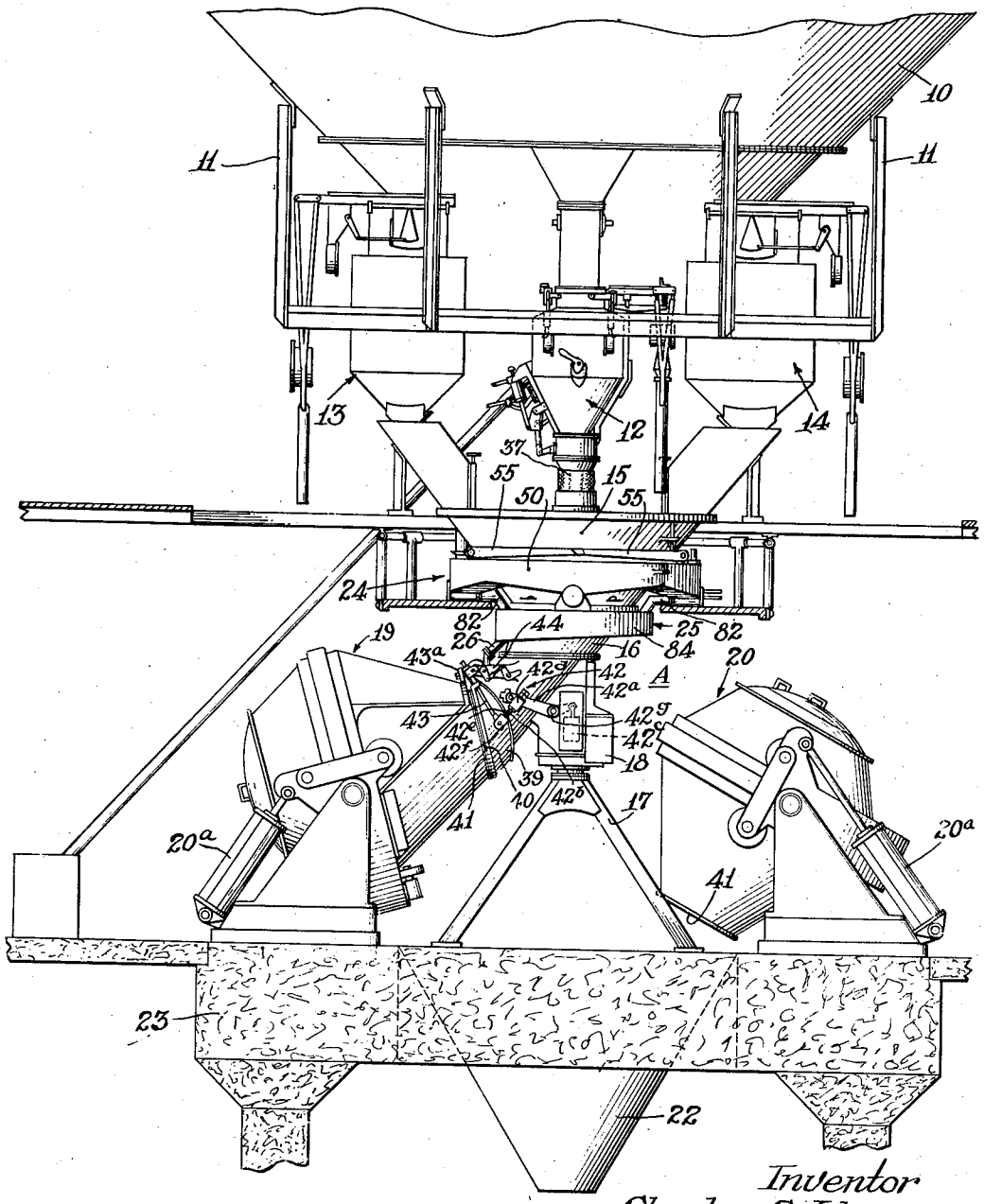
Sept. 26, 1939. C. S. JOHNSON 2,174,089

MIXING APPARATUS

Filed Feb. 6, 1939 3 Sheets-Sheet 1

Fig. 1.



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Fig. 2.

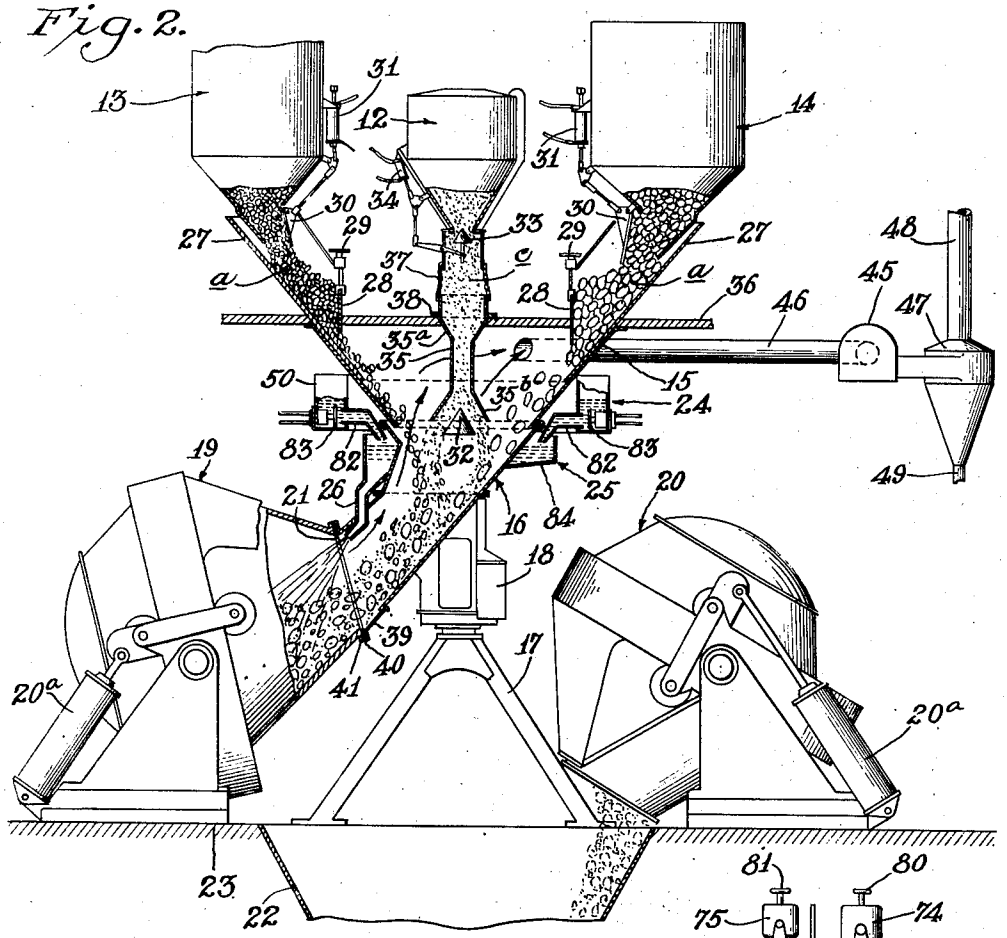


Fig. 3.

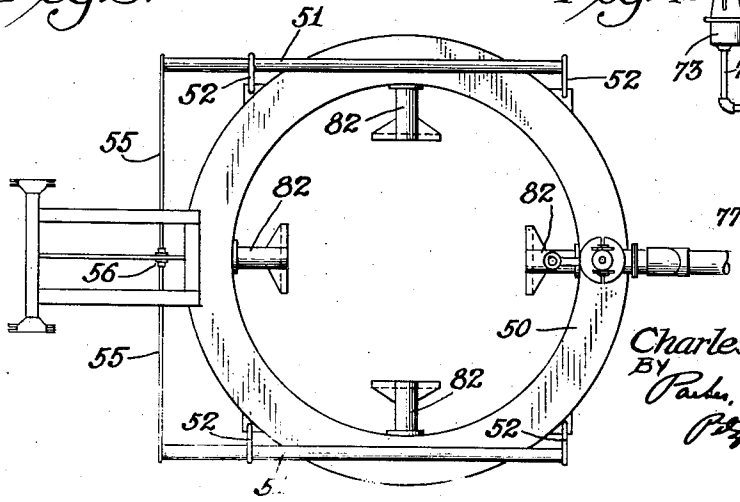
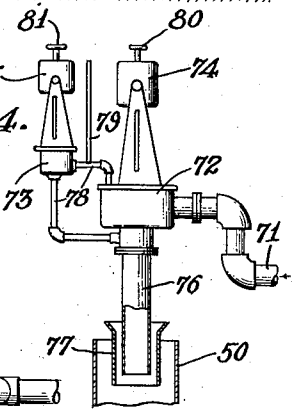


Fig. 4.



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MIXING APPARATUS

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Fig. 7.

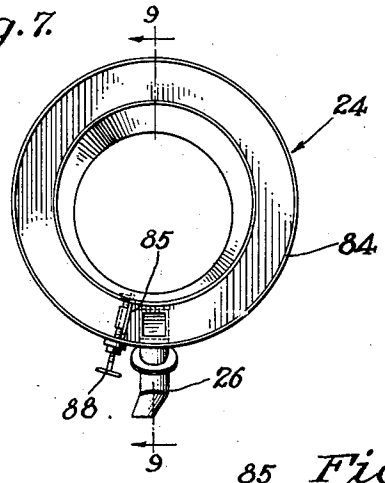


Fig. 8.

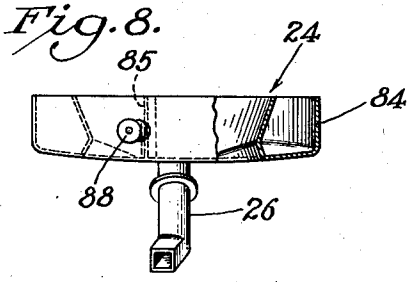


Fig. 9.

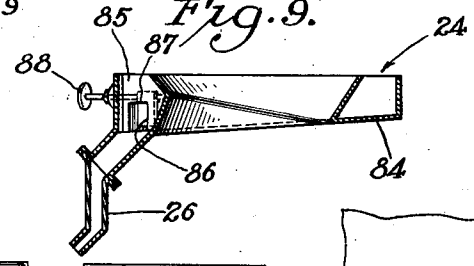


Fig. 6a.

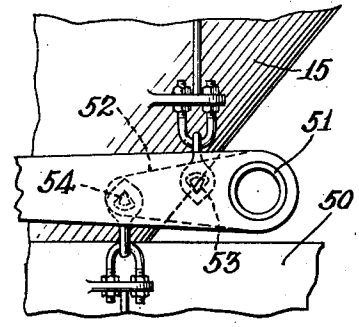


Fig. 6.

Fig. 5.

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2,174,089

UNITED STATES PATENT OFFICE

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MIXING APPARATUS

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Application February 6, 1939, Serial No. 254,881

15 Claims. (Cl. 259—154)

The present invention relates to apparatus for preparing mixed concrete and is particularly applicable to so-called central mixing plants.

For an example of a form of central mixing plant heretofore available reference may be made to my prior Patent No. 2,109,534 issued March 1, 1938. Briefly stated, a central mixing plant ordinarily embodies a mixer or battery of mixers, a group of elevated bins above the mixers and in which are stored the reserves of necessary constituents for the concrete mix, batching means for withdrawing predetermined quantities of the respective materials from the bins to form charges for the mixer or mixers, and a charging mechanism for chuting the batches of material to the mixers. Such plants find particular utility in the building of dams and the like in which enormous quantities of mixed concrete are required. Despite the large quantities of material which must be handled very rigorous control of quality must be observed. The ultimate strength of the concrete structure is largely governed by the uniformity with which the concrete in it meets the specified standards of mixing. Accordingly, a mixing plant must not only be capable of achieving a mix of specified quality but it must be capable of reproducing this mix time after time with extreme uniformity.

With the development of the art has come a demand for improvements in control, better coordinated operation of the elements of the plants and more general use of mixers of larger and larger individual capacity. Such demands have, however, introduced many new problems because of the volume of material which must be speedily and efficiently handled in each mixer charge. For example, in a small mixer it is of comparatively little importance in what order or in what relation to each other the mix constituents are charged into the mixer, but in a large mixer of three or four cubic yards capacity such factors are very critical and more especially so where several mixers are charged from one source. This is for the reason that not only is the time required for the mixing greatly increased when the various batches of each of the materials are charged into a large mixer serially or indiscriminately rather than simultaneously and in coordinated relation, but in addition the mixer is likely to become clogged and even filled with set concrete if the materials are not charged in a particular manner. Furthermore, uniformity of successive mixes can only be accomplished when the constituents are fed into the mixer under carefully coordinated controls and in a manner which is accurately duplicated in each successive mix. Similarly, dust rising from a stream of material fed into a small mixer is little more than a nuisance, but with large capacity mixers its handling becomes a major problem. Accordingly, one general object of the present invention is to provide an improved form of central mixing plant which is especially adapted to meet the requirements imposed by the use of large capacity mixers and plants. It should be understood, however, that the present invention, in some of its aspects, also finds utility as applied to mixing plants using smaller mixers.

A more specific object of the invention is to provide a central mixing plant of such character that a uniform and effective distribution of dry cement is insured throughout the stream of other materials supplied in each mixer charge, even when the charge is very large in total volume.

Another object of the invention is to provide in a concentric zone type of mixing plant, an improved water batcher by means of which selected quantities of water may be quickly and effectually supplied to each mixer during its charging period.

Still another, and important, object of the invention is to provide in a mixer charging apparatus, a novel form of water batcher and charging mechanism of such character that the water is supplied not only in measured total quantities but at a controlled rate and in a desirable relation to the charging of other materials to the end that effectual mixing of the concrete is accomplished and gumming or clogging of the mixer obviated, and whereby all mixers in a battery may be similarly and coordinately charged.

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

Figure 1 is a partial front elevation of a central mixing plant embodying the invention.

Fig. 2 is an enlarged front elevation of the central portion of the apparatus shown in Fig. 1, with some of the parts shown in vertical section.

Fig. 3 is an enlarged plan view of the water batcher.

Fig. 4 is a detail side elevation of the water supply arrangement for the batcher of Fig. 3.

Figs. 5 and 6 are respectively end and side elevations of the water batcher of Fig. 3.

Fig. 6ª is an enlarged detail view of a portion of the water batch scale beam linkage.

Fig. 7 is a plan view of a water charging reservoir for the plan of Fig. 1.

Fig. 8 is a front elevation partly in section of the reservoir of Fig. 5.

Fig. 9 is a vertical sectional view along the line 9—9 in Fig. 7.

General plant layout

For purposes of exemplification the invention has been shown herein as embodied in a concentric zone type of central mixing plant. The general arrangement of the parts for such a plant (see Fig. 1) will be familiar to those skilled in the art and, accordingly, a brief identification will suffice for the conventional elements of the combination. It will be appreciated that substitutions may be made of equivalent elements as desired, and that in some aspects the invention is applicable to entirely different types of mixing plants in which, for example, a single mixer rather than a battery of mixers is used, although in other aspects the invention is applicable primarily only to plural mixer installations. Consequently, even though one particular embodiment of the invention has been shown and described in some detail there is no intention to thereby limit the invention to such embodiment, but on the other hand the appended claims are intended to cover all modifications and alternative constructions falling within the spirit and scope of the invention.

The general layout of elements in the mixing plant shown herein (Fig. 1) includes a series of bins 10 supported in elevated position by a framework 11. These bins afford segregated storage spaces for reserve supplies of the dry constituents of concrete mixes, including dry cement as well as so-called aggregates such as sand, gravel and rock or cobbles of various sizes. These materials are withdrawn through a suitable gravity flow chute system (not shown in detail) into weigh batchers 12—14. A separate weigh batcher is provided for each constituent of the final mixer charge, and may be of any suitable form such, for example, as that disclosed in my prior Patent No. 2,008,305 issued July 16, 1935. Desirably, the centrally located batcher 12 is used for the dry cement and as many additional batchers are provided as may be required for the number of different types of aggregates used. Alternatively a multiple material batcher may be used.

From the batchers the materials are chuted to a centrally located collector cone or supply hopper 15 in which they intermingle and flow into a turnhead or spout 16, rotatable about a vertical axis on a tripod 17, and driven by a suitable electric motor 18. The turnhead 16 can be turned into charging relation with respect to any one of a battery of mixers which may, for example, be four in number arranged at intervals of 90° about a central axis. Two such mixers 19—20, are shown in Fig. 1. These mixers have been shown as being of the conventional front-charged front-discharged type with openings 21 in their forward ends which are arranged to face inwardly toward the center of a charging zone A, on the center line on which the turnhead 16 is located. These mixers are of the rotating type and are shiftable in the usual manner by air rams 20a from an upwardly tilted charging position, like that of the mixer 19 in Fig. 1, to a downwardly tilted discharging position, like that of the mixer 20 in Fig. 1. When in this discharge position the contents of the mixer falls into a centrally located discharge hopper 22, concentric with the charging zone A and which serves to direct the cement mix into a suitable receiver such as a conveyor or truck (not shown). A platform 23 serves to support the mixers 19—20, the discharge hopper 22 and the turnhead tripod 17.

Water is supplied for each mixer charge from a novel form of water batcher, designated generally by the numeral 24, through the medium of a water charging mechanism 25 carried by the turnhead 16, all as is hereinafter described in greater detail. For the present it is sufficient to note that the water is discharged from the charging mechanism 25 through a spout 26 (see also Fig. 2) through which it flows into the open mouth 21 of the mixer which is being charged.

Mixer charging mechanism.

To accomplish a large degree of premixing and coordinated material charging, a novel form of charging mechanism has been employed. By "premixing" is meant not only the mixing of the dry constituents of each mixer charge prior to the time it enters the mixers 19—20 but also the feeding of all constituents at controlled rates relative to each other so that the ingredients of each increment of the charge are in substantially the same proportions to each other as in the final mix. This is an especially important consideration when charging large capacity mixers which receive a charge of say, three or more cubic yards. Such importance will be apparent when it is considered that the output of the plant is largely governed by the time required by each mixer to complete the necessary mixing of the charge constituents in it. If the constituents of the charge should be fed serially rather than simultaneously into a large mixer a comparatively long time would be required in order to break up the segregated masses of each material and mix them thoroughly throughout the entire mass of the charge. By charging the constituents into the mixer itself substantially simultaneously and at controlled rates with respect to each other, however, each of the constituents can be so thoroughly disseminated throughout the entire mass that the mixing time required in the mixer itself is materially reduced. In the present instance the charging mechanism is so arranged that the materials are fed into the mixer in a thoroughly premixed condition.

Regulation of the flow of aggregates from each of the individual batchers 13—14 is accomplished in the present arrangement. After the batches are complete in the batchers 13—14 they are dumped by fully opening the respective bottom discharge gates 30 through the medium of suitable air ram actuator mechanisms 31 which may be operated by means of either an automatic or manual supervisory control system (not shown). From these gates the aggregates *a* are chuted into the collector cone 15 through sharply inclined chutes 27 having control valves or gates 28 interposed therein (Fig. 2). These gates 28 may be shifted vertically by manual operating handles 29 so as to regulate with nicety the rate of flow of the corresponding stream of aggregates. In this way the rates of flow for the respective aggregates can be regulated to give any desired relation of one with respect to the others.

In order that the dry cement c shall be diffused throughout all of the multiple streams of aggregates entering the collector cone 15, a distributor head or cone 32 has been provided (Fig. 2). The cement batcher 12 is dumped by opening a lower-end cone shaped valve head or gate 33, through the medium of a suitable air ram actuator 34. Thereupon the dry cement *c* falls by

gravity through a cylindrical conduit 35 having funnel shaped upper and lower ends 35a and 35b. The lower funnel shaped end 35b is generally complemental in contour with the diffusing cone 32 and is arranged in spaced relation above the same. Consequently the stream of dry cement flowing downwardly through the conduit 35 strikes the opposed face of the cone 32 and is fanned out over the streams of aggregates *a* entering the collector cone 15 and is thereby thoroughly intermingled with the same.

From the foregoing it will be seen that a substantial degree of premixing of the batch constituents is accomplished. In other words the streams of aggregates *a* flow into the collector cone 15 simultaneously and at controlled rates, rather than in sequence, and most important, the dry cement *c* is effectually diffused through these converging streams of aggregates.

Dust-proofing of the equipment is also a serious problem in charging large capacity mixers, and the improved charging mechanism herein shown is particularly adapted to meet this problem. Upon reference to Fig. 2 it will be seen that the top of the collector cone 15 is closed by a horizontal partition or floor 36. The aggregate control gates 28 cooperate with the chutes 27 to form substantially closed connections from the batchers 13—14 to the top of the collector cone. There is some clearance between the upper ends of the chutes 27 and the discharge spouts on the lower ends of the batchers 13—14 but these spouts extend a substantial distance within the chutes so that in view of the heavy character of the material the connections are substantially dust tight. In the case of the cement batcher 12, a dust tight connection is formed by the lower end of the batcher and the upper end of the conduit 35. For this purpose a flexible cylindrical casing 37 is telescoped over the lower end of the batcher and also over an annular collar 38 registering with the upper end 35a of the conduit 35. Suitable clamping rings or the like (not shown) may, of course, be utilized to secure the conduit 37 in position. In this way the escape of dust and finely divided material is prevented at the top of the collector cone 15.

To seal the connection between the turnhead 16 and any one of the mixers 19—20 which it is charging, a special dust-proof connection is provided. In the particular arrangement shown an annular sheet metal collar or extension section 39 (Fig. 1) is telescoped over the lower end of the turnhead chute or spout 16. This section is carried by a yoke 43 which embraces the top of it and is pivoted at 43a on a bracket 44 fast on the turnhead 16. This extension section 39 carries a flange 40 complemental to a flange 41 on the mouth of the mixer so that when the section 39 is swung toward the mixer the flanges 40—41 are pressed against each other and a dust tight connection is completed from the spout to the mixer. Similarly, when the section 39 is retracted the mixer is freed for tilting movement without interference by the extension section. A linkage mechanism, designated generally by the numeral 42, serves to actuate the extension section. This linkage 42 includes a bell crank 42a, pivoted at 42s on the turnhead structure, and adapted to be oscillated by an air ram 42c. The outer end of the bell crank is pivoted to a collar 42d which is oscillatable between stops on a pin 42e. This pin 42e is in turn pivotally connected to the yoke 43. A compression spring 42b is interposed between the collar 42d and the head at the lower end of the pin 42e. Accordingly, the spring completes a yieldable connection from the ram actuated bell crank 42a to the yoke 43 so that the extension section 39 is yieldably pressed against the mixer mouth. On the other hand, when the bell crank 42a is oscillated to retract the extension section 39 (in a clockwise direction as viewed in Fig. 1) the collar 42d abuts against the head on the free end of the pin 42e so as to form a positive connection for retracting the extension section.

In order to prevent choking of the mixer and chute structure as the aggregates are charged into the mixers through the dust-tight charging mechanism described above, an exhaust fan 45 (Fig. 2) is provided. This fan exhausts air from the interior of the collector cone 15 through a conduit 46 and discharges it into a suitable dust separator 47 from which the air finally passes through an upright conduit 48. Any entrained dust may be collected in a suitable receptacle as it emerges from a dust outlet 49 on the separator.

In the charging of the mixer 19, for example, the air displaced from it by the entering charge passes upwardly through the turnhead 16 and collector cone 15 and finally passes out through the conduit 46, the direction of flow being indicated by the arrows in Fig. 2. It will be appreciated that the regulation of flow of the streams of aggregates *a* is of particular importance when using such a dust-tight charging arrangement as that described since the premixed stream of aggregates in the spout portion of the turnhead 16 must be sufficiently limited to permit a free escape of the displaced air from the mixer and without any jamming or clogging at the mixer entry throat.

Charging cycle

Speedy and uninterrupted mixer operation is, in large measure, dependent upon proper regulation of the flow cycles for the constituent elements of the mix. The most critical of all is proper regulation of the water charge in coordination with the charging of the other mix constituents. Preferably, the charging is carried on in a cycle which includes the following steps:

1. Charging of the water started first and carried on for a sufficient interval before the dry constituents enter the mixer so that a pool is formed in the bottom of the mixer.

2. Large cobbles or rock started next and before the finely divided constituents such as sand and cement start to enter the mixer.

3. Thereafter and during the remaining major portion of the charging cycle all of the materials are flowed simultaneously into the mixer and at rates proportioned so that the flow of the dry materials will terminate substantially simultaneously.

4. The charging of the water, which is continued throughout the charging of the dry constituents, is prolonged after the aggregate and cement charging has terminated, for a period of from three to five seconds.

By instituting the charging of the water before that of the dry constituents, as noted above, a pool of water is formed in the bottom of the mixer into which the aggregates are folded as they enter. In this way the proper mixing of the aggregates at the initiation of the mixing cycle can be more effectually carried out and without danger of forming by accumulation set-concrete in the interior of the mixer which will thereafter have to be cleared away by laborious drilling and

chipping operations. Furthermore, the mixer is thoroughly scoured by the water and heavy cobbles which are first charged into it before and during the regular mixing operation. During the main part of the charging operation the water is charged at a rate proportionate to the flow of the dry constituents so that it is mixed with them in the proper proportions as they enter the bottom of the mixer body. Finally, by continuing the water charge for a short interval after the dry constituents have been charged into the mixer, the mouth of the mixer is scoured so as to prevent any gumming which would interfere with its free discharge after the mixing is complete. As will hereinafter appear, the water batching and charging mechanisms **24** and **25** are particularly designed to effectuate such a charging cycle as that described above.

Water batcher

A minimization of over-all operating time, and especially in a concentric zone type of mixing plant embodying a plurality of mixers, is achieved by the utilization of the novel form of water batcher herein disclosed. This batcher is arranged concentrically with the axis of the charging zone A, and in the particular construction shown (Fig. 1) embodies a scale hung annular tank **50** encircling the collector cone **15**. By thus locating the water batcher closely adjacent the charging zone, water can be quickly charged from it into a selected mixer without the time interval required in prior installations such as that shown in my Patent No. 2,109,534 referred to above and in which the water batcher is remote from the mixers and the water has to flow through a long conduit before reaching the charging zone (see conduits **21** and **22** in Fig. 1 of said patent). Elimination of any delay in starting the water charging is particularly important in carrying out the charging cycle set forth above, or a series of such cycles, and in which the water must hit the mixer in advance of any of the dry constituents of the mix.

Any suitable proportioning arrangement may be provided for filling the water batcher tank **50**. The arrangement for this purpose herein shown embodies an automatic weighing mechanism adapted to control the flow of water to the tank so that a predetermined batch of water is accumulated in the tank. In particular it includes a pair of horizontal scale levers **51** (Fig. 3) connected to the tank **50** by rocker arms **52**. These rocker arms are pivoted intermediate their ends (Fig. 6[a]) at **53** on the the stationary collector cone **15** and are journaled at their outer ends on the scale levers **51**, and are pivoted at their inner ends to the tank **50**, as indicated at **54**. Accordingly, as water is flowed into the batcher tank **50** the rocker arms **52** turn in a counterclockwise direction (as viewed in Fig. 6[a]) so that the scale levers **51** are elevated as the tank **50** descends, due to its increasing weight.

The scale levers **51** are interconnected by a pair of opposed levers **55** (Fig. 3), which are rigidly connected to the levers **51**, and are gathered by a shackle **56** (Fig. 6). From the shackle **56**, the levers **55** are connected to a scale beam **57** (Fig. 5) by a suitable system of levers **58**, **59**, **60** and **61** (Figs. 5 and 6). The balancing mechanism associated with the scale beam **57** is substantially like that shown for the batchers illustrated in my Patent No. 2,109,534 referred to above and, consequently, a detailed description is not believed to be necessary. In general, any one of a series of weighing beams **62**—**65** may be placed in operative relation with the scale beam **57** by releasing its associated beam lifter **66**. The several weighing beams **62**—**65** are set for predetermined different weights and the operator need only render the selected one operative in order to weigh out a corresponding batch of water. After one of the weighing beams **62**—**65** has been selected and placed in operative relation with the scale beam **57** the latter serves to actuate a pair of mercury switches **67**—**68** for automatically terminating the filling of the batcher tank **50** when the water batch is complete. A pointer **69** cooperates with a graduated scale **70** in order to give the operator a visual check of the operation of the automatic weighing mechanism.

Water is supplied to the batcher tank **50** (Fig. 4) from a suitable water supply pipe **71**. The flow of water from this pipe to the batcher tank is controlled by a pair of parallel connected poppet valves **72** and **73**. To initiate the water batching operation both of the valves **72** and **73** are opened by their associated power actuating mechanisms **74** and **75**, respectively. Thereupon, water flows from the supply pipe **71** into the tank **50** through the main valve **72** and a supply conduit **76** loosely telescoped within a cylindrical splasher guard **77** in the top of the tank. In addition, water also flows from the pipe **71** into the filling pipe **76** through the second or by-pass valve **73** and its associated piping **78**. A water hammer relief line **79** may be provided if desired. When a major portion of the batch is complete the weigh beam **57** is tilted sufficiently that the switch **67** is closed (Fig. 5) to thereby cause the main valve actuator **74** to close the main valve **72** and cut off the major feed of water. Thereafter a minor or dribble feed continues through the auxiliary or by-pass valve **73** until the batch is finally complete, at which time the weigh beam **57** is tilted still further and closes the other switch **68** so as to cause the valve actuator **75** to close the minor feed valve **73**. By utilizing such a major and minor feed arrangement, overrunning of the batch is effectually prevented. The rate of flow of water through each of the valves **72** and **73** can be regulated by suitable adjustment means actuated by adjusting screws **80** and **81**, respectively.

To insure rapid charging of the water from the batcher tank **50** to the respective mixers, the tank **50** is provided with a series of outlets **82** (Figs. 2 and 3) corresponding in number and location to the several mixers **19**—**20**. During the filling of the batcher tank, while the automatic weighing operation described above is in progress, all of these outlets **82** are closed by their respective solenoid actuated valves **83**. Then, when the mixer charging cycle is instituted all four of the valves **83** are opened simultaneously so that the water may flow rapidly into the charging mechanism **25**. Irrespective of the location of the turnhead **16**, and of the charging mechanism **25** which it carries, one of the batcher outlets **82** will, however, always be located directly in registry with the water charging spout **26** so that a strong and undelayed initial flow of water into the mixer is assured. To expedite the final draining of the batcher tank **50**, its bottom is inclined from high points **50[a]**, intermediate the outlets **82**, toward such outlets (Figs. 5 and 6).

Water charging mechanism

Two functions are performed by the water charging mechanism **25** (Figs. 1 and 2). First,

it serves to direct the water from the batcher tank 50 into any selected one of the mixers 19—20 which is to be charged and second, it feeds the water from the batcher to the mixer at a controlled rate which can be proportioned with respect to the rate of flow of the other ingredients of the mix. In the illustrative apparatus the water charging mechanism includes an annular tank or reservoir 84 encircling the turnhead 16 and fixed to it. In order that the reservoir 84 may receive water from the batcher tank 50, irrespective of the rotational position of the turnhead 16, the reservoir 84 is made with an open top and into which the spouts 82 of the batcher tank 50 all project. The bottom wall of the reservoir 84 (Fig. 9) is inclined toward its outlet spout 26 so that all of the water received within the reservoir 84 will flow by gravity to the outlet spout and thence into the mixer which is being charged.

To minimize, in so far as possible, the time interval between the instant the charging cycle is initiated and when the water reaches the mixer, the outlet spouts 82 on the batcher tank 50 are arranged so that one of them will always be directly above the water charging spout 26 when the latter is in registry with one of the mixers. In other words, with four mixers, four of the outlet spouts 82 are provided (see Fig. 3) and located just above the position occupied by the charging spout 26 when the latter is in registry with corresponding ones of the mixers. Consequently, when the water batcher valves 83 are opened water flows directly downward, and without any appreciable loss of time, into the water charging spout 26 and is directed by it into the interior of the mixer which is being charged. Since the water batcher is located below the outlet gates for the aggregate batchers 13—14, it is apparent that the water will reach the mixer before any of the dry constituents of the mix even though all of the batcher gates be opened simultaneously, thus insuring that the apparatus will effectually carry out the first step in the preferred cycle of charging outlined above. Similarly in the second step of the cycle, the cobbles reach the mixer before the sand and other more finely divided aggregates since the cobbles are heavier and fall faster to start their flow. Generally stated then, the apparatus is thus capable of carrying out the cycle described even without the necessity of providing a timing mechanism for sequential actuation of the batcher gates.

At this point it should be noted that the outlet of the water charging spout 26 is preferably directed laterally (Fig. 7) so that the water entering the mixer is correspondingly directed laterally as well as downwardly to aid in mixing the water with the dry materials and also to aid in scouring the mixer walls.

To regulate the flow of water so that a portion of it will be held back and not fed into the mixer until after all of the dry constituents have been charged, a flow regulating arrangement is provided in the reservoir 84. For this purpose a transverse partition 85 (Figs. 7–9) is provided in the reservoir. A flow regulating orifice or aperture 86 (Fig. 9) is fashioned in this partition and is adapted to be variably restricted by an adjustable gate 87 manipulable by an adjusting handle 88. Since the reservoir 84 is symmetrical about a horizontal axis passing through the spout 26, all of the water in the left hand half of the reservoir (as viewed in Fig. 7) behind the partition 85 must flow through the orifice 86 in order to reach the spout 26. Consequently, the discharge of the water in this portion of the reservoir can be prolonged by the setting of the regulating gate 87 on the orifice 86 so that the time of the water feed will exceed that of the dry constituents of the mix as set forth in the preferred charging cycle previously described.

Brief résumé of operation

In the operation of the mixing plant described above any desired control system for initiating the operation of the batchers may be utilized, such, for example, as that shown in my prior Patent No. 2,109,534, previously noted. Assuming that the batchers are filled and have automatically weighed out predetermined quantities of the respective materials the aggregate batcher discharge gates 30 (Fig. 2) will be closed and the cement batcher discharge gate 33 will also be closed, as are the discharge valves 83 on the water batcher tank 50. Also the turnhead 16 is assumed to be located with its outlet in registry with an uptilted empty mixer.

To initiate the charging cycle with the parts arranged as described above, the water batcher outlet valves 83 are opened and substantially simultaneously the other batcher discharge gates 30 and 33 are also opened. Thereupon water flows through all of the outlet spouts 82 of the water batcher tank 50 into the water charging mechanism reservoir 84. Furthermore, water flows directly from one of the spouts 82 into the charging spout 26 through which it spurts into the interior of the mixer which is being charged. Since the water batcher is located closer to the mixer than are the other batchers the water enters the mixer first. Thereafter the aggregates flow in converging streams into the collector cone 15 and thence into the turnhead 16 where they commingle and are in effect premixed. The flow regulating gates 28 have been previously set so as to maintain selected rates of flow for the streams of various aggregates. Into these converging streams of aggregates dry cement is distributed by the cone 32 so that it is thoroughly disseminated throughout the mass of aggregates before they enter the mixer. During this charging period the flow of water continues from the batcher tank 50 into the reservoir 84 and thence through the spout 26 into the mixer.

The exhaust fan 45 is in operation throughout the mixing cycle so that the air displaced in the mixer leaves the charging chute system through the conduit 46 as does all of the loose dust and dirt rising from the streams of aggregates entering the mixer. In view of the dust-proof connections heretofore described little or no dust escapes about the mixing plant.

After the charging of the aggregates and cement is complete the water charging is prolonged for from three to five seconds by the flow of water which has been trapped behind the reservoir partition 85 and must escape through the orifice 86 in order to reach the mixer. The water charged into the mixer in this final period serves to wash the throat of the mixer and prevent gumming or clogging at this point.

After one of the mixers has been completely charged, as described above, the toggle mechanism 42 is actuated to retract the spout extension section 39 and the turnhead 16 is swung through an arc of 90° to bring it into registry with the next mixer. The aggregate, cement and water batchers are refilled, and upon the completion of this refilling operation the same charging cycle

is repeated for the next mixer. After the mixing operation is complete for each mixer it is tilted to discharge position (see mixer **20** in Fig. 2) so that its contents are discharged into the discharge hopper **22**.

From the foregoing it will be seen that the improved mixing plant herein disclosed is capable of charging even large mixers with a high degree of rapidity while minimizing the over-all time required for mixing. In fact with the apparatus shown, even mixers of four cubic yards capacity can be charged in as little as twelve seconds while still regulating the charging to obtain the preferred cycle set forth.

I claim as my invention:

1. A central mixing plant comprising, in combination, a dry material batching means for accumulating predetermined batches of dry materials, a mixer located below said batching means, said mixer embodying a container adapted to receive and retain a quantity of material while mixing the same, means for directing dry materials by gravity flow from said batching means to said mixer, a water batcher, means for flowing water by gravity from said water batcher to said mixer, and means for simultaneously discharging all of said batchers, said water batcher being located adjacent to and above said mixer but at a substantial distance below said dry material batcher so that upon a simultaneous discharge of all of said batchers the water will reach the mixer in advance of the dry materials due to the shorter path which it traverses.

2. A central mixing plant comprising, in combination, a plurality of mixers arranged about a central charging zone with charging openings therein facing inwardly toward said zone, each of said mixers embodying a container adapted to receive and retain a quantity of material while mixing the same, a collector cone located above said zone substantially upon its vertical center line, a turnhead chute pivotal about said center line for chuting material by gravity flow from said collector cone into the charging opening of any selected one of said mixers, an annular water batcher tank encircling said collector cone, means carried by said turnhead chute for directing water discharged by gravity flow into it from said tank into the mixer with which said turnhead chute is in registry, a plurality of dry material batchers located a substantial distance above said cone for feeding predetermined batches of material by gravity flow into the same, and means for simultaneously discharging all of said batchers, whereby upon the simultaneous discharge of both said dry material and water batchers the water will reach the mixers in advance of the dry materials due to the shorter path which it traverses.

3. In a mixing plant the combination of a mixer embodying a container adapted to receive and retain a quantity of material while mixing the same, means for feeding to said mixer a stream of dry materials of predetermined total quantity to charge the same, means for segregating a batch of water of predetermined amount, means for charging the water into the mixer in a stream which reaches the mixer in advance of the stream of dry material upon a substantially simultaneous initiation of the operation of said dry material and water charging means, and means for simultaneously discharging all of said batchers.

4. In a mixing plant the combination of a mixer embodying a container adapted to receive and retain a quantity of material while mixing the same, means for feeding to said mixer a stream of dry materials of predetermined total quantity to charge the same, means for accumulating a batch of water of predetermined amount, means for charging the water into the mixer upon a substantially simultaneous operation of said dry material and water charging means in a stream which reaches the mixer in advance of the stream of dry material and which is prolonged by a selected variable interval of time beyond that required by the dry material feed, and means for simultaneously discharging all of said batchers.

5. In a mixing plant the combination of a water batcher including a tank having a valved outlet and adapted to contain a batch of water, a reservoir located below said batcher tank and positioned to receive at least a portion of the water discharged from said outlet, said reservoir having an outlet from which water may be directed to a mixer, and means for directing the main portion of the water in a major stream from the reservoir into a mixer and for automatically and variably restricting the flow of the remaining minor portion of the water in said reservoir through said outlet thereof to prolong by a selected amount the time required for draining the same into the mixer.

6. In a mixing plant the combination of a water batcher including a tank having a valved outlet and adapted to contain a batch of water, an annular reservoir located below said batcher tank and positioned to receive at least a portion of the water discharged from said outlet, said reservoir having an outlet from which water may be directed to a mixer, the bottom of said annular reservoir being inclined toward said outlet on each side of a transverse center line passing through said outlet, and means for variably restricting the flow of water to said reservoir outlet from a point adjacent one side thereof to prolong by a selected amount the time required for emptying the same into the mixer.

7. In a mixing plant the combination of a water batcher including a tank having a valved outlet and adapted to contain a batch of water, an annular reservoir located below said batcher tank and positioned to receive at least a portion of the water discharged from said outlet, said reservoir having an outlet from which water may be directed to a mixer, the bottom of said annular reservoir being inclined toward said outlet on each side of a transverse center line passing through said outlet, a transverse partition in said reservoir at one side of said outlet and adjacent the same, said partition having an aperture therein, and means controlling said aperture for variably restricting the flow of water to said reservoir outlet to prolong by a selected amount the time required for emptying the same into the mixer.

8. In a mixing plant the combination of an aggregate collector hopper, an annular water batcher tank encircling said hopper, means including a scale beam for supporting said tank on the exterior of said hopper, a plurality of mixers located below said hopper, and means for directing aggregates from said hopper and water from said tank into any selected one of said mixers.

9. In a mixing plant the combination of an aggregate collecting hopper located above a charging zone, a plurality of mixers located at spaced points about the periphery of said charging zone, a water batcher tank fashioned to embrace said hopper and extend substantially about the same, and means including a plurality of outlets for said batcher tank corresponding in number to the number of mixers and with one of said outlets

located substantially in alinement with each of said mixers for charging water substantially directly from said bank into any selected one of said mixers.

10. In a mixing plant, the combination of an aggregate collecting hopper located above a charging zone, a plurality of mixers disposed at spaced points about the periphery of said charging zone, a water supply means including a tank mounted closely adjacent said hopper, and means including a plurality of outlets for said tank corresponding in number to the number of mixers and with one of said outlets located substantially in alinement with each of said mixers for charging water substantially directly from said tank into any selected one of said mixers.

11. In a mixing plant, the combination of a plurality of mixers located at spaced points about the periphery of a central charging zone, an annular open top reservoir mounted for rotation about the vertical center line of said charging zone and having an outlet spout swingable into registry with any selected one of said mixers, a stationary water batcher tank located above said reservoir, and said tank having a plurality of outlets positioned to discharge into said open top reservoir irrespective of the rotational position of the latter, said tank outlets corresponding in number to the number of mixers and being positioned so that at least one of said tank outlets discharges directly into said reservoir outlet spout when the latter is in charging position for any one of said mixers.

12. In a concrete mixing apparatus the combination of, a mixer having a charging opening, a chute structure for supplying aggregates to said mixer charging opening, a cement supply conduit leading downward into the chute structure for the gravitational flow of dry cement to a point lying between streams of aggregates in the chute structure, and means for spreading laterally the falling stream of cement to insure its diffusion into the streams of aggregates at the sides thereof.

13. In a concrete mixing apparatus, the combination of a mixer having a charging opening, means for directing a stream of aggregates into said mixer charging opening, means for supplying a stream of dry cement to interior of the stream of aggregates prior to its entry into the mixer, and means for spreading the stream of dry cement laterally substantially throughout the stream of aggregates as it enters the latter.

14. In a concrete mixing apparatus, the combination of a supply hopper having an outlet opening in its bottom, a mixer having a charging opening, means for directing a plurality of streams of aggregates into the hopper along separate paths lying along its inner face and converging at its center line, a dry cement supply means for directing a stream of dry cement vertically downward substantially along the center line of said hopper, and means including a deflector cone located within said hopper and in alinement with the stream of dry cement for spreading the same laterally into the streams of aggregates and means for directing the mixed streams of material from said hopper outlet to the mixer.

15. In a mixing plant an apparatus for charging water into a mixer comprising, in combination, means for segregating a batch of water of predetermined amount, and means operative automatically upon the initiation of its operation to direct the water from said batcher means into a mixer in an initial large stream comprising a major portion of the batch and thereafter continuing the charging of the water in a relatively smaller stream prolonged throughout a selected interval of time.

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