April 4, 1967 E. W. HACKER 3,312,176

PUMPING MACHINE FOR HEAVY FLOWABLE CEMENTITIOUS MATERIALS

Filed March 12, 1965 4 Sheets-Sheet 1

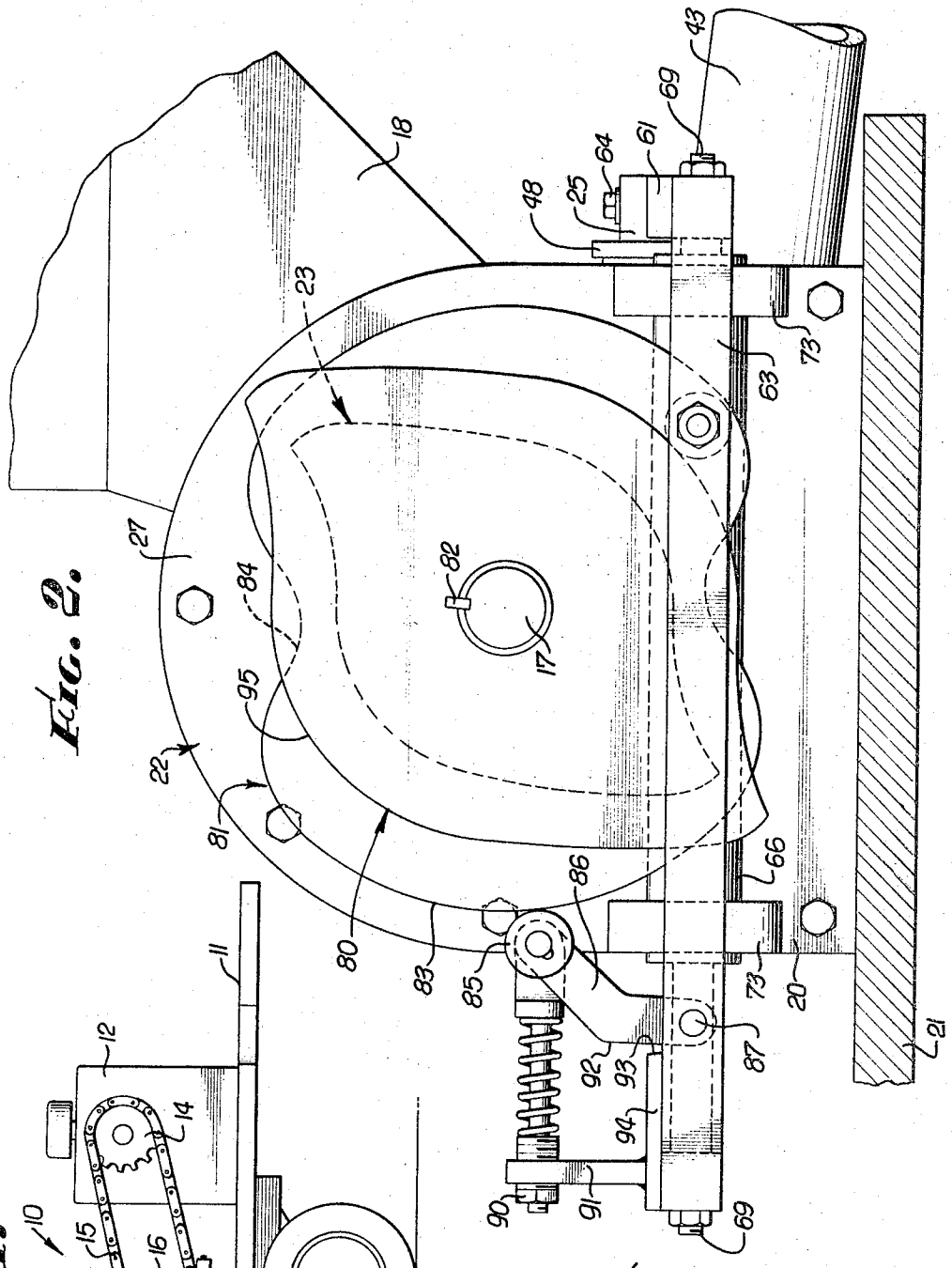


FIG. 2.

FIG. 1.

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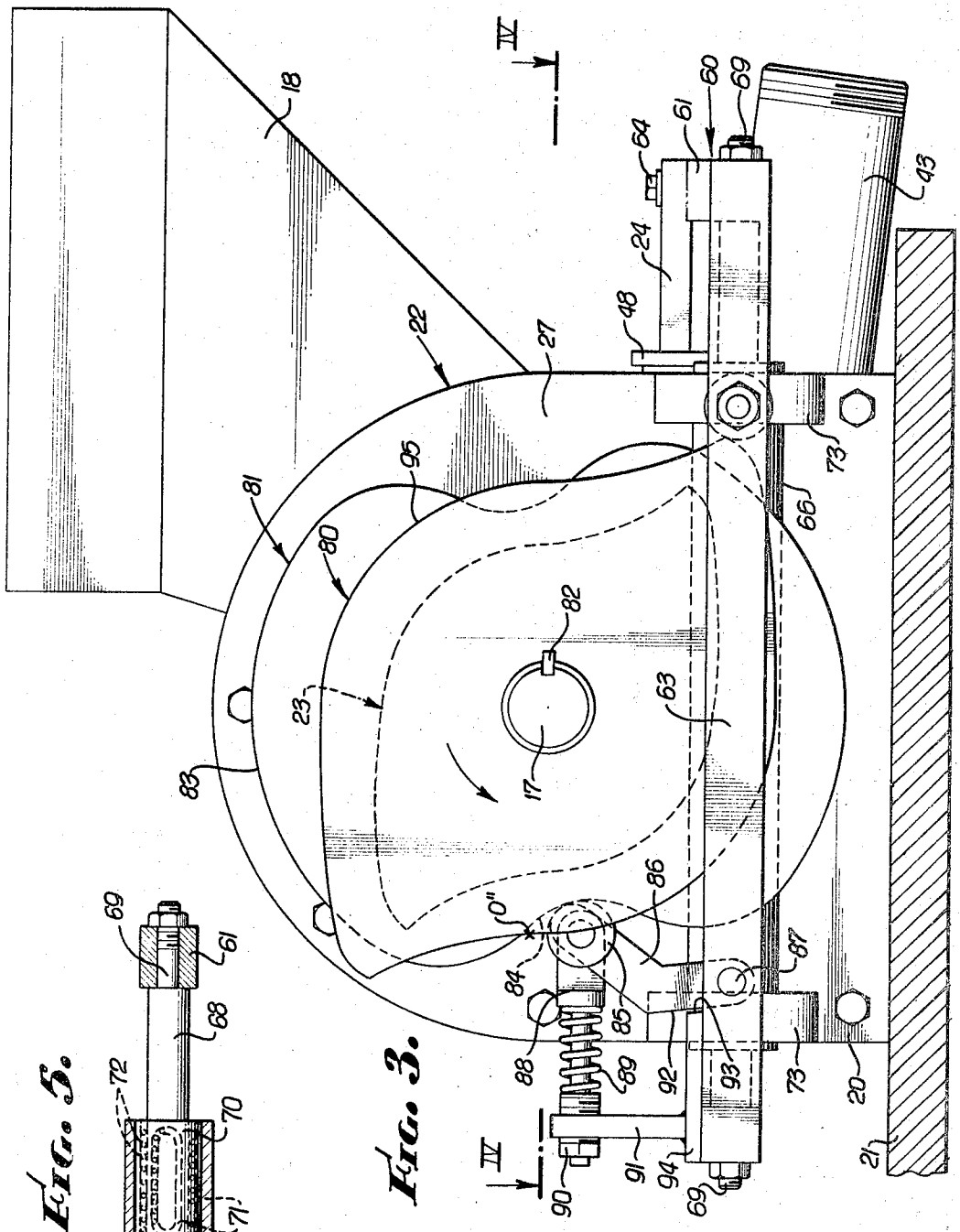


FIG. 3.

FIG. 5.

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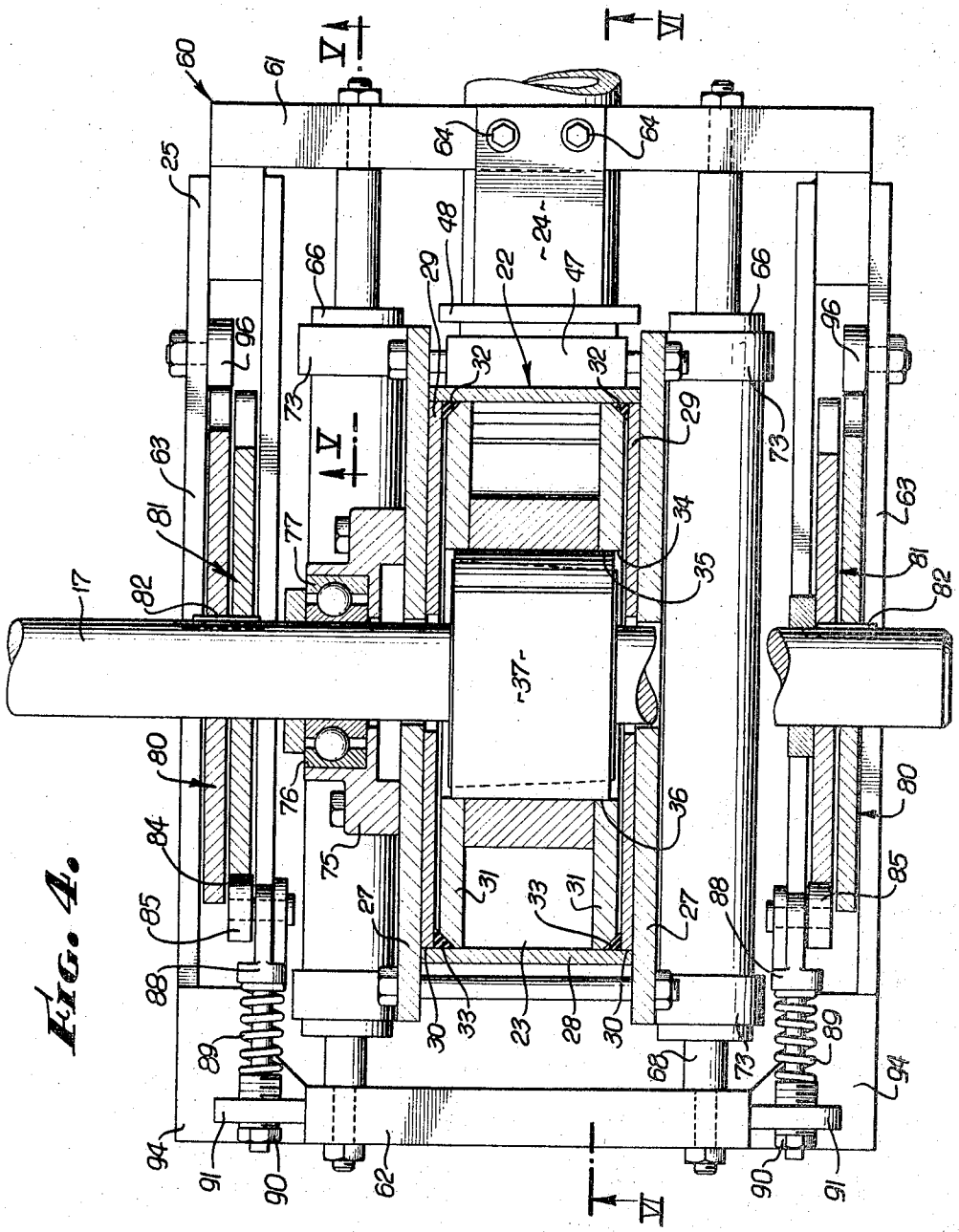


Fig. 4.

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PUMPING MACHINE FOR HEAVY FLOWABLE CEMENTITIOUS MATERIALS

Filed March 12, 1965 4 Sheets-Sheet 4

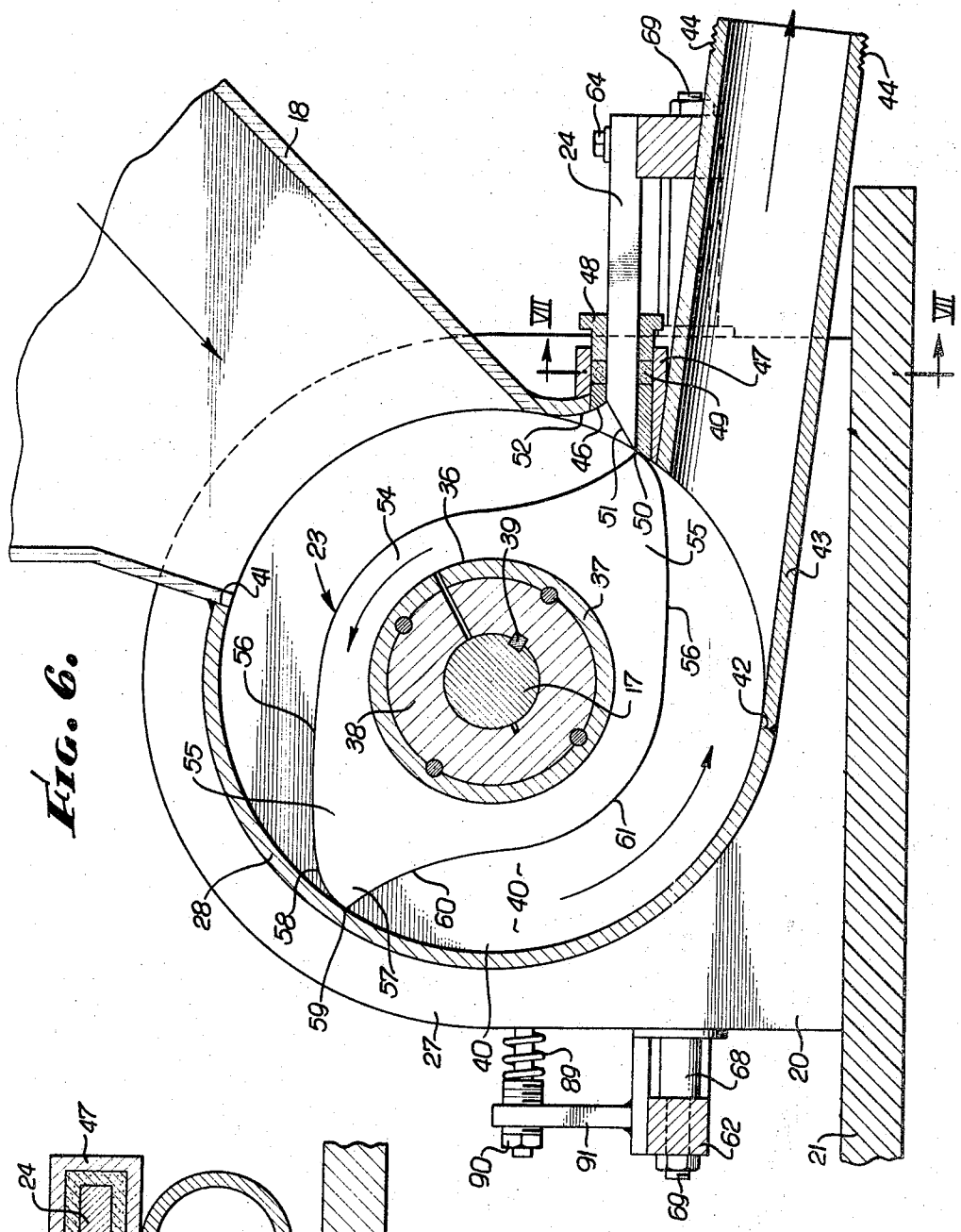


FIG. 6.

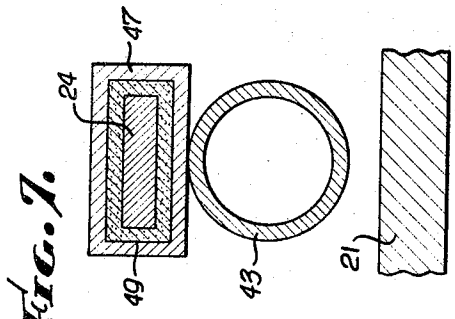


FIG. 7.

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PUMPING MACHINE FOR HEAVY FLOWABLE CEMENTITIOUS MATERIALS

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14 Claims. (Cl. 103—123)

This invention relates to a pumping machine for flowable heavy materials such as plastic cementitious materials as concrete in a wet plastic state and more particularly to a pumping machine which may be used for pumping plastic concrete from a supply source thereof to a location at which the concrete is to be placed in forms or the like.

An exemplary concrete material adapted to be pumped by the machine of this invention may include coarse aggregate such as crushed rock up to three-fourths to one inch in size, and a concrete mixture having a relatively small slump characteristic. Coarse and medium aggregates employed in such material to be pumped may include gravel and crushed rock and may include lightweight, exfoliated volcanic particles. The material adapted to be pumped by the machine of this invention may also include other cementitious or other plastic materials such as fine aggregate and binder-type mortars and grouts. It is to be understood that the pumping machine of this invention may be readily adapted to other types of heavy flowable material. The description of the invention made hereinafter refers to a plastic concrete material as one example of a material which may be pumped by the machine of this invention.

Various prior methods have been used to move, handle, or transport wet plastic concrete from the mixing source to the pouring location. Originally, such concrete was transported to concrete forms by means of wheeled carts or concrete buggies. In other instances, where the distance was not great, the wet concrete could be directed to a concrete form by means of suitable inclined chutes leading from a concrete mixing source. Where greater distances were involved, prior proposed pumping machines for conveying wet plastic concrete through a long, flexible hose of suitable diameter included air pressure systems which forced a batch or slug of concrete through the hose. Such air pressure systems had several disadvantages: control of discharge was difficult, stoppage of the slug of plastic concrete in the hose might create excessive air pressure which might damage the hose and, in some instances, action of the pneumatic pressure systems produced in the wet concrete mixture separation of the finer particles from the coarser aggregates and thereby changed the homogeneous character of the concrete mixture.

Other prior proposed machines for pumping wet concrete over relatively long distances have included various arrangements of reciprocating piston-type pumping machines in which control means such as valves were used to admit wet plastic concrete into the chamber of the piston-type machine. Such control means fed concrete to the piston chamber from which the plastic concrete was discharged therefrom by reciprocal action of the piston. Such piston-type pumping machines had several disadvantages including intermittent surge of pumped concrete mass and timing between piston action and valve means was often critical and difficult to maintain and adjust. In addition, the amount of plastic concrete fed to the piston chamber was required to be accurately measured.

The present invention contemplates a novel pumping machine for heavy viscous plastic or semi-pasty materials wherein the material may be fed by gravity to a pumping chamber and a rotor provided with two or more rotor lobes rotates in said pump chamber for positively displacing the material between lobes to a discharge outlet which leads to a discharge hose. In order that the material between lobes is completely discharged from the space therebetween, a reciprocally movable slide valve member is disposed between the inlet opening and discharge opening of the pump chamber. The present invention contemplates a novel construction for actuating said valve member in proper relationship to the rotation of the rotor means whereby the valve member will closely follow the contour of the rotor means and deflect or urge material being pumped into the discharge opening. The present invention provides means for positive reciprocal action of the valve member in accordance with the contour of the rotor means and in timed relation to its rotation.

The primary object of the present invention is to disclose and provide a pumping machine for heavy flowable plastic material such as a wet concrete mixture and the like which is effective to positively move such material with a minimum of surge effect and at an effective flow rate or capacity.

Another object of the invention is to disclose a pumping machine for heavy plastic flowable materials wherein means are provided for interrelating the movement of a slide valve member with respect to a rotor means rotatable in a pump chamber.

Another object of the invention is to disclose and provide a pumping machine wherein pairs or sets cam members are provided for positive movement of the valve member into and out of a pumping chamber.

A further object of the invention is to disclose and provide a pumping machine for plastic, flowable material wherein relief means are provided to prevent binding or jamming of the machine in the event an oversized particle or object becomes lodged in the pump chamber.

A still further object of the invention is to disclose and provide a pumping machine wherein the pump chamber may be readily fabricated from rolled steel plate of selected hardness and resistance to wear.

A particular object of the invention is to disclose and provide a novel actuating means for a slide valve member reciprocally movable into and out of a pump chamber containing a heavy flowable cementitious mixture including coarse aggregates.

Various other objects and advantages of this invention will be readily apparent from the description of the drawings in which an embodiment of the invention is shown.

In the drawings:

FIG. 1 is a side elevational view of a pumping machine embodying this invention mounted on a trailer.

FIG. 2 is an enlarged fragmentary side elevational view of the pumping machine shown in FIG. 1, the valve-actuating means therefor being shown in valve-in position.

FIG. 3 is a side elevational view similar to FIG. 2 with the valve-actuating means shown in valve-out position.

FIG. 4 is a transverse horizontal sectional view taken in the plane indicated by line IV—IV of FIG. 3.

FIG. 5 is a fragmentary sectional view taken in a vertical plane indicated by line V—V of FIG. 4.

FIG. 6 is a vertical sectional view taken in the plane indicated by line VI—VI of FIG. 4.

FIG. 7 is a vertical transverse fragmentary view taken in the plane indicated by line VII—VII of FIG. 6.

Referring to FIG. 1, a pumping machine generally indicated at **10** embodying this invention is shown as being mounted on a two-wheeled trailer **11** adapted to be attached to a prime mover such as a truck or other vehicle. On trailer **11** may also be supported a motor means **12** including a transmission or gear box (not shown) for

driving through a sprocket 14 and chain 15, a sprocket 16 mounted on an end of a pump driven shaft 17.

Pumping machine 10 may be fed material to be pumped through a hopper 18. Hopper 18 may be made of suitable size and capacity so as to receive the discharge of concrete from a concrete mixing machine which may be a truck type transit mixer adapted to deliver one or more cubic yards of concrete. Concrete discharged from the transmit mixer flows into the hopper 18 and by gravity into pumping machine 10 as later described.

Pumping machine 10 may have a base 20 suitably secured to bed 21 of the trailer. The pumping machine generally includes a pump housing or casing 22, the pumping shaft 17 rotatably mounted on the pump housing, a rotor means 23 carried by the shaft 17 and rotatable within the pump housing, a valve member 24 reciprocally slidably movable in a plane into and out of the pump housing, and an actuating means 25 for reciprocally moving valve member 24.

Pump housing 22 may comprise a pair of spaced side walls 27 of suitable metal plate and a part cylindrical peripheral wall 28 extending therebetween, coaxial with shaft 17, and seated against inner surfaces of side walls 27 in spaced relation to the peripheral edges of side walls 27. The peripheral edge wall 28 may preferably be made of rolled steel plate presenting a hardened abrasive and wear resistant surface to the material being pumped. Intermediate side walls 29 may be seated against inner surfaces of outer side walls 27 and may have peripheral edges 30 seated against inner edge marginal surfaces of peripheral wall 28. Both side walls 27 and intermediate walls 29 are ported for receiving pump shaft 17 therethrough. Inner side walls 31 may be slightly spaced from intermediate walls 29 and peripheral edges of inner walls 31 may be provided with outwardly directed peripheral beveled surfaces 32 providing peripheral seats for annular resilient seal rings 33 each of generally triangular section. Seal rings 33 may be made of suitable resilient material and are so seated against the opposed triangularly disposed surfaces of the walls 31, 29 and 28 that any leakage under pressure tends to more tightly seat the rings against said surfaces.

Inner side walls 31 may be provided with enlarged ports 34 presenting inner peripheral edges 35 which may seat on an outer cylindrical surface 36 of an outer hub portion 37 mounting the rotor means 23. The outer hub portion 37 may be provided with a tapered or conical-like fit with an inner complementary hub portion 38 which may be keyed as at 39 to shaft 17. The inner side walls 31 and the peripheral edge wall 28 define a generally cylindrical pump chamber 40.

The peripheral edge wall 28 may be provided with a material inlet opening 41 subtending an angle of less than 90° communicating with hopper 18. Inlet opening 41 (as viewed in FIG. 6) may be formed in the upper right-hand quadrant of pump chamber 40.

Peripheral edge wall 28 may also be provided with a material outlet or discharge opening 42 formed in the lower right quadrant (as viewed in FIG. 6) and below inlet opening 41. The discharge opening 42 subtends an angle sufficient to provide full flow of pumped material tangentially into discharge duct or pipe 43 of selected diameter. Discharge pipe 43 may terminate beyond the base of the pumping machine and may be provided with threads 44 adapted to provide a suitable connection with a coupling (not shown) on a flexible hose or conduit (not shown) for conveying pumped material to a location at which it is to be discharged into suitable concrete forms or the like.

Between inlet opening 41 and discharge opening 42, peripheral wall 28 may be provided with a valve opening 46, said valve opening lying below a horizontal plane passing through the axis of pump shaft 17. Valve opening 46 may be defined by a horizontally extending rectangular-in-section nipple 47 (FIG. 7) in which may be received a suitable bushing 48 carrying a rectangular resilient packing 49. The opening in bushing 48 and packing 49 receives valve member 24 for reciprocal sliding movement into and out of pump chamber 40.

The valve member 24 may be made of suitable metal plate stock and may have at its inner end an inclined or beveled valve face 51 terminating in a valve edge 50. It should be noted that the inner surface 52 of the portion of peripheral wall 28 just above the valve face 51 may be curved outwardly and downwardly into valve opening 46 so as to prevent packing or storing of material during pumping. It will be noticed that each movement of the valve member 24 into the pump chamber will tend to dislodge any material at and above the valve opening so that such material will be swept into the path of the rotor means. In this respect the valve opening is intermittently self-cleaning.

Rotor means 23 includes a rotor member having a hub portion 54 of rather thick section. Integral therewith and extending in diametrically opposite directions are lobe portions 55. As best seen in FIG. 6 each lobe portion 55 includes a trailing surface 56 which extends tangentially from the surface of hub portion 54 in a relatively shallow convex curve. Adjacent tip 57 of each lobe, surface 56 curves more acutely as at 58 and terminates in a lobe edge 59 which may be spaced from the internal surface of peripheral wall 28 a selected tolerance, depending upon the material to be pumped. In an example of this pumping machine designed for pumping concrete, such tolerance may be from one-eighth to three-eighths inches. When the material to be pumped is of greater fluidity and plasticity, the tolerance may be decreased.

The leading surface of each lobe 55 may comprise a slightly convex surface portion 60 which smoothly merges with a cylindrical portion 61 of hub 54. In this example, it may be noted that the radius of curvature of the convex portion 60 may be approximately the same as that of the radius of curvature of the internal surface of the peripheral wall 28.

In FIG. 6 it will be noted that the edge 59 of lobe 55 will pass and clear the outer edge of the valve member 24 when the valve member is in valve-out or retracted position.

In this example of the invention, actuating means 25 for the valve member 24 may comprise an open rectangular frame means 60 (FIG. 4) including end bars 61 and 62 interconnected by spaced pairs of side bars 63 extending transversely to shaft 17. The open frame means 60 lies in a plane below the axis of shaft 17 and surrounds the lower portion of pump casing 22 with sufficient clearance so that it may reciprocally move transversely with respect to the shaft axis. End bar 61 carries at its central portion the valve member 24 which may be rigidly secured thereto by a pair of bolts 64. Elongated openings in the valve member 24 may receive the spaced bolts 64 so as to provide longitudinal adjustment of valve member 24 with respect to end bar 61 and valve opening 46.

Means for supporting the open frame means 60 for reciprocal movement in said horizontal plane may comprise a pair of transversely extending linear type bearings 66 disposed outwardly of side walls 27 of the pump casing and below the shaft axis. Each linear bearing 66 may include an elongated cylinder 67 which receives therethrough a bearing rod 68 projecting from opposite ends of cylinder 67 and having end portions 69 secured in suitable manner to end bars 61 and 62. In FIG. 5 an example of a linear bearing construction is shown in which end bushings 70 carried by cylinder 67 may include longitudinally extending ball bearing grooves or races 71 which carry a plurality of ball bearings 72 so that linear movement of bearing rod 68 is relatively friction free and axially guided without binding. The linear

bearings 66 may be suitably mounted on side walls 27 by end mounting straps or brackets 73 (FIG. 4). It will thus be apparent that linear bearing 66 accurately guides and permits reciprocal movement of the frame means 60.

Pump shaft 17 is supported by a suitable bearing means 75 secured to outer side walls 27 of the pump casing and providing a bearing chamber 76 for a ball bearing assembly 77. For purposes of brevity and clarity, only one shaft bearing means 75 is shown in FIG. 4, and it will be understood that on the opposite side of the pump casing a similar bearing means will support the shaft 17.

Means for positively moving valve member 24 into and out of the pumping chamber 40 in timed relation with rotation of shaft 17 and rotor means 23 fixed thereto, in this example, may comprise a dual set of cam plate members 80 and 81 adjacent and between pairs of side bars 63 and fixedly keyed as at 82 to shaft 17. Cam plate members 81 which are disposed inboardly of cam plate members 80 are provided with a peripheral cam edge face 83 configured so as to move valve member 24 inwardly in such a manner that valve edge 51 will first follow the trailing rotor edge face 56, then portion 61, and then concave portion 60. In such movement, edge 51 of the valve member closely follows such faces with a selected minimum tolerance so as to cause material in the pump chamber to be deflected into the discharge pipe 43. As shown in FIG. 3, cam edge face 83, in valve-out position, has a smoothly curved concave shape indicated at 84 which is engaged by a cam follower roller 85 supported by an angle arm 86 having its lower end pivotally connected at 87 to side bars 63. The upper end of arm 86 is also connected to an end cap 88 which provides a seat for a coil spring 89 which biases the cam follower roller 85 toward and against the cam edge faces 83 and 84. The other end of spring 89 may be seated against a threaded adjustment bolt 90 carried by an upstanding bracket 91. In normal operation back face 92 of arm 86 may abut a surface 93 on a spacer block 94 between pairs of side bars 63 so that as the cam plate member 81 rotates counterclockwise as viewed in FIG. 3, the cam edge faces 83 and 84 will cause the open frame means 60 and valve member 24 to move to the left so as to move valve member 24 into the pump chamber. Forces causing valve member 24 to move into the chamber are produced by rotation of shaft 17, and such forces are imparted to the cam follower roller 85 through cam edge faces 83.

The biased pivotal mounting of the cam follower roller 85 prevents a foreign or unwanted object in the pump chamber from binding or jamming between the edge face of valve member 24 and the rotor means 23, spring means 89 and said pivotal mounting permitting movement of open frame means 60 and valve member 24 away from the rotor means to thus prevent damage to the pumping machine.

The outboard cam plate members 80 are provided with cam edge faces 95 which in general follow the contour of rotor means 23 and may be slightly different at the lobe tip portions 57. The cam edge faces 95 are engaged by a cam follower roller 96 supported on side bars 63 at the side of shaft 17 opposite to the cam roller 85. The engagement of cam rollers 96 with the faces 95 retracts or moves outwardly the valve member 24 from the pump chamber in accordance with the configuration of the rotor means 23. From a consideration of FIG. 6, it will be apparent that valve member 24 is caused to retract from the chamber commencing with engagement of roller 96 with the cam edge face 95 at the point designated as O (FIG. 3). It will thus be apparent that the cam plate member 80 will positively move open frame means 60 and valve member 24 in a direction to the right of FIG. 3.

From the above description, it is believed that the operation of the pumping machine of this invention will be readily understood. A concrete mix fed from a transit mixer or the like to hopper 18 will flow by gravity downwardly and into opening 41 to pump chamber 40. Rotation of shaft 17 will cause rotation of the rotor means 23 and the cam plate members 80 and 81. As a lobe portion 55 beneath the hopper opening 41 moves upwardly across said opening, a quantity of material is moved counterclockwise as viewed in FIG. 6 into the pump chamber and therearound. As the lobe portion 55 reaches the lower portion of its path of rotation, the concave surface portion 60 will push the material out of the outlet opening 42 and into the discharge pipe 43. During this time the valve member 24 is caused to move inwardly and then outwardly in accordance with the rotation of cam members 80 and 81. In such movement, the edge face of the valve member 24 closely follows the contour of the rotor means and tends to wipe said surface so that the material being pumped will be urged toward the outlet opening. As the rotor continues its counterclockwise movement, additional material is picked up by the lobe portions and pumped outwardly through the discharge duct.

It is important to note that the curvature at 52 prevents any build-up of packing or storing of concrete material which may move into that area during a pumping operation. The valve member 24 in its reciprocal sliding movement tends to continually dislodge any material which may fall into the space adjacent the surface 52.

Moreover, in operation, the two lobed rotor means contoured as indicated in the drawings, has provided a relatively smooth flow of pump material with very little surge effect. The size of the inlet opening to the pump chamber has sufficient area so that working portions of the pump chamber will be completely filled with material from the hopper. In one example of a machine 10 embodying this invention employing a 60 horsepower motor to drive the pump shaft through a suitable transmission, a cubic yard of concrete mixture was pumped at 135 revolutions in a suitably sized pump chamber. At usual operating speeds of between 45–67 r.p.m., approximately 30–40 cubic yards of concrete mixture may be pumped per hour. Such concrete mixtures may have slump test characteristics ranging between 1½" to 10". The maximum size of coarse aggregate used in the concrete mixture will depend somewhat upon the size of the discharge duct and hose, as for example, for a 2" hose, coarse aggregate may be between ⅜"–½" crushed rock; 3" hose, approximately 1" crushed rock and 4" hose, approximately 1½" crushed rock. The exemplary machine 10 described above has a capacity for pumping a concrete mixture in a 3" line approximately 300–350 feet and may develop approximately 300 pounds per square inch pressure and may pump the mixture through a 3" hose to a height of approximately 100–125 feet. It will thus be apparent that the exemplary pumping machine 10 has operating characteristics which enable it to fill many requirements and demands for pumping heavy flowable, cementitious mixtures in the construction field.

It should be noticed that the configuration of the pump chamber and the rotor means is such that the pumping machine may be readily cleaned and washed out with water after a pumping operation. The internal surfaces of the pump chamber are smooth and not interrupted by recesses, nicks or protuberances. In operating practice, a wet concrete mixture may remain stopped in the drainage hose for a period up to about one hour since it is not exposed to air. In washing out the discharge hose at the end of a day's operation, it may sometimes be advisable to position a sponge or other yieldable, resilient mass of suitable material at the discharge duct so that air pressure or water pressure acting against the sponge will cause the slug of concrete mixture to be completely removed from the discharge hose without dilution or changing the characteristics of the last portion of the concrete mixture in the hose.

It will be readily apparent to those skilled in the art that the double-cammed actuating means for the valve mem-

ber provides positive forceful movement of the valve member into the pump chamber and also positive forceful movement out of the pump chamber. Because of the positive valve actuating means provided by this invention, material pumped may be of heavy flowable plastic, viscous characteristic and even though the concrete mixture may be relatively stiff, as with a slump characteristic of 1½", the pumping machine of this invention is so designed and constructed that such a stiff mixture may be readily pumped.

An exemplary pump chamber construction using rolled steel plate has been described above; other abrasive and wear resistant materials may be used. As additional examples the pump casing may be formed as by casting. The internal surfaces of the pump chamber may be treated to provide hardened wear resistant surfaces, such treatment including case hardening, and application of plastic, rubber, or synthetic composition coatings which both physically and chemically resist or are unaffected by the material being pumped. The rotor may also be treated in similar manner.

It will also be understood that the tolerance between the rotor lobe tips and the peripheral chamber wall may vary depending upon the material to be pumped and may be generally a loose fit.

It will be understood that various changes and modifications may be made in the pumping machine described above which come within the spirit of this invention and all such changes coming within the scope of the appended claims are embraced thereby.

I claim:

1. In a pumping machine for plastic flowable materials, said machine including a motor; the combination of: a rotatable shaft driven by the motor; a pump casing having a peripheral wall coaxial with said shaft and providing a pump chamber; said wall having spaced adjacent inlet and outlet openings for said chamber and having a valve opening between said inlet and outlet openings; a rotor means on said shaft within said chamber; valve means reciprocally movable through said valve opening into said chamber in relation to rotational movement of said rotor means; external means surrounding said casing for actuating said valve means in timed relation to rotation of said rotor means to discharge pumped material through said outlet opening; said actuating means including a frame means connected with said valve means and surrounding said pump casing; cam follower means on said frame means; cam means on said rotatable shaft engageable by said cam follower means for reciprocating said frame means and valve means in a plane; said cam means on said shaft including at each side of said pump casing a cam member for camming said valve means into said chamber and a separate cam member for camming said valve means out of said chamber.

2. A machine as stated in claim 1 wherein said cam follower means associated with said cam means for moving said valve means into said chamber includes a spring biased cam follower.

3. In a pumping machine for coarse, flowable plastic material such as concrete, the combination of: a driven rotor shaft having a pump rotor member thereon; a pump casing having a casing wall defining a pump chamber; said wall having surfaces coaxial with said shaft; said wall having an inlet opening, an outlet opening spaced therefrom, and a valve opening between said inlet and outlet openings; a valve member reciprocally slidable through said valve opening in a plane spaced from and parallel to said shaft; said pump rotor having a lobe portion cooperating with said wall surfaces and defining therewith a working chamber; means for reciprocally actuating said valve member into and out of said chamber; said actuating means comprising an open frame means externally positioned with respect to said pump casing and including a bar having a connection to one end of said valve member; means for guiding said frame means in reciprocal movement; cam means carried by said rotor shaft and cam follower means carried by said frame means cooperably engageable therewith for reciprocal movement of the valve member in relation to rotation of said rotor member; said pump casing including outer casing side walls, inner casing side walls and intermediate walls between said outer and inner casing side walls; said inner and intermediate side walls having peripheral edges lying within said wall surfaces; and seal means between the peripheral edges of said inner and intermediate side walls and said wall surfaces.

4. In a pumping machine for heavy flowable cementitious materials, the provision of: pump chamber means arranged about an axis of the pumping machine and including radially extending spaced casing walls and a peripheral wall coaxial with said axis and defining an annular chamber with said casing walls and means defining with said wall means and said peripheral wall a seal space; and seal means in said space.

5. In a pumping machine as stated in claim 4, wherein said seal means is of triangular cross-section.

6. An actuating means for a movable valve member for a pumping machine having a driven rotor shaft with an axis and a base means; the combination of: an open rectangular frame means disposed in a plane spaced from said axis and including end bars parallel to said axis and side bars transverse to said axis; a valve member on one end bar lying parallel to said plane; bearing means supported from said base means and connected to said frame means for guiding movement of said frame means in said plane; cam means at spaced locations on said shaft; cam follower means on side bars of said frame means cooperable with said cam means for moving said frame means and valve member; and yieldable means connected with said frame means for movement of said frame means and valve member in said plane and responsive to jamming of said valve member in said machine.

7. An actuating means for a reciprocally movable valve member for a pumping machine including a pump chamber means and a driven rotor shaft comprising: a base means; a pair of parallel linear bearing means carried by said base means on opposite sides of the pump chamber means; an open rectangular frame means supported by said bearing means for reciprocal movement in a plane spaced from the rotor shaft and receiving the pump chamber means within said open frame means; said frame means carrying said valve member; and cam means on said shaft and cam follower means on said frame means for reciprocating said valve means and supporting frame means in relation to rotation of said shaft.

8. Actuating means as stated in claim 7 wherein said cam means on said shaft include a cam plate member for moving said valve means in one direction into a pump chamber and a cam plate means for moving said valve member out of said pump chamber.

9. Actuating means as stated in claim 7 wherein said cam follower means on said frame means include a biased cam roller member for yieldable movement of the valve means in a direction not conforming to the cam means.

10. An actuating means for a movable valve member for a pumping machine having a driven rotor shaft with an axis and a base means: the combination of: an open rectangular frame means disposed in a plane spaced from said axis and including end bars parallel to said axis and side bars transverse to said axis; a valve member on one end bar lying parallel to said plane; bearing means supported from said base means and connected to said frame means for guiding movement of said frame means in said plane; and cam means at spaced locations on said shaft and cooperable with cam follower means on side bars of said frame means for reciprocating said frame means and valve member.

11. An actuating means as stated in claim 10 wherein said cam means at each location include a cam member to move the valve member in one direction and a separate

cam member to move the valve member in the opposite direction.

12. An actuating means as stated in claim 11 wherein one of said cam members has a configuration generally similar to the configuration of the rotor means.

13. An actuating means as stated in claim 10 wherein one of said cam follower means includes a cam roller, an arm carrying said roller and pivoted to said side bars, and a spring means for biasing said arm and roller to provide movement of said frame means and valve member in a direction not conforming to said cam member.

14. In a pumping machine for heavy flowable cementitious materials the provision of: a pump casing having a pump chamber, said casing comprising spaced inner and intermediate casing walls having peripheral edges, a peripheral edge wall extending beyond said edges, and outer casing walls having marginal faces in abutting contact with said peripheral edge walls; said peripheral edges

on said inner walls being beveled to provide a seal space; and seal means in said space.

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