into the line between the tank and the mixing receptacle whereby the water may be forced into the aggregates in the latter under materially greater pressure and in considerably less time than can be attained by gravity flow. Sight gauges are also provided in most instances whereby the quantity of water in either or both compartments may be readily observed at all times.

A principal phase of the present invention has relation to the measuring means whereby variably predetermined quantities of water may be discharged from the water tank, or from the main compartment thereof if it be of the two-compartment type, when the valve controlling the discharge is opened, with the object of providing a construction which will enable the utilization of either the full capacity or only part of the capacity of the water tank or compartment, and the accurate predetermination of the quantity of water to be discharged under either condition by a single measuring means.

A further object of the invention is to provide means in conjunction with the variable quantity determining member for insuring a sharp cut-off of the flow of water, without dribble, when the desired amount has been discharged, thereby insuring substantially absolute accuracy in the quantity of water furnished to the batch.

With the above and other objects in view which will appear as the description proceeds, the invention consists in the novel details of construction and combinations of parts more fully hereinafter disclosed, and illustrated in the accompanying drawings forming a part of this specification, in which like reference characters designate like parts throughout the several views.

In the said drawings, wherein there is shown for purposes of disclosure but not of limitation, one exemplification of the invention as applied to a truck-mounted concrete mixing unit of a well known inclined-axis rotatable drum type:

Figure 1 is a fragmentary side elevational view of the forward end of such a unit, with one form of water tank and measuring mechanism constructed and arranged in accordance with the invention in place thereon;

Figure 2 is an elevational view, on a somewhat larger scale, of one end portion of the tank and of the said measuring mechanism shown in Figure 1, as seen from the right of said figure;

Figure 3 is a partial sectional-elevational view, taken approximately on the planes indicated by the line 3—3 of Figure 2, looking in the direction of the arrows;

Figure 4 is a partial longitudinal sectional-elevational view, taken approximately on the plane indicated by the line 4—4 of Figure 3, looking in the direction of the arrows;

Figure 5 is a sectional-plan view, taken on the plane indicated by the line 5—5 of Figure 4, looking down;

Figure 6 is an elevational view of a typical scale card for use with the sight gauge of the main compartment of the tank when employing the mechanism of the present invention; and

Figure 7 is an elevational view of a corresponding typical scale card for use with the measuring mechanism itself.

Referring more particularly to the said drawings, 10 indicates a concrete mixing drum mounted in a framework 11 for power-driven rotation about an inclined axis 12, in a manner analogous to that disclosed in prior U. S. Patent No. 2,045,532 granted June 23, 1936, on an application filed

by John C. Merwin and Charles F. Ball. As here shown, the said framework includes or carries at its upper forward portion a pair of transversely spaced bracket members 13 which cradle and support the water tank 14. This tank may be of any suitable construction and form, being here shown as substantially rectangular in both cross and longitudinal section, with a top wall 15, bottom wall 16, side walls 17 and 18, and end walls 19 and 20. As best shown in Figures 4 and 5, the tank is provided interiorly with the transverse partition 21, dividing it into a main compartment 22 and a wash water compartment 23. The top wall 15 is provided with the filling openings 24 and 25 through which water may be introduced into the respective compartments, which openings are normally closed by the caps or closures 26 and 27.

Within the main compartment 22 is a vertical overflow pipe 30 which extends through the bottom wall 16 of the tank, being provided exteriorly thereof with a control valve 31 operable by means of a handle or lever 32, see Figure 3. The upper end of this pipe is open, as shown at 33 in Figure 4, and is located a predetermined distance above the tank bottom 16, with the result that when the valve 31 is open water may be introduced into the compartment 22 only to the level of the said open end 33, with any excess flowing down through the pipe 30 and valve 31 and being discharged on the ground. On the other hand, with the valve 31 closed, water may be introduced into the said compartment to completely fill the same. The quantity of water which may be retained in the compartment 22 with the valve 31 open, and its ratio to the total capacity of the compartment, of course may vary according to the size of the mixer and/or other conditions, but in the illustrated embodiment—which is a tank for what is known to the trade as a 4 yard mixer—the total capacity of the main compartment 22 is 155 gallons, while its retention capacity with the valve 31 open is 95 gallons. The purpose of this feature will be explained more fully below.

The mechanism for variably predetermining the quantity of water which will be discharged when the control valve for compartment 22 is opened includes an adjustable conduit or tube 35. This may take a variety of forms, but to avoid the necessity for packing, stuffing boxes, glands and the like, it preferably comprises an accordion pleated tube analogous to that disclosed in the prior U. S. Patent No. 1,913,301 granted June 6, 1933. The said conduit 35 is mounted within and guided by a tube 36 extending through and supported by the upper wall 15 of the tank, and having a plurality of longitudinal slots 37 in its walls through which the water may enter to the said conduit. The upper end of the tube 36 may be closed by a removable cover plate 38, as shown in Figures 3 and 4. The lower end portions of the conduit 35 and the tube 36 project into a well 39 extending below the bottom wall 16 of the tank, the lower end of which well is closed by a plate 40 having an elbow passage or duct 41, to the flange 42 of which the lower end of the accordion conduit 35 is secured, as will be readily understood from Figure 4.

The upper end of conduit 35 is secured to a sleeve 45 having a plurality of radial arms 46 forming a spiderlike connection with the lower end of a cap member 47. As will be clear from the said Figure 4, this cap member is of larger diameter than the sleeve 45, and its lower end is positioned somewhat below the upper end of the sleeve, thereby providing an annular passage 48 between the two which in effect constitutes a very short leg of a siphon, the longer leg of which is provided by the accordion conduit 35. Since the axis of the passage 48 is always vertical and the lower edge of the cap member 47 defining the admission port to the said passage is always horizontal and substantially parallel to the plane of the water surface, this arrangement secures a sharp cut-off of the water when the predetermined quantity has been discharged, for when the water level reaches the plane of the lower end of the cap 47, air is admitted to the annular passage 48, immediately destroying the siphonic action, and since the upper end of the sleeve 45 is above and parallel to the water level, a sharp cut-off without dribble is obtained.

The cap member 47 is connected to the outer forked end of the oscillating arm 50 by means of a pin 51 engaging in slots 52 in the legs 53 of the fork, said pin also passing through an opposed pair of the slots 37 in the tube 36, whereby the said pin, cap member 47 and accordion conduit 35 are guided in their vertical movements, as will be readily understood. The arm 50 is rigidly carried by a shaft 54 journaled in a bearing member 55 which extends through and is secured to the wall 18 of the tank. The outer end of the shaft 54 rigidly carries an arm 56, which may be of a bifurcated construction, as indicated at 57, to embrace and pivotally mount a threaded block or nut 58 the aperture of which receives the threaded rod or shaft 59. This shaft is journaled in a bearing 60 which is mounted on a plate 61 rigid with the bearing member 55, for oscillation about an axis at right angles to that of the shaft or rod 59. This oscillatory mounting of the rod accommodates lateral movement thereof and of the block 58 occasioned by the arcuate swing of the pivotal connection of the latter with the end of the arm 56. Below the bearing 60 the said rod carries an operating handle 62 by means of which the rod may be rotated in either direction to screw the nut 58 axially of the rod, thereby swinging the arm 56, shaft 54 and arm 50 in one direction or the other to raise or lower the cap member 47 and extend or collapse the accordion conduit 35. The pitch of the threads on the rod 59 is such that the threading action is irreversible, i. e. pressure on the nut 58 by the weight of the parts 35, 47, 50 and 56 tending to move it axially of the rod will not produce rotation of the rod, and the construction is therefore self-locking to retain the cap member 47 and conduit 35 in any position to which they may be adjusted.

The shaft 54 also rigidly carries an arm 65 which is pivotally connected at 66 to an indicator arm 67, pivoted at 68 to the plate 61. The indicator arm 67 has an angularly disposed extension 69 which travels in front of a scale card 70 carried by a bracket 71 rigidly mounted by the plate 61. It will therefore be readily understood that as the positions of the cap member 47 and conduit 35 are varied by arcuate movements of the shaft 54 and arm 50, the indicator arm 67 will be correspondingly swung on its pivot 68 by its connections 65 and 66 with the shaft 54, so that the extension 69 will visibly indicate on the scale 70 the setting of the conduit 35 and cap 47.

A sight gauge or glass 73 having a scale card 74 associated with it is provided whereby the quantity of water in the wash water compartment 23 may be visibly indicated; and a similar gauge or glass 75 having a scale card 76 is pro-

vided for the main compartment 22. The card 76, as best shown in Figure 6, is provided with appropriate graduations 77 having two sets of indicia 78 and 79 associated therewith. The former start at zero and run to the full capacity of the tank or compartment, while the latter run from zero to the retention capacity of the compartment when the valve 31 is open.

As best shown in Figure 7, the sale card 70 for the setting indicator has appropriate graduations 80, also having two sets of indicia 81 and 82, associated with them. Since in view of the mode of operation to be later described, the same settings of the parts 35 and 47 may be employed in two different ways, depending upon whether the compartment 22 contains water to its full capacity or only to its retention capacity with the valve 31 open, the two sets of indicia are arranged somewhat differently from those on the card 76. The indicia 82 extend through the range of the said retention capacity of the compartment, as did the indicia 79 on card 70, but are arranged in reverse order, i. e. reading down, they extend from the retention capacity to zero. The "full capacity" indicia 81, on the other hand, while covering the same quantity as the "retention capacity" indicia 82, range downwardly from the full capacity limit, or, in the example shown, from 155 down to 60.

Water from the main compartment 22, flowing through the accordion conduit 35 and passage 41, reaches the control valve 85 which, when opened, permits it to continue to pipe 86. In gravity installations this pipe may lead into the mixing drum 10; in force feed installations such as here illustrated, it may lead to the intake side of a centrifugal or other pump 87, the outlet side of which is connected as by a pipe 88 to the said drum. Water from the wash water compartment 23 flows through a duct or passage 90 provided along the bottom wall 16 of the tank, and a pipe 91, to a control valve 92 which, when open, passes it to the pipe 86 also. The valves 85 and 92 may be entirely separate, but for convenience may be combined in a single structure, as shown in Figure 4, where they may be alternatively actuated by an arm 93 operable by a lever or handle 94.

As above indicated the present apparatus is susceptible of use in two ways in each of which the same settings of the members 35 and 47 are employed but different results obtained insofar as the quantity of water supplied to the mixer drum is concerned. First assuming that a batch of concrete equivalent to the rated capacity of the mixer is desired, the full tank method of operation will be employed to supply the water therefor, i. e. the water will be introduced into the compartment 22 through its filling opening 24 with the valve 31 of the over-flow pipe closed and the compartment will be filled to its full capacity. The difference between the full capacity of the compartment and the retention capacity when charged with the over-flow valve 31 open, in the present instance 60 gallons, is less than the total amount of water which would be required for a full capacity or say a 4 yard batch of even the lowest slump. Therefore if the accordion conduit 35 be extended so that the lower edge of the cap member 47 is at substantially the same level as the top of the over-flow pipe 30, which in practice is the uppermost limit to which the cap member may be raised and corresponds to the 60 gallon graduation on the scale 81, then on opening the valve 85 by means of the lever 94, water will flow through the conduit 35, passage 41, valve 85 and pipe 86 to the pump 87 which in turn will force it through the pipe 88 into the mixing drum 10. This flow will continue until the water level reaches the plane of the lower edge of the cap member 47 whereupon air will be admitted to the short leg 48 of the siphon breaking the siphonic action and causing a sharp cut-off which insures that exactly 60 gallons has been passed to the pump and into the drum. This action of course takes place automatically and when the operator observes that water has ceased to flow he will release the valve lever 94 and permit the control valve 85 to close.

If after a predetermined mixing period an examination of the mixture discloses that it is too dry the accordion conduit 35 and cap member 47 may be lowered in a required amount by operating the handle 62 to discharge additional quantities of water in 5 gallon amounts or less upon re-opening of the valve 85. Should further water be necessary or desirable for tempering the batch further lowering of the conduit 35 and cap member 47 will set the apparatus to supply any such additional amounts up to the full capacity of the tank, say, 155 gallons. It will thus be seen that in this mode of operation a fixed initial amount of water which is at least not greater than the total amount which will be necessary for the batch, is discharged into the drum at one time and that without the necessity of refilling the tank any required additional amounts may be supplied by merely adjusting the setting of the member 47. Of course if it be known in advance that more than 60 gallons will be required to produce the desired slump in any particular batch of concrete the initial quantity may be raised above the 60 gallon mark by first adjusting the position of the cap 47 to correspond to the desired amount. In other words should it be known that 125 gallons at least will be required for a batch this amount may be discharged at one time by first setting the member 47 at the 125 gallon level.

It sometimes happens however that it may be desired to mix less than a capacity batch of concrete in the mixing drum; for instance the occasion may arise where it is desired to mix only one cubic yard in a 4 yard drum and in this case the initial fixed quantity of water, say 60 gallons, would be too great for such a batch. In such case the second mode of operation of the apparatus would be employed whereby when filling the compartment 22 the valve 31 of the over-flow pipe is opened so that no matter how much water may be introduced into the compartment not more than 95 gallons will be retained therein with the excess discharging through the fixed over-flow pipe 30. Since as above mentioned the upper limit of adjustment of the cap member 47 is substantially that of the retention capacity of the compartment, with the compartment thus filled to only its retention capacity water may be supplied to the pump 87 and drum 10 in any desired amounts by merely lowering the cap 47 to the required level.

In operating under the first or full tank method the settings of the cap member 47 are read upon the left hand graduations of the scale card 70 by means of the indicia 81 associated therewith and the amount of water which has been supplied to the drum is read upon the left hand graduations of the gauge card 76 by means of the indicia 78 associated therewith. On the other hand when employing the second or over-flow pipe method of operation the settings of the

member 47 are read upon the right hand graduations of the card 70 by means of the indicia 82 and the total amount of water which has been supplied to the drum will be indicated by the indicia 79 at the right hand side of gauge card 76.

In pressure systems such as here illustrated, employing a pump 87 for forcing the water into the materials within the mixing drum 10, such pump insures or materially aids in the re-establishment of the siphonic action, particularly where the additional water is to be supplied in rather small amounts and intake of the conduit 35 is consequently lowered only a relatively small distance each time.

While in compliance with the patent statutes one form of the invention has been illustrated and described in order that others may practice the same, it will be obvious that those skilled in the art to which it pertains may vary the precise details of construction and arrangement of parts and substitute equivalents thereof without departing from the spirit of the invention and therefore it is not intended to be limited to the above disclosure except as may be required by the state of the prior art.

What is claimed is:

1. In apparatus for supplying water to the mixing chamber of a concrete mixer, a water receptacle; a vertically adjustable outlet conduit in the receptacle for discharging water therefrom to the mixing chamber in successive predeterminable amounts, said conduit having a short siphon leg at its intake end having an admission port uncoverable by the water level as it falls to automatically cut off the flow without dribble when each predetermined amount has been discharged; valve means for controlling said conduit; and means insuring re-establishment of the siphonic action upon adjustment of the conduit to determine the succeeding amounts to be discharged.

2. In apparatus for supplying water to the mixing drum of a concrete mixer, a water receptacle; a vertically adjustable accordion outlet conduit in said receptacle for discharging water therefrom to the drum; an oscillatory arm in the receptacle for extending and contracting said conduit to determine the amount of water discharged therethrough; a guide tube carried by the receptacle surrounding said conduit and having elongated slots to admit water to the conduit; and operating connections between said arm and conduit, extending through certain of said slots.

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