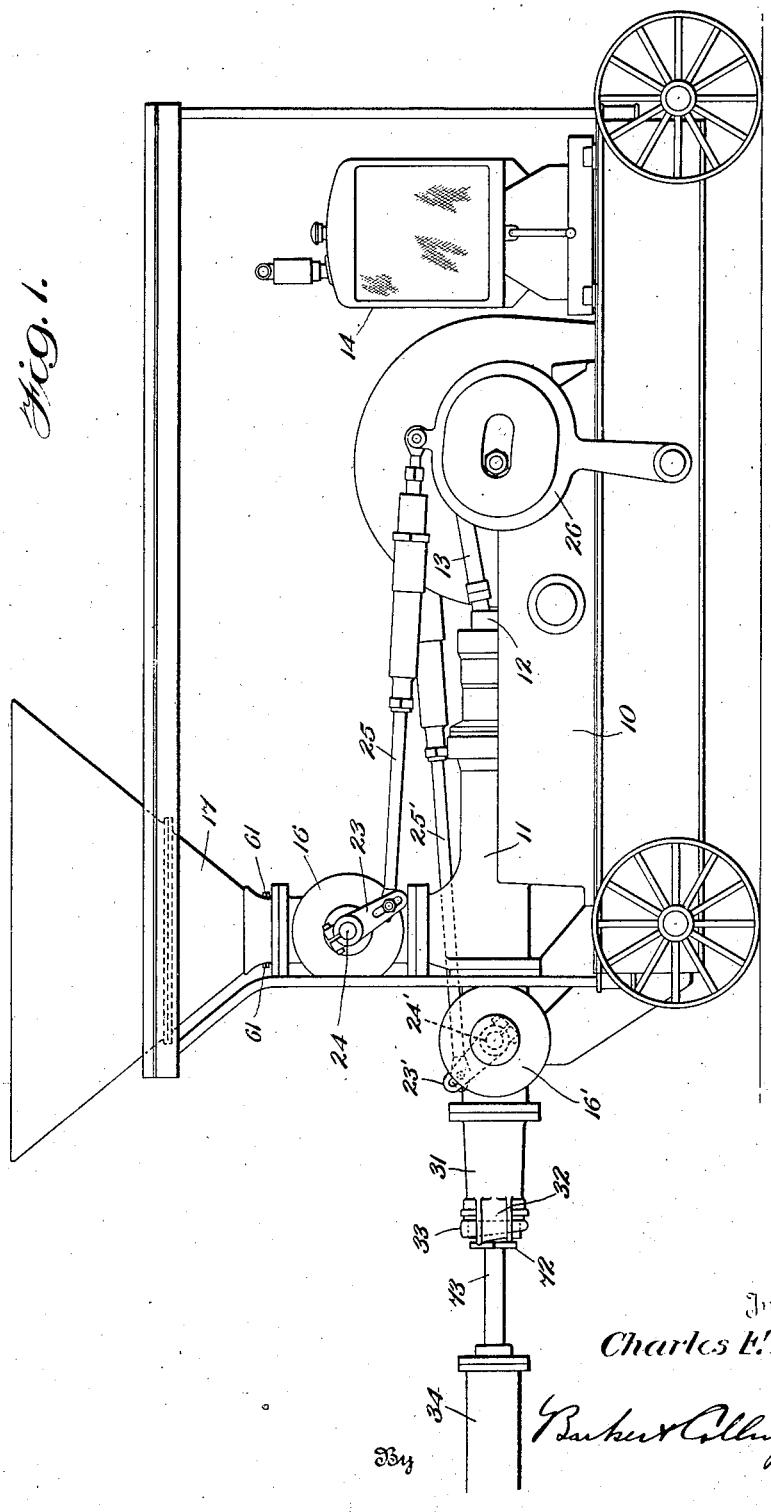
Sept. 3, 1935. C. F. BALL 2,012,944

CONCRETE PUMP

Filed Jan. 16, 1933 2 Sheets-Sheet 1

Fig. 1.



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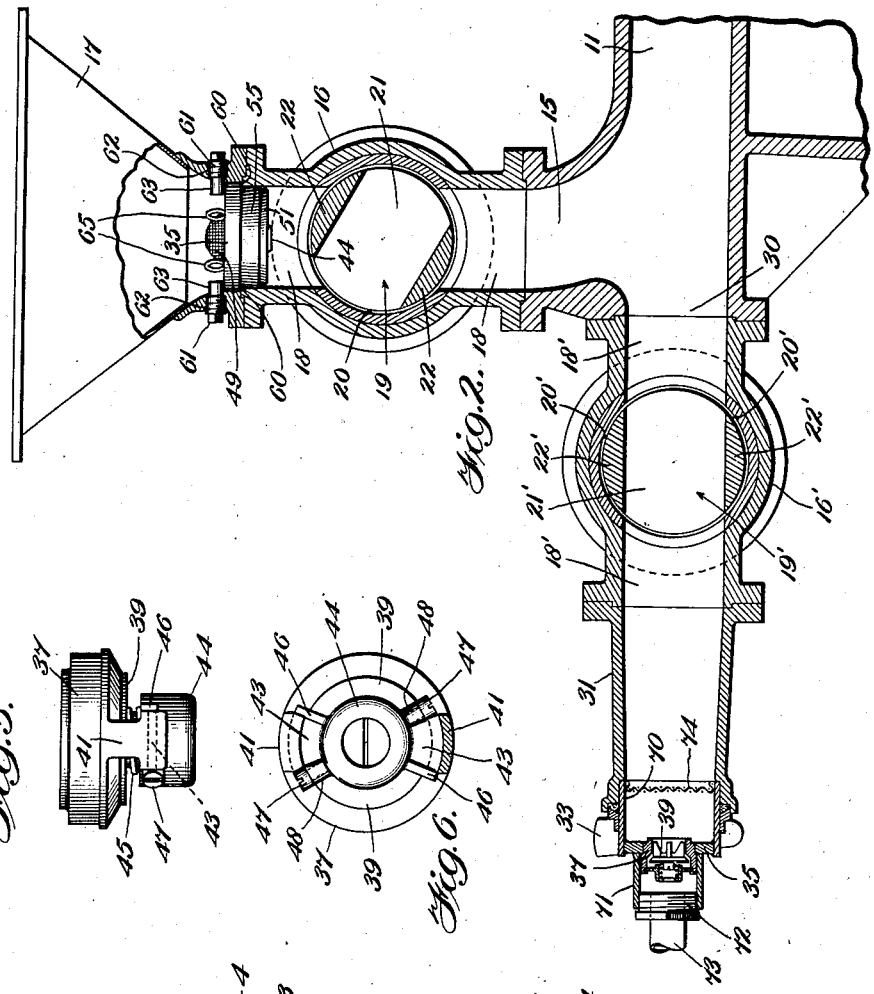

Fig. 2.

Fig. 5.

Fig. 6.

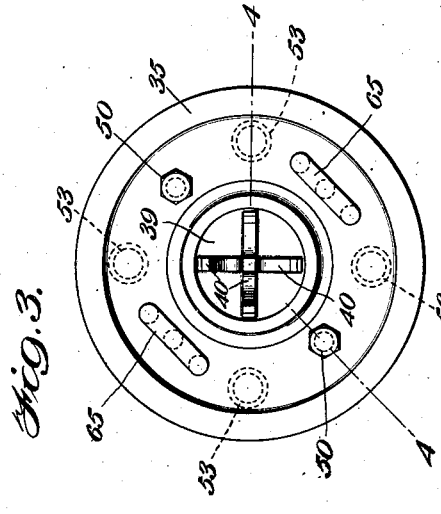

Fig. 3.

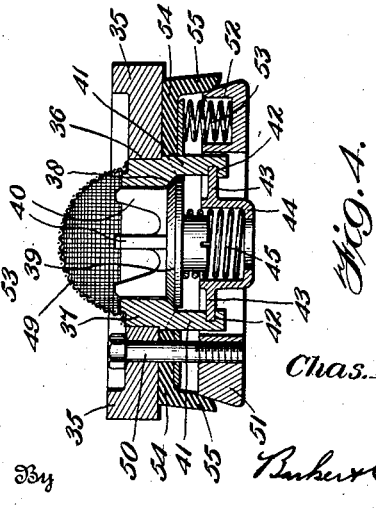

Fig. 4.

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CONCRETE PUMP

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Application January 16, 1933, Serial No. 652,076

5 Claims. (Cl. 103—204)

This invention relates to pumps for concrete and other plastic mixtures having physical characteristics similar thereto, and more particularly to a recently developed type of concrete pump in which the valves are never completely closed but on the other hand are moved from a fully open position to a partly closed position in which they only partially restrict the passages through which the mixture is moving, advantage being taken of the peculiar stowing property of the mixture upon meeting such a restriction to effectively prevent reverse movement thereof.

In pumps of this type there is thus always present a more or less open passageway whether the valve be in fully open position or in fully restricting position, and the pumps are of course incapable of efficiently handling liquids, since these would freely flow back and forth through the valves, even when the latter were in their most nearly closed positions. On the other hand it is highly desirable at certain times to be able to pump water, for example, with such a pump, for the purpose of forcing the same through the discharge line or sections thereof to remove adhering portions of the mixture.

It is the principal object of the present invention therefore to provide simple and effective means whereby pumps of this character which heretofore have been incapable of pumping clean water may be quickly and readily enabled to do so.

A further object of the invention is to provide means for thus converting the concrete pump into a liquid pump and vice versa, which may be readily put in place and removed, so as not to interfere with the proper functioning of the normal concrete handling valves.

A still further object of the invention is to provide a set of supplemental liquid valves which may be readily introduced into the pump and removed therefrom without removing or in any way interfering with the concrete handling, valves, and which when in place will automatically function independently of such concrete handling valves to enable the pump to efficiently handle liquids which are passed through the concrete handling valves, thereby effectively flushing and cleaning the latter.

With the above and other objects in view which will appear as the description proceeds, the invention consists in the novel details of construction and combinations of parts more fully hereinafter described and particularly pointed out in the appended claims.

Referring to the accompanying drawings forming a part of this specification in which like reference characters designate like parts in all the views:—

Figure 1 is a side elevational view, more or less diagrammatic, of one form of concrete pump to which the present invention may be applied;

Figure 2 is an enlarged vertical sectional view, partly in elevation, through the inlet and outlet passages and valves of the pump shown in Figure 1, and illustrating the supplementary or auxiliary liquid handling valves in operative positions relative to the concrete handling valves;

Figure 3 is a top plan view of the complete liquid handling valve structure employed in the inlet passage of the pump;

Figure 4 is a vertical sectional view of the valve structure shown in Figure 3 taken approximately on the plane indicated by the line 4—4 of the latter figure;

Figure 5 is a detail side elevational view of the valve and valve housing shown in Figures 3 and 4; and

Figure 6 is a bottom plan view partly broken away of the parts shown in Figure 5.

Referring more particularly to Figure 1 the concrete pump there shown comprises a base member 10 which carries a cylinder 11 within which is reciprocably mounted a piston 12 adapted to be moved back and forth within the said cylinder by means of a connecting rod 13 operated by a crank mechanism, not shown, which in turn is driven from an internal combustion engine or other prime mover located within the housing 14. The cylinder 11 has communicating with it an inlet passage 15, see Figure 2, which passage is controlled by a valve 16, here shown as of the oscillating plug type. A feed hopper 17 surmounts the valve 16 and is adapted to feed concrete or other analogous plastic mixture to the passage 18 of the said valve.

The valve plug 19 is of somewhat smaller diameter than the interior of the housing of the valve 16 to provide a clearance 20 between the parts which clearance, while not objectionable but in fact beneficial, so far as the concrete mixture is concerned, tends to render the valve inefficient in so far as the handling of liquids is concerned. The plug 19 is furthermore provided with a passage 21 which in the open position of the valve is arranged to align with the passages 18 and which in the most restricted position is moved only to a point substantially as indicated in Figure 2 in which the solid portions 22 of the plug fail to completely cut off communication through the valve but leave an open, although restricted

pasageway therethrough, which further reduces the capability of the valve for handling liquids as will be readily understood. The said valve plug 19 is journalled in the valve housing 16 for oscillatory movements which are imparted by means of the valve arm 23 carried by the shaft 24 of the valve plug, which arm is actuated through connecting rod assembly 25 from a rocker arm assembly 26 actuated by suitable cams upon the crank shaft.

The cylinder 11 is further provided with an outlet port 30 which communicates with an outlet valve 16' which is similar in construction to the inlet valve 16, and the corresponding elements of which have been designated by the primes of the corresponding reference characters. It has been assumed in Figure 2 that the piston 12 of the pump is making a pressure stroke, and the valve plug 19' of the outlet valve has consequently been shown in the fully open position, while the plug 19 of inlet valve 16 is illustrated in its most restrictive position.

The outlet valve 16' discharges into a short section of pipe 31, the outer end of which is provided with a suitable detachable pipe coupling here shown as comprising a pair of lateral ears 32, and a pair of wedges 33, which may be employed for wedging the flange of the first section of the discharge pipe 34 into place in cooperative relation with the short section 31, as will be readily understood by those skilled in the art.

In order to render the pumping mechanism just described effective for the handling of wash water, for the purpose of cleaning out the discharge line, there is provided a supplemental inlet valve structure best shown in Figures 2 to 6 inclusive. This structure comprises a disk or similar member 35 provided with an axial bore 36 into which is pressed or otherwise rigidly secured the cage or housing member 37 of the valve proper. The said cage is provided with a valve seat 38 adapted to coact with the complementary surface of the valve disk 39, which latter may be provided with the spider 40 for guiding it within the said housing. The housing is provided with a pair of depending legs 41 which are recessed as at 42 to receive the ears 43 of a cup-shaped member 44 which serves as a seat and housing for a helical spring 45 which normally urges the valve disk 39 to closed position against its seat 38, as will be readily understood from Figure 4. The ears 43 are preferably provided with the perpendicular lugs 46 which engage one side of the legs 41 to prevent arcuate movement of the ears in the recesses 42 in one direction, while movement in the opposite direction may be prevented by screws 47 received in bosses 48 provided on the said ears and which screws engage with the opposite sides of the said legs 41. A screen or strainer 49 may be welded or otherwise rigidly secured to the cage member 37, substantially as shown in Figures 2 and 4.

A pair of bolts 50 (see Figures 3 and 4) extend downwardly through the disk member 35 and their lower threaded ends engage a follower disk 51, which latter is provided with a plurality of recesses 52 serving as seats for coil springs 53. A leather, rubber or other yielding cupped packing 54 is interposed between the disk 35 and the follower 51 and the outer circumference of the said follower 51 is preferably beveled or tapered, as clearly shown in Figure 4, so that as the follower is drawn up toward the disk 35 through rotation of the bolts 50, the annular flange 55 of the packing member will be spread outwardly, as will be readily understood. Such movement of the follower 51 of course is against the compression of the springs 53, which latter serve to move the follower downwardly again when the bolts 50 are backed off, thus permitting the flange 55 of the packing to contract.

When it is desired to use the pump for pumping water or the like, a supplemental valve structure such as has been just described is introduced into the upper inlet passage 18 of the inlet valve 16 by inserting it through the hopper 17 until the disk member 35 engages the shoulder 60, which is provided in the present instance by the joint between the hopper 17 and the valve housing 16. During this insertion the bolts 50 are of course backed off so that the flange 55 of packing 54 is contracted and permits the ready movement of the valve assembly into place. Thereafter the bolts 50 are turned to draw the follower 51 upwardly and thus expand the flange 55 of the packing member 54 against the wall of the passage 18 and thus provide a liquid tight joint between the valve assembly and the said wall. A pair of plugs 61 are also preferably screwed into apertures 62 provided in the wall of the base member of the hopper 17, said plugs having extensions 63 which engage with the upper surface of the disk member 35 and prevent the valve assembly from being forced outwardly on the pressure stroke of the pump piston.

Upon operation of the piston in the normal way, if water instead of plastic mixture be introduced into the hopper 17, upon the suction stroke of the piston, during which the valve plug 19 is in wide open position, the suction created by the piston will unseat the valve 39 against the pressure of its spring 45 and permit the water from the hopper 17 to be drawn through the passages 18, 21 and 15 into the cylinder 11. At the completion of the suction stroke the valve 39 will be reseated as the piston begins its pressure stroke and the water which has been drawn into the cylinder will be forced out through the port 30, passages 18', 21' and the pipe section 31. The water is thus passed through all chambers and passages of the pump, including the concrete handling valves 16 and 16', and through the discharge line 34, effectively flushing the same and removing all adhering portions of the plastic mixture. At the completion of the flushing operation the plug members 61 are removed, bolts 50 are backed off and the water valve elevated out of the hopper whereupon after replacing the plugs 61 the pump may be operated in its normal manner as a concrete pump. A pair of eye-bolts 65 may be provided in the disk member 35 to facilitate the placement and removal of the inlet valve assembly as will be readily understood.

The same sort of water valve assembly may be employed in the outlet line but it is preferred to use a slightly different construction, such as that illustrated at the left of Figure 2. That is to say, the disk 35 in this instance is welded or otherwise rigidly secured within one end of sleeve 70, which in turn has welded or otherwise secured to it a somewhat smaller sleeve 71, constituting an extension and a housing for the valve member, as well as a connection into which a plug 72 may be screwed. A water pipe or nozzle 73 is carried by the plug 72 and serves to conduct the water to the discharge line 34. The valve may be protected by a screen or strainer 74 mounted in the sleeve 70. The valve cage 37, valve 39 and other parts illustrated in Figures 5 and 6, are in

this outlet valve assembly identical with those previously described in connection with the inlet valve assembly.

The outlet valve assembly is placed in position by detaching the first section of the discharge conduit **34**, which is usually a short section, and substituting therefor the valve assembly just described which is retained in position by means of the wedges **33** and ears **32** above mentioned. The water forced through the outlet valve **16'** and the pipe section **31** will pass the valve **39**, which is opened against the pressure of the spring **45**, and flow through the pipe **72** and into the discharge conduit sections, as will be readily understood. The conduit **34** is usually flushed in its assembled condition, although if necessary or desirable the sections may be dismantled and flushed one at a time. After the flushing operation is completed the outlet valve assembly may likewise be removed from the position shown in Figure 2 and the discharge conduit connected up to pipe **31**, whereupon the pump will function as an ordinary concrete pump.

In some instances it may be found desirable to omit the valve spring **45** and permit the valve **39** to function as a gravity controlled check valve which is normally open, and which is closed solely through the action of the water on the pressure stroke of the pump piston. This will avoid the formation of air pockets in the pump.

It is obvious that those skilled in the art may vary the details of construction as well as the precise arrangement of parts without departing from the spirit of the invention, and therefore it is not wished to be limited to the above disclosure except as may be required by the claims.

What I claim is:

1. Means for facilitating the washing of the elements of a concrete pump of the type having a pressure member, mixture passages, and valves which are inherently incapable of efficiently pumping ordinary fluids, comprising additional valve means capable of efficiently handling washing fluids, removably positioned in and controlling the mixture passages of the apparatus, whereby washing fluid may be circulated therethrough by means of the pressure member of the pump.

2. Mechanism for facilitating the washing of the elements of a concrete pump and connections, said pump having a pressure member, inlet and outlet passages and valve means which are inherently incapable of efficiently handling washing fluids controlling said passages, said mechanism comprising an additional set of valves capable of efficiently handling washing fluids, removably positioned in and controlling said inlet and outlet passages without removal of said first named valve means, whereby washing fluid may be circulated through the passages, connections, and the concrete handling valves of the pump, by means of the pressure member of the pump.

3. Mechanism for facilitating the washing of the elements of a concrete pump and connections, said pump being of the type having a pressure member, inlet and outlet passages, and valves controlling said passages which are inherently incapable of efficiently pumping washing liquids, comprising supplemental valve structures capable of efficiently handling washing liquids, removably positioned in the inlet and outlet passages respectively ahead of and beyond the inlet and outlet concrete-handling valves, whereby the latter valves may be cleaned by washing liquid circulated through the pump by means of the pressure member thereof.

4. Mechanism for facilitating the washing of the elements of a concrete pump of the type having a mixture passage and a concrete handling valve which is inherently incapable of efficiently handling washing liquids, comprising a supplemental valve structure capable of efficiently handling washing liquids, arranged to be removably positioned in said mixture passage of the pump, said structure including an expansible packing member, a follower, and means for moving said follower to expand said packing member and thereby provide a liquid-tight joint between the valve structure and the wall of the mixture passage.

5. Mechanism for facilitating the washing of the elements of a concrete pump of the type having a mixture passage, and a concrete handling valve which is inherently incapable of efficiently handling washing liquids, comprising a supplemental valve structure capable of efficiently handling washing liquids, arranged to be removably positioned in said mixture passage of the pump; and means engageable with the wall of said passage for positively retaining said structure in place against unintentional displacement.

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