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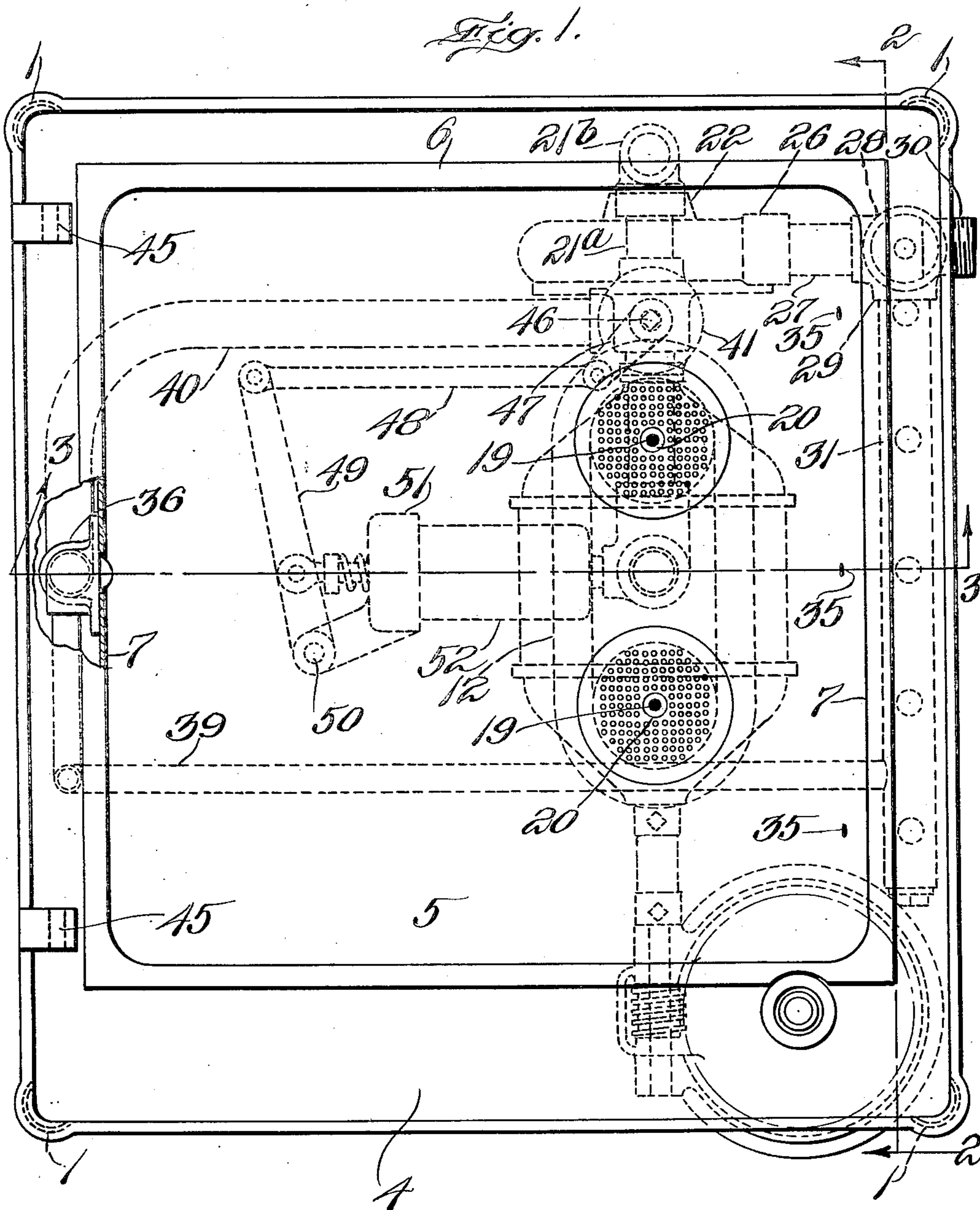
O. T. DEHLE

1,897,953

WASHING MACHINE

Filed Aug. 23, 1928

4 Sheets-Sheet 1



Inventor:
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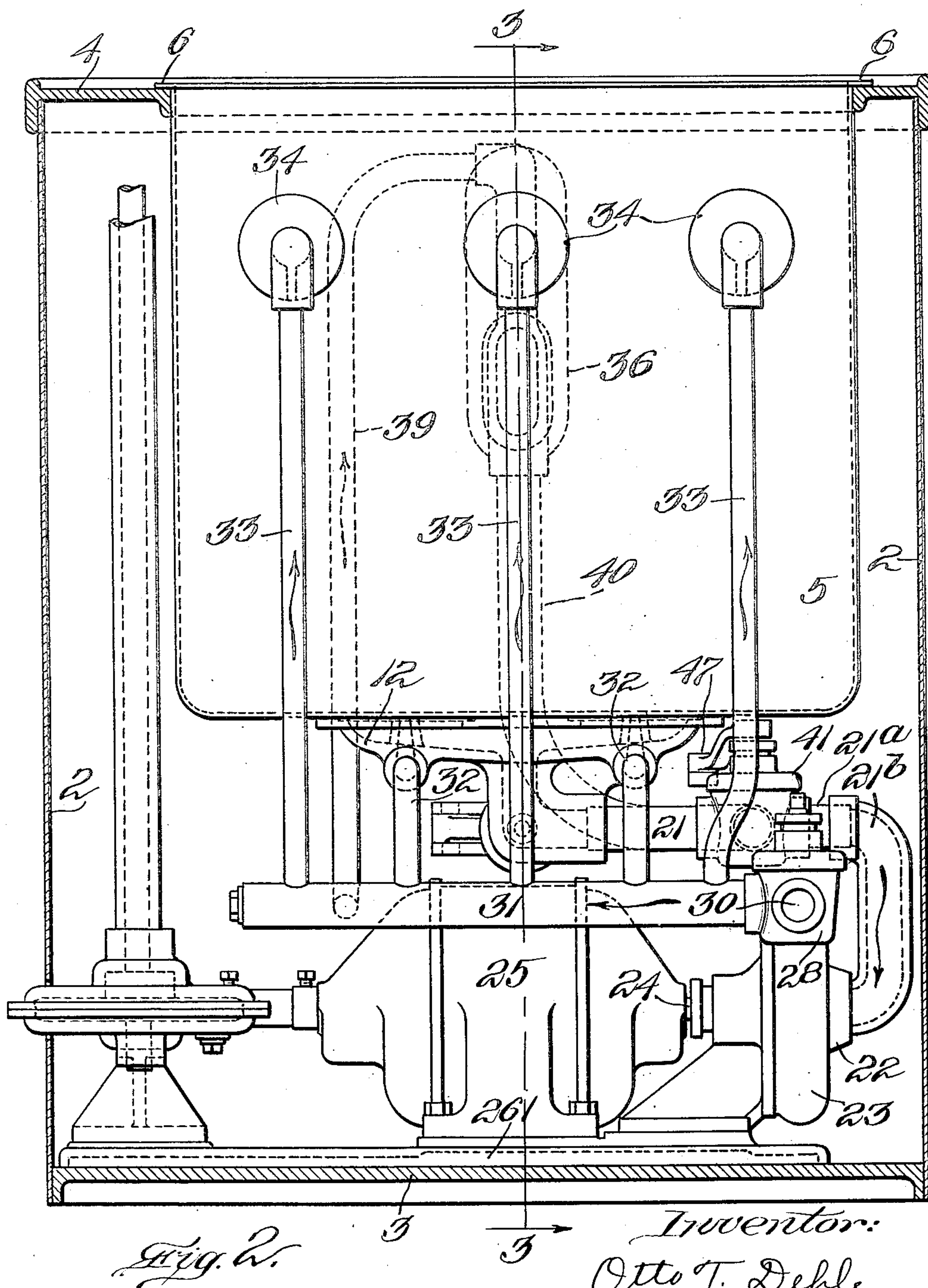
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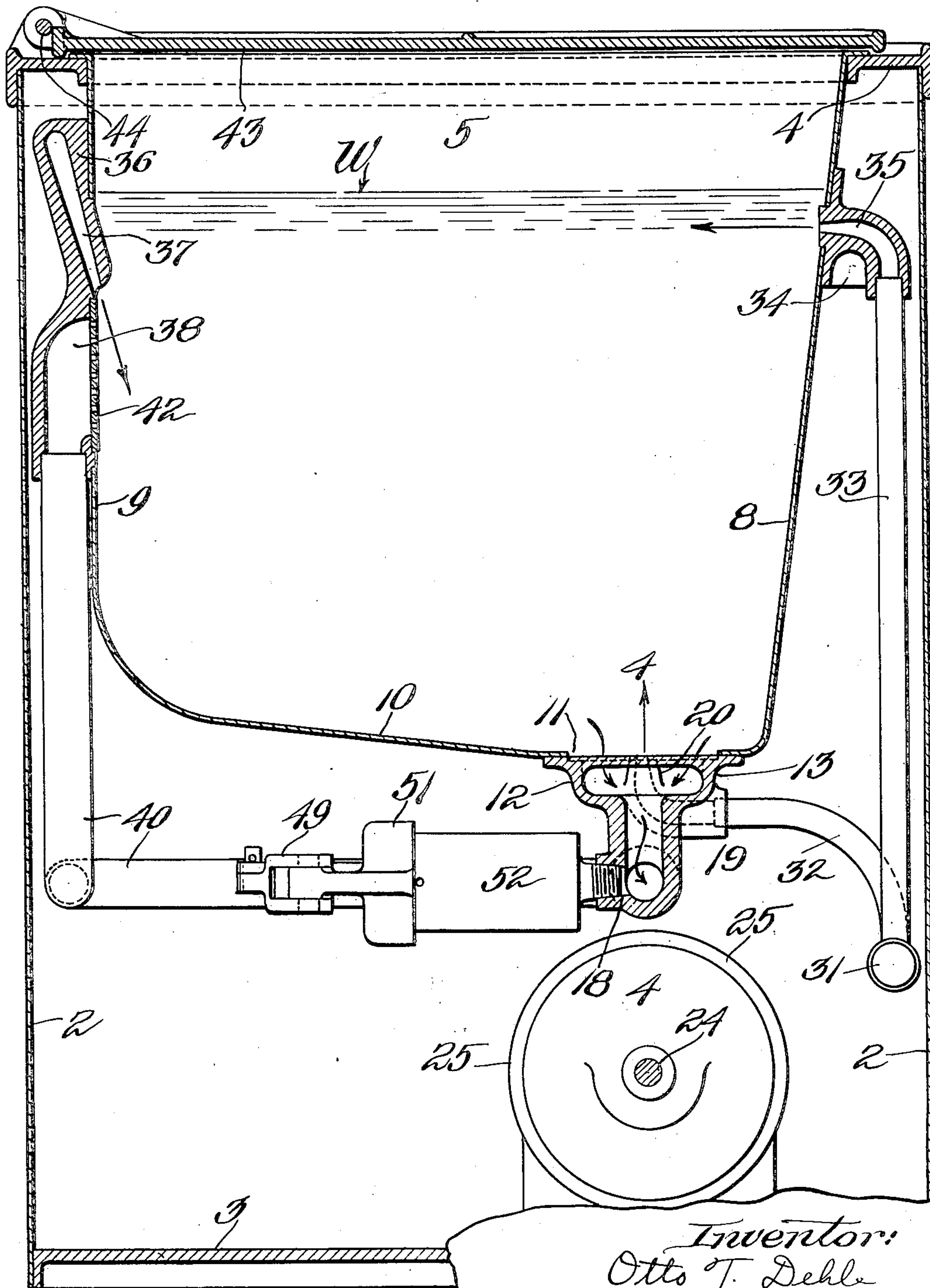


Fig. 3.

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4 Sheets-Sheet 4

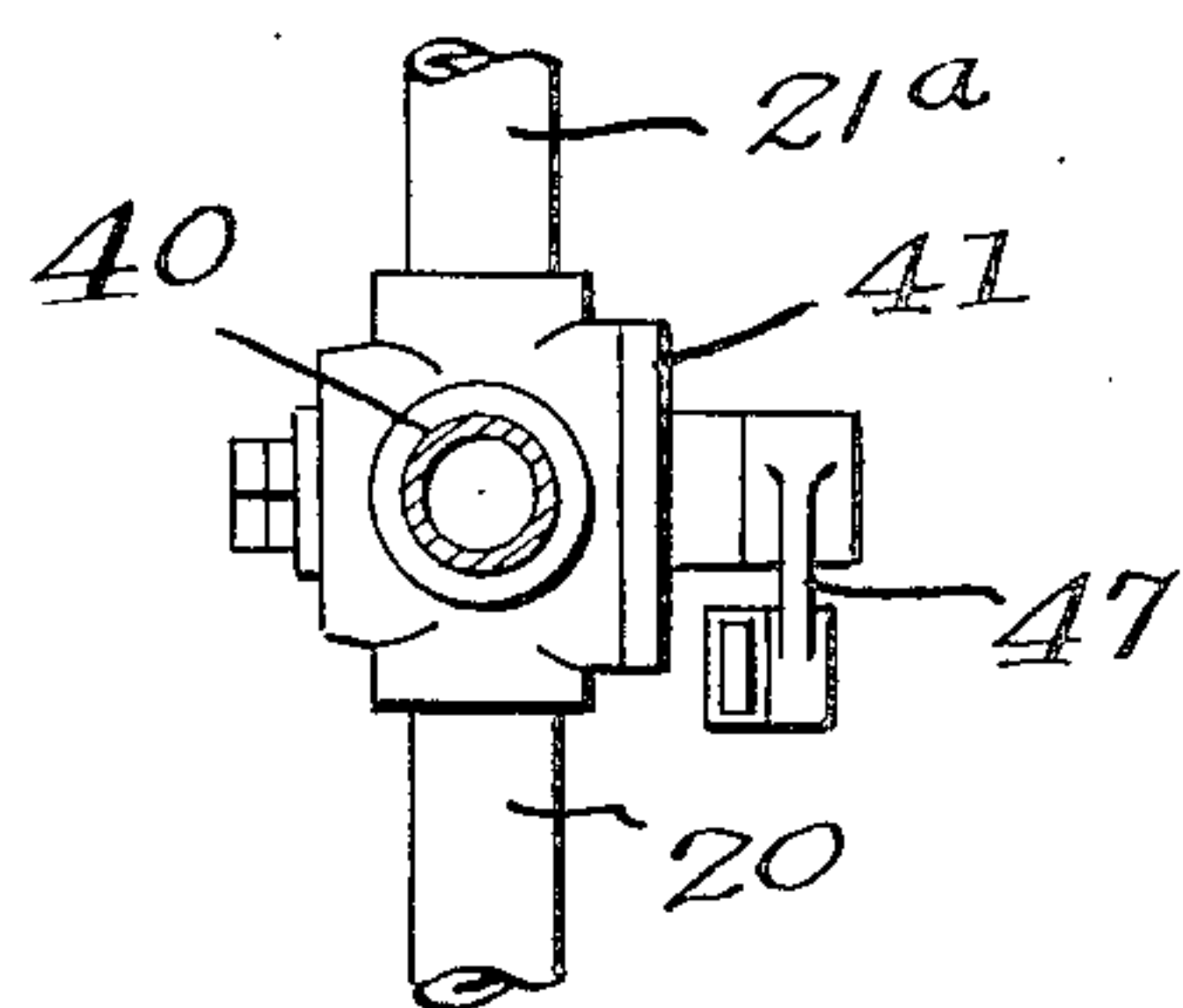
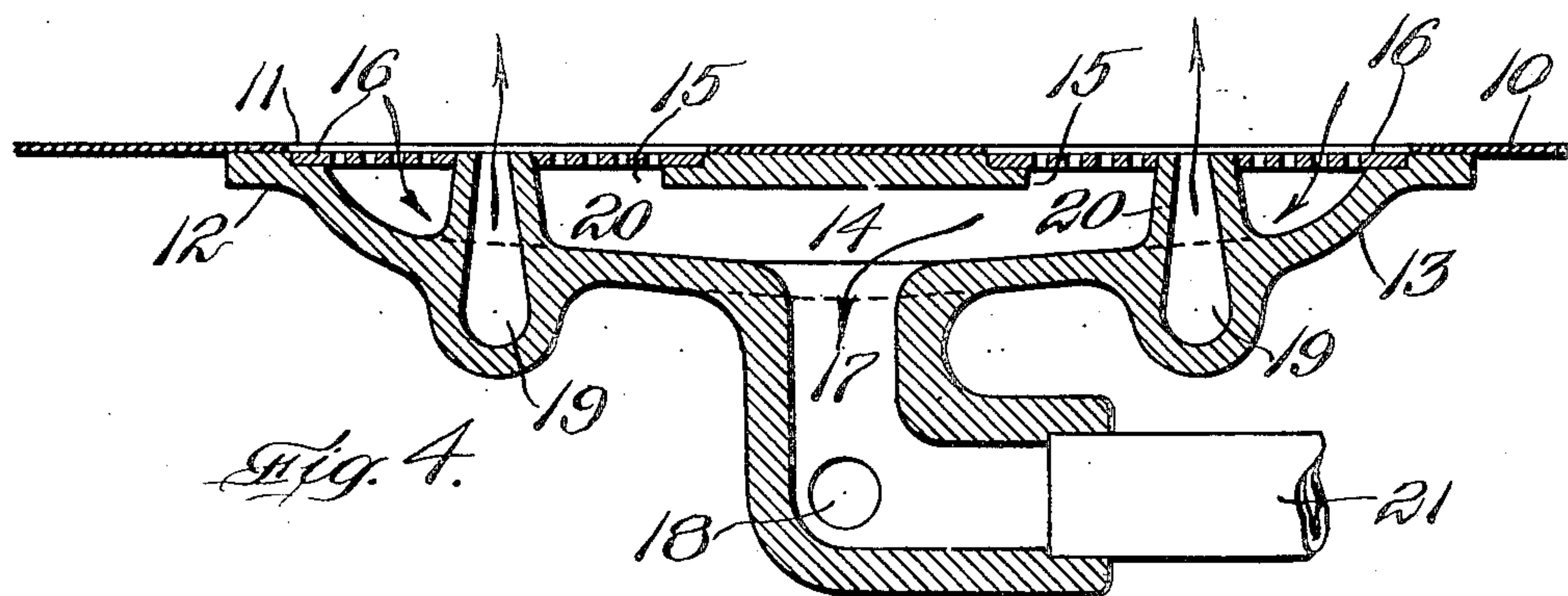
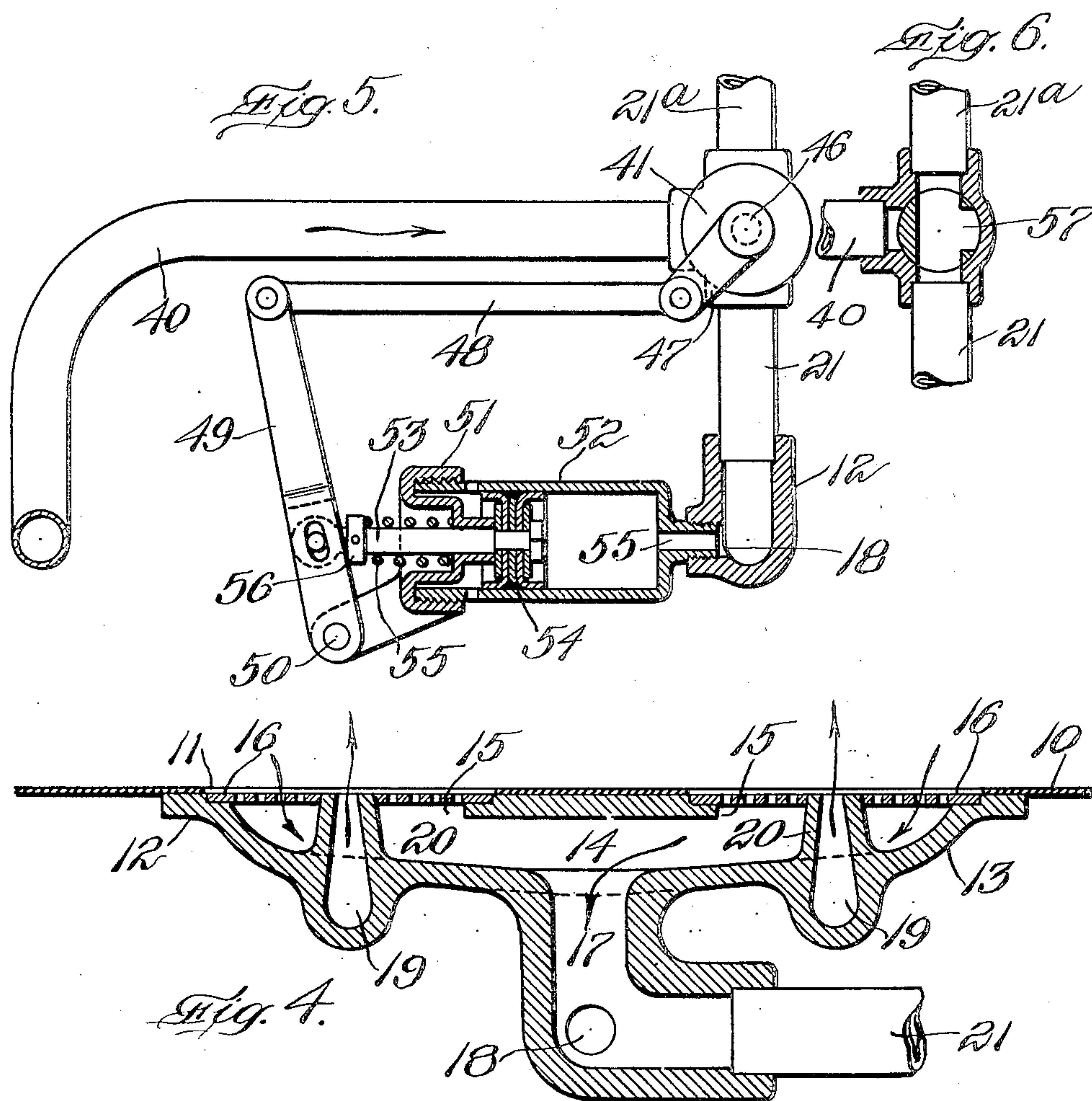


Fig. 7.

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UNITED STATES PATENT OFFICE

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WASHING MACHINE

Application filed August 23, 1928. Serial No. 301,541.

This invention relates to improved washing machines and method of washing.

The primary object of my invention is to provide a machine that will quickly wash clothes clean by the movement of a saponaceous fluid in a tank introduced under pressure without the use of dashers, paddles, pounders, or mechanical agitators of any kind now so commonly used.

I am aware that I am not the first to make a washing machine designed to wash clothes clean by delivering water under pressure to the tank and causing it to circulate. The machines heretofore made for this purpose wash very slowly, and while accomplishing fairly satisfactory results with small pieces just slightly soiled, are unsatisfactory when used to do the ordinary family washing which includes large pieces such as sheets, and clothes which are very soiled. Their failure has been largely due to the fact that they established a relatively smooth and regular path of movement with the consequence that their action lacked the vigor which is necessary to wash clothes clean.

In order to thoroughly wash soiled clothes, the water must be rapidly and vigorously forced through the meshes in the cloth many times to thereby carry away the loosened soil or dirt. To do this in a short space of time is one of the objects of my invention. I have found that dirty clothes may be thoroughly and quickly cleaned, with the minimum of wear, by the rapid movement of streams of soapy water under pressure introduced to the tank in several different directions at the same time, one or more of which streams flows upwardly. For instance, surprising results are accomplished with my machine by simultaneously introducing the liquid in (1) upwardly directed streams through inlets located at the bottom of the tank, (2) in horizontally directed streams through inlets located at one side of the tank, and (3) a downwardly directed stream through an inlet located at the opposite side. This subjects the clothes to counteracting forces from three different directions in the form of streams of water which forcefully and rapidly pass through them. The soiled clothes are repeat-

edly penetrated with suds as they are vigorously pushed upwardly by the vertical streams from the bottom, and while ascending come in contact with the horizontal streams which tend to push them sidewise. As the horizontal streams of water pour through the clothes, their tendency to push the clothes sidewise is at first partly counteracted by the upward motion previously imparted to the clothes, and this clash of streams tends to hold them momentarily in a fixed position, and the horizontal streams of water are forced through the clothes much oftener and much more forcibly than when they are not subjected to counteracting streams; for instance, as when they follow an even circular path around the tank. The horizontal streams push the clothes over to the opposite side of the tank where the downwardly directed stream pushes the clothes to the bottom again, and the same action is repeated. The clothes follow a somewhat irregular, triangular path, and the three sudden changes in the direction of their movement serve to vigorously force water through them rapidly and repeatedly as they are moved about.

The foregoing and other objects which will appear as the nature of the invention is better understood, may be accomplished by a construction, combination and operative arrangement of parts such as is disclosed by the drawings. The nature of the invention is such as to render it susceptible to various changes and modifications, and, therefore, I am not to be limited to the construction disclosed by the drawings; but am entitled to all such changes therefrom as fall within the scope of my claims:

In the drawings:

Figure 1 is a plan view, with the cover removed, of a washing machine constructed in accordance with my invention.

Figure 2 is a section on line 2—2 of Figure 1.

Figure 3 is a section on line 3—3 of Figures 1 and 2.

Figure 4 is a section on line 4—4 of Figure 3.

Figure 5 is a detail, in plan and partly in

section of part of the return conduit and automatic unclogging mechanism.

Figure 6 is a sectional detail hereinafter described.

5 Figure 7 is a side view of a three-way valve.

Like numerals and letters of reference indicate corresponding parts in each figure.

10 The embodiment of my invention herein illustrated includes a frame which may be in the form of a cabinet or box comprising four corner posts 1, Figure 1; four metal side walls 2, Figures 2 and 3, one of which is usually constructed with a door opening and
15 door (not shown) to provide for access to the interior of the cabinet, a bottom wall 3 and a top wall 4. The top wall 4 is a rectangular frame providing within it a rectangular opening that is occupied by a metal tank or container 5 that is square as viewed
20 in plan. The chime of this tank is made with an out-turned flange 6 resting upon and secured to the top wall frame 4.

25 There are four side walls of the tank 5, two of which walls 7, 7 (opposite each other) are disposed vertically and are integral with the side walls 8 and 9 and the bottom wall 10. The bottom wall 10 slopes downwardly at an appreciable angle toward the side wall 8, and adjacent said wall 8 an elongated hole or opening 11, Figures 3 and 4, is made that
30 is immediately above a pipe terminal 12. This pipe terminal 12 may, as shown, be a metal casting comprising a flanged body 13 soldered, riveted, or otherwise fastened in position against the bottom side of the bottom wall 10. The body 13 provides a chamber 14 provided at its top with two inlet openings 15, the outer end of each of the
35 latter being counterbored to receive within it a grille disk 16 which may be a thin perforated metal plate, through the holes or openings in which water escapes and returns to the pump.

40 The chamber 14 is also provided with an outlet port 17 with which a branch port 18 communicates. Also, the body 13 is made with two ports or openings 19 the outlet end of each of which is made as an upwardly directed nozzle 20, through whose opening 19
45 water flows upwardly into the tank, whose upper end occupies a position within a hole provided at the middle of one of the grille disks 16.

50 The outlet port 17 of chamber 14 is connected by a pipe line 21, 21a, 21b with the intake 22 of a centrifugal pump 23 whose rotor is connected with and driven by the armature shaft 24 of an electric motor 25.
55 Both the centrifugal pump 23 and the motor 25 are fixed to a base plate 261 which, in turn, is fixed to the bottom wall 3 of the cabinet.

60 The outlet 26 of the pump 23 is connected by a pipe 27 with the inlet port of a three-way valve 28, Figures 1 and 2, provided with

two outlets 29 and 30. The outlet 29 has connected with it a manifold 31 from which two branch pipes 32 extend upwardly to the pipe terminal 12 where their upper ends are connected with the inlet ends of the two ports
70 or openings 19.

The manifold 31 also has connected with it three pipes 33 which extend upwardly therefrom alongside of the tank or container 5 to near the upper end of the latter where
75 they are connected by pipe terminals 34 with the interior of the tank 5. Each pipe terminal 34 is preferably a casting soldered, riveted, or otherwise fastened to the wall 8 of the tank and made with a port 35 through it, whose inlet end is connected with one of the
80 pipes 33. The opposite delivery end portion of the port 35, through which a horizontal stream enters the tank, communicates with and is directed laterally into the tank 5, said
85 end portion tapering toward the latter as shown.

Upon the outer side of the opposite wall 9 of the tank 5 is soldered, riveted or otherwise fastened, a single pipe terminal 36 which is preferably a casting made interiorly with two
90 ports 37 and 38. The port 37 serves as an inlet for the introduction of water to the tank, while the port 38 serves as an outlet for the escape of water from the tank under certain conditions referred to later. The inlet end of the port 37 is connected by a pipe
95 39 with the manifold 31 while the outlet end of the port 38 is connected by an auxiliary suction or return conduit 40 with one of the two inlets of a three-way valve 41, the other inlet of this valve being connected by the pipe line section 21 with the outlet end of the
100 port 17 of pipe terminal 12. The single outlet of the three-way valve 41 is connected by pipe line sections 21a and 21b with the intake 22 of pump 23. Normally the valve 41 maintains the pipe 40 closed with the two pipe line sections 21 and 21a in communication as
105 shown in Figure 6.

A metal grille 42, through the holes of which water escapes and returns to the pump in case the holes in grille disk 16 become clogged, is secured to the inner side of the
110 pipe terminal 36 and covers the inlet end of the port 38 so that the clothes or other articles being washed are prevented from entering the latter.

The other port 37 of the terminal 36 is made with a straight delivery end portion
115 communicating with the interior of the tank 5, and this delivery end portion occupies an oblique downwardly directed position as shown in Figure 3, delivering water into the tank in a downward direction.
120

The stem 46 of the three-way valve 41, Figures 1 and 5, has an arm 47 fast thereon which is connected by a link 48 with a lever
125 49 that is fulcrumed at 50 upon an arm projecting from the head 51 of a cylinder 52.

Intermediate its ends the lever 49 has pivotally connected to it the outer end of the stem 53 of a piston 54 that is slidably mounted within the cylinder 52.

5 The cylinder 54 is made at one end with a port 55 extending through an exteriorly threaded nipple 56 upon the exterior of that end of the cylinder, and this nipple is screwed into the interiorly threaded outer end portion
10 of the branch port 18 above referred to. It will thus be clear that the pressure within the cylinder 52 is always the same as the pressure within the main suction or return conduit of which chamber 14 and pipe 21
15 form part, and varies with the pressure within the latter.

A coiled spring 55 mounted on stem 53 between head 51 and an adjustable collar 56 carried by the stem, serves to normally and yieldingly hold the piston 54 at the limit
20 of its movement toward the left, Figure 5. The collar 56 is set so that the pressure of the spring 55 is sufficient to hold the piston in this position while the machine is in operation and so long as the pressure within the
25 cylinder 52 remains normal and above a predetermined point for which the collar 56 is adjusted. When the pressure within the cylinder falls below this predetermined point, the atmospheric air pressure acting upon the
30 outer end of the piston 54 overcomes the resistance of spring 55 and moves the piston toward the right, Figure 5. Normally the spring 55 acts through the lever 49 and link
35 48 to hold the plug 57 of the valve 41 in position to close the auxiliary suction or return conduit 40 and maintain communication between the chamber 14 of terminal 12 and the intake of pump 23 as shown in Figure 6.
40 When, however, the piston 54 is shifted toward the right, Figure 5, through an increase in the suction effects within conduit 17 and chamber 14, then said piston acts through the lever 49 and link 48 to adjust the plug
45 57 of valve 41 so that the latter establishes communication between the auxiliary return or suction conduit 40 and the intake 23 and simultaneously shuts off, or regulates, communication between chamber 14 and the
50 intake 23.

A cover 43 hinged at 44 to lugs 45 provided upon top wall 4 is provided for closing the top of tank 5.

55 In using the machine, the tank 5 is loaded with water until the level of the latter is just above the ports 35 as shown at W in Figure 3 and into this water are placed the clothes that are to be washed. When the motor and pump are started in operation by closing the
60 usual switch (not shown) that is in the circuit of the motor, water is caused to flow from tank 5 through the grilles 16, chamber 14, port 17, pipe section 21, valve 41, and pipe sections 21a and 21b to the intake of the
65 pump 23 from which latter it is forced

through pipe section 27 and valve 28 into the manifold 31. From the manifold 31 the water is discharged through the pipes 32, 33 and 39 back into the tank 5.

During the operation of the machine three
70 jets of water are discharged horizontally across the upper portion of the tank 5 from the ports 35; a single downwardly oblique jet of water is discharged from the port 37
75 at the opposite side of the tank toward which the ports 35 are directed, and two jets of water are discharged upwardly from the ports 19 at the bottom of the tank. These jets of water not only cause a vigorous movement of the body of water but also of the
80 clothes, moving them in an uneven, triangular path as they tumble about.

Each nozzle 20, through which one of the ports 19 extends, is positioned at the middle
85 of its grille disk 16 and is surrounded by the openings of the latter which are all comparatively close to said nozzle. This is a feature of advantage since the upwardly directed jets discharging from the ports 19 operate to propel the clothes away from the outlet
90 grilles thereby preventing the clothes from lodging on the grilles and clogging the main outlets of the tank. It is also a feature of importance that the outlet grilles 16 and nozzles 20 are disposed adjacent the lower
95 end of that side wall of the tank 5 from which the horizontally directed jets are discharged, for the reason that with this disposition of parts the outflowing water and the upwardly directed jets from the nozzles assist in maintaining the motion of the tank's
100 contents previously referred to.

If by chance some article in the wash or foreign matter lodges on one or both of the outlet grilles 16 and clogs the machine, then
105 the increased suction effects within the chamber 14 and ports 17 operate to cause the piston 54 to be shifted toward the right, Figure 5, thus reversing, or adjusting the three-way valve 41 so as to open communication
110 between the auxiliary return or suction conduit 40 and the intake of the pump, and at the same time reducing or eliminating the suction effects within the chamber 14. The article or garment being thus freed from the
115 suction effects of the pump is forced upwardly away from the outlet grilles 16 by the jets of water discharged from the ports 19, whereupon the pressure condition within port 17 and cylinder 52 returns to normal,
120 and the piston 54 is automatically operated to restore valve 41 to its normal position, thus closing the auxiliary return 40 and restoring the machine to its normal operating condition. Thus, should the machine become
125 clogged while operating, the valve 41 is automatically operated to unclog the same.

The jet of water discharged from port 37 obliquely downwardly in front of the grille
130 42 of auxiliary port 38 also serves as a screen

to prevent an article that is being washed from lodging on said grille while the auxiliary return conduit is temporarily in use as above described.

5 The three-way valve 28 is provided for use in drawing off or removing the water from tank 5 after washing operations. When this is to be done, the motor is stopped and the clothes are removed from the tank, after
10 which the valve 28 is adjusted to close the inlet end of manifold 31 and establish communication between the outlet of the pump and the outlet 30 of valve 28. The motor is then started and as will be clear the discharge from the
15 pump will leave the valve 28 through the outlet 30 thereof to be discharged.

What I claim is:

1. A washing machine comprising a receptacle adapted to receive a cleansing liquid and the articles to be cleaned, means for forcing said liquid into said receptacle and receiving it again, said receptacle having not
20 less than three ports for the introduction of said liquid into it, said ports being so positioned with relation to each other that the entering streams of said liquid move the clothes about the receptacle in a path, abruptly
25 changing the direction of their movement at least three times in each cycle of travel about the receptacle.

2. A washing machine comprising a receptacle adapted to receive a cleansing liquid and the articles to be cleaned, means for forcing said liquid into said receptacle and receiving it again, said receptacle having ports
35 for the introduction of said liquid into it at the bottom and at two sides opposite each other, said ports being so positioned with relation to each other that the entering streams force the clothes to travel continuously from close
40 proximity to the bottom port to close proximity to one of the side ports, thence to close proximity to the port at the opposite side and thence to close proximity to said bottom port.

3. A clothes washing machine comprising a receptacle adapted to receive a cleansing liquid and the articles to be cleaned, means for forcing said liquid to said receptacle and receiving it again, said receptacle having a port
50 at the bottom for the introduction of a stream upwardly, a port at one side for the introduction of a stream horizontally and a port at the opposite side for the introduction of a stream downwardly, said ports being widely
55 spaced apart and so positioned with relation to each other that the upward stream moves the articles to a point adjacent the entering point of said horizontal stream, and the horizontal stream moves the articles to a point adjacent the entering point of said downward
60 stream, and said downward stream moves the articles to a point adjacent the entering point of said upward stream.

4. A clothes washing machine comprising a
65 receptacle adapted to receive a cleansing liquid

and the articles to be cleaned, means for forcing said liquid to said receptacle and receiving it again, said receptacle having a port at the bottom adjacent one side of the
70 receptacle, a port at said side more than half-way up the receptacle and a port at another side opposite the first-mentioned side, said ports being so positioned with respect to each other that the streams entering through them
75 cause the articles to be moved in a path about the receptacle moving consecutively from close proximity to one port to close proximity to another, whereby each stream entering through said ports changes the direction of
80 said movement.

5. A clothes washing machine comprising a receptacle adapted to receive a cleansing liquid and the articles to be cleaned, means for forcing said liquid to said receptacle and receiving it again, said receptacle having a port
85 at the bottom for the introduction of a stream upwardly, a port at one side for the introduction of a stream horizontally, and another port at the opposite side for the introduction of a stream obliquely downward, said ports
90 being so located relative to each other that said articles are caused to be moved by the streams entering through said ports in a substantially regular course in said receptacle and are brought in close proximity to each of
95 said ports during each complete movement about the receptacle.

6. A clothes washing machine comprising a receptacle adapted to receive a cleansing liquid and the articles to be cleaned, means for forcing said liquid to said receptacle and receiving it again, said receptacle having
100 ports at three widely separated points for the introduction of said liquid in three different directions, one of said ports being located at the bottom, another port at a side and another port at a side opposite said first-mentioned side, said bottom port being so positioned
105 relative to said first-mentioned side port whereby said liquid entering said receptacle through said bottom port will force said articles in close proximity to said first-mentioned side port, and said ports at said sides being so positioned relative to each other that
110 said liquid entering said receptacle through said first-mentioned side port will cause said articles to be moved in close proximity to said second-mentioned side port, and said second-mentioned side port being so positioned relative to said bottom port that said liquid entering
115 said receptacle through said second-mentioned side port will force said articles in close proximity to and above said bottom port.

7. A clothes washing machine comprising a receptacle adapted to receive a cleansing liquid and the articles to be cleaned, means for forcing the liquid to said receptacle and receiving it again, said receptacle having
120 openings for the introduction of the liquid,
125
130

openings to permit its return to said forcing means, and auxiliary return openings, and auxiliary receiving means, normally closed, connected to said auxiliary openings and
5 automatic means to open said auxiliary means when the first mentioned return openings become clogged.

8. A washing machine comprising a receptacle adapted to receive a cleansing liquid and
10 the articles to be cleaned, a pump and conduits for forcing liquid to said receptacle and receiving it again, said receptacle having openings for the introduction of the liquid through said conduits leading to the recepta-
15 cle and openings to permit its escape into said conduits leading from the receptacle and auxiliary openings to permit its escape when the first said escape openings become clogged, and an auxiliary conduit connecting said aux-
20 iliary openings to said pump which auxiliary conduit is normally closed, and automatically operated means set in operation upon the clogging of the first said escape openings to open said auxiliary conduit.

25 9. A clothes washing machine comprising a receptacle adapted to receive a cleansing liquid and the articles to be cleaned, means for forcing said liquid into said receptacle and receiving it again from said receptacle,
30 said receptacle having a port at the bottom near one side of said receptacle for the introduction of a stream upwardly, a horizontal port in the upper part of said side for the introduction of a stream diametrically, and
35 a port at the opposite side inclined towards said first port for the introduction of a stream downwardly.

10. A washing machine comprising a receptacle adapted to receive a cleansing liquid
40 and the articles to be cleaned, means for forcing said liquid into said receptacle and receiving it again, said receptacle having ports for the introduction of said liquid in streams into it one at the bottom and one at each of
45 two sides opposite each other, comprising means to direct each stream from its respective port toward the next succeeding port.

In testimony that I claim the foregoing invention, I have hereunto set my hand this
50 22nd day of August, 1928.

OTTO T. DEHLE.