

March 30, 1937.

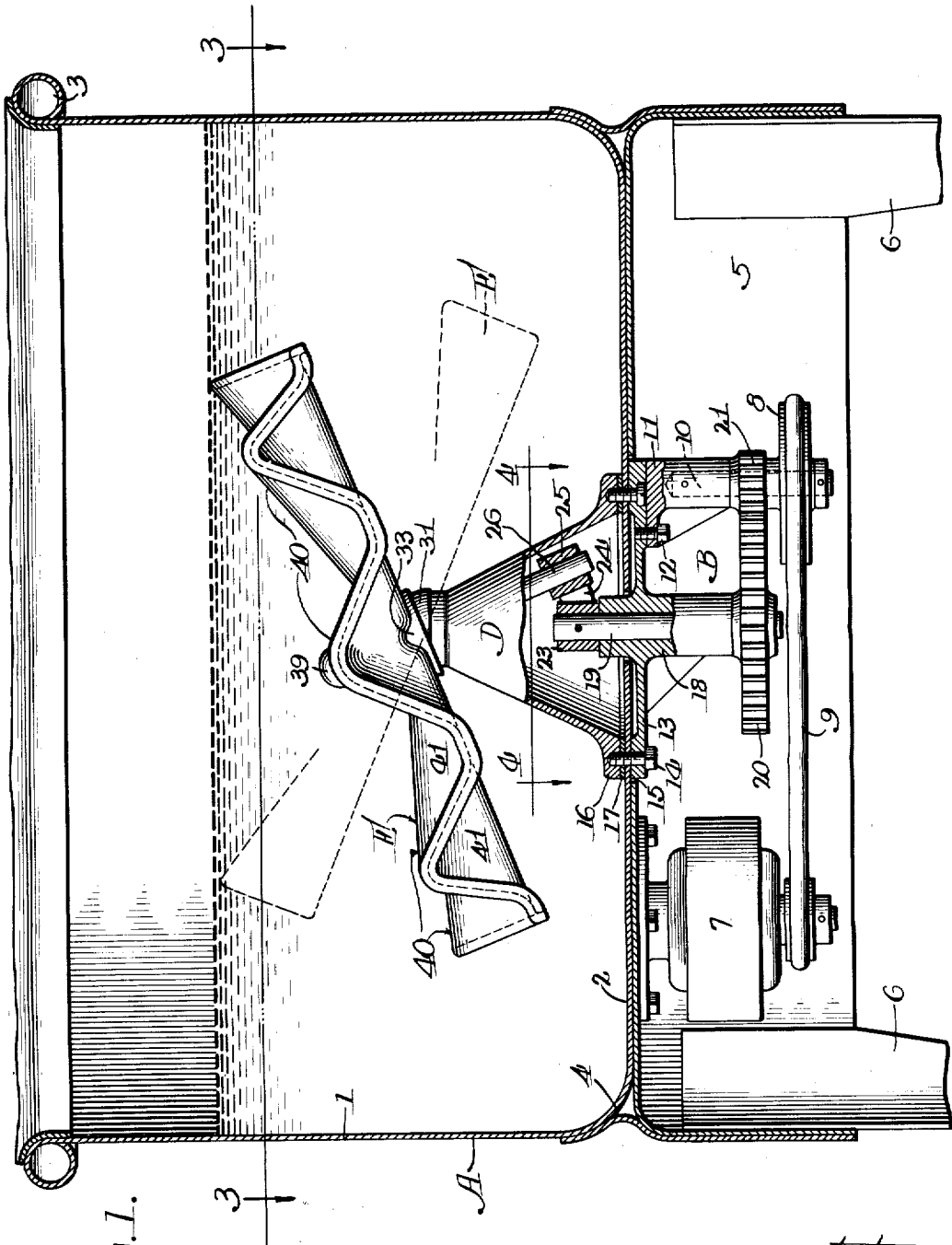
J. SEKAVEC

2,075,628

WASHER

Original Filed Dec. 9, 1932

4 Sheets-Sheet 1



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March 30, 1937.

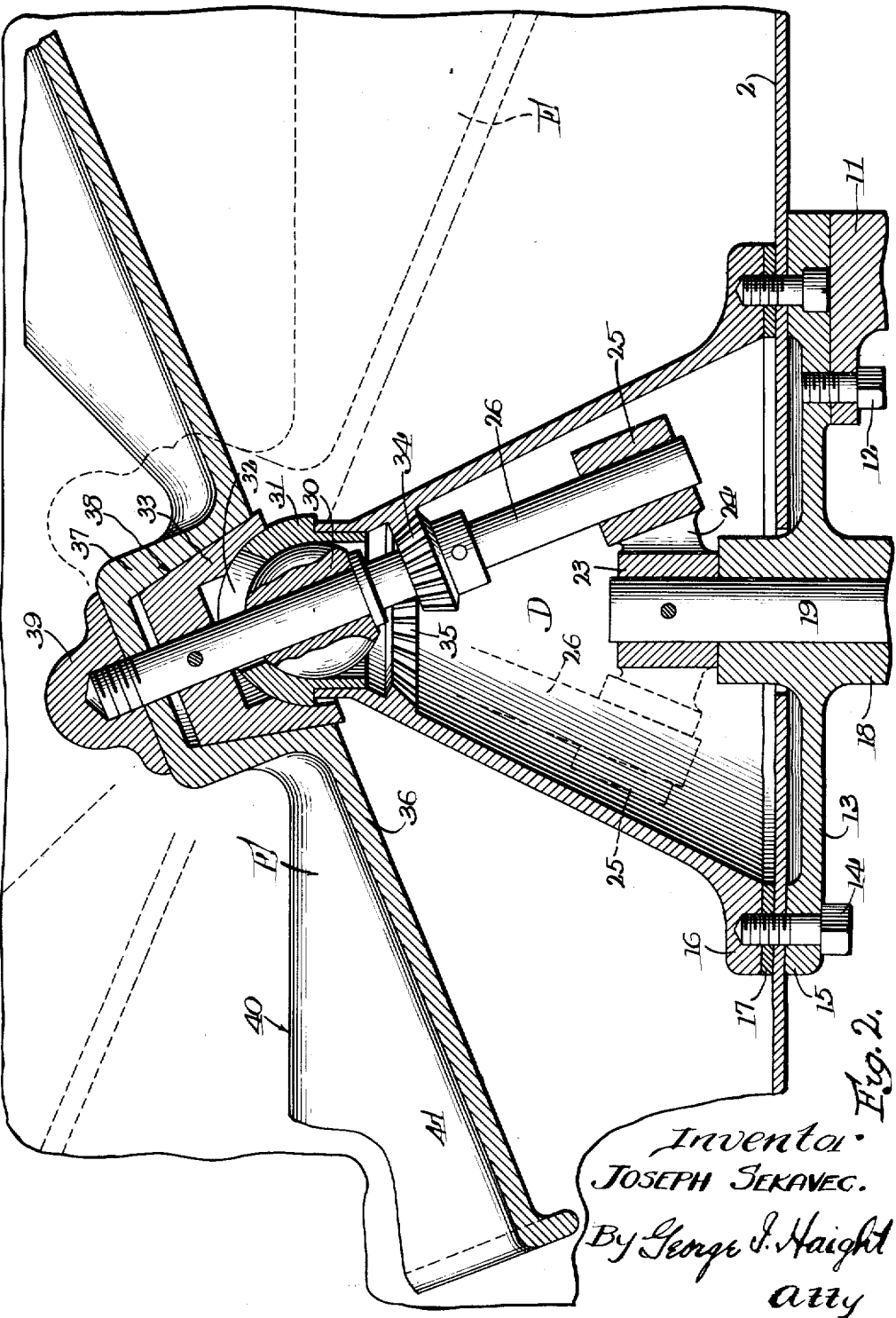
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Fig. 3.

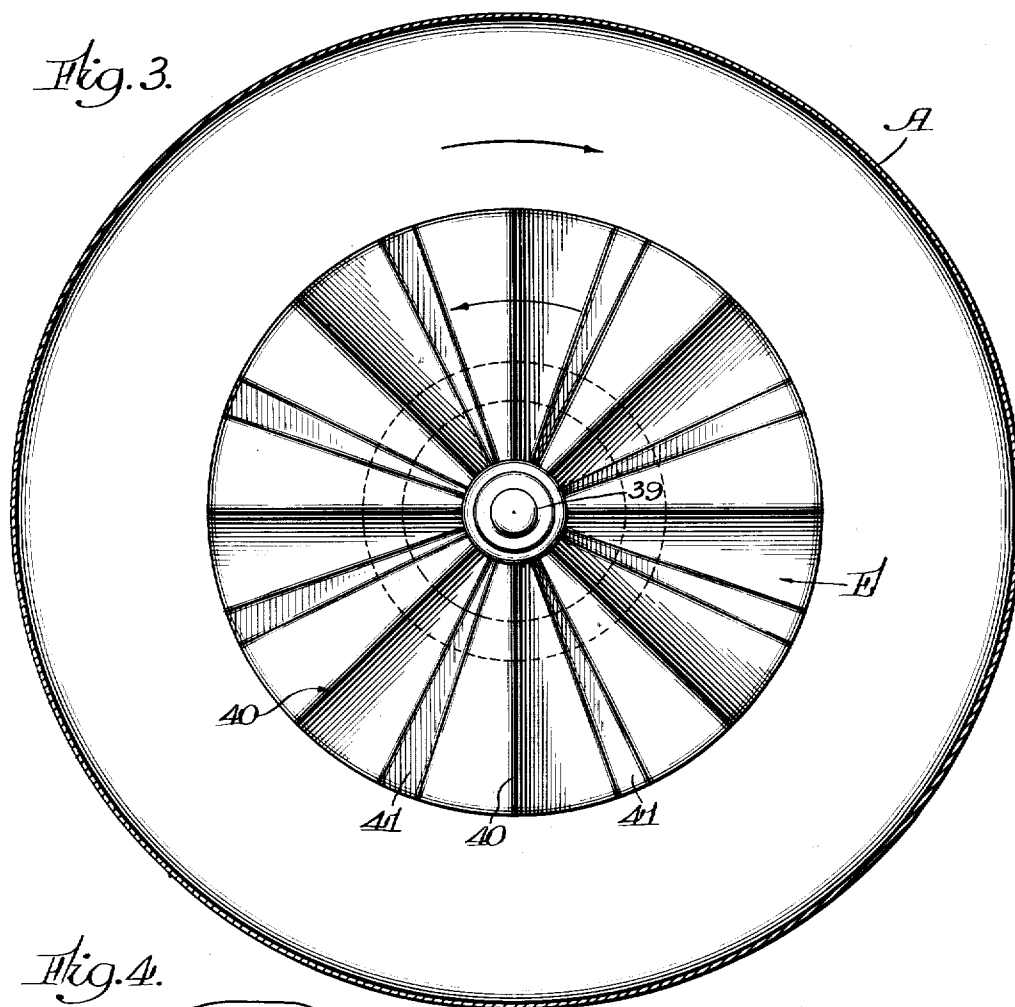


Fig. 4.

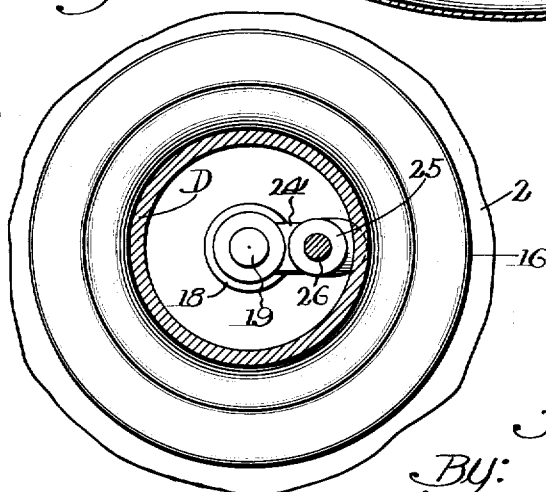
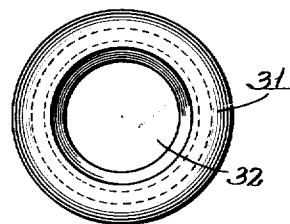


Fig. 5.



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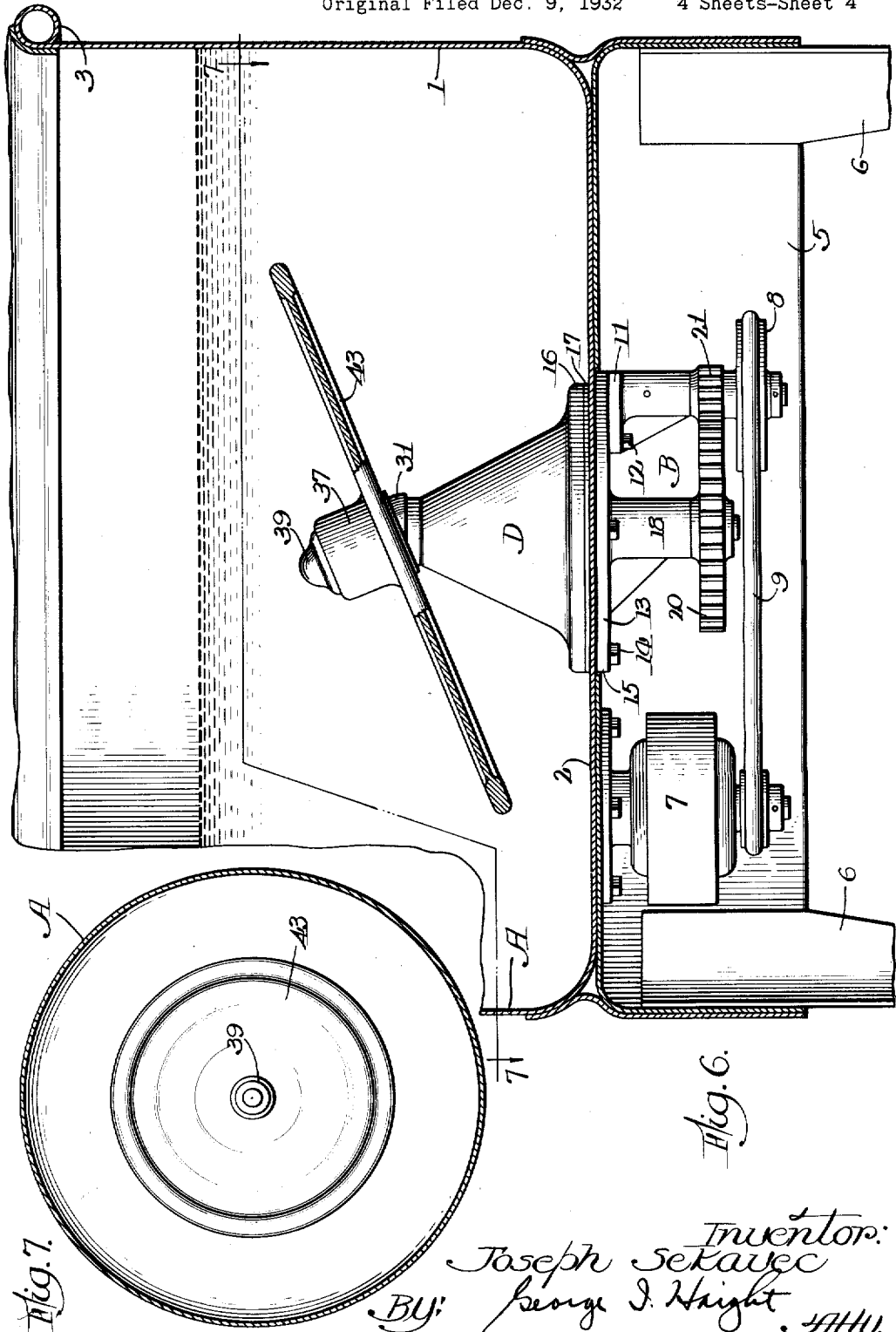
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2,075,628

WASHER

Original Filed Dec. 9, 1932

4 Sheets-Sheet 4



Inventor:
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UNITED STATES PATENT OFFICE

2,075,628

WASHER

Joseph Sekavec, Chicago, Ill., assignor, by direct and mesne assignments, to Electric Household Utilities Corporation, Chicago, Ill., a corporation of Illinois

Application December 9, 1932, Serial No. 646,393
Renewed February 12, 1936

18 Claims. (Cl. 259—102)

My invention involves an improved method of and apparatus for washing or cleansing clothes in a tub or container of the character usually employed in washing machines of the so-called domestic type.

Washing machines of this character usually employ a tub which is cylindrical in shape with a generally flat bottom and an open top, in which tub the washing water and clothes to be cleansed are placed, and in which the water and clothes are maintained in motion whereby the water is forced through the clothes and thereby cleaned.

One of the objects of my invention is to forcefully maintain movement of the water and clothes in the tub in a wavy or undulating motion which progresses in a horizontally circular direction within the tub in a manner as to cause the washing water to be impelled through the clothes and thoroughly clean them.

A further object of my invention is to provide a centrally disposed impeller within the tub arranged for a rotary undulating motion and acting upon the water and clothes in such manner as to set up strong currents of water capable of thoroughly cleansing the clothes.

Other objects of my invention will appear from the following description and drawings of a structure in which the invention is embodied. Referring to the drawings,

Fig. 1 is a vertical section of a washing machine tub and impeller and associated parts, some of which are shown in elevation to better illustrate the structure;

Fig. 2 is an enlarged vertical sectional view of the impeller and the actuating mechanism therefor;

Fig. 3 is a top plan view of the impeller with the tub in section taken on a line 3—3 of Fig. 1;

Fig. 4 is a detail transverse section on line 4—4 of Fig. 1;

Fig. 5 is a detailed plan view of the socket member of the universal bearing;

Fig. 6 is a vertical sectional view similar to Fig. 1 but illustrating a modified impeller structure; and

Fig. 7 is a transverse or plan section on the line 7—7 of Fig. 6.

This invention concerns the method of and apparatus for agitating the water and clothes in a washing machine more particularly of the domestic type, and in the drawings those portions of a washing machine structure are shown as are needed to illustrate the invention.

The tub or vessel A is representative of the usual type employed in domestic washers, and

comprises a cylindrical structure having a substantially vertical wall 1, a substantially flat bottom 2, and open at the top. The tub is usually formed of sheet metal and its upper edge is turned to form a bead 3 for reinforcement and for supporting a suitable removable cover, not shown. The side wall and bottom merge in a slightly rounded corner 4 incidental to the formation of the tub in one piece and to facilitate cleaning of the tub.

An inverted pan 5 is secured to the bottom of the tub and has a number of legs 6 for properly supporting the structure. This pan also serves as a sort of housing or enclosure for the motor 7 and driving mechanism B for the impeller.

The motor 7 is mounted on the underside of the pan 5 and drives a pulley 8 by means of the belt 9. The pulley is carried by a stud shaft 10 which is mounted in a suitable bracket 11 secured by bolts 12 to a plate 13. The plate 13 is secured by bolts 14 to the bottom of the tub, a suitable opening 15 being provided in the pan to accommodate the plate. The bolts 14 extend through the bottom wall of the tub and into the base flange 16 of the impeller standard D within the tub, and a gasket 17 is interposed between the bottom wall and the flange to prevent the entrance of water within the interior of the standard. The plate 13 has a central vertically disposed elongated bearing 18 in which is journaled a vertical main drive shaft 19. This shaft is driven a proper speed through the medium of the gear 20 and pinion 21. The gear 20 is mounted on the lower end of the vertical shaft 19 and meshes with and is driven by the pinion 21 on the hub of pulley 8.

The bearing 18 extends through an opening in the tub bottom and into the hollow interior of the standard D. The shaft 19 extends above the bearing and has keyed to it a hub 23 having a crank arm 24 which has a bearing 25 at its end for an angularly disposed shaft 26, on the upper end of which the impeller member E is mounted and by which the impeller is actuated.

The lower end of the impeller shaft is thus spaced from the axis of the vertical shaft 19 and when the latter is rotated this lower end of the impeller shaft is revolved with a planetary movement in an orbit about the vertical shaft. The impeller shaft 26 is supported in a universal bearing in the upper end of the standard and the center of the bearing is axially in line vertically with the drive shaft 19, so that the portion of the shaft which projects beyond the bearing is given a movement similar to its lower end, which motion

is imparted to the impeller as hereinafter described.

The universal bearing comprises a ball member 30 in which the shaft is rotatable, and a socket member 31 in which the ball is seated for universal movement, this socket being provided with an opening 32 for the portion of the shaft which projects beyond. The socket is mounted in the upper end of the standard which is cone-shaped and hence smaller at its upper end to accommodate the socket. The shaft has fastened to it an inverted cup-shaped member 33, the rim of which is curved to fit and bear upon the outer surface of socket member. Within the standard, the impeller shaft carries a pinion 34 which meshes with and travels around an internal stationary gear 35 formed on the inner wall of the standard. The effect of this gearing is to impart rotation to the shaft opposite to the direction in which the shaft is revolved by the crank movement hereinbefore described.

The parts described which form a universal bearing for the shaft readily permit free movement of the shaft and at the same time provides an effective seal to prevent the entrance of water into the interior of the standard and working parts. This is important because the standard and impeller are submerged in the water. The curved rim of the cup member 33 bearing on the exterior of the socket and the ball bearing on the interior surface of the socket provides a double seal which can be made very effective because these surfaces are all accurately machined.

The structure described forms a suitable mounting and actuating mechanism for the impeller, but it will be obvious that any other suitable mechanism may be employed which will actuate the impeller in the manner to obtain the action on the clothes and water about to be described.

The impeller E is preferably in the form of a disc-like member 36 which, although relatively large in diameter, is preferably spaced a substantial distance from the vertical wall of the tub. It has a central hollow boss 37, the interior wall 38 of which is tapered to form a wedge fit on the correspondingly tapered outer surface of the member 33. It is clamped thereon by a cap nut 39 which is screwed on the threaded end of the impeller shaft.

The impeller is positioned in the tub so that it will be well submerged in the water, the preferred level of which is indicated in Fig. 1. When the desired load of clothes is placed in the tub and the impeller is started in operation, the body of water and clothes are given a combined wave and whirling movement around the tub. This is due to the fact that the impeller member is constantly at an angle to the horizontal, but its position is constantly changing by virtue of its rocking motion while being rotated, which progressively lowers one side of the impeller and raises the opposite side. As a result, the lowering side of the impeller presents to the water an angularly disposed face on its underside and the raising side of the impeller likewise presents to the water a corresponding angularly disposed upper face. Since both faces move in the same direction, they act to force the water and clothes with a whirling undulating motion around the tub. The degree of violence with which this action takes place can be regulated or governed by the speed at which the impeller is rocked, by the shape of the impeller, and by rotation of the impeller in its

own plane in a direction opposite to its wave or rocking motion. In the form shown in Figs. 1 and 2, the impeller is made in a wave formation so that on both its upper and lower faces there is provided a series of alternate hills 40 and valleys 41. These are greatest in height and width at the circumference of the disc and gradually decrease towards the center of the disc. These hills and valleys, by virtue of rotation of the disc in its own plane, act to retard to some extent the undulating and whirling movement of the water and clothes and prevent them piling up too high ahead of the revolving impeller, and the effect can be regulated as desired by the speed of rotation of the impeller in its own plane.

In the form shown in Figs. 6 and 7, the impeller is in the shape of a flat disc 43, and its retarding effect is less; therefore it can be rotated in its own plane at greater speed. The speed of rotation of the disc in its own plane can be determined by proportioning the gears 34 and 35.

I have illustrated and described a new method of agitating water and clothes in a tub for the purpose of cleansing the clothes, and a structure by which this method is carried into effect. It is obvious that changes may be made in the construction, operation and arrangement of the parts without departing from the spirit of the invention and it is understood that I contemplate such changes as fairly fall within the scope of the appended claims.

I claim:

1. In a washing machine of the character described, the combination of a tub adapted to contain the washing fluid and clothes to be washed and having a cylindrical, substantially vertical side wall and a bottom, an impeller substantially centrally positioned within and a substantial distance above the bottom of the tub and to be submerged below the level of the water in a quiescent state and comprising a disc member of appreciable diameter but substantially spaced from the wall of the tub to provide for the free circulation of the clothes around and beneath the impeller, a hollow standard upstanding from the bottom of the tub, a support for said disc member maintaining said member in a plane at an angle to said water level, said support being fulcrumed on and extending into the interior of said standard, and means within the standard for revolving said support in a circular orbit about the vertical axis of its fulcrum for imparting a bodily movement to the disc member while maintaining its angular relation to the water level.

2. In a washing machine of the character described, the combination of a tub adapted to contain the washing fluid and clothes to be washed and having a cylindrical, substantially vertical side wall and a bottom, an impeller substantially centrally positioned within and a substantial distance above the bottom of the tub and to be submerged below the level of the water in a quiescent state and comprising a disc member of appreciable diameter but substantially spaced from the side wall of the tub to provide for the free circulation of the clothes around and beneath the impeller, a hollow standard upstanding from the bottom of the tub, a support for said disc member maintaining said member in a plane at an angle to said water level, said support being fulcrumed on said standard and extending into the interior of said standard, means within said standard for revolving said support in a circular orbit about the vertical axis of its fulcrum for imparting a bodily movement to the

disc-like member while maintaining its angular relation to the water level, and means within the standard for rotating the support on its own axis to impart rotation to the disc member in its own plane.

3. In a washing machine of the character described, the combination of a tub for containing the water and clothes to be washed, a standard upstanding from the bottom of the tub, a vertical drive shaft within said standard, an inclined impeller shaft fulcrumed on said standard with the axis of the fulcrum in line with the axis of the drive shaft, a crank arm on the drive shaft connected to said impeller shaft for revolving the impeller shaft below the fulcrum in an orbit about the drive shaft, an impeller member mounted upon the impeller shaft above the fulcrum and comprising a disc member disposed in a plane substantially at right angles to the axis of the impeller shaft and adapted to be bodily revolved about the axis of the drive shaft by the portion of the impeller shaft above the fulcrum, and motor driven means for rotating said drive shaft.

4. In a washing machine of the character described, the combination of a tub for containing the water and clothes to be washed, a standard upstanding from the bottom of the tub, a vertical drive shaft within said standard, an inclined impeller shaft fulcrumed on said standard with the axis of the fulcrum in line with the axis of the drive shaft, a crank arm on the drive shaft connected to said impeller shaft for revolving the impeller shaft below the fulcrum in an orbit about the drive shaft, an impeller member mounted upon the impeller shaft above the fulcrum and comprising a disc member disposed in a plane substantially at right angles to the axis of the impeller shaft and adapted to be bodily revolved about the axis of the drive shaft by the portion of the impeller shaft above the fulcrum, and means for rotating said impeller shaft on its own axis to rotate the impeller disc member in its own plane.

5. In a washing machine of the character described, the combination of a tub for containing the water and clothes to be washed, a hollow standard upstanding from the bottom of the tub in the center thereof, a drive shaft extending vertically into said hollow standard, an arm on said shaft adapted to swing in a horizontal plane by the rotation of the shaft, an impeller shaft, a universal bearing for the impeller shaft mounted on said standard with its center substantially in line with the axis of the drive shaft, said impeller shaft being connected with said arm below the fulcrum at a distance from the axis of the drive shaft, an impeller member mounted on the impeller shaft above the fulcrum and adapted to be bodily revolved thereby about the axis of the drive shaft, said impeller member including a continuous operating surface extending substantially normal to the axis of the impeller shaft and normally submerged below the surface of the water when said impeller is operating upon a capacity load of clothes and motor driven means for rotating said drive shaft.

6. In a washing machine of the character described, the combination of a tub for containing the water and clothes to be washed, a hollow standard upstanding from the bottom of the tub in the center thereof, a drive shaft extending vertically into said hollow standard, an arm on said shaft adapted to swing in a horizontal plane by the rotation of the shaft, an impeller shaft, a universal bearing for the impeller shaft

mounted on said standard with its center substantially in line with the axis of the drive shaft, said impeller shaft being connected with said arm below the fulcrum at a distance from the axis of the drive shaft, an impeller member mounted on the impeller shaft above the fulcrum and adapted to be bodily revolved thereby about the axis of the drive shaft, means for rotating the impeller shaft on its own axis to rotate the impeller member in its own plane, and motor driven means for driving the drive shaft.

7. In a washing machine of the character described, the combination of a tub for containing the water and clothes to be washed, a hollow standard upstanding from the bottom of the tub in the center thereof, a drive shaft extending vertically into said hollow standard, an arm on said shaft adapted to swing in a horizontal plane by the rotation of the shaft, an impeller shaft, a universal bearing for the impeller shaft mounted on said standard with its center substantially in line with the axis of the drive shaft, said impeller shaft being connected with said arm below the fulcrum at a distance from the axis of the drive shaft, a disc impeller member mounted on the impeller shaft above the fulcrum and adapted to be bodily revolved thereby about the axis of the drive shaft, a stationary gear supported by said standard, a gear on the impeller shaft meshing with said stationary gear for rotating the impeller shaft on its own axis to rotate the impeller member in its own plane, and motor driven means for rotating said drive shaft.

8. In a washing machine of the character described, the combination of a tub having side walls and a bottom for containing the water and clothes to be washed, an impeller member supported within the tub at an appreciable distance above the tub bottom and from the side walls to provide space around and below the impeller for the free circulation of the clothes, said impeller being substantially submerged below the normal water level in the tub, means for bodily revolving the impeller member about a vertical axis with the plane of said impeller member at an angle to the normal water level, and driving means connected with the impeller for simultaneously rotating said impeller member in its own plane.

9. Impeller mechanism for agitating the water and clothes in the tub of a washing machine comprising an impeller member, an inclined rotatable shaft for said impeller member the axis of said shaft being substantially normal to the plane of the impeller member, said impeller member including a continuous operating surface extending substantially normal to the axis of the impeller shaft and normally submerged below the surface of the water when said impeller is operating upon a capacity load of clothes, a universal bearing for said impeller shaft permitting the shaft to be bodily revolved about the center of said universal bearing and at an angle to the vertical axis of said bearing, a standard for supporting said universal bearing, and means within the standard for bodily revolving the impeller shaft about said center below the bearing for imparting corresponding movement to the impeller above the bearing.

10. Impeller mechanism for agitating the water and clothes in the tub of a washing machine comprising a disc impeller member, an inclined rotatable shaft for said impeller member the axis of said shaft being substantially normal to the plane of the impeller member, a universal bearing, for said impeller shaft permitting the shaft

to be bodily revolved about the center of said universal bearing and at an angle to the vertical axis of said bearing, a standard for supporting said universal bearing, means within the standard for bodily revolving the impeller shaft about said center below the bearing for imparting corresponding movement to the impeller disc above the bearing, and means for rotating said impeller shaft on its own axis.

11. In a washing machine of the class described, the combination of a cylindrical tub having substantially vertical side walls and substantially horizontal bottom wall, a cone-shaped hollow standard upstanding from the center of said tub bottom, a vertical drive shaft extending into said standard, a socket member in the standard above said drive shaft, a ball member in said socket for universal movement therein, an impeller shaft rotatable in said ball member and extending above and below the socket member, the center of rotation of the ball member being in substantial alignment with the axis of the drive shaft, a crank arm on the drive shaft connected to the lower end of said impeller shaft at a distance from the axis of rotation of the drive shaft whereby to hold the impeller shaft at an angle to said axis and to swing said lower end of the impeller shaft circularly around said drive shaft axis and to reproduce said circular movement at the upper end of said impeller shaft, and a disc impeller member mounted upon the upper end of said impeller shaft with its plane substantially at right angles to the axis of the impeller shaft.

12. In a washing machine of the class described, the combination of a cylindrical tub having substantially vertical side walls and substantially horizontal bottom wall, a cone-shaped hollow standard upstanding from the center of said tub bottom, a vertical drive shaft extending into said standard, a socket member in the standard above said drive shaft, a ball member in said socket for universal movement therein, an impeller shaft rotatable in said ball member and extending above and below the socket member, the center of rotation of the ball member being in substantial alignment with the axis of the drive shaft, a crank arm on the drive shaft connected to the lower end of said impeller shaft at a distance from the axis of rotation of the drive shaft whereby to hold the impeller shaft at an angle to said axis and to swing said lower end of the impeller shaft circularly around said drive shaft axis and to reproduce said circular movement at the upper end of said impeller shaft, a disc impeller member mounted upon the upper end of said impeller shaft with its plane substantially at right angles to the axis of the impeller shaft, a stationary ring gear in said standard, a pinion gear on the impeller shaft meshing with and adapted to travel around said ring gear for rotating the impeller shaft upon its own axis, and motor driven mechanism for rotating said drive shaft.

13. In a washing machine of the character described, the combination of a tub having side walls and a bottom for containing the water and clothes to be washed, an impeller member of disk form positioned centrally within the tub at an angle to the vertical axis of the tub, said impeller being angularly spaced from the side wall of the tub and located above the bottom wall thereof a sufficient distance to provide space for the free movement of the clothes and water around and beneath the impeller whereby the clothes change

washing position with respect to the impeller as the impeller operates, means for revolving the impeller member in said angular relation to the vertical axis for causing a continuous downward movement of successive marginal portions of said disc impeller and causing continuous upward movement of successive diametrically opposite marginal portions of said disc impeller, and means permitting the rotation of the impeller member in its own plane.

14. The combination of a tub having a bottom and upright wall for containing the water and clothes to be washed, a standard extending up from the bottom of said tub in the center thereof, a shaft extending upwardly through and supported in said standard, a disc agitator member driven by said shaft and positioned at an appreciable distance above the bottom of the tub and having its margin spaced from the wall of the tub to permit circulation of the clothes around and beneath the agitator whereby the agitator freely turns the clothes as it operates, said agitator being disposed in a plane at an angle to the vertical axis of the tub, and means below the tub for driving said shaft to bodily revolve the agitator member about the vertical axis of said support, for causing a continuous downward movement of successive marginal portions of said disc impeller and causing continuous upward movement of successive diametrically opposite marginal portions of said disc impeller.

15. The combination of a tub having a bottom and upright wall for containing the water and clothes to be washed, a standard extending up from the bottom of said tub in the center thereof, a shaft extending upwardly through and supported in said standard, a disc agitator member driven by said shaft and positioned at an appreciable distance above the bottom of the tub and having its margin spaced from the wall of the tub to permit circulation of the clothes around and beneath the agitator whereby the agitator freely turns the clothes as it operates, said agitator being disposed in a plane at an angle to the vertical axis of the tub, means below the tub for driving said shaft to bodily revolve the agitator member about the vertical axis of said support, for causing a continuous downward movement of successive marginal portions of said disc impeller and causing continuous upward movement of successive diametrically opposite marginal portions of said disc impeller, and means permitting the rotation of the agitator in the plane of itself.

16. In a washing machine of the character described, the combination of a tub adapted to contain the washing fluid and clothes to be washed, a vertical drive shaft having a portion extending upwardly through the bottom of the tub, a crank arm carried on said portion of the drive shaft, an impeller member of disc form connected to the outer end of said arm, said impeller being positioned with its axis disposed obliquely to the axis of the drive shaft, and adapted to be bodily revolved with said arm in an orbit about the axis of the drive shaft, for causing a continuous downward movement of successive marginal portions of said disc impeller and causing continuous upward movement of successive diametrically opposite marginal portions of said disc impeller, and motor driven means for rotating said drive shaft.

17. In a washing machine of the character described, the combination of a tub adapted to contain the washing fluid and clothes to be washed, a vertical drive shaft having a portion

extending upwardly through the bottom of the tub, a crank arm carried on said portion of the drive shaft, an upwardly extending impeller shaft connected to the outer end of the crank arm and disposed with its axis at an angle to the axis of the drive shaft, an impeller member of disc form mounted on the impeller shaft and disposed at substantially right angles to the axis of said impeller shaft, and adapted to be bodily revolved with said impeller shaft in an orbit about the axis of the drive shaft, for causing a continuous downward movement of successive marginal portions of said disc impeller and causing continuous upward movement of successive diametrically opposite marginal portions of said disc impeller, and motor driven means for rotating said drive shaft.

18. In a washing machine of the character described, the combination of a tub adapted to contain the washing fluid and clothes to be

washed, a vertically disposed drive shaft having a portion extending upwardly through the bottom of the tub, a laterally extending crank arm carried on said portion of the drive shaft, an upwardly extending impeller shaft connected to the outer end of said arm and disposed with its axis at angle to and in line with the axis of the drive shaft, an impeller member of disc form mounted upon the impeller shaft and disposed substantially at right angles to the axis of said impeller shaft, and adapted to be bodily rotated with said impeller shaft in an orbit about the axis of the drive shaft, for causing a continuous downward movement of successive marginal portions of said disc impeller and causing continuous upward movement of successive diametrically opposite marginal portions of said disc impeller, and motor driven means for rotating said drive shaft.

JOSEPH SEKAVEC. 20

CERTIFICATE OF CORRECTION.

Patent No. 2,075,628.

March 30, 1937.

JOSEPH SEKAVEC.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 4, first column, line 71, claim 13, for the word "angularly" read annularly; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 11th day of May, A. D. 1937.

(Seal)

Henry Van Arsdale
Acting Commissioner of Patents.

extending upwardly through the bottom of the tub, a crank arm carried on said portion of the drive shaft, an upwardly extending impeller shaft connected to the outer end of the crank arm and disposed with its axis at an angle to the axis of the drive shaft, an impeller member of disc form mounted on the impeller shaft and disposed at substantially right angles to the axis of said impeller shaft, and adapted to be bodily revolved with said impeller shaft in an orbit about the axis of the drive shaft, for causing a continuous downward movement of successive marginal portions of said disc impeller and causing continuous upward movement of successive diametrically opposite marginal portions of said disc impeller, and motor driven means for rotating said drive shaft.

18. In a washing machine of the character described, the combination of a tub adapted to contain the washing fluid and clothes to be

washed, a vertically disposed drive shaft having a portion extending upwardly through the bottom of the tub, a laterally extending crank arm carried on said portion of the drive shaft, an upwardly extending impeller shaft connected to the outer end of said arm and disposed with its axis at angle to and in line with the axis of the drive shaft, an impeller member of disc form mounted upon the impeller shaft and disposed substantially at right angles to the axis of said impeller shaft, and adapted to be bodily rotated with said impeller shaft in an orbit about the axis of the drive shaft, for causing a continuous downward movement of successive marginal portions of said disc impeller and causing continuous upward movement of successive diametrically opposite marginal portions of said disc impeller, and motor driven means for rotating said drive shaft.

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