Feb. 21, 1928. 1,660,301

J. F. ROBB

COMPULSORY SYNCHRONIZATION CONTROL FOR PAVERS

Filed Aug. 17, 1926 3 Sheets-Sheet 1

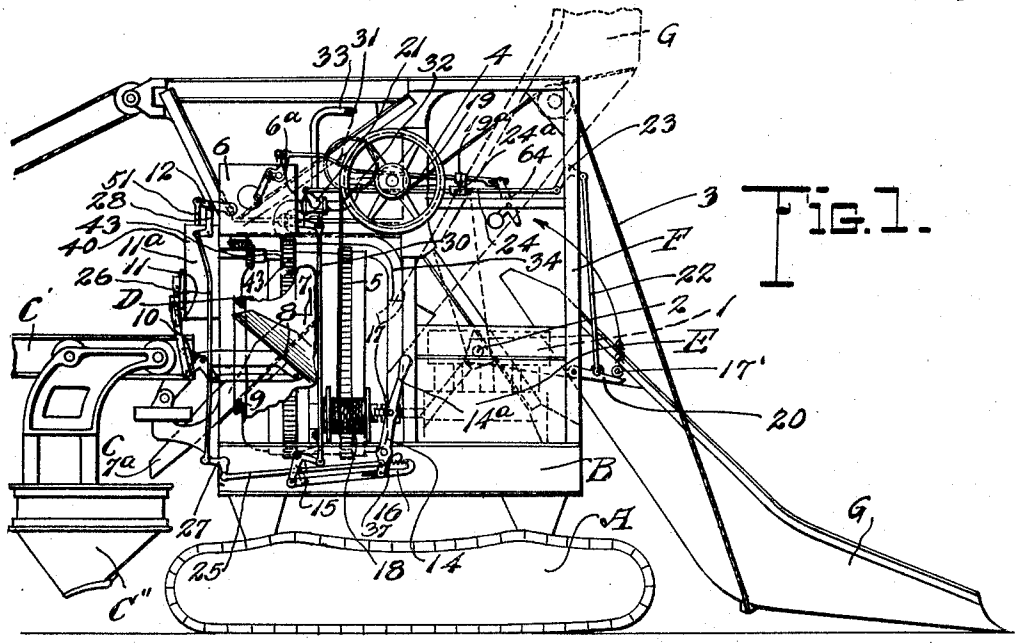


Fig. 1.

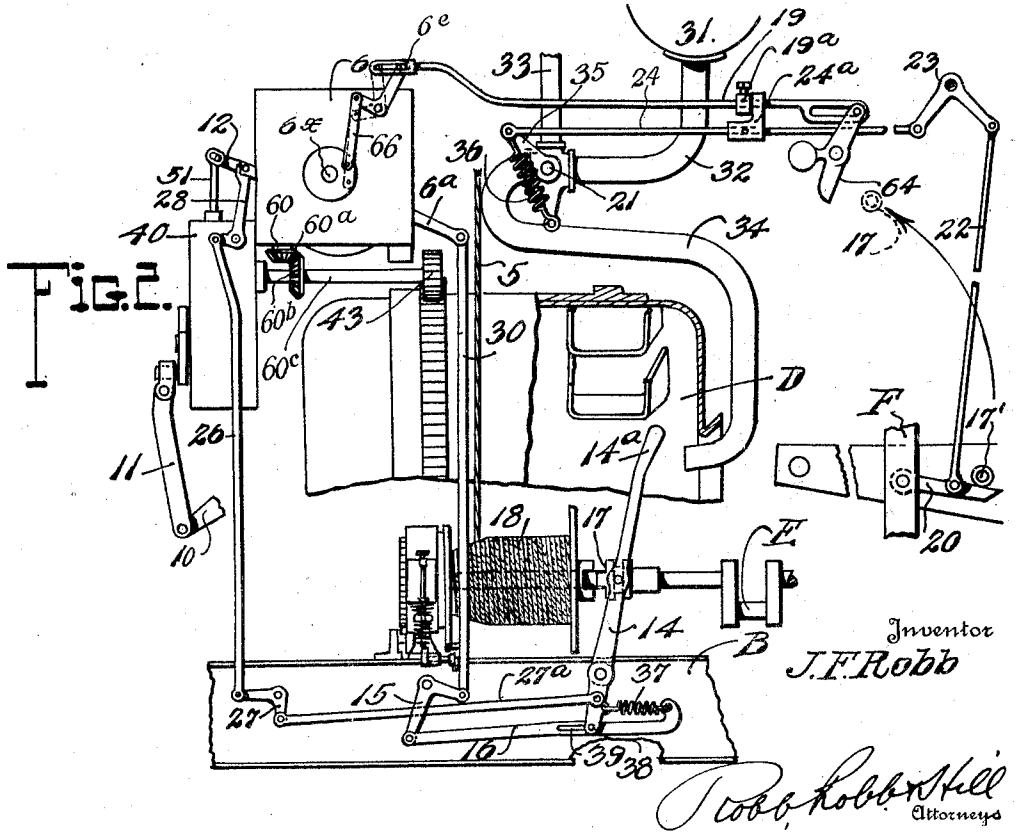


Fig. 2.

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Fig. 3.

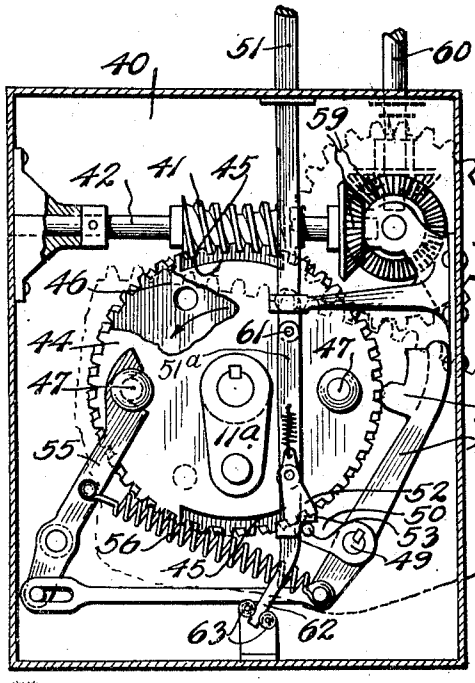


Fig. 7.

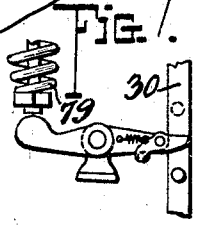
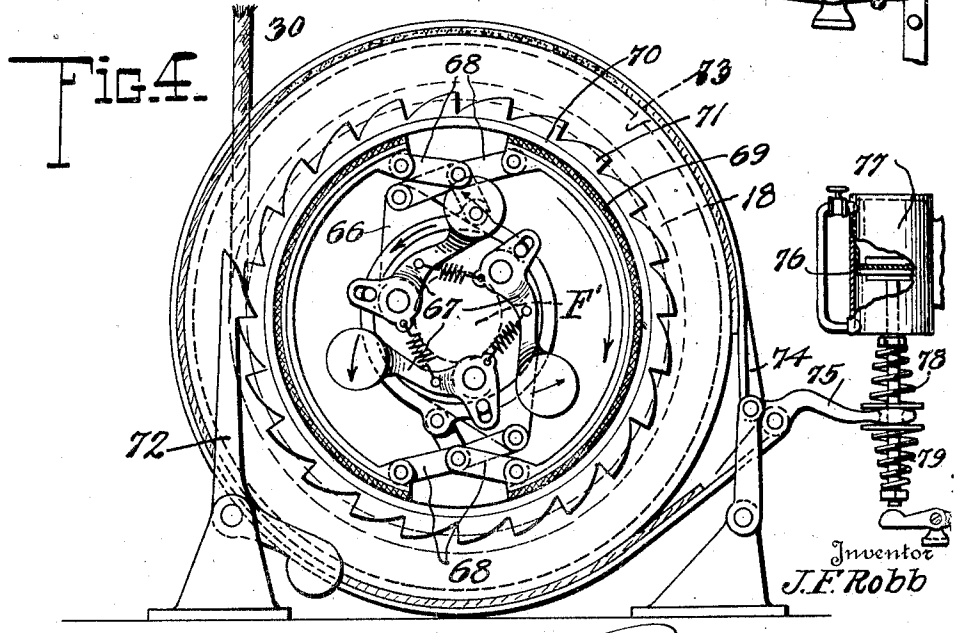


Fig. 4.



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Filed Aug. 17, 1926 3 Sheets-Sheet 3

Fig. 1.

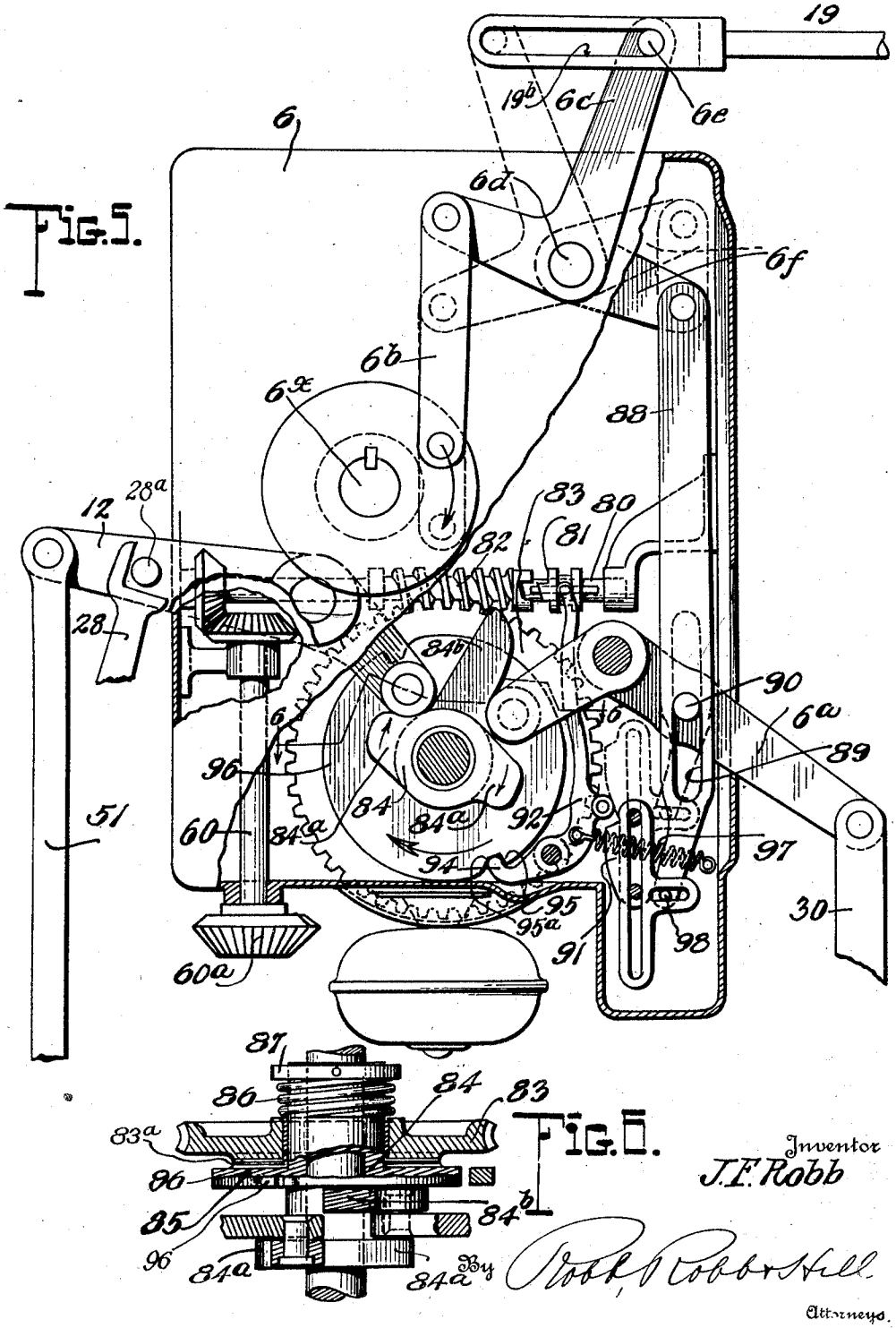


Fig. 5.

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UNITED STATES PATENT OFFICE.

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COMPULSORY SYNCHRONIZATION CONTROL FOR PAVERS.

Application filed August 17, 1926. Serial No. 129,785.

The universal practise today in building concrete roads and pavements, and laying down the concrete base of other types of pavements, is to employ a portable mixing plant which is commonly known as a concrete paver or paving machine. This plant embodies a concrete mixer operated by a suitable prime mover such as a gas or steam engine; means for charging the mixer, usually a loading skip; means for discharging the mixer, ordinarily a discharge chute cooperative with the mixing drum, or some means for tilting the drum itself; and means for distributing the mixed concrete as it is discharged from the mixer base to lay concrete down on the subgrade being paved.

It has been found in commercial practise, that the efficiency of a road paving job, so called, depends largely upon the efficiency of the portable mixing and paving machine. It has also been found that it is desirable, if possible, to utilize the mixing and distributing machine as the pace maker for the whole work of paving, because by proper operation this machine may be caused to operate with considerable speed if the materials are supplied thereto and therefrom under proper system of control. Moreover, it has been learned that an improperly operated paving machine may cause a very material loss to the contractor if its various mechanical devices for charging, mixing, discharging and distributing the concrete are not efficiently timed. In explanation of this factor of efficient operation, it is notable that these paving machines are designed usually to mix a batch of concrete under a time control of a minute or a minute and a half. If the materials are properly supplied, mixed and discharged, a relatively high production of mixed concrete per hour may be obtained. However, should the actions of the various associated material handling instrumentalities not be properly employed anywhere from five to fifty seconds or more of time may be lost in the handling of each batch of concrete. When it is borne in mind that hundreds of batches of concrete are handled each day, the actual loss to the contractor when a few seconds of time are lost per batch, may be readily reckoned and quite commonly the efficiency of a machine may be reduced ten to twenty percent under the above conditions.

Setting forth this invention more clearly, it is further noted that the discharge operation of the mixer in an efficient type of paving machine may be effected in approximately ten seconds, and the operation of loading or charging the mixer with aggregates ordinarily takes about the same time. Obviously, if the operator of a paving machine turns the discharge of the mixer to discharge position and waits ten seconds for it to be discharged, thereupon raising the loading skip and charging a fresh batch of aggregates into the machine, there will be an approximate loss of about eight seconds of time due to the delay of charging alone. There is no reason why the loading skip which takes some seven or eight seconds to reach its elevated inclination to charge the aggregates into the mixing drum, may not be started in operation simultaneously with the rendering of the discharge chute operative to discharge. By thus overlapping the actions of the discharge means and the loading or charging means, a saving of time may be readily accomplished which at the end of day's work will materially increase the production of a mixing machine. The foregoing not ony applies to the related actions of charging and discharging means for the paving machine, but equally has to do with the related timing of the introduction of water into the machine, and other functions which are performed.

Having in view the foregoing, the primary object of this invention has been to produce a control mechanism for a concrete machine which acts compulsorily so as to necessitate an overlapping of operation of the charging means and discharging means and water supply means and other functions of the parts of the machine in such a way as to absolutely do away with costly losses of time incident to manual controls of the operating features of the machine, especially when such controls are not performed efficiently.

But there are certain conditions in the operation of concrete paving machines that prevent at times the overlapping of the actions of the various instrumentalities to which I have referred above. For instance, it may be that the vehicles bringing the aggregates to the loading skip are not on time and the batch of fresh aggregates are there-

fore not ready to be raised and charged into the mixer. Or again, it may be that the occasion of delay is due to the fact that the distributing bucket which runs on a long horizontal boom has not been brought back to its receiving position beneath the discharge chute mechanism and is therefore not ready to be supplied with the mixed aggregates, to be distributed. On account of these features this invention proposes such manual control means as appears required and desirable to interfere with the automatic and compulsory synchronizing means to the extent that when the occasion arises, the operator of the paving machine is able to interpose his manual control and prevent the automatically synchronized movements of the charging skip, the discharging chute or means, and the water supply means.

By the compulsory synchronizing mechanism of the invention, material savings of small time losses, that in a whole day's period of operation are very large in the aggregate and cause really tremendous losses of efficiency of operation of the machine over a period of a season's work, are done away with to the utmost possible degree, and the efficiency of the concrete producing plant is greatly increased with material savings to the owner of the machine.

A single embodiment of the invention is illustrated in the accompanying drawings but I do not wish to be limited to the particular disclosure hereinafter described merely in detail because owing to the use of different types of machines the specific means that may be employed in the machine for performing any of its various functions may be modified or of a different type from that shown.

In the said drawings:—

Figure 1 is a side view of a certain well known type of concrete paving machine embodying the invention.

Figure 2 is an enlarged side view of certain of the control instrumentalities by which compulsory synchronization is obtained.

Figure 3 is a view in side elevation and partly broken away, to bring out more clearly, a certain simple type of automatic discharge controlling means such as may be employed as one of the synchronized units of the invention.

Figure 4 is a view illustrating a certain type of centrifugal controller and movement delaying controller for the skip.

Figure 5 is a plan view of the batch meter, certain of the parts being broken away to show a portion of the interior mechanism.

Figure 6 is a sectional view on the line 6—6 of Figure 5, showing more clearly the worm wheel and the friction driven cam elements.

Figure 7 is a fragmentary view showing the actuating mechanism for the dashpot controller for the skip.

Describing the invention specifically, as those versed in the art are familiar with the portable paving machines or plants to which my invention relates, it is necessary only to refer to Figure 1 as showing a typical machine now almost in universal use. This machine comprises the traction base A having the truck or base frame B and equipped with a distributing attachment C carried by said frame B and comprising a boom C′ and a bucket C″. On the body or frame B of the machine is mounted the mixing drum D and a suitable vertical frame work F that supports the boom C′ and the motor or engine E by which the mixer or drum D is operated as well as the various other moving parts of the machine. The machine is equipped with the usual loading or charging skip G pivotally mounted on the frame F by a bracket 1 pivoted at 2. This skip G is raised and lowered by cable means 3 operated by a cable driving wheel 4 mounted on the frame F which wheel 4 is connected by cable means 5 with an operating cable drum 18 hereinafter referred to. Mounted on the machine frame work F is the batchmeter 6 of a known type and the mixer or drum D is adapted to be discharged by the movable discharge chute 7 pivotally supported by an axis 8 and connected by link means 9 with an operating arm 10 connected by link means 11 with a lever arm 11^a forming a part of the batchmeter operating mechanism which is controlled by the actuation of the batchmeter 6. At the end of the mixing period of a minute, or other period for which the batchmeter is set, said batchmeter 6 is tripped to cause its lever arm 6^a to be raised, this at the same time actuating the batchmeter lever 12 which controls the automatic operation of the discharge chute 7 to throw the latter to and from discharging position.

The discharge chute 7 coacts with a stationary discharge chute 7^a that conveys the mixed aggregates to the distributing bucket C″. The batchmeter lever 6^a is connected by a rod 30 with a bell crank lever 15 connected by a link 16 to the clutch 17 on the operating or drive shaft for the cable drum 18 aforesaid. Operation of the link 16 is adapted to throw the clutch 17 through the provision of a lever 14 intermediate the parts 16 and 17, which lever 14 has a handle 14^a for certain manual operation as later set forth. The driving shaft carrying the drum 18 is operated from the engine E previously mentioned.

As seen best in Figure 2, there is provided the water tank 31 partially illustrated with its outflow pipe 32 leading to what is known as a three-way valve 21 which com-

prises a connection between the water supply main 33 and the pipe 32, and the pipe 34 which leads from the valve to a point within the mixing drum D. The lever arm for the valve 21 is designated 35 and a snap-over spring 36 cooperates with said arm to shift it past a certain dead center position and hold it at opposite sides of such position in either of two positions. One position of the valve establishes communication between the water supply pipe or main 33 and the pipe 32 leading to the tank 31 so that a fresh supply of water may be fed into the tank 31. The other position of the valve 21 cuts off communication from the pipe 33 to the tank 31 and establishes communication between the pipe 32 and the down flow pipe 34 so that the measured quantity of water in the tank 31 will pass to the mixing drum D.

The connection between the link 16 and the clutch throw lever 14 includes an elastic member or spring 37 and a pin and slot feature designated 38—39.

As thus far described, the main features of the paving machine set forth are such as already known except that I have employed a special design of connection between the batchmeter and the clutch 17 involving the lever 14, which connection is novel and provided for purposes to be hereinafter set forth.

Next may be described the automatic, or under some conditions, the manually controlled means for moving the discharge chute 7. This means may embody a casing 40 enclosing a constantly driven worm 41 on a shaft 42 which carries a gear 43 arranged to mesh with one of the gear rings surrounding the drum D and by which the latter is rotated. The worm 41 is adapted to drive a worm driven disc 44 provided with worm receiving recesses 45 in which the worm 41 may be received, under which conditions the drive to the disc 44 is discontinued. The recesses 45 are at diametrically opposite points of the periphery of the disc 44. The drive from the worm 41 to the member 44 is established peculiarly by means of a driving worm gear 46 engaging the worm 41 and constantly driven thereby. The driving disc shaft 44^a is provided with the arm 11^a previously referred to as operating the link means 11 to turn the chute 7 to or from its discharging position. Normally, the gear 46 is turning and the disc 44 carries engaging pins 47 out of engagement with the gear 46 but adapted to enter registering openings in the latter. A cam lever 48 is mounted in the casing 40 on axis 49 and is equipped with an operating arm 50. The batchmeter lever arm 12 is connected by a rod 51 with the lever 48 so that when the batchmeter is operated at the end of a mixing period to force the rod 51 downwards, a latch 52 on said rod engages a pin 53 on the lever 48 and rocks the lever 48. This causes a cam 54 of the lever 48 to engage the adjacent pin 47 and project it from the disc 44 into an opening in the gear 46 which is constantly turning. Under these conditions, the gear 46 will carry the disc 44 around a one-half revolution until a throw-out lever 55 engages and cams the operating or engaging pin 47 on the disc 44 out of its engagement with the gear 46. A spring normally connects the two levers 55 and 48 tending to hold the lever 48 out of the path of the pins 47 and the lever 55 in the path of said pins.

A link connection 57 between the two levers 48 and 55 permits independent rocking movement of these levers and moreover, rocks the lever 55 out of the path of the pins 47 as the lever 48 is caused to engage one of said pins. A one-half revolution of the disc 44 as controlled by the above means will move the discharge chute 7 from non-discharging position to discharging position, and another such movement of the disc will carry the discharge chute from its discharging position back to its non-discharging position.

The lower end of the rod 51 is hinged or pivoted at 61 to the body of the rod and the lower extremity of the pivoted portion, designated 51^a, is formed with a cam 62 which operates between two camming rollers 63, the purpose of which is to cause a lateral movement of the lower pivoted end 51^a of the rod 51 to swing the lach 52 laterally to a position in which it escapes from the pin 53.

Mounted on the upper portion of the frame work F to be actuated by the loading or charging skip G is an actuating lever 64, said lever having a slotted link connection 19 with the batchmeter mechanism for the operation of said batchmeter as hereinafter set forth. The lever 64 is adapted to be struck at its lower end by a roller or projection 17′ on the charging skip G. For the automatic operation of the valve 21, its arm 35 is connected by a rod 24 with a bell crank lever 23 which has a rod 22 extending downwardly and connecting it with the trip lever 20 pivoted to the frame F. The rod 24 carries an abutment member 24^a adapted to engage and be operated by an adjustable collar or member 19^a on the rod 19 as later set forth.

Interference means are provided for cooperation with the batchmeter arm 12 and includes an angle lever 28 engageable with a pin 28^a projecting from a side of the lever 12, said angle lever being connected by a rod 26 attached at its lower end to an angle lever 27, connected by a horizontal rod 27^a with the clutch lever 14.

The batchmeter 6 is of usual construction and carries the setting shaft 6^x which in

Figure 5 is turned to the left or counterclockwise upon the setting or time measuring position as shown in full lines. After the mixing period has elapsed, the batchmeter mechanism releases the shaft 6^x and a spring, not shown, rotates the shaft 6^x to the right, positioning the parts as shown in dotted lines. In order to provide an automatic skip hoist clutch control, and an automatic discharge chute control, which are normally under control of the batchmeter I provide a constantly rotating shaft 80 driven by the gear 43 from the drum ring gear through the vertical shaft 60 and bevel gears 60^a and 60^b, the latter on a shaft 60^c.

The shaft 80 has splined thereon the clutch element 81 adapted to engage and rotate a worm 82 loosely journaled on said shaft. The worm 82 meshes with a worm wheel 83 journaled on a sleeve 84 which also carries the power discharge trip cams 84^a, and the skip hoist actuating cam 84^b. The sleeve 84 terminates in a flange or disc 86 and is provided with a friction surface 85 which is held in contact with the friction face 83^a of the worm wheel 83 by a spring 86^a. The tension of the spring may be adjusted by screwing upon the collar 87 which is threaded upon the end of the sleeve 84. A friction clutch is thus provided so that if a delayed discharge is necessary, as when the lever 28 is moved beneath the pin 28^a to prevent the arm 12 from being depressed, the sleeve and cam elements will be held from rotation although the clutch 81 may at that time be engaged with the worm 82 causing rotation of the worm wheel 83. No breakage of part can thus occur.

The batchmeter shaft 6^x is connected by the link 6^b to one arm of the angle lever 6^c. The angle lever 6^c is pivoted on the stub shaft 6^d and is connected to the skip actuated rod 19 by a pin 6^e located at the extremity of its other arm. A slot 19^b is provided on the end of the rod 19 receiving the pin 6^e.

It will be observed that after the skip, in rising has pulled the rod 19 to the right, (note the diagrammatic showing in Figure 2), as the skip is again lowered, the roller 17' will actuate the rod 22 through the lever 20 and bell crank 23 to return the three-way water tank valve 21 to tank filling position. This moves the abutment 24^a to the left which will, thru the abutment 24^a striking, thru the abutment 19^a on the rod 19, cause said rod to be moved to the left or initial position. Since the lever 6^c (Figure 5) is held from movement until after the predetermined mixing period has elapsed, the slot 19^b in the rod 19 must be provided because it is very desirable to fill the water tank, as soon after its discharge as possible. It will be observed that the lever 6^c also actuates another arm 6^f which in turn reciprocates a vertically disposed rod 88. This rod 88 is slotted at 89 to receive a pin 90 projecting from the lever 6^c. When the rod 88 is moved downwardly (due to its connection with the arm 6^f), by the skip G, the upper end of the slot 89 will move the skip hoist clutch actuating lever 6^a downward and disengage the skip hoist clutch, thus arresting the skip's upward movement, as the skip reaches its upper limit of movement.

In the lower right hand corner of the batchmeter case is located a sliding or reciprocating cam 91 for engaging the clutch 81 with the worm 82 to cause rotation of the worm wheel 83. The cam 91 engages the clutch actuating lever 92 to swing said lever (92) to the left clutching the sleeve 82 with the splined driving element 81. The lever 92 is pivoted at 93 and carries a hooked extension or bearing foot 94. While the clutch element is disengaged, this foot 94 is engaged by the shoulder 95 in the periphery of the flange 96. However, when the clutch 81 is engaged and after the worm wheel 83 and disc 96 have made a fractional rotative movement, the foot 94 will rest upon the periphery of the disc 96 and maintain or lock the clutch 81 engaged for one half of a revolution or until the second notch and shoulder 95 engages the foot 94, at which time the spring 97 will return the lever 92 to its declutched position.

The cam element 91 has a slot and pin connection 98 with the lower extremity of the rod 88 and is so constructed that it will actuate the lever 92 to engage the clutch 81 and unlock the disc 96 for rotation upon each upward or downward movement of the said rod 88.

With the parts as shown in Figure 5 of the drawings representing the batchmeter set by the skip and under control of the said batchmeter timing mechanism; at the end of the mixing period the shaft (6^x) is released and a spring in the batchmeter (not shown) moves the parts from full line positions to the dotted line positions.

The angle lever 6^c is rocked to the left raising the rod 88, which in turn raises the cam 91 causing a clutching engagement of the driving element 81 with the worm 82. The foot 94 of the clutch lever 92 having now passed out of the depression 95^a rides on the periphery of the disc 96 holding the clutch 81 engaged. Due to the frictional engagement of the disc 96 with the worm gear 83 one of the cams 84^a will cause the lever 12 to be moved downward thereby actuating the power discharge 40 causing the discharge chute to be turned to discharge position.

Simultaneously with the engagement of cam 84^a and lever 12 or slightly behind the engagement of the said cam and lever, depending upon the desired relations of the

cam 84ª with the cam 84ᵇ, the cam 84ᵇ will engage the skip hoist clutch control lever 6ª thus engaging the skip hoist clutch 17 for elevating the skip to dumping position. The cam 91 has moved up to dotted line position out of the way of the clutch lever 92 so that as the depression 95ª and shoulder 95 reach the foot 94 of the lever 92, the spring 97 will cause a disengagement of the clutch 81, arresting the rotation of the cams 84ª and 84ᵇ.

As the skip reaches its uppermost position and the aggregates begin to slide into the drum, the roller 17′ on the skip bracket will engage the lever 64 whereupon the rod 19 is moved or pulled to the right. This turns on the water and sets the batchmeter, again shifting the parts as seen in Figure 5, to the full line positions. The rod 88 is moved this time downwardly and the cam 91 again causes a half revolution of the disc 96 and the cams 84ª and 84ᵇ. The cams 84ᵇ having been diametrically opposite from the position as shown in Figure 5 moves to the position shown in that figure, but does not function during this half cycle of operation. The other cams 84ª again actuate the lever 12 which in turn actuates the power discharge, thereby turning the discharge chute from discharging to mixing position. The downward movement of the rod 88 causes the upper extremity of the slot 89 to engage the pin 90 on the lever 6ª rocking it downwardly and disengaging the skip hoist clutch 17. The skip is momentarily held by the brake band and dash-pot and then lowered by the safety governor.

In the event of a delayed discharge, the operator will grasp the lever 14ª holding the clutch 17 out of engagement with the skip hoist drum. Since the angle lever or latch member 28 is operatively connected to the skip hoist manual control lever 14, the latch member 28 will prevent the operation of the disc member 96 and cams 84ª and 84ᵇ which of course takes place after the timing mechanism in the batchmeter has tripped and in the event that the operator manually holds the clutch 17 disengage. The disc 96 may rotate a very slight degree, sufficient to position the foot 94 on the periphery thereof. This is in order that the operator by his release of the lever 17 permitting the latch 28 to be withdrawn form the path of the pin or the lever 12 may cause the proper functioning of parts. The lever 12 in turn being now free to swing, releases the cam 84ª and disc 96. The machine will again under these conditions operate synchronously and automatically, it being only necessary to keep the machine supplied with aggregates.

The operation of the clutch knockout mechanism of course occurs in the upward movement of the skip G and there are provided suitable means for holding the skip a few seconds at its upward limit of movement and thereafter causing the skip to lower automatically and with retarded movement under a special brake control. Figure 4 illustrates a means for accomplishing the last mentioned result and embodies a centrifugal operating brake involving a rotor 66 carried by the skip hoist drum and equipped with centrifugal weight levers 67 each connected by toggle links 68 with the opposite ends of a pair of brake shoes 69. The brake shoes 69 act on the interior of a brake drum 70, the exterior of which is provided with ratchet teeth 71 cooperative with a ratchet pawl 72. The brake drum 69 is coaxial with the shaft F′. A clutch flange 73 carried by the skip hoist drum is surrounded and engaged by a clutch band 74. The clutch band 74 is adapted to be applied with clutch engagement to the clutch flange 73 by an actuating lever 75 operable under the control of a dash-pot 77, the piston member 76 of which has a piston rod 78 encircled by springs 79. A pin projecting from the rod 30 sets the dash-pot upon each downward movement of said rod, which occurs at each clutch throwout of the skip hoist clutch.

By the use of the automatic dash-pot and centrifugal brake control above described, the whole operation of the skip G becomes automatic if desired, and subject to interference only as now set forth.

Should it be desired that the skip G not be raised for discharging the same, in synchronism with the discharge of the mixer B by the chute 7, all the operator of the machine has to do is to grasp the handle 14ª of the clutch lever 14 and hold the clutch 17 out of engagement with the drum 18 even though the batchmeter operates to actuate the lever 6ª that would otherwise throw the clutch 17 into active relation with the drum. Under these conditions, of course the drum 18 will not be operated to elevate the skip on account of the manual interference thus set up.

In the event of the condition arising that the bucket C″ is not at the mixer D ready to receive the contents of the latter, manual interference may be established to prevent the operation of the discharge 7 in the following manner. The operator will grasp the handle 14ª of the clutch lever 14 and push said lever to the right as seen in Figure 2 to thereby rock the locking lever 28 previously described until said lever engages in the under side of the batchmeter lever 12. Uuder these conditions, the lever 12 will be held upraised when the batchmeter 6 is set off and the rod 51, see Figure 3, cannot be forced downwards in order to cause the operation of the discharge chute.

It is notable that as the skip G moves downwardly, its member 17 will strike the upper side of the trip lever 20 and will rock

the lever 23 actuating the rod 24 in such a manner as to shut off the connection between the tank 31 and the mixing drum D and re-establish the communication between the water supply pipe 33 and said tank. This action is performed on the batchmeter resetting operation. The tank 31 is thus re-filled in good time so that it may be supplied with a measured quantity of water to be later discharged when the skip ascends to charge the solid aggregates into the mixer.

General operation of mechanism.

Let it be understood that a timed period for the mixing of a batch of concrete aggregates in the mixer D has ended. The batchmeter operates as usual. As it is proposed that the cycles of discharging and charging the drum D are to be synchronized, the immediate objective at this time is to cause operation of the above parts. Thus on the operation of the batchmeter as stated above the arm 12 will move downwards correspondingly moving the rod 51, see Figure 3, and actuating the lever 48 to connect the disc 44 with the worm gear 46. Thereupon the discharge chute through the operation of the parts 11, 11ª, 9 and 10, will be actuated to carry it from its previous non-discharging position to a discharging position. The aggregates in the drum will then flow into the distributing bucket C″.

Simultaneously, with the downward movement of the arm 12, the arm 6ª of the batchmeter 6 moves upwards and causes a rocking of the lever 15 and movement of the connection 16 to carry the clutch 17 of shaft E into engagement with the skip hoisting cable drum 18. The clutch 17 may be a jaw clutch, as illustrated, or a friction clutch, if desired. Thus, as the mixer D is being discharged by the discharge chute 7, the clutch 17 will be operative, to cause the raising of the skip G so that the upward movement of the skip or charging cycle of the machine will take place simultaneously with, or at least materially overlapping the discharging cycle. No time, therefore, is lost as usually incident to omission to raise the skip G until after the discharging cycle is completed.

As the skip G reaches a point near its upper limit of movement, it dumps its contents into the mixer and at such time by engagement of its actuating projection 17′ with the lever 64 the skip exerts a pull on the slotted link 19 and resets the batchmeter for a subsequent operation, namely, a control period which is measured from the time of introduction of the aggregates, and water preferably, into the mixer. Owing to the fact that the collar 19ª on the member 19 strikes the abutment 24ª on the rod 24 when the batchmeter is reset, an outward pull on the rod 24 is effected which throws the three-way valve 21 by actuating its arm 35 so as to discharge the measured quantity of water in the tank 31 into the mixing drum 33. This action is timed to synchronize it with the introduction of the solid aggregates passing from the skip G, and the discharge of the water may be commenced at such suitable point in the upward movement of the skip as to cause an overlapping or synchronization of the charging of aggregates into the mixer and charging of water into the mixer, so no time will be lost in respect to the last mentioned operation. As the skip G reaches its maximum extreme of movement upwards the clutch knockout mechanism is operated to unclutch the clutch 17 from the drum 18, as usual.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States, is:—

1. In a mixing machine of the class described, in combination, a mixer, charging means therefor, discharging means therefor, and means for compelling synchronizing of the actions of the said charging and discharging means to simultaneously discharge the mixer and cause operation of the charging means.

2. In a machine of the class described, in combination, a concrete mixer, water supply means therefor, control means for the water supply means, means for charging solid aggregates into the mixer, means for discharging mixed concrete from the mixer, and means for compelling synchronizing of the actions of the discharging means and the water control means.

3. In a mixing machine, a mixing drum, means whereby to discharge said drum of mixed concrete, means for charging the drum with aggregates to be mixed therein, and batchmeter mechanism for controlling the synchronizing of the operations of the last two means, to overlap their effective discharging and charging operating periods, respectively.

4. In a mixing machine, a mixing drum, means whereby to discharge said drum of mixed concrete, means for charging the drum with aggregates to be mixed therein, and batchmeter mechanism for controlling the synchronizing of the operations of the last two means, water supply means for the mixing drum, and means for synchronizing the operation of said water supply means with the operations of the charging means and discharging means.

5. In a mixing machine, a mixing drum, means whereby to discharge said drum of mixed concrete, means for charging the drum with aggregates to be mixed therein, and batchmeter mechanism for controlling the synchronizing of the operations of the last two means, water supply means for the mixing drum and means for synchronizing the

operation of said water supply means with the operations of the charging means and discharging means, including operating instrumentalities between the charging means and the water supply means.

6. In a mixing machine, in combination, a mixing drum, means whereby to cause discharge of concrete therefrom, a loading skip for charging the drum, clutch control means for operating said loading skip and means for causing simultaneous operation of the said discharging means and the clutch operating means for the loading skip.

7. In a mixing machine, in combination, a mixing drum, means whereby to cause discharge of concrete therefrom, a loading skip for charging the drum. clutch control means for operating said loading skip and means for causing simultaneous operation of the said discharging means and the clutch operating means for the loading skip, including a batchmeter.

8. In a mixing machine, in combination, a mixing drum, means whereby to cause discharge of concrete therefrom, a loading skip for charging the drum, clutch control means for operating said loading skip and means for causing simultaneous operation of the said discharging means and the clutch operating means for the loading skip, including a batchmeter, water supply means for the drum, control means for said water supply means and operating means intermediate the loading skip and the said control means for causing the operation of the water control means simultaneously with the action of the loading skip and the discharge action of the discharging means.

9. In a mixing machine, in combination, a mixing drum, charging means therefor, means whereby to discharge the drum, operating devices for the charging means and the discharging means, and means for actuating said operating devices to cause simultaneous effective action of the discharging means and charging means.

10. In a mixing machine, in combination, a mixing drum, charging means therefor, means whereby to discharge the drum, operating devices for the charging means and the discharging means, and means for actuating the said operating devices to cause simultaneous effective action of the discharging means and charging means, including a batchmeter having control features common to the charging and discharging means.

11. In a mixing machine, in combination, a mixing drum, charging means therefor, means whereby to discharge the drum, operating devices for the charging means and the discharging means, and means for actuating the said operating devices to cause simultaneous effective action of the discharging means and charging means, including a batchmeter having control features common to the charging and discharging means, and means for initiating the operation of the batchmeter from the charging means.

12. In a mixing machine, a mixing drum, means whereby to discharge said drum of mixed concrete, means for charging the drum with aggregates to be mixed therein, and batchmeter mechanism for controlling the action of the aggregates charging means.

13. In a mixing machine, a mixing drum, means whereby to discharge said drum of mixed concrete, means for charging the drum with aggregates to be mixed therein, and batchmeter mechanism for determining the time of a proper mixing period for the aggregates, combined with instrumentalities for causing charging action of the said charging means by the batchmeter.

14. In a mixing machine, in combination, a mixing drum, charging means therefor, means whereby to discharge the drum, operating devices for the charging means and the discharging means, and means for compelling the overlapping of the periods of time during which the charging means and discharging means operate to perform their effective functions.

15. In a mixing machine of the class described, in combination, a mixer, charging means therefor, discharging means therefor, means for compelling synchronizing of the actions of the said charging and discharging means, and a manually operable instrumentality to interfere with the action of the compelling means.

16. In a mixing machine, a mixing drum, means whereby to discharge said drum of mixed concrete, means for charging the drum with aggregates to be mixed therein, batchmeter mechanism for controlling the synchronizing of the operations of the last two means, to overlap their operating periods, and a single manual device to prevent the batchmeter mechanism from causing the operation of the charging means or discharging means, at will.

17. In a mixing machine, a mixing drum, means whereby to discharge said drum of mixed concrete, means for charging the drum with aggregates to be mixed therein, batchmeter mechanism for controlling the synchronizing of the operations of the last two means, to overlap their operating periods, and a single manual device to prevent the batchmeter mechanism from causing the operation of the charging means or discharging means, at will, comprising independent operating parts, certain for the discharging means, and others for the charging means.

18. In a mixing machine, in combination, a mixing drum, means whereby to cause discharge of concrete therefrom, a loading skip for charging the drum, clutch control means for operating said loading skip, means for causing simultaneous operation of the said

discharging means and the clutch operating means for the loading skip, and a manual instrumentality to prevent operation of the discharging means at will.

19. In a mixing machine, in combination, a mixing drum, means whereby to cause discharge of concrete therefrom, a loading skip for charging the drum, clutch control means for operating said loading skip, means for causing simultaneous operation of the said discharging means and the clutch operating means for the loading skip, and a manual instrumentality to prevent operation of the charging means operable also to interfere with the operation of the discharging means.

20. In a mixing machine, a mixing drum, means whereby to discharge said drum of mixed concrete, means for charging the drum with aggregates to be mixed therein, batchmeter mechanism for controlling the synchronizing of the operations of the last two means, to overlap their operating periods, and a single manual device to prevent the batchmeter mechanism from causing the operation of the charging means or discharging means, at will, comprising independent operating parts, certain for the discharging means, and others for the charging means, including connections to interfere with the action of either the loading skip or discharge means.

21. In a mixing machine, in combination, a mixing drum, means whereby to cause discharge of concrete therefrom, a loading skip for charging the drum, clutch control means for operating said loading skip, and means for causing simultaneous operation of the said discharging means and the clutch operating means for the loading skip, including a batchmeter, water supply means for the drum, control means for said water supply means and operating means intermediate the loading skip and the said control means for causing the operation of the water control means simultaneously with the action of the loading skip and the discharging means to supply water to the drum at the same time as the skip charges solid aggregates into the same, and means operable by the skip to reset the batchmeter for operation and cut off the supply of water to the drum.

22. In a mixing machine, in combination, a mixing drum, charging means therefor, means whereby to discharge the drum, operating devices for the charging means and the discharging means, means for actuating said operating devices to cause simultaneous effective discharging and charging actions, respectively, of the discharging means and charging means, and means under control of the charging means for returning the discharging means to non-discharging position.

23. In a mixing machine, a mixing drum, a discharge device for emptying the drum, and a charging device for loading the drum, a time control device for predetermining the period of time necessary to elapse to insure a proper mix of aggregates within the drum, said control device being operatively connected to the drum discharging means to cause a discharge thereof and an operation of the charging device, and means operatively connected to the charging device to cause the resetting of the said time control device and a return of the discharge device to non-discharging position prior to any discharge of the fresh aggregates introduced into the drum by the charging means.

24. In a mixing machine, a mixing drum, a discharge device for emptying the drum and a charging device for loading the drum, a time control device for predetermining the period of time necessary to elapse to insure a proper mix of aggregates within the drum, said control device being operatively connected to the drum discharging means to cause a discharge thereof and an operation of the charging device, means operatively connected to the charging device to cause the resetting of the said time control device and a return of the discharge device to non-discharging position prior to any discharge of the fresh aggregates introduced into the drum by the charging means, and means for returning the charging device to its initial position.

25. In a mixing machine, a mixing drum, a discharge device for emptying the drum and a charging device for loading the drum, a time control device for predetermining the period of time necessary to elapse to insure a proper mix of aggregates within the drum, said control device being operatively connected to the charging device to cause the resetting of the said time control device and a return of the discharge device to non-discharging position prior to any discharge of the fresh aggregates introduced into the drum by the charging means, means for returning the charging device to its initial position, and means under manual control for delaying or interfering with the normal function of the charging and discharging means.

26. In a mixing machine, the combination of a mixing drum, a charging device for delivering aggregates into the drum, a discharging device for removing the aggregates from the drum, and a control device adapted to be set by the charging device for causing a return of the discharging device to non-discharging position, said control device being adapted to cause automatic operation of the discharging device for emptying the drum and automatic operation of said charging device for loading the drum, the

setting of said control device by the charging means being so arranged as to occur just prior to loading the fresh aggregates into the drum.

27. In a mixing machine, the combination of a mixing drum, a charging means, a discharging means and a control device for causing automatic operations of said charging and discharging means, and means for automatically suplying a predetermined quantity of water into the mixing drum with each operation of the charging device.

28. In a mixing machine, the combination of a mixing drum, a charging means, a discharging means and a control device for causing automatic operations of said charging and discharging means, means for automatically supplying a predetermined quantity of water into the mixing drum with each operation of the charging device, and a manual control for interrupting the automatic functions of said charging, discharging and control devices.

29. In a mixing machine, in combination, a mixing drum, means for charging said drum with aggregates, and a batchmeter for automatically causing operation of the charging means.

30. Means as set forth in claim 29, combined with manual means to interfere with the operation of the charging means by the batchmeter.

31. Means as set forth in claim 29, combined with water supply means for the mixing drum operable under the control of the batchmeter.

32. Means as set forth in claim 29, combined with water supply means for the mixing drum operable under the control of the batchmeter indirectly through the action of the charging means.

33. Means as set forth in claim 29, combined with charging means operable under the control of the batchmeter, and manual devices to separately interfere at will with the automatic action of the charging means and the discharging means by the batchmeter.

34. In a concrete mixing machine, in combination, a mixer charging means for feeding concrete aggregates to a mixer, means whereby discharging of the mixer may be effected, and means for causing automatic operations of the charging and discharging means.

35. Means as set forth in claim 34 wherein the automatic means mentioned is arranged to effect a series of continuing operations of the charging and discharging means.

36. Means as set forth in claim 34, wherein the automatic means acts to cause a series of continuing operations of the charging and discharging means, combined with manual devices that may be used at will to delay the actions of either the discharging means or the charging means.

37. In a concrete mixing machine, in combination, a mixer charging means for feeding concrete aggregates to the mixer, means whereby discharge of the mixer may be effected, and means for causing automatic operations of the charging and discharging means, the actions of the charging and discharging means so coordinated as to cause an overlapping of the time of operation of the discharging means with the operation of the charging means so that the discharging means will be operative during the charging cycle of action.

38. Means as set forth in claim 34, wherein the automatic means acts to cause a series of continuing operations of the charging and discharging means, combined with manual devices that may be used at will to delay the actions of either the discharging means or the charging means, the times of operation of the charging and discharging means being coordinated so that the discharging means is made operative during the effective charging operation of the mixer by the charging means, and the necessity of delaying the action of the discharging means until the charging means has finished its effective operation is avoided.

39. In a machine of the kind described having a driving member, charging control mechanism, discharge control mechanism, and automatic mechanism actuated from the driving member for operating said charging and discharge control mechanism in a cycle of timed relation and for continuously repeating said cycle in timed relation.

40. In a mixing machine of the class described, in combination with a skip, of means to raise the skip, means to control lowering thereof, and means for automatically controlling both said operations and for automatically controlling the entire cycle of operation of the skip to rise, discharge, and assume its original receiving position.

41. In concrete mixing apparatus of the class described, in combination, a charging device, means for automatically initiating and causing movement thereof to charging position and for discontinuing movement of the said device at such position, means for maintaining the charging device in charging position for a predetermined length of time, and means automatically initiating its return movement and restoring the charging device to its original position.

In testimony whereof I affix my signature.

JOHN F. ROBB.