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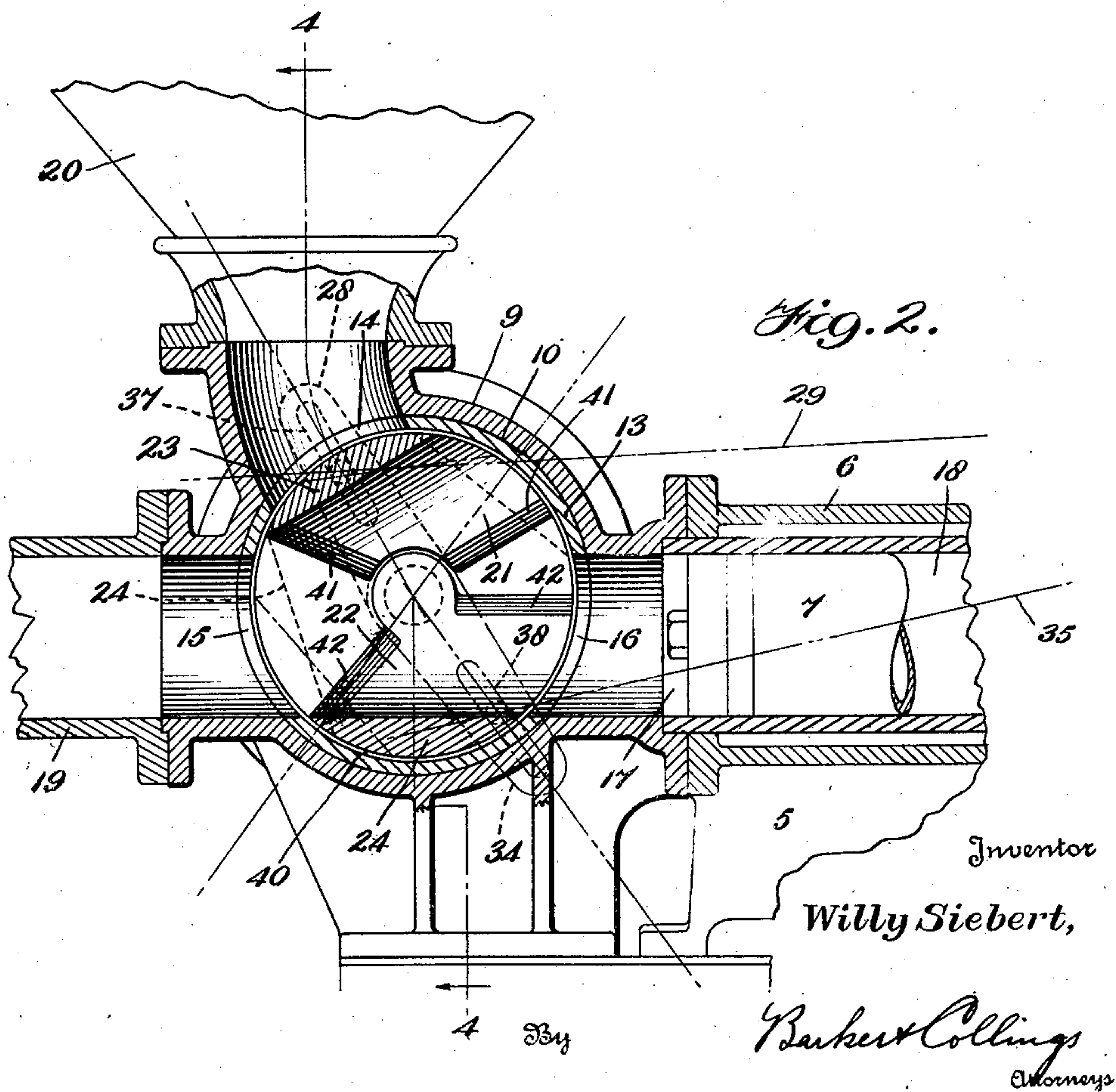
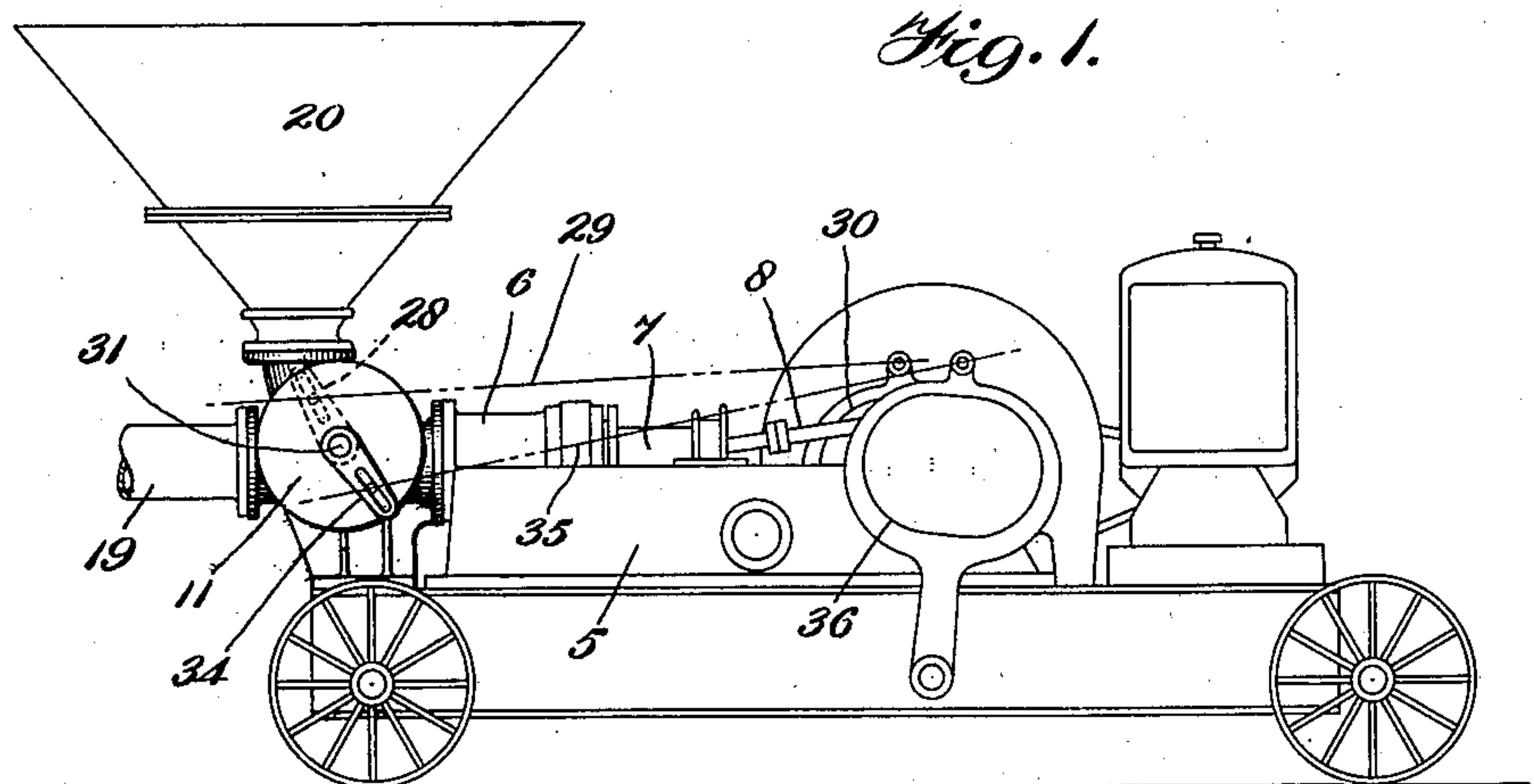
W. SIEBERT

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VALVE FOR CONCRETE PUMPS

Filed June 14, 1935

2 Sheets-Sheet 1



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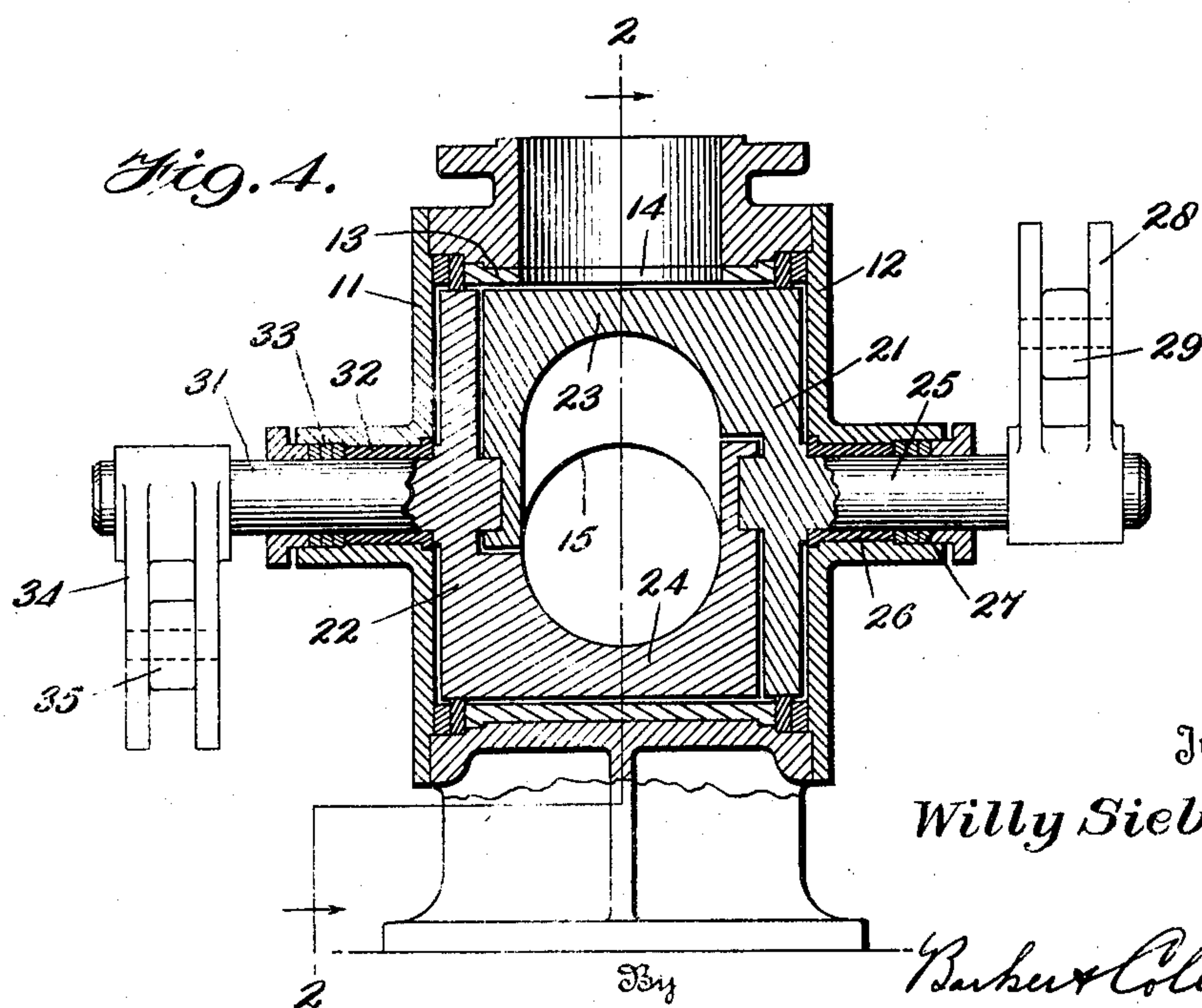
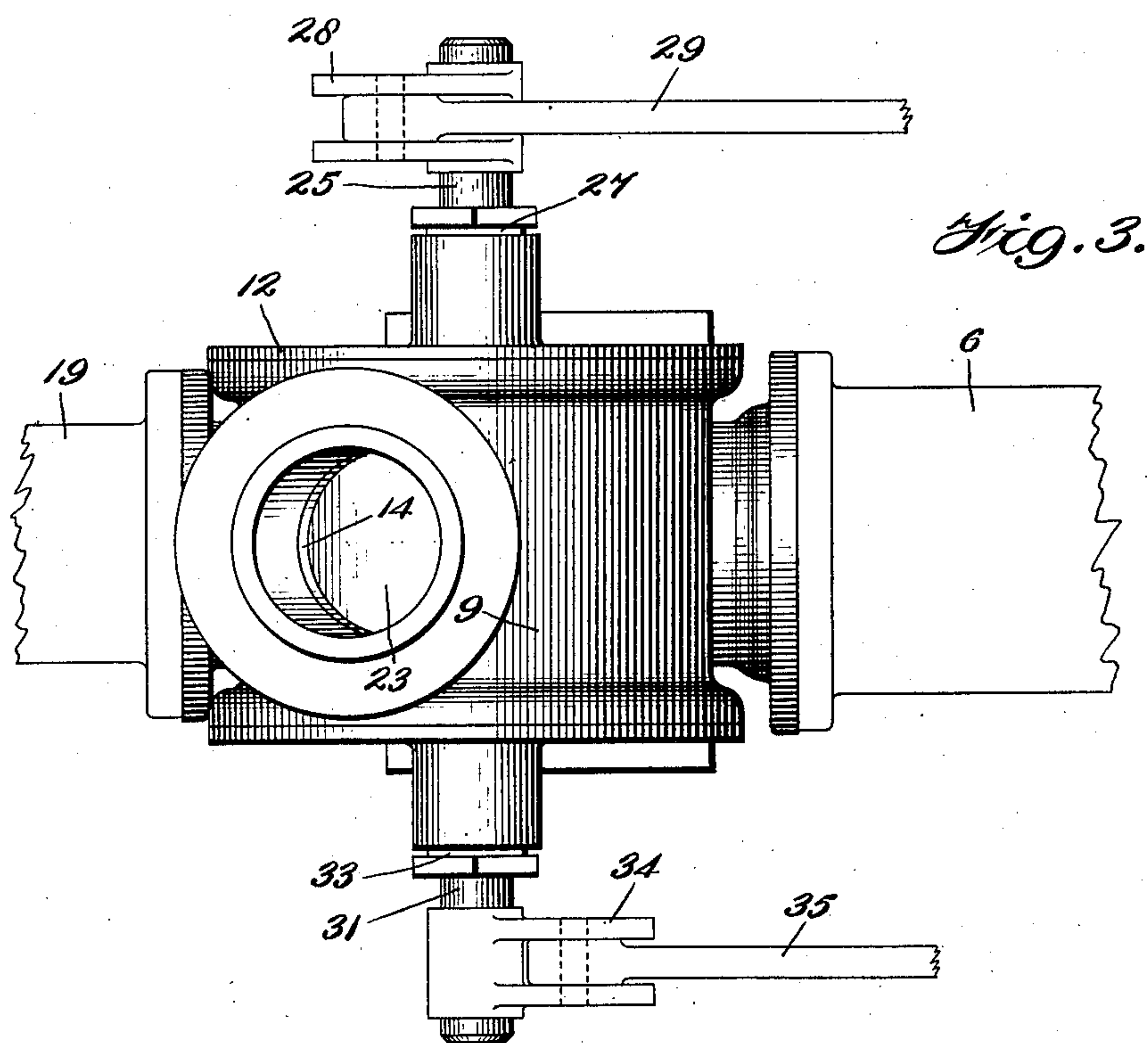
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2 Sheets-Sheet 2



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## UNITED STATES PATENT OFFICE

2,123,591

## VALVE FOR CONCRETE PUMPS

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Application June 14, 1935, Serial No. 26,670  
In Germany June 30, 1934

4 Claims. (Cl. 277—52)

This invention relates to multi-way valves of the type which is particularly adapted for use with pressure pumps for plastic concrete mixtures, one example of which is to be found in the now extensively used Kooyman concrete pump; and for purposes of the present disclosure, the invention will be illustrated and described in connection with such a pump, although obviously not limited solely thereto.

As is well known to those skilled in the art, such pumps are of the single-action reciprocating-piston type, and in general comprise an open-ended working cylinder, a piston working therein, and valve-controlled inlet and discharge passages, both communicating with the open end of said cylinder. The inlet and discharge passages of the said Kooyman pump ordinarily include separate oscillating plug valve structures for controlling the passage of material therethrough, the said valves being alternately rapidly and positively moved by suitable valve actuating mechanism in timed relation to the movements of the piston, from fully open positions to partially closed positions in which they produce a stowing of the mixture which completes the valving action. The said valves are provided with means for varying their timing and travel, and since each controls only its own passage, backslip which might occur if both valves should be open simultaneously, may be minimized.

It has also been proposed to provide pumps of this class with a single oscillating plug valve structure disposed at the juncture of the inlet and discharge passages with the working cylinder, such valve including a plug having a single segment which is rapidly and positively moved to alternately partially restrict, or in some instances to completely close off, the inlet and discharge passages. While such an arrangement secures certain advantages over the two-valve pump, among them an appreciably lower feed-hopper height, it is nevertheless incapable of variation of lag and lead to minimize backslip.

It is one of the principal objects of the present invention to provide a structure which will secure the advantages of both the above types, and produce a pump having a relatively low hopper height, in which the inlet and discharge passages are each controlled by their own valve segment, which segments are contained within a single housing, and are adjustable relative to one another to vary their lap and lead with resultant substantial elimination of backslip. The area and arrangement of the inlet, outlet, and working chamber ports of the valve, and the angular

extent and arrangement of the valve segments, are such that the latter never interfere with the free passage of the material to and from the working chamber, for even a partial restriction thereof would prevent proper working of the apparatus, and if occurring on the pressure stroke of the piston, might cause bursting of the valve or cylinder.

With the above and other objects in view, which will appear as this description proceeds, the invention consists in the novel details of construction, and combinations and arrangements of parts, more fully hereinafter disclosed, 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 diagrammatic side elevational view of a concrete pump with the present valve structure applied thereto;

Figure 2 is an enlarged longitudinal sectional view through the valve structure and adjacent pump parts, taken approximately on the plane indicated by the line 2—2 of Fig. 4, looking in the direction of the arrows;

Figure 3 is a top plan view of the valve as shown in Fig. 2; and

Figure 4 is a transverse sectional view, taken approximately on the plane indicated by the line 4—4 of Fig. 2, looking in the direction of the arrows.

Referring more particularly to the said drawings, the pump as shown comprises a bed 5 on which is mounted a cylinder 6 in which a piston 7 is reciprocated by means of the piston rod 8 actuated by the crank shaft of the pump, not shown. The valve constituting the present invention comprises a housing 9 having a substantially cylindrical bore 10 which is closed by suitable end plates 11 and 12 to provide a valve chamber. This chamber may be lined with a wear-resisting liner 13, if desired.

The valve housing 9 and the liner 13 are provided with the inlet port 14, discharge port 15 and a port 16 which communicates with the open end 17 of the working chamber 18. The outlet port 15 and the working chamber port 16 of the valve are preferably axially aligned as is clearly shown in Fig. 2, while the inlet port 14 preferably extends upwardly at an angle of approximately 60° from the horizontal upon the side of the valve upon which the outlet port 15 is located. The discharge line 19 is connected to the outlet port 15 of the valve and a feed hopper 20



surmounts the valve and communicates with the inlet port 14, as will be clear from the drawings.

Within the valve chamber there is provided the two co-axial valve members 21 and 22 which are disposed in axially overlapping relationship, as clearly shown in Fig. 4, and which respectively control the inlet port 14 and the outlet port 15 of the valve. The said members are respectively provided with the segments 23 and 24 which are arranged to be oscillated back and forth across the respective ports to control the passage of the material through the valve. The member 21 is carried by a shaft 25 which is suitably journaled in a bearing 26 carried by the end plate 12 and it passes through a suitable gland or stuffing box 27, as best shown in Figs. 3 and 4. The said shaft 25 carries at its outer end an arm 28 to which is connected the valve actuating rod or pitman 29 which in turn is actuated by a rock lever 30 controlled by a suitable cam upon the pump crank shaft.

In like manner the valve member 22 is carried by a shaft 31, co-axial with the shaft 25, and journaled in a suitable bearing 32 of the end plate 11, the said shaft passing through the gland or stuffing box 33 and carrying an arm 34 to which is connected the pitman 35 actuated by the rock lever 36 of the pump. This valve actuating mechanism is, or may be, substantially the same as that employed in the standard Kooyman pumps referred to above and illustrated and described in detail in U. S. Patent No. 2,017,975, granted October 22, 1935.

The said arms 28 and 34 are preferably provided with elongated slots 37 and 38 respectively by means of which the connections between the said arms and their respective pitman may be shifted radially in and out with respect to the axis of oscillation of the valve members. In this manner the length of travel of the said members may be varied and the said members may therefore be adjusted to be moved either completely across their respective ports as is illustrated in full lines in Fig. 2 in connection with the inlet segment 23, or if the travel be shortened the said segments may be moved to only partially restrict the said ports so that the valve will operate as partial restriction valve in accordance with the basic principle of the said Kooyman pump. For concrete work there is also preferably provided the circumferential clearance 40 between the valve members and the liner 13 in accordance with the said Kooyman principles.

The angular extent and positioning of the several ports 14, 15, and 16, together with the angular extent of the segments 23 and 24 is such that while the said segments may be moved from positions in which they either completely or partially restrict their respective ports, to positions in which they completely clear the said ports to permit free passage of the material therethrough, at the same time the segments never obstruct the working chamber port 16, inasmuch as material must, at all times, be free to move therethrough in one direction or the other.

The edges of the valve members 21 and 22 may be beveled as indicated at 41 and 42 to avoid the catching of stones or pieces of large aggregate between the members as they are moved to and fro.

By employing two separate segments for respectively controlling the inlet and outlet ports

instead of a single segment, as has been heretofore proposed, it is obviously possible to vary the lap and lead of the said segments through proper design of the respective cams which actuate them, and/or through radial shifting of the pivotal connections between the pitmans 29 and 35, and their respective arms 28 and 34 all as set forth in said prior Patent No. 2,017,975. In other words, it is possible in the present valve to move the segment 24 from its full line position shown in Fig. 2 to its dotted line position shown therein before the segment 21 is moved from its full line to dotted line position. Of course, such movement takes place at the end of the pressure stroke of the piston 7 when the material is substantially at rest and under positive action of the cams on the pump crank shaft, such movements are almost instantaneous. It thus results that the outlet port 15 may be either completely closed or sufficiently restricted to prevent reverse movement of the concrete under back pressure before the inlet segment is moved to open position, and therefore backslip of the mixture through the valve may be substantially eliminated.

While one form of the invention has been illustrated and described, 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 is claimed is:

1. In a multi-way valve for plastic concrete mixtures, a housing having a circular valve chamber provided with circumferentially spaced inlet and outlet ports; and a pair of valve members, one for each port, coaxially mounted in said chamber for independent circumferential movement around the chamber wall to alternately open and close their respective ports.

2. In a multi-way valve for plastic concrete mixtures, a housing having a circular valve chamber and plates closing the ends thereof, said chamber being provided with circumferentially displaced inlet and outlet ports; an oscillatable valve member in said chamber journaled in one of said end plates for circumferential movement adjacent the chamber wall to control said inlet port only; a separate oscillatable valve mounted in said chamber in circumferentially spaced relation to said first member and journaled in the other end plate for circumferential movement adjacent the chamber wall to control said outlet port only; and means for independently actuating said valve members.

3. In a power actuated multi-way valve for plastic concrete mixtures, a housing having a circular valve chamber provided with three ports angularly disposed around its circumference; and a pair of valve members coaxially mounted in said chamber for independent sequential oscillation around the circumferential wall of the chamber, each controlling one of said ports only, and arranged to provide when in open position a free and unobstructed passage for the plastic material between its port and the third port.

4. In a power actuated multi-way valve for pumps for handling plastic concrete mixtures, a housing having a circular valve chamber provided with an inlet port, an outlet port and a working chamber port, said outlet and working chamber ports being disposed on opposite



5 sides of the chamber circumference and said inlet port being located between the other two circumferentially; and a pair of valve members coaxially mounted in said chamber for independent sequential oscillation in proximity to the circumferential wall of the chamber, one of said members controlling said inlet port only,

and the other of said members controlling said outlet port only, and each providing in its open position a free and unobstructed passageway for the plastic material between its port and said working chamber port.

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