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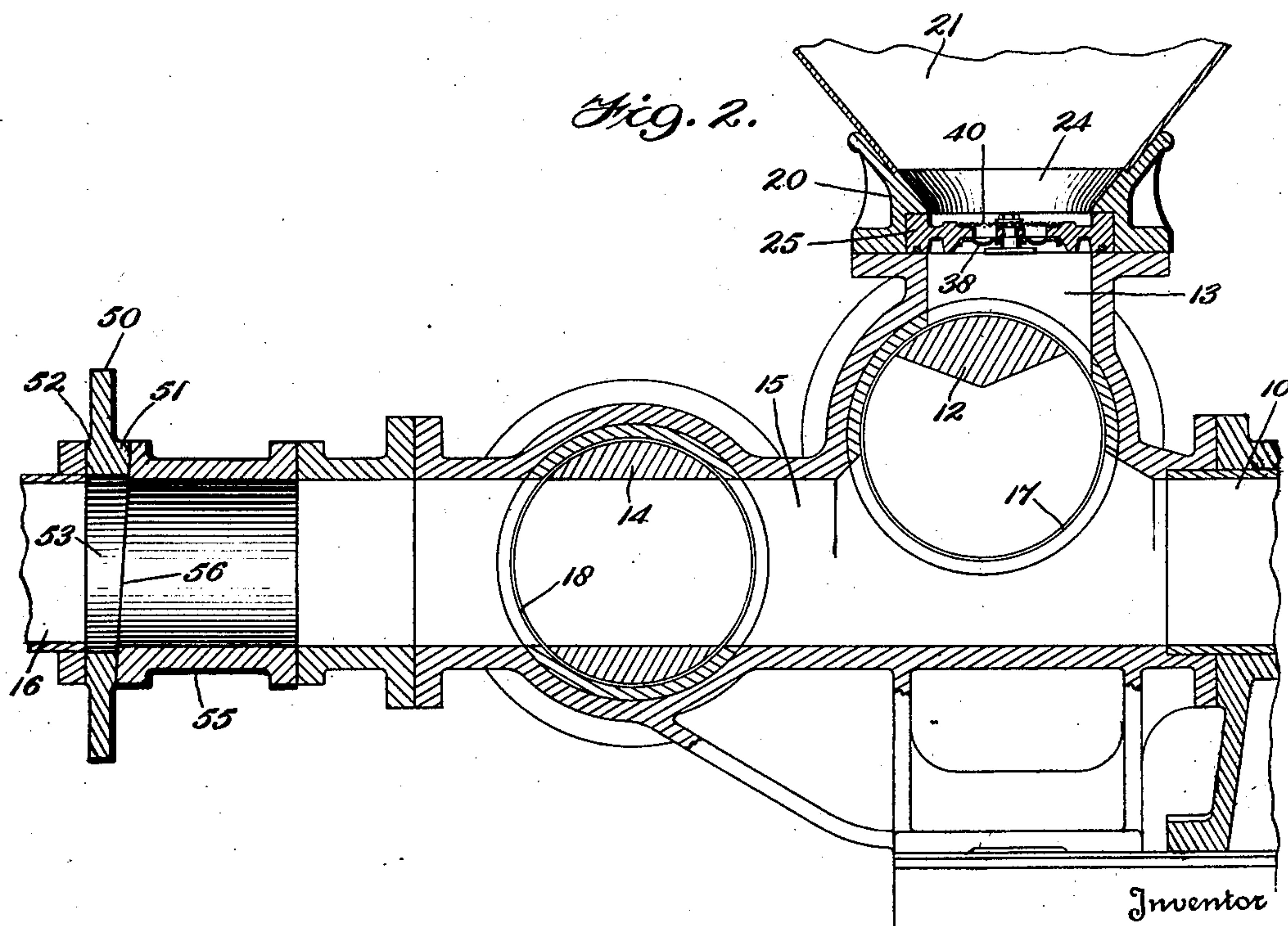
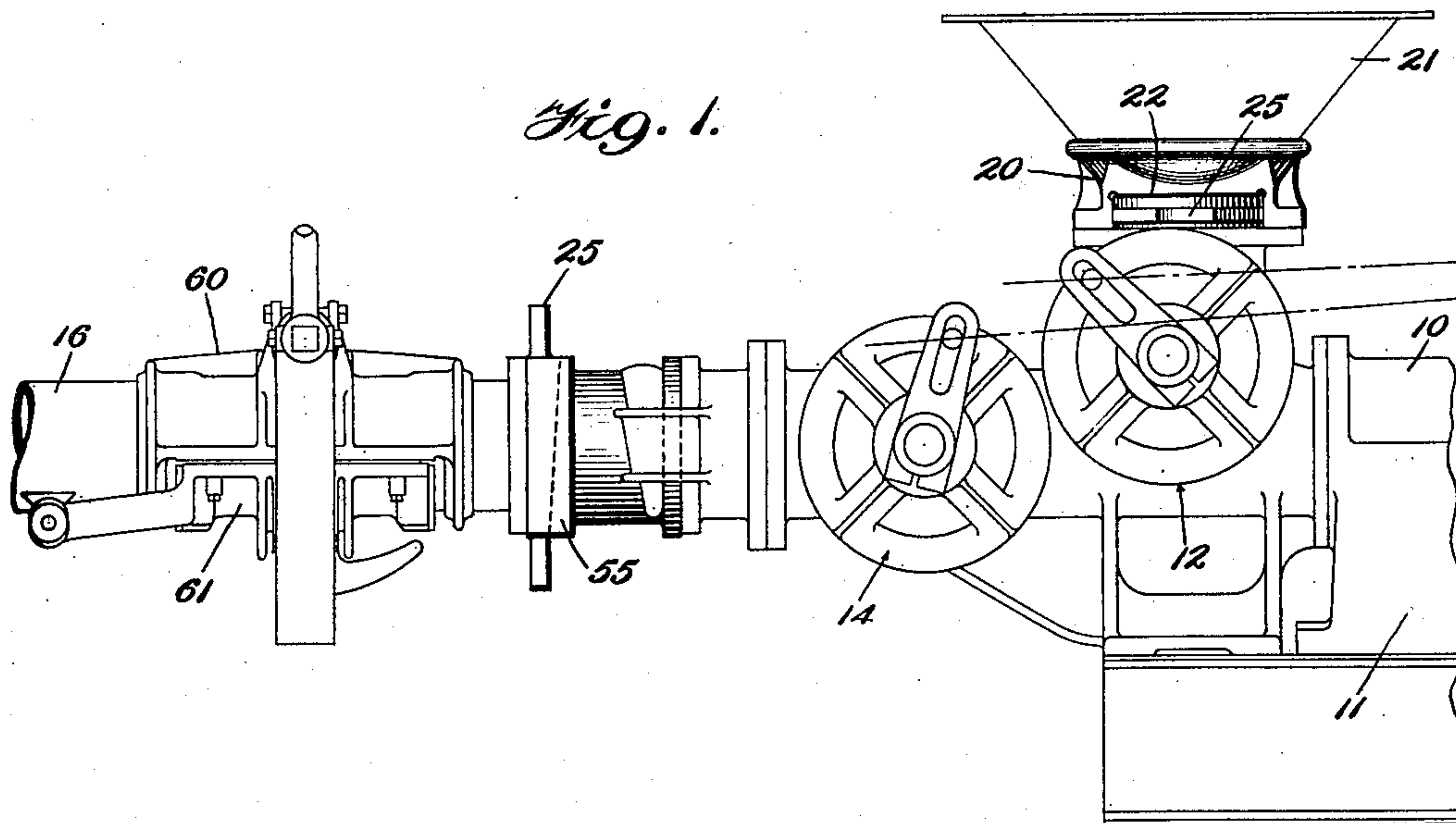
C. F. BALL

2,123,583

AUXILIARY VALVE STRUCTURE FOR CONCRETE PUMPS

Filed April 10, 1936

3 Sheets-Sheet 1



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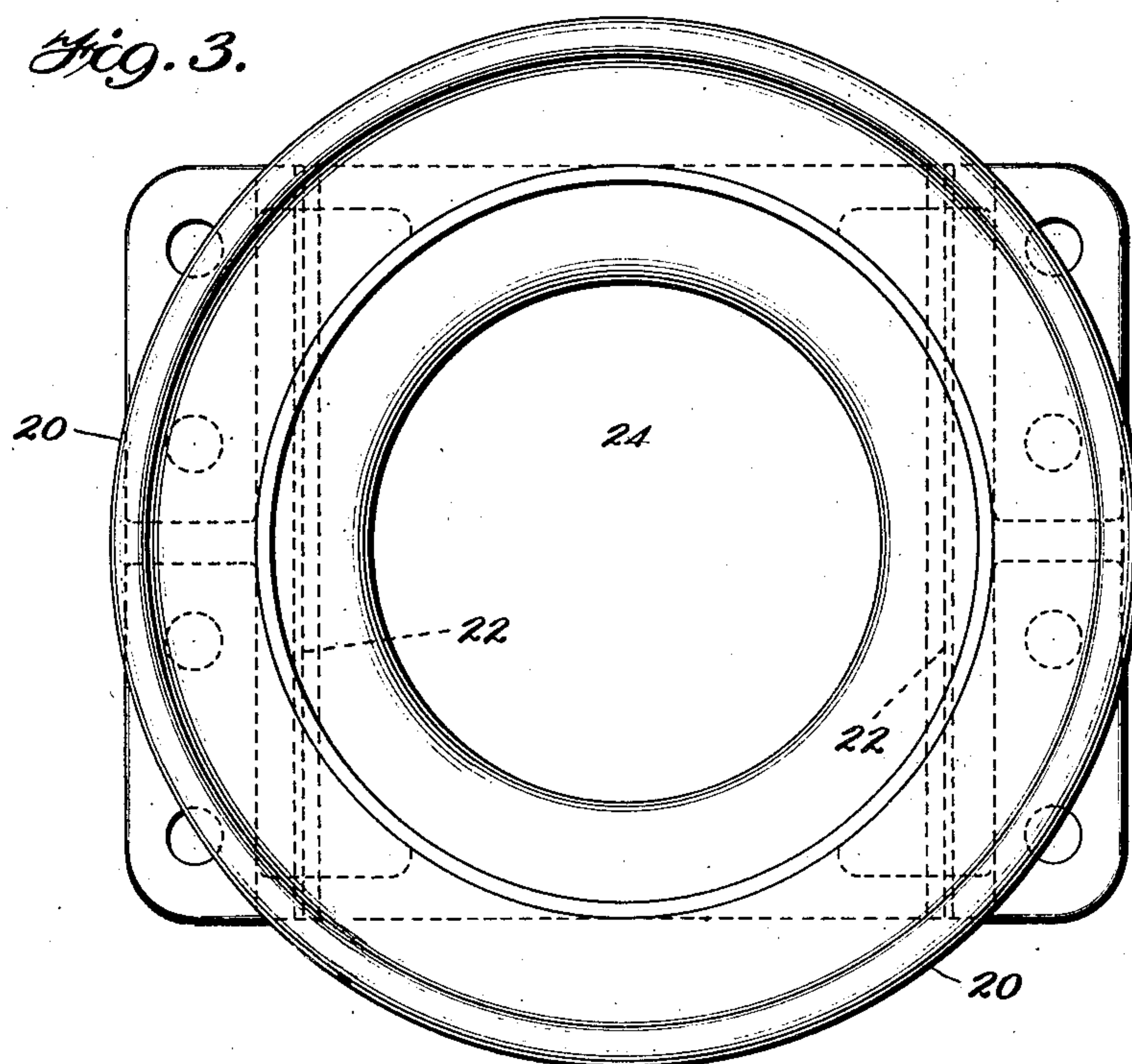
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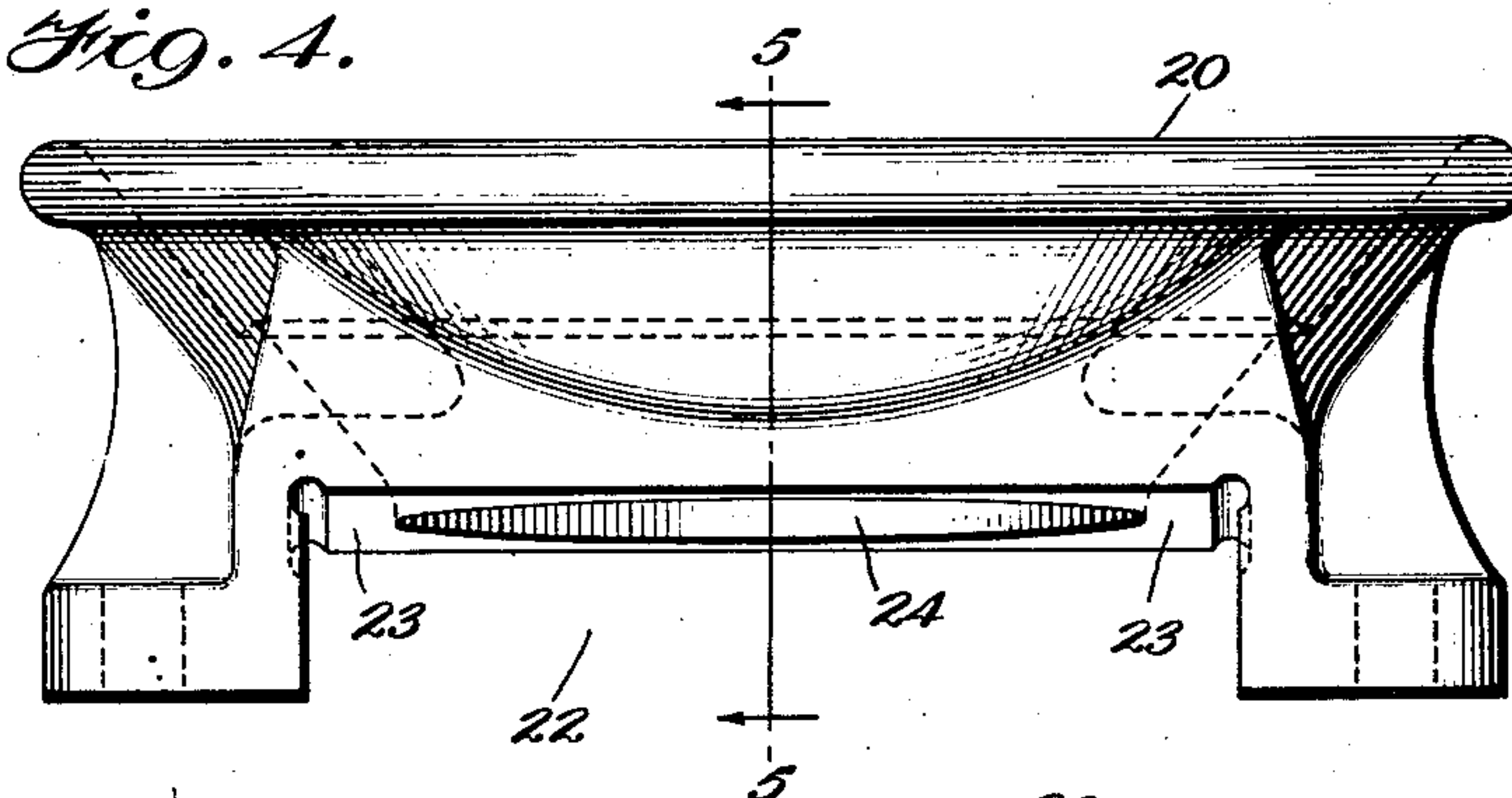
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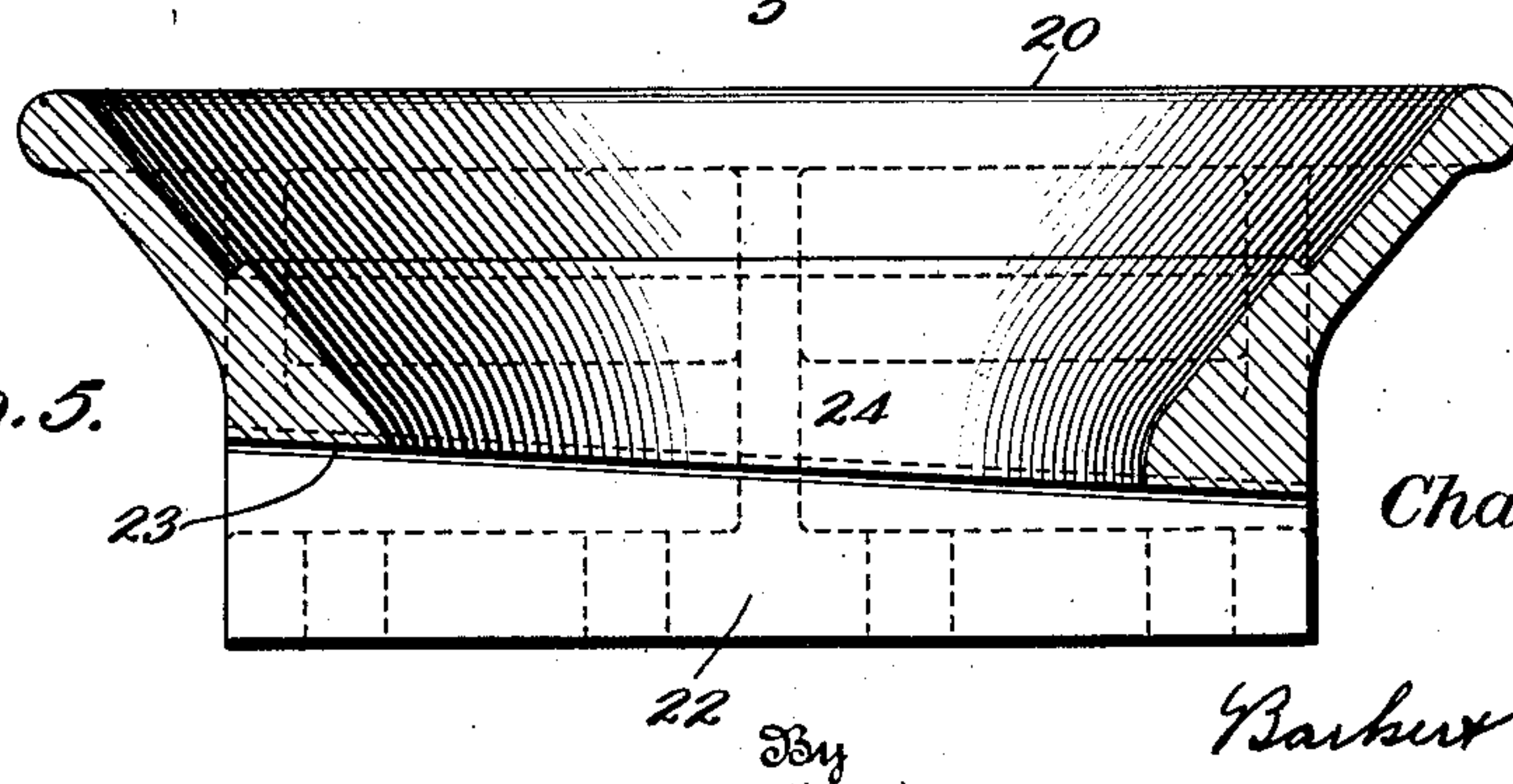
*Fig. 3.*



*Fig. 4.*



*Fig. 5.*



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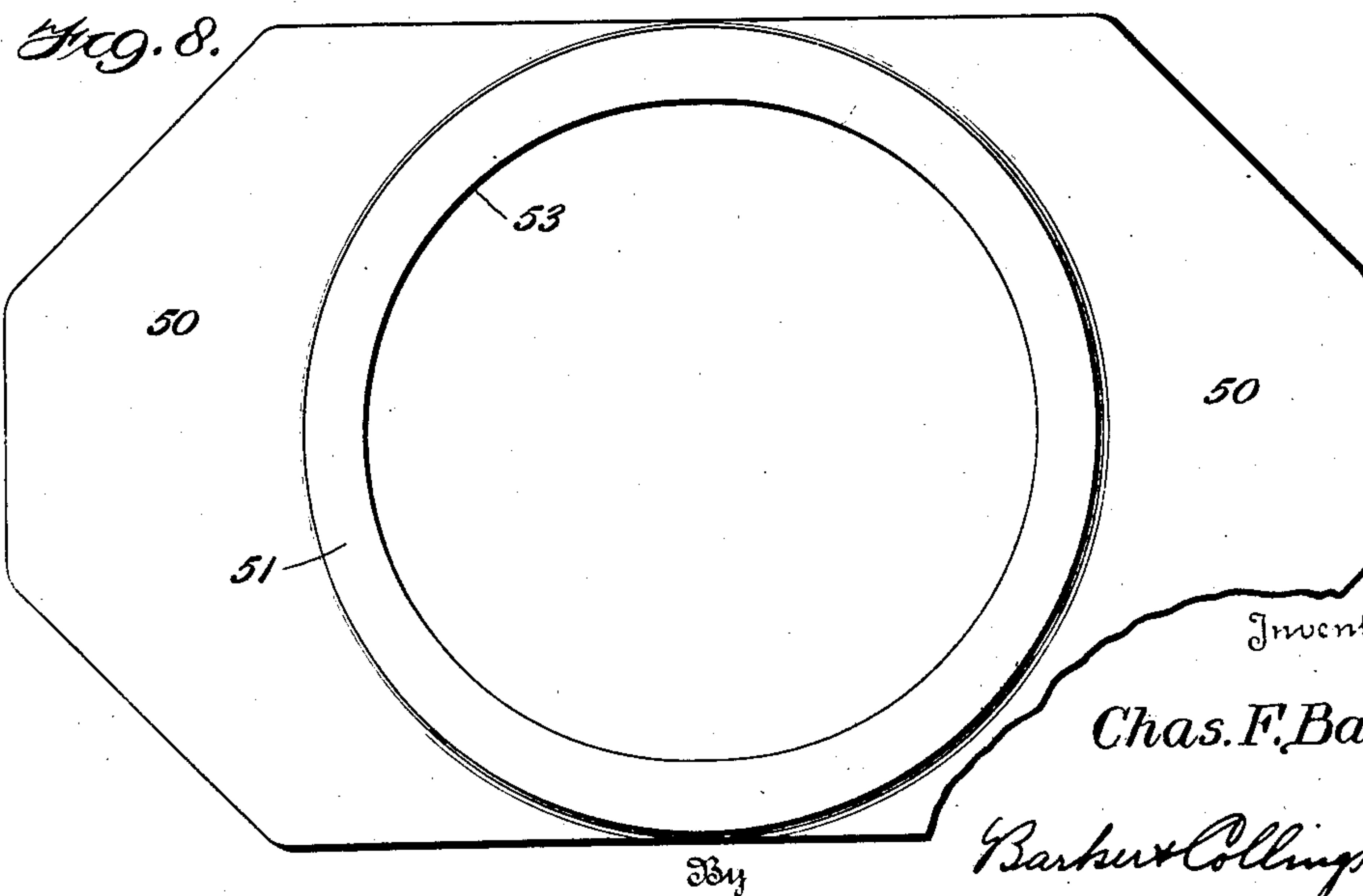
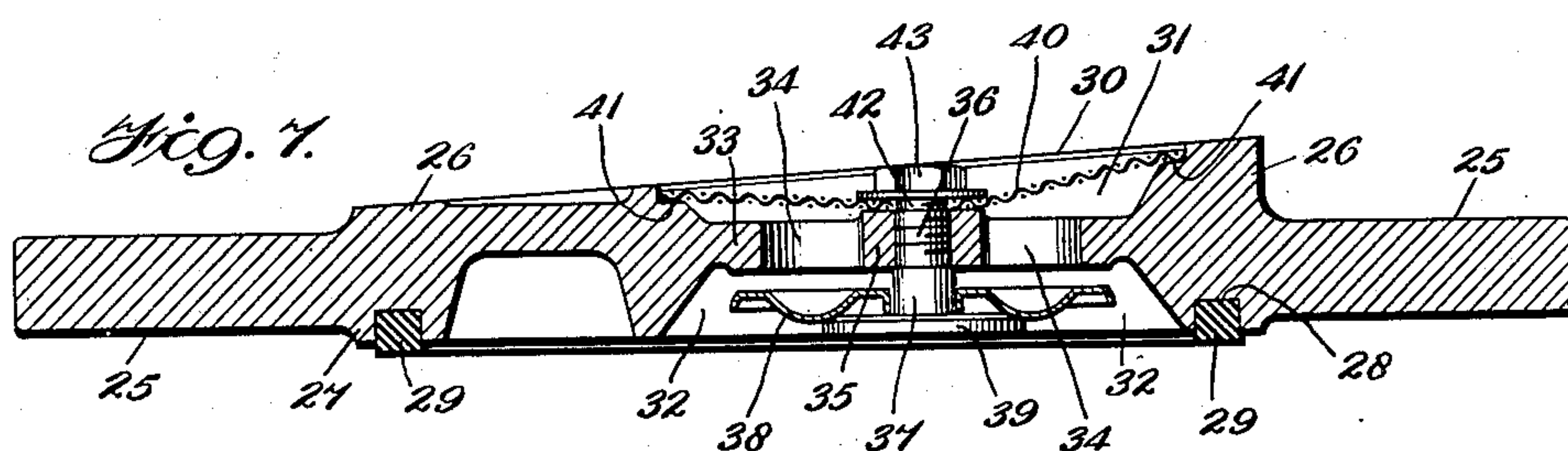
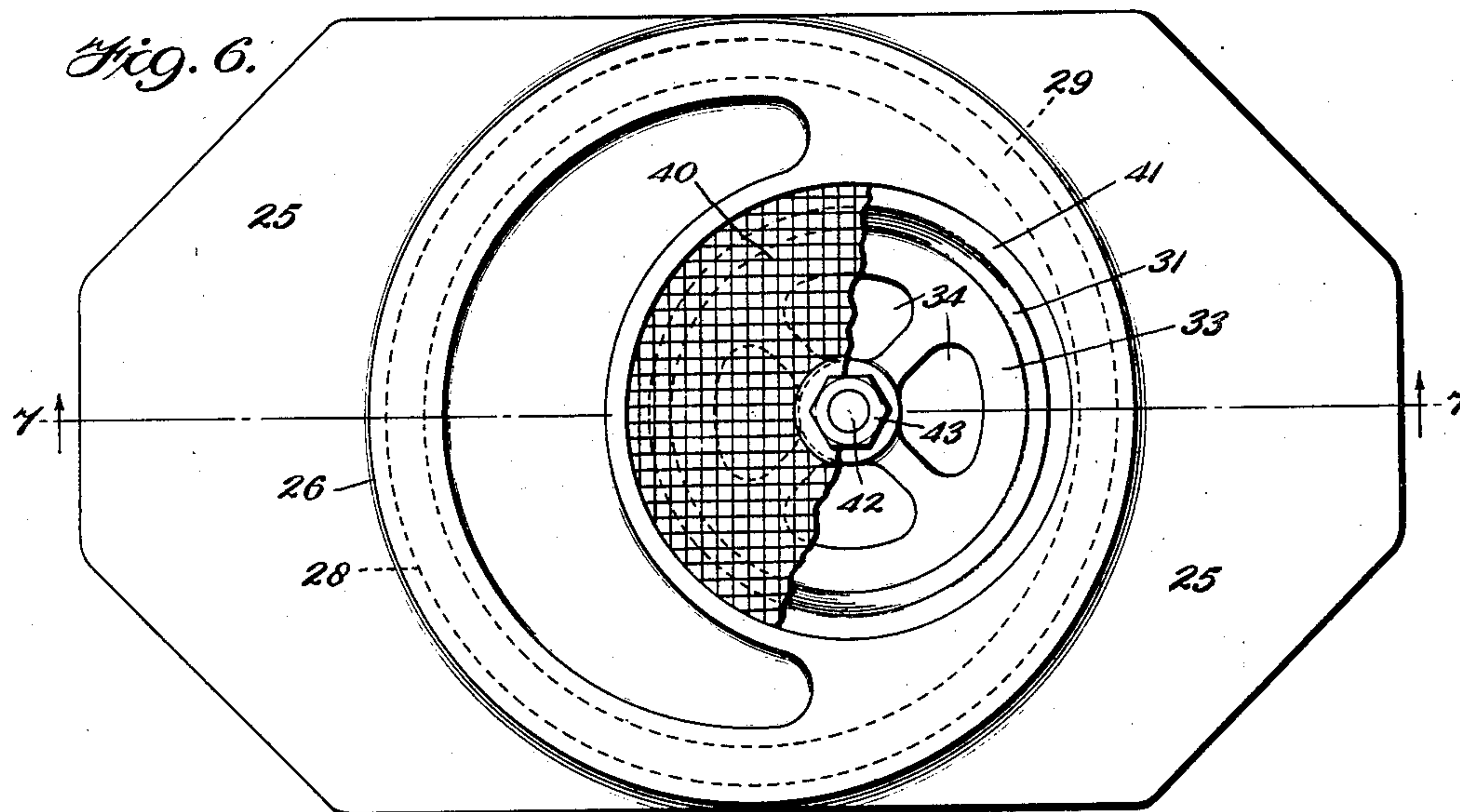
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AUXILIARY VALVE STRUCTURE FOR CONCRETE PUMPS

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3 Sheets-Sheet 3



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## UNITED STATES PATENT OFFICE

2,123,583

AUXILIARY VALVE STRUCTURE FOR  
CONCRETE PUMPS

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Application April 10, 1936, Serial No. 73,791

6 Claims. (Cl. 210—166)

This invention relates to valve structure for concrete pumps, and more particularly to supplemental liquid-handling valves for pumps of the type having concrete handling valves which are inherently incapable of efficiently handling liquids, one example of which may be found in the prior U. S. patent of Jacobus C. Kooyman, No. 2,017,975, granted October 22, 1935. Reference may also be made to my prior U. S. Patent No. 2,012,944, granted September 3, 1935, since the present valve structure is another form of the liquid-handling valve arrangement disclosed and generically claimed therein.

As is fully set forth in my said Patent No. 2,012,944, the concrete-handling valves of pumps of the Kooyman type are inherently incapable of efficiently restraining liquids, because of their relatively great clearances, and also because they ordinarily do not attempt to completely close off the concrete conducting passages but merely partially restrict the same, both of which peculiarities flow from the peculiar "stowing" property of a concrete mixture embodying coarse aggregate. However, at times, as at the conclusion of a concrete pumping operation, it is essential to remove those portions of the concrete mixture which have unavoidably adhered to the parts of the pump and system with which they have come into contact, in order that they may not harden thereon and interfere with a subsequent pumping operation. Such removal can be most expeditiously and effectively accomplished by passing wash water through the pump and system, as for example in the manner set forth in the prior co-pending application filed November 24, 1933, by Charles I. Longenecker and myself, Serial No. 699,632 now Patent No. 2,087,679, granted July 20, 1937; and while this can be done through the use of a separate water pump, it is more economical and satisfactory to temporarily equip the concrete pump itself with valves which can efficiently handle the wash water so that the latter may be circulated through the pump passages and the system by means of the working piston or element of the pump.

The said liquid-handling valves are not capable of successfully handling the concrete mixture, with its high percentage of coarse aggregate, its gritty and abrasive fine aggregate, and its sticky binder, but must be removed from the pump or system prior to the beginning of a new concrete placement operation. It is therefore, one of the primary objects of the present invention to provide a valve structure which, while being of simple construction, and highly efficient in the

valving of the washing fluid, may be placed in operative position and removed therefrom with the greatest facility. The invention also includes the provision of means, in the form of a dummy member, which may be inserted in the apertures provided in the side walls of the pump passages or line for the reception of the water-handling valve members, which dummy member serves to close said apertures during concrete pumping and prevent unwanted escape of the mixture therethrough.

The said pumps are ordinarily provided with charging hoppers, usually of inverted cone shape, the smaller end of which is received in and/or secured to a hopper base, or supporting member, which in turn is secured to the inlet pipe, or the inlet valve housing of the pump. The hoppers themselves are usually of sheet metal, while the supporting bases ordinarily take the form of castings; and the latter, with suitable modification, constitute a ready means for introducing the fluid-handling valve member into the inlet passage. The invention therefore also comprises the modification of the hopper base or supporting member to constitute it a housing for the inlet fluid-handling valve member. The housing of the outlet concrete-handling valve of the pump may likewise be modified for the reception of the fluid-handling outlet valve; or, as is herein illustrated, a separate member may be provided and suitably secured to the pump outlet valve, or elsewhere in the discharge line as may be desired.

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 and arrangements of parts more fully hereinafter disclosed, and particularly pointed out in the appended claims.

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

Fig. 1 is a fragmentary side elevational view of a modified form of the Kooyman pump now in extensive use, showing a fluid-handling valve structure in accordance with the present invention applied thereto;

Fig. 2 is an enlarged longitudinal sectional view of the parts shown in Fig. 1, with one of the fluid-handling valve members being shown in position in the inlet passage of the pump, and one of the dummy members being illustrated in the outlet line;

Fig. 3 is a top plan view of the hopper base,



modified to accommodate the inlet fluid-handling valve of the present invention;

Fig. 4 is a side elevational view of the base member shown in Fig. 3;

Fig. 5 is a vertical sectional view through the base member, taken on the plane indicated by the line 5—5 of Fig. 4;

Fig. 6 is a face view of one of the fluid-handling valve structures constituting one of the principal features of the invention;

Fig. 7 is a longitudinal sectional view through the parts shown in Fig. 6, taken approximately on the plane indicated by the line 7—7 of Fig. 6; and

Fig. 8 is a face view of one of the dummy members which are substituted for the members shown in Figs. 6 and 7 during a concrete pumping operation.

Referring more particularly to Figs. 1 and 2, only so much of the pump is shown as is necessary to an understanding of the invention. The said pump comprises a working cylinder 10 mounted upon a base 11, which cylinder has associated with it an inlet valve 12 controlling the inlet passage 13, and an outlet valve 14 controlling the outlet passage 15 which communicates with the pipe line 16 leading to the point of placement of the concrete mixture. As in my said prior Patent No. 2,012,944, the valves 12 and 14 are of the oscillating plug type and have intentionally relatively great circumferential clearances 17 and 18 between themselves and their housings. The said valves also normally do not completely close off the passages which they control when in their "closed" positions, but only partially restrict them as is shown in connection with the inlet valve 12, all as fully set forth and claimed in the said Kooyman Patent No. 2,017,975.

The housing of the inlet valve 12 is surmounted by a hopper base or supporting member 20, bolted or otherwise rigidly secured thereto, which base receives and supports the conical sheet metal supply hopper 21 which is rigidly secured to the base in any suitable manner. As above mentioned, the base member 20 usually takes the form of a casting and it affords a ready means, when suitably modified from the usual construction, for the reception of the inlet fluid-handling valve member.

As best shown in Figs. 3, 4 and 5, the lower portion of the hopper base 20 is cut away as at 22 with the upper surface 23 of the cut away portion being inclined to provide a tapering recess. This cut away 22 preferably extends completely across the base member and spans the feed opening 24 through which the concrete mixture passes from the hopper 21 to the inlet passage 13 of the pump.

The fluid-handling valve structure is best shown in detail in Figs. 6 and 7, and comprises a plate member 25 having oppositely disposed substantially circular bosses 26 and 27 upon its flat faces. The boss 27 may have an annular recess 28 for the reception of a packing ring 29 adapted to provide a fluid-tight joint between the plate member 25 and the upper surface of the housing of valve 12, as will be readily apparent from Fig. 2. The boss 26 is provided with an inclined surface 30 formed with substantially the same inclination as the upper surface 23 of the hopper base, so that when the member 25 is inserted in the cut away 22 of the said hopper base a wedging action will be had with the complementary inclined surfaces 23 and 30 in intimate engagement.

The plate member 25 within the circumference

of the bosses 26 and 27 is preferably recessed as at 31 and 32 with a web 33 provided between the said recesses. This web is apertured as at 34 to provide a spider-like construction having a central hub 35 in which is threaded a stud 36. The said stud has an enlarged portion 37 projecting into the recess 32, upon which is slidably mounted a stamped metal or other suitable valve member 38, which is arranged to control the passage of fluid through the apertures 34, as will be readily understood from Figs. 2 and 7. The enlarged portion 37 of stud 36 has a still further enlarged head 39 which serves to limit the outward movement of valve member 38, as will be readily apparent.

Mounted within the recess 31 is a screen member 40, the outer circumference of which rests upon a shoulder 41 provided around the recess 31, and the central portion of which embraces the upper projecting end 42 of the stud 36. A nut 43 is threaded upon this end 42 and serves to retain the screen member 40 in place, as will be clear from Fig. 7.

The recesses 31 and 32 are preferably disposed eccentrically of the bosses 26 and 27 toward the thicker part of the boss 26 and with the valve member 38 mounted within the recess 32 and the screen 40 and nut 43 disposed within the recess 31 the entire valve structure is kept within the limits defined by the outer faces of bosses 26 and 27 so that the liquid-handling valve may be readily slid into the cut away portion 22 of the hopper base without any interference of the parts. When thus positioned in the inlet passage the valve member 38 will function automatically in response to alternate positive and negative pressure conditions induced by the piston or other working element of the pump to permit or prevent the flow of water or other washing fluid which may be introduced into the hopper 21 from the said hopper to the inlet passage 13, valve 12 and cylinder 10, as will be readily understood.

As above stated the fluid-handling valves are not adapted to pass the constituents of the concrete mixture which may include coarse aggregates up to three inches or even more in greatest dimension. Therefore, when it is desired to use the pump for forcing plastic concrete mixtures it is necessary to withdraw the fluid-handling valve member 25 from the cut away 22 in the hopper base. This, of course, would leave lateral apertures through which the mixture might escape and in order to prevent such unwanted escape when the fluid-handling valve is removed the dummy member shown in detail in Fig. 8, and also in the outlet line in Fig. 2, is substituted in the cut away 22 for the liquid-handling valve structure. This dummy member merely comprises a plate 50 similar to the plate 25 of the liquid-handling valve, which plate is provided with oppositely disposed substantially circular bosses 51 and 52 similar to the bosses 26 and 27 of plate 25, with the outer face of boss 51 being inclined the same as the outer face of boss 26. The member 50, however, instead of being provided with a valve structure merely has an aperture 53 of substantially the transverse dimensions of inlet passage 13 through the bosses 51 and 52 so that the concrete mixture may freely flow there-through but will not be permitted to escape through the lateral portions of cut away 22 in the hopper base. In other words the walls of the aperture 53 in member 50 merely constitute continuations of the walls of the pump inlet passages.



The aperture 53 may be truly circular, but it is preferred to make it slightly elliptical with the longer axis of the ellipse coincident with the axis of movement of the member 50 during the insertion and withdrawal from the cut away portion 22 so that any slight inaccuracies in construction or in the seating of the member due to wear of the parts will not produce a partial restriction of the inlet passage which might result in stowing of the plastic mixture.

As above set forth the housing of the outlet valve 14 of the pump may also be modified for the reception of one of these liquid-handling valve structures such as shown in Figs. 6 and 7, but it is preferred to provide a separate receiving member 55 which may be bolted or otherwise rigidly secured to, or in the outlet line adjacent to, the outlet valve housing. This said member 55 is provided with a cut away 56 similar to cut away 22 of the hopper base member and into which either the liquid-handling valve structure or the dummy member 50 may be inserted as occasion requires.

As stated above, the procedure of washing out the pump and pipe line may be similar to that set forth in the Ball and Longenecker Patent No. 2,087,679. However, instead of breaking the line 16 adjacent the pump for the purpose of introducing the free piston, it is preferred to include therein, just beyond the member 55, a gate structure 60, here illustrated in Fig. 1 as being of the type described and claimed in the co-pending application of Edwin A. C. Eickstaedt, filed May 1, 1936 Serial No. 77,422 now Patent No. 2,092,961, granted September 14, 1937. With this arrangement, when a wash operation is to be performed, the swinging gate 61 of gate structure 60 is opened, and, with a liquid-handling valve structure such as shown in Figs. 6 and 7 in place in the inlet passage, and a dummy member 50 in the outlet passage, if water be introduced into the pump hopper 21 and the pump operated, the said water will be drawn and forced through the pump passages, valves, and chambers, and discharged through the open port of the gate structure 60. When the pump is clean, a free piston or "go-devil" is introduced into the line 16 through the port of gate structure 60, whereupon the gate 61 is closed, and a water-handling valve structure substituted for the dummy member 50 in the discharge line. The free piston is then forced through the line by the pressure of the water behind it, forcing out the concrete in the line ahead of it, the said line being flushed and cleaned by the following water.

As will be readily understood from the foregoing description, taken in connection with the drawings, the invention provides a fluid-handling valve mechanism for facilitating the flushing of concrete pumps and pipe lines, which can be placed in and removed from operative position with maximum facility, and as in my prior Patent No. 2,012,944, the said fluid-handling valves function independently of and without interference with the concrete-handling valves, through which the cleansing fluid may pass and flush away adhering portions of the concrete mixture, as well as from the cylinder, piston, and pump and line passages. The change-over from concrete pumping condition to fluid pumping condition, and vice versa, may be accomplished in a minimum of time, wholly exterior of the pump, and without the necessity of a workman entering the feeding hopper. The functioning of the auxiliary valves is not affected by wear of the passages and

hopper throat, and there are no parts in the structure liable to be damaged should the pump be overloaded due to a plug in the line during a clean-out operation.

In some instances, as where the line 16 is horizontal only, or horizontal and vertically downward, as distinguished from vertically upward, there will be no back pressure in the line, and an outlet valve will not be strictly necessary. In such cases, the pump may be arranged as in Fig. 2 for liquid pumping, with an auxiliary valve structure in the inlet passage only, and a dummy member in the outlet passage.

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. Auxiliary liquid-handling valve structure for concrete pumps, comprising a plate-like member having opposite recessed faces, there being a perforated web between said recesses providing a valve seat; a stud carried by said web and projecting into each recess; a valve member mounted on said stud in one of said recesses for movement toward and from said seat; and a screen member in the other of said recesses, and engaged with said stud; said valve and screen structure lying wholly within the planes of the faces of said plate member.

2. Auxiliary liquid-handling valve structure for concrete pumps, comprising a member having opposite recessed faces, there being a perforated web between said recesses providing a valve seat; a stud carried by said web, projecting into one of said recesses; a valve member mounted on the projecting portion of said stud for coaction with said seat; and a screen member in the other of said recesses; said valve and screen members lying wholly within the planes of the faces of the supporting member.

3. Auxiliary liquid-handling valve structure for concrete pumps, comprising a plate-like member having oppositely disposed longitudinally tapering faces adapted upon introduction of the member into a complementary transverse opening in a conduit to provide liquid-tight contact with the walls of such opening, one of said faces being recessed, and there being liquid conducting perforations through the member communicating with said recess; a valve seat formed in the recess around said perforations; and a valve member mounted for co-operation with said seat to control the flow of liquid through said perforations, said valve member being positioned and operating wholly within the planes of the opposite faces of said plate-like member.

4. Auxiliary liquid-handling valve structure for concrete pumps, comprising a tapering plate-like member having opposite recessed faces, said recesses being located in the thicker portion of the member, and there being a perforated web between said recesses providing a valve seat; a stud carried by said web, projecting into one of said recesses; a valve member mounted on the projecting portion of said stud for coaction with said seat; and a screen member in the other of said recesses; said valve and screen members lying wholly within the planes of the faces of the supporting member.

5. In apparatus of the class described, a peri-



metrically closed conduit for conducting plastic concrete mixtures under pressure, said conduit having a tapering opening in a plane transverse to its axis; and a tapering member removably seated in said opening, having an unobstructed aperture therethrough of substantially the same configuration and cross sectional area as said conduit, adapted to aline with the latter to provide a leakproof non-stowage inducing passage-way for the mixture.

6. In apparatus of the class described, a perimetrically closed conduit for conducting plastic

concrete mixtures under pressure, said conduit having a tapering opening in a plane transverse to its axis; and a tapering member removably seated in said opening provided with an unobstructed aperture therethrough having a transverse dimension equal to that of the conduit and a longitudinal dimension slightly in excess of that of the conduit, said aperture being arranged to aline with the conduit to provide a leakproof non-stowage inducing passageway for the mixture.

CHARLES F. BALL.