

Aug. 7, 1934.

J. W. POULTER

1,969,324

MACHINE FOR RAISING PAVEMENT

Filed June 4, 1931

3 Sheets-Sheet 1

FIG. 1.

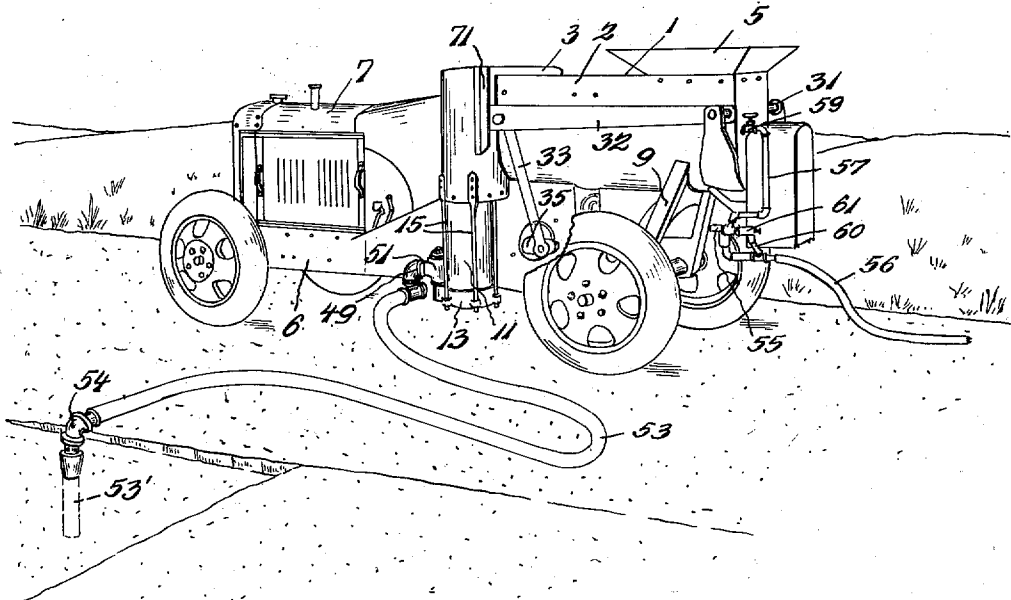
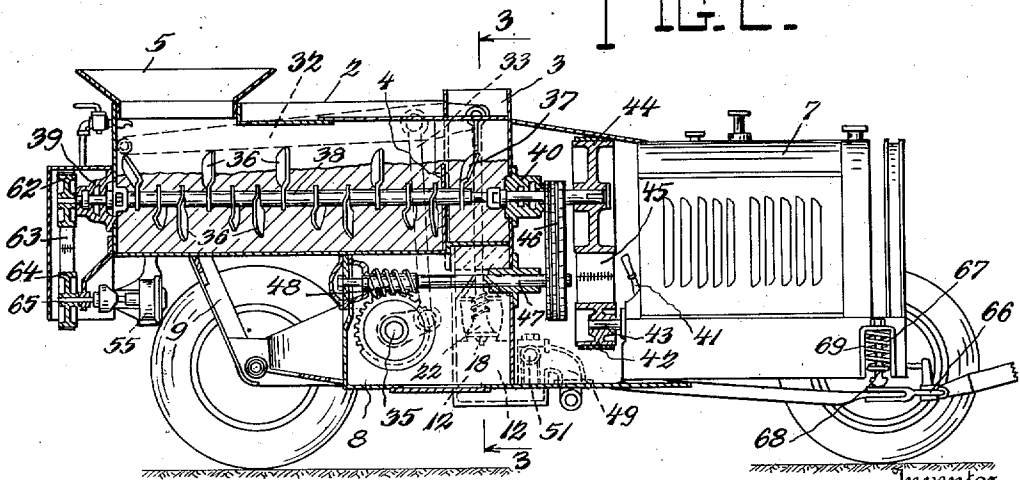


FIG. 2.



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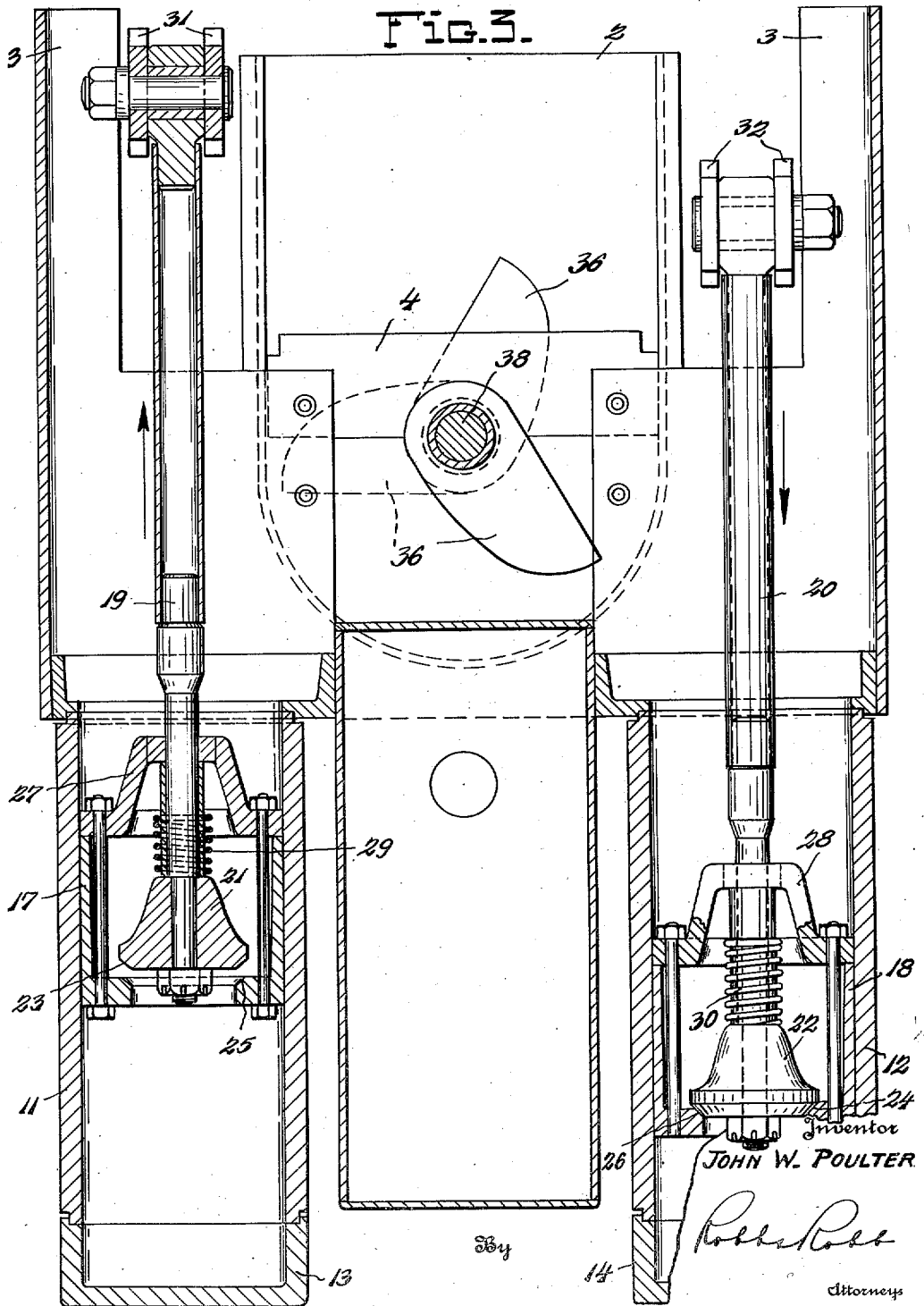
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FIG. 4.

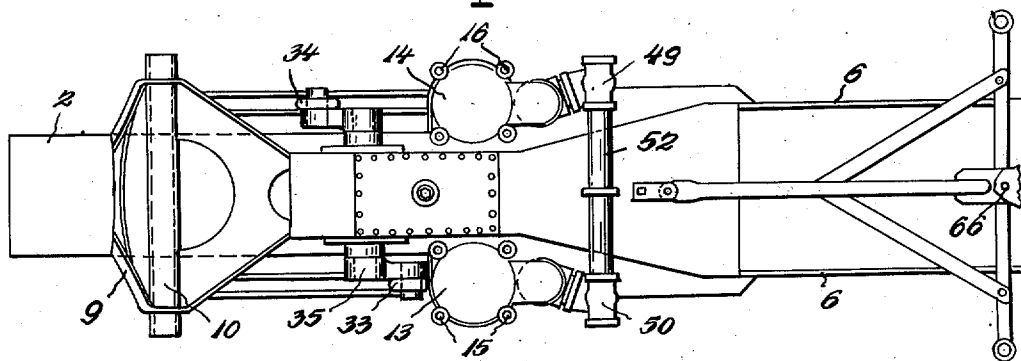


FIG. 5.

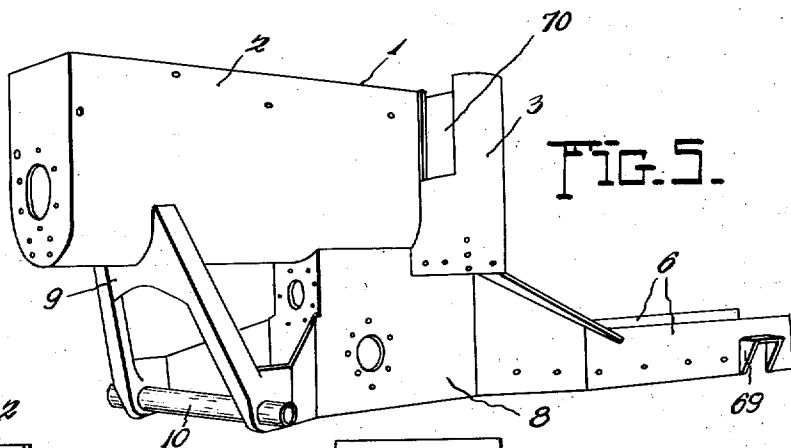


FIG. 7.

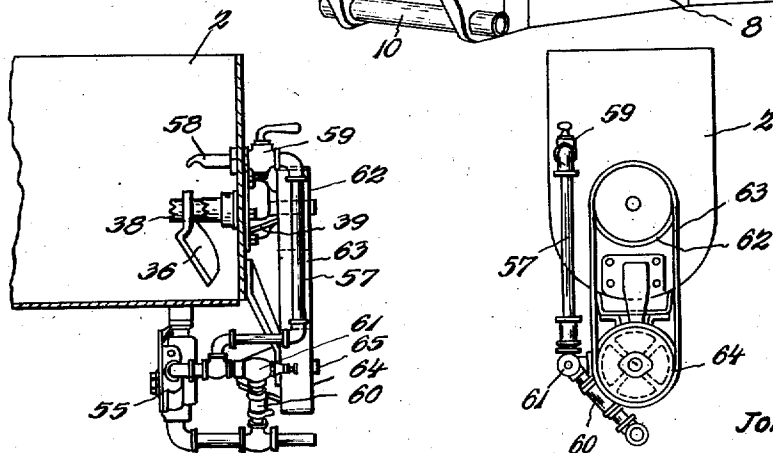


FIG. 6.

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# UNITED STATES PATENT OFFICE

1,969,324

## MACHINE FOR RAISING PAVEMENT

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Application June 4, 1931, Serial No. 542,153

7 Claims. (Cl. 61-63)

This invention relates to a combined mixing and pumping apparatus which is especially designed for carrying out the process described in my Letters Patent No. 1,929,215, issued October 3, 1933 for process of treating sunken pavements.

The apparatus is particularly adapted to building up of pressures behind or on one side of various structures such as masonry slabs, including brick and concrete pavements, walls, floors, and the like, which have become misaligned or have shifted from their original positions, for the purpose of moving the same back to the original position or to a new position by means of hydrostatic pressure. The machine may be also used to raise any structure which has settled due to settlement of the ground about its foundation.

One of the largest fields of use of the apparatus lies in hard surface road construction and maintenance where portions of the paved roadway have become sunken due to settlement of the subgrade, thereby creating an exceedingly dangerous condition, which, if permitted to continue in existence, makes travel over the pavement at high speeds hazardous.

With the apparatus forming the embodiment of the present invention the sunken portion of the roadway may be quickly and readily elevated to its proper position in alignment with the adjacent portions, and this at a considerably less cost than is entailed in the repair by any of the various means heretofore employed. It is to be understood in the beginning, however, that the use of the apparatus is not to be confined to this road repair work, as there are many other uses to which the apparatus is equally well adapted, as will hereinafter more fully appear.

In carrying out the process described in the aforementioned copending application, a mixture of soil, cement and water in the desired proportions is made to form a pressure fluid which is forced by suitable pumping mechanism to the point desired. By drilling holes through the sunken pavement of a roadway at various intervals, the location of which depends upon the location of cracks and other conditions, the pressure fluid may be forced beneath the pavement through the holes successively, thereby filling up the voids in the subgrade and effecting a raising of the pavement to a proper elevation. It is to be understood that the application of the pressure fluid to the slab or depressed portion of the pavement is not to be

confined to the forcing of the same through holes drilled therein, but may be applied to the slab in various other ways. Suitable cuts may also be made in the slab to permit of expansion of the same due to the raising action.

It is also to be understood that the invention is not confined to the utilization of the apparatus solely for the purpose of raising or shifting various objects as it may also be employed as a subgrade filler to fill cavities or voids in the subgrade, in which event it constitutes a preventative. By filling the voids before the pavement or other structure settles, settlement is prevented.

It is an object of the invention to provide a mobile apparatus which serves both as a mixing device for mixing the pressure material, and as a pumping device for delivering the mixed material to the desired point and building up the required pressure.

Another object of the invention is to provide a unitary frame structure which forms the mixing chamber, support for a power plant or unit, housing for a power take-off, and traction wheel support, thereby eliminating the necessity of a separate chassis or subframe.

A further object of the invention is to prevent passage of the pressure materials to the pumping mechanism before the said materials become thoroughly mixed.

A still further object is to provide a simple and ready control for varying the consistency or fluidity of the pressure materials.

Other and further objects and advantages of the invention will be hereinafter set forth and the novel features thereof defined by the appended claims.

In the drawings,

Figure 1 is a perspective view of the apparatus as used for raising a sunken portion of pavement,

Figure 2 is a longitudinal sectional view of the apparatus, the forward portion thereof being shown in elevation,

Figure 3 is a sectional view taken approximately on the line 3-3 of Figure 2,

Figure 4 is a bottom plan view,

Figure 5 is a perspective view of the unitary frame structure,

Figure 6 is a fragmentary detail view showing the water pump circulating system, and control therefor, and

Figure 7 is an end view of the parts shown in Figure 6.

Like reference characters designate corresponding

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ponding parts in the several figures of the drawings wherein 1 denotes generally a unitary frame structure forming a substantially U-shaped or trough-shaped mixing chamber 2, at one end of which is positioned a supplemental mixing chamber 3 constituting a temporary storage chamber. The mixing chambers are separated by a baffle 4 which extends upwardly from the bottom of the chambers less than the full height of the said chambers. At one end of the mixing chamber 2 is a hopper 5 into which the materials to be mixed are placed for entrance into the mixing chambers. Extending forwardly of the mixing chambers, in spaced relation to each other are the longitudinal beam members 6 which constitute the support for the power plant or motor unit generally denoted by the reference character 7. Below the mixing chambers and at the rear of the longitudinally extending members 6 is formed a power take-off or gear housing 8 to which is connected a brace member 9 for supporting the rearward end of the mixing chamber 2. A housing 10 extends transversely of the frame member in which the rear axle is positioned. All of the foregoing parts are preferably welded together to provide a rigid unitary structure which eliminates the use of a separate chassis or subframe for supporting the various chambers.

Suspended from the chamber 3 in any suitable manner are the cylinders 11 and 12, said cylinders being preferably provided with removable heads 13 and 14 which may be secured in position by the tie rods 15 and 16. Located within the cylinders are pistons 17 and 18 each of which includes a head having a longitudinal bore or passage through the same, the heads being slidably mounted on piston rods 19 and 20. Fixedly secured to the ends of the rods are valves or plug members 21 and 22 having tapered faces 23 and 24 adapted to engage the seats 25 and 26 formed in the heads. Positioned intermediate the valves 21 and 22 and the bails 27 and 28 for the piston heads are suitable cushioning springs 29 and 30 to absorb the shocks incident to the longitudinal displacement of the valves with respect to the heads on the return strokes.

Pivotaly connected to the piston rods at their upper ends are walking beams 31 and 32 which are in turn pivotaly connected at their opposite ends to the mixing chamber 2. Connecting rods 33 and 34 are pivotaly connected to the walking beams intermediate the ends thereof, said connecting rods being journalled on a suitable crank shaft 35, having a one hundred and eighty degree throw.

Positioned within the mixing receptacle 2 are suitable agitating or mixing instrumentalities in the form of radially extending paddles or blades 36 mounted on a shaft 38 extending longitudinally of the chamber. It is also preferable to provide the auxiliary or temporary storage chamber 3 with one or more blades as at 37 to keep the materials mixed until they are passed to the cylinders 11 and 12 which constitute the pressure chambers. The blades are so arranged as to pass the materials being mixed longitudinally of the chambers, thereby causing the mixed materials to assume a greater depth at the end of the chamber opposite to the material receiving end. The baffle 4 prevents passage of the materials to the chamber 3 and cylinders before they have become thoroughly mixed, it being necessary for the materials to flow up

over the baffle in order to enter the chamber 3. The shaft 38 is carried by the combined bearing and stuffing box units 39 and 40 located at the opposite ends of the mixing chambers.

The power means for driving the mixing instrumentalities and the pistons may be of any conventional type, being preferably provided with a clutch control 41 to permit interruption of the power at will. Suitable pulleys, 42 on the end of the power shaft 43, and 44 on the end of shaft 38 are provided, being connected together by belt 45. The crank shaft 35 is driven from the shaft 38 through a sprocket and chain connection 46, shaft 47 and worm gears 48. In the event clogging occurs in the pumping mechanism or the mixing instrumentalities become wedged, no harm will result since the belt 45 will slip and for this reason, it has an advantage over a positive drive.

Extending from the cylinders or pressure chambers 11 and 12 are discharge connections 49 and 50 in which are located suitable check-valves 51. The connections are joined by a pipe 52 to provide a common discharge connection to which a preferably flexible conduit 53 is connected, such as a length of heavy hose. The end of this conduit is provided with an elbow 54 to which an expansible and flexible nozzle 53' is attached. By inserting the nozzle into an aperture drilled in the pavement, the pressure exerted by the pump apparatus expands the nozzle within the aperture to maintain the same in position without further additional securing or anchoring means.

For the purpose of controlling the consistency or fluidity of the pressure materials, the apparatus is preferably provided with a water pump as shown at 55 having a preferably flexible intake conduit 56 which may be lead to the water supply. The water is forced from the pump through pipe 57 and discharged from the spout 58 into the mixing chamber 2, a control valve 59 being provided to control the discharge. A by-pass 60 extends between the intake and discharge pipes for the purpose of continuously by-passing the water through the pump when the control valve 59 is closed, thereby avoiding the necessity of stopping the pump when sufficient water has been discharged into the mixing chamber. A suitable automatic valve 61 is positioned in the by-pass connection for the purpose of preventing flow through the by-pass when the control valve 59 is open, the valve 61 opening by the back pressure when valve 59 is closed. The pump may be driven from the shaft 38 through pulley 62 belt 63 pulley 64 and shaft 65.

The operation of the apparatus should be apparent from the foregoing and may be briefly described as follows:

The holes having been bored to receive the nozzle, the same is positioned therein and the apparatus placed in operation by means of the clutch control 41. The materials to be mixed are dumped or shoveled through the hopper 5 into the mixing chamber 2, a suitable quantity of water being added by manipulating the control valve 59. Rotation of the shaft 38 and blades 36 thoroughly mixes the materials into a creamy mud fluid whereupon it is passed into the temporary storage chamber 3 under the influence of the blades 36, the mixing action being preferably continued in the latter chamber. On the up-stroke of the pistons in the cylinders, the valves are withdrawn from their seats in

the piston heads by virtue of the slidable connection between the piston rods and the heads, and the mixed materials are passed from the chamber 3 through the pistons into the cylinders or pressure chambers. The piston valves are positively closed on the down-strokes and the materials in advance of the cylinders are placed under compression and forced through the check valves in the discharge connections to flow evenly through the conduit 53 and discharge nozzle 53'. When the desired quantity of pressure material has been discharged, the apparatus may be stopped and the nozzle transferred to another position as is more fully described in the co-pending application.

Suitable draft connections, generally designated 66 are preferably provided for the purpose of moving the apparatus from place to place. The forward end of the machine is also preferably yieldably supported by suitable springs 67 positioned intermediate the front axle 68 and the abutments 69 formed on the longitudinal power unit supports.

To permit reciprocation of the pistons by the crank shaft through the medium of the walking beams, the chamber 3 is slotted or notched as at 70 and 71 to afford free up and down movement of the walking beams.

While the specific details of construction have been herein shown and described, the invention is not confined thereto as changes and alterations may be made without departing from the spirit thereof as defined by the appended claims.

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

1. In an apparatus of the class described, a mixing chamber, mixing instrumentalities therein, a pressure chamber for receiving mixed materials from said mixing chamber, a reciprocable piston in said pressure chamber for said mixed materials, a temporary storage chamber intermediate said mixing and pressure chambers, mixing instrumentalities in said storage chamber, driving means for operating said mixing instrumentalities and reciprocating said piston, and means communicating with said pressure chamber for directing the mixed material to a desired point of emplacement beneath a concrete slab or the like, said piston and driving means constituting a pressure system serving to impart a pressure to said mixed materials in an amount sufficient to create a lifting action on said slab.

2. In an apparatus of the class described, a mixing chamber for receiving the materials to be mixed, mixing instrumentalities therein, a pressure chamber, a reciprocable piston in said pressure chamber, means for transferring the mixed materials from the mixing chamber through the piston to the pressure chamber, means communicating with said pressure chamber for placing the transferred materials under pressure for delivery at a desired point, and means for actuating said mixing instrumentalities and said piston.

3. In an apparatus of the class described, a mixing chamber for receiving the materials to be mixed, mixing instrumentalities arranged therein, a pressure chamber associated with said mixing chamber for receiving mixed materials from said mixing chamber, a piston in said pressure chamber including a head having a longitudinal passage therethrough, a valve seat

in said head, a piston rod on which said head is slidably mounted, said rod having a valve fixedly secured to the end thereof for cooperation with the seat in said head to close the passage through the head on the pressure stroke, said valve being adapted to be withdrawn from engagement with the seat on the return stroke to open the passage through the piston, means for cushioning the withdrawal movement of the valve with respect to the head, a walking beam pivotally secured to the mixing chamber at one end and having a pivotal connection with the piston rod at the other end, a crank shaft, driving means for said crank shaft, and a connecting rod having one end connected to said crank shaft and being connected at the opposite end to the walking beam at a point intermediate the ends of the latter, said materials in said mixing chamber being transferred to said pressure chamber incident to reciprocation of said piston for delivery under pressure at a desired point.

4. In an apparatus of the class described, a mixing chamber for receiving the materials at one end thereof to be mixed, instrumentalities disposed in said mixing chamber for mixing the materials, said instrumentalities being adapted to pass the materials longitudinally of the mixing chamber, a temporary storage chamber at the opposite end of the mixing chamber and separated therefrom by a baffle of less height than the height of said mixing chamber, said baffle constituting means for preventing the passage of unmixed materials to the storage chamber, a pressure chamber communicating with said storage chamber, a piston in said pressure chamber, means in said piston for interrupting the communication between said pressure and storage chambers incident to reciprocation of said piston, said materials being transferred from said storage chamber to said pressure chamber incident to reciprocation of the piston, driving means for said mixing instrumentalities and piston, and means for conducting said materials under pressure from said pressure chamber to a desired point.

5. In an apparatus of the class described, a mixing chamber, mixing instrumentalities therein, a temporary storage chamber separated from said mixing chamber by a baffle member of less height than said mixing chamber, a pressure chamber communicating with said storage chamber, a reciprocable piston in said pressure chamber, a valve in said piston adapted to be closed on the pressure stroke of the piston to interrupt the communication between said storage and pressure chambers, a discharge connection for said pressure chamber, a check valve in said connection, a flexible conduit secured to said connection and including an expansible nozzle secured to the free end thereof for insertion in an aperture, the expansion of said nozzle by the pressure in the conduit and pressure chamber constituting the means for maintaining said nozzle in the aperture, a water pump associated with the mixing chamber, said water pump having a flexible intake conduit and a discharge conduit for effecting discharge in said mixing chamber, a control valve in said discharge conduit, a by-pass connection between said intake and discharge conduits, an automatic valve in said by-pass connection adapted to be normally closed when said control valve is open and to be opened by the back pressure when the control valve is closed, and drive mechanism for said water pump, mixing instrumentalities, and

piston, said drive mechanism including a clutch for controlling the operation of the same at will.

6 6. A unitary frame structure for apparatus of the class described, including a trough-shaped mixing chamber having a transversely extending storage chamber at one end thereof and a chamber-separating partition extending less than the full height of said mixing chamber, spaced power plant supporting members extending longitudinally from said chambers, and a power take-off housing beneath said chambers.

10 7. A unitary frame structure for apparatus of

the class described, including a trough-shaped mixing chamber having a transversely extending storage chamber at one end thereof and a chamber-separating partition extending less than the full height of said mixing chamber, spaced power plant supporting members extending longitudinally from said chambers, a power take-off housing beneath said chambers, and a brace member extending from said housing to the mixing chamber adjacent to the free end thereof.

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CERTIFICATE OF CORRECTION.

Patent No. 1,969,324.

August 7, 1934.

JOHN W. POULTER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, lines 42 and 43, claim 1, strike out the words "for said mixed materials" and insert the same after "chamber" in line 43; and line 62, claim 2, for "though" read through; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of September, A. D. 1934.

Leslie Frazer

Acting Commissioner of Patents.

(Seal)

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