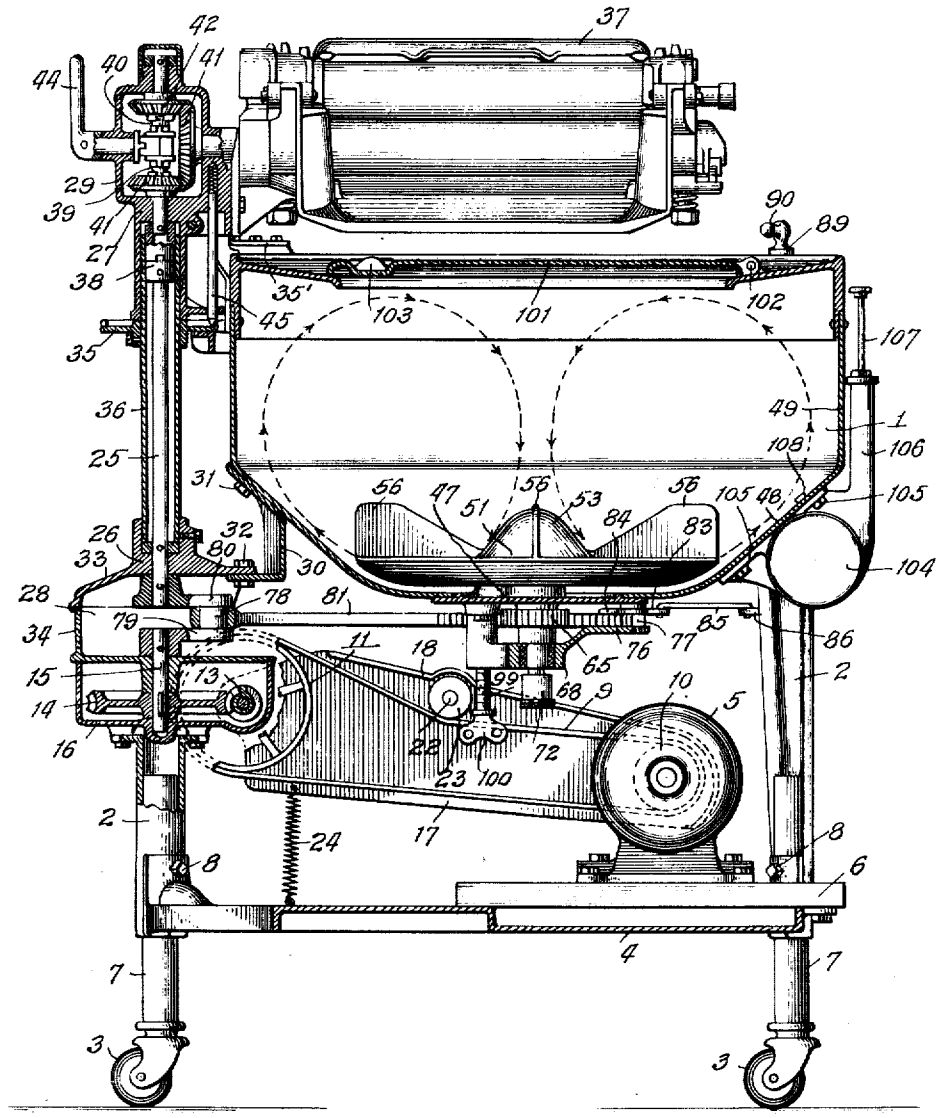
July 12, 1932. H. F. SNYDER 1,866,779

WASHING MACHINE

Filed June 14, 1922 3 Sheets-Sheet 1

Fig. 1.



Inventor:
Howard F. Snyder,
by Wallace R. Lane.
Atty

July 12, 1932. H. F. SNYDER 1,866,779

WASHING MACHINE

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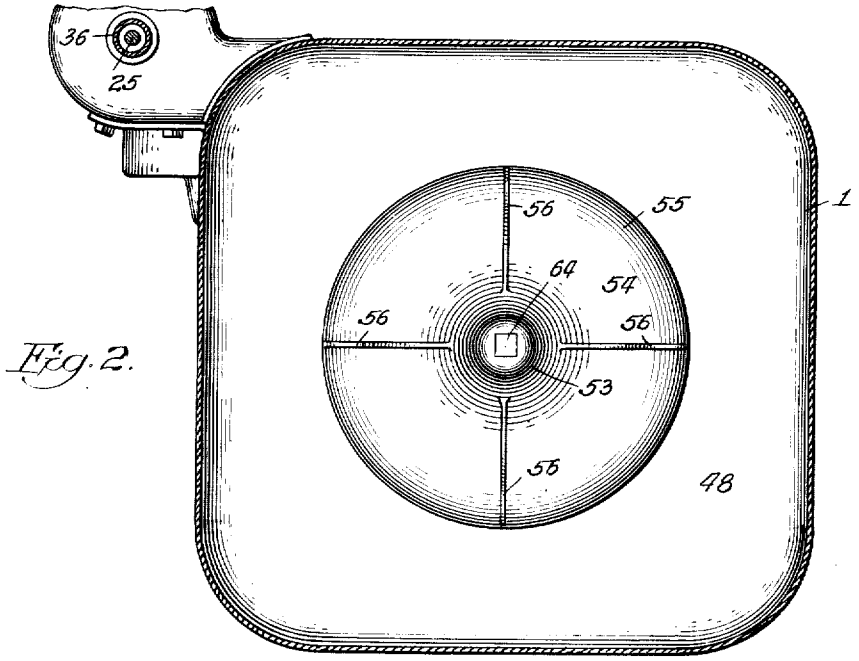


Fig. 2.

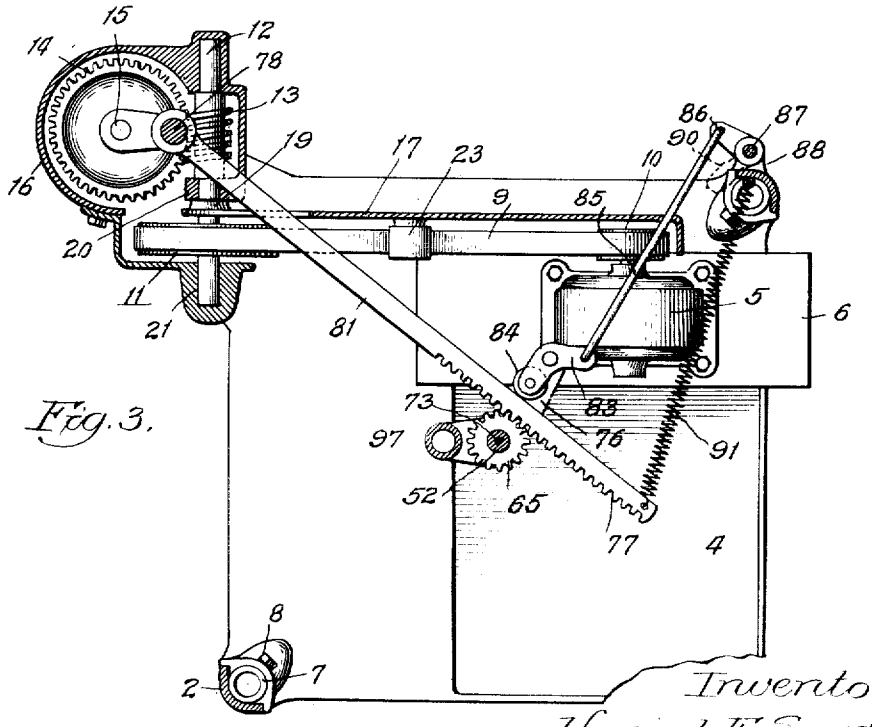


Fig. 3.

Inventor:
Howard F. Snyder,
by Wallace R. Lane
Atty.

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WASHING MACHINE

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Fig. 4.

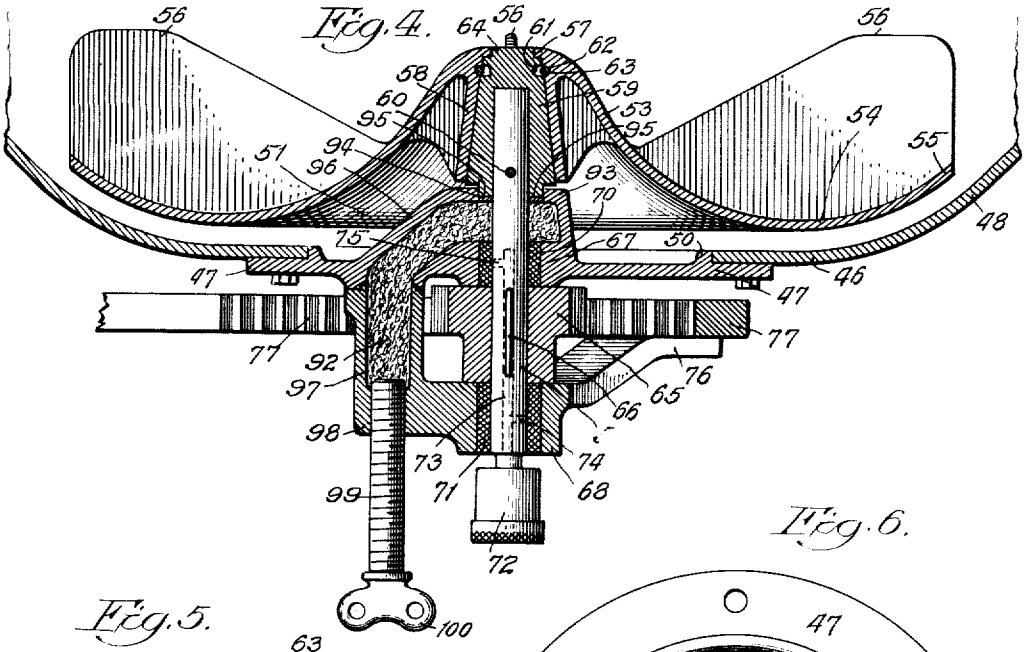


Fig. 5.

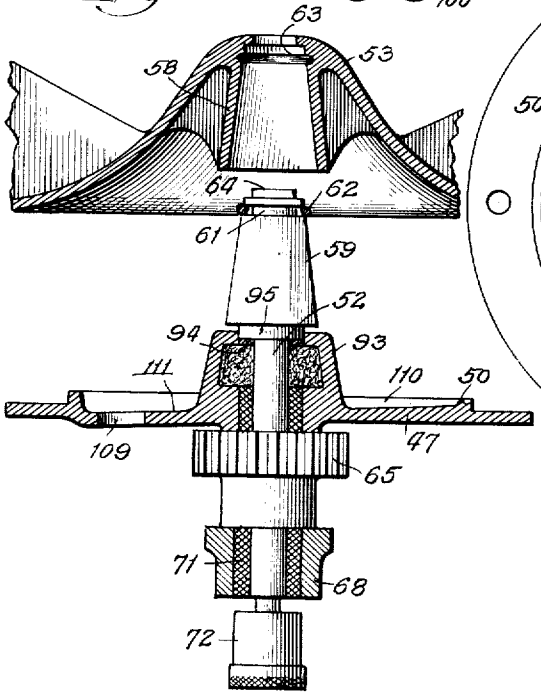
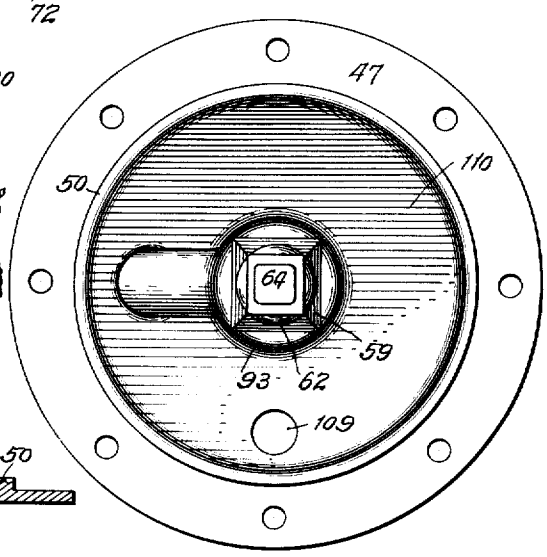


Fig. 6.



Inventor:
Howard F. Snyder;
by Wallace R. Lane,
Atty.

Patented July 12, 1932 1,866,779

UNITED STATES PATENT OFFICE

HOWARD F. SNYDER, OF NEWTON, IOWA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE MAYTAG COMPANY, OF NEWTON, IOWA, A CORPORATION OF DELAWARE

WASHING MACHINE

Application filed June 14, 1922. Serial No. 568,158.

The present invention relates to a power driven washing machine and more particularly to the construction of the gyrator or impeller and tub thereof and the gyrator or impeller operating mechanism for such machine.

Among the objects of the invention is to provide a novel construction designed to wash and thoroughly cleanse clothes, fabrics and various similar materials of all kinds. My invention is equally efficient in washing fabrics, and other similar materials of a very delicate nature, that may have become frail and weak owing to aging, wear and otherwise. Among such delicate materials are included fine laces, nettings, veils, fine silks, lace curtains and various other articles. Very often valuable articles, relics, heirlooms and other objects of great value are composed partly or wholly of fine and frail textures, such that they cannot be easily washed when soiled, since their nature would not permit subjecting them to the rigors of the ordinary washing machine operation, or even washing by hand. By my invention, the washing and cleansing of such objects is not only made possible, but practicable, such that most delicate and frail objects can be handled mechanically during the washing operation without marring their character and beauty. By reducing friction on the articles to be washed the life of the article is preserved.

These and the other objects of the invention are attained by so constructing and associating the tub and the gyrator of the washing machine, and so operating the gyrator that the weight of the articles does not interfere with the gyrator, or its action, or with the tub and its co-action with the gyrator. In my invention the gyrator and tub, irrespective of the upper or lower end position of the gyrator therein, so coact that the goods to be cleansed are not only given a definite washing and cleansing movement, but are also maintained, during such movement, in a suspended condition in the liquid, so that the rapid and energetic alternating rotary movements of the gyrator do not interfere with the goods or cause them any injury or damage, while at the same time the goods and the wash water, (or the rinse water, when rinsing), are turbulently swirled or whirled about with a surging and seething movement within the tub. Even in the form of the invention illustrated, wherein the liquid impelling blades are disposed at the bottom of the tub, the action of the agitator on the liquid is to constantly press the clothes upwardly in a swirling formation so that they are maintained in substantial suspension in the liquid above the blades. To this end the tub preferably has a smooth interior not interrupted by flanges or other projections, and preferably has an inclined bottom portion so associated with the gyrator and the remainder of the tub as to cooperate therewith in aid of such action.

One of the principal objects of this invention resides in providing this improved method of and apparatus for cleansing fabrics without bringing them into substantial rubbing contact with the walls of the tub or the liquid agitating mechanism.

As another object of the invention, the gyrator is provided with flanges which, during the alternations thereof, act to successively impart movement to the contents of the tub, such that the resultant direction of movement of the contents in the embodiment illustrated in the drawings is normally radially outward from the central portion of the tub, then upwardly, then inwardly and then downwardly toward the center of the gyrator, and yet at the same time there is a generally rotary progression or movement about the inside of the tub, first in one direction and then in an opposite direction, such movement being in the nature of a gyratory action or movement and appearing to be that of a helix around a ring. In this way the goods or objects undergoing the washing operation are driven about in the tub in devious paths, while at the same time the wash water or cleansing fluid is being vigorously agitated and rigorously moved about the tub in devious paths to sustain the washable materials, whereby they will not be injuriously affected by the gyrator operating or actuating mechanism. This mechanism may be

readily thrown into and out of operative connection with the gyrator at will.

Still further objects of this invention reside in providing a novel construction of agitator blade; and in further providing resilient means, tending to normally render the gyrator inoperative but yieldable to render the same operative when manually actuated; to provide a combined means for guarding against the accidental contact or interference of the operator with the driving mechanism of the washing machine and maintaining the driving mechanism in effective driving condition, as by constantly maintaining a driving belt taut; and to provide other features having the objects, advantages and capabilities hereafter more fully appearing.

Due to the construction and arrangement of the tub, gyrator and driving mechanism, this machine provides a decidedly new method of cleaning fabrics, in that while the clothes are washed thoroughly, this is done by the action of the water itself on the materials as distinguished from their being rubbed or drawn through the water by a dolly or other mechanism, or tumbled against the sides of the tub or rubbed against projections on the interior of the tub. In my machine the clothes are driven and swirled about in and by the water in the interior of the smooth tub. The materials never come in any substantial contact with either the tub, or the gyrator which initially causes the agitation, seething and surging of the water on the interior of the tub. The peculiar movement of the water caused by the action of my gyrator in operation largely prevents rubbing the clothes against the container or gyrator and eliminates the deterioration of the materials being washed by it. These and other advantages which I find it difficult to explain because of the unusual movement of the water are possessed by my machine.

By the term gyrator is meant an alternating rotary member operable to effect movements of fluids and materials from the central portion of the member toward its outer edge or borders.

In the drawings illustrating a preferred form of the invention:—

Fig. 1 is a vertical sectional view taken through the washing machine.

Fig. 2 is a horizontal sectional view taken through the tub, showing the gyrator in top plan view.

Fig. 3 is a sectional view showing portions of the operating mechanism.

Fig. 4 is a detail vertical sectional view on an enlarged scale of the bottom of the tub, the gyrator, part of the gyrator operating mechanism and the packing means for the bearing of the gyrator shaft.

Fig. 5 is a detailed sectional view of the driving connection between the gyrator and the driving mechanism therefor.

Fig. 6 is a top plan view of the removable plate at the bottom of the tub, with the gyrator removed.

Referring more particularly to the drawings the washing machine comprises a tub 1 supported upon and fastened to legs 2 having roller casters 3. To the legs 2 is secured a platform 4 upon which is supported a motor 5 bolted to an insulating base piece 6 in turn bolted to the platform 4. The legs 2 have telescopic sections 7 of tubular form slidable in clamp portions, forming part of the legs 2, for the purpose of adjusting the height of the washing machine, the sections 7 being held in adjusted position by means of set screws 8. The motor 5 is connected to the driving mechanism by means of a belt 9 running over a pulley 10 fixed to the motor shaft and a driven pulley 11 fastened to a cross shaft 12 carrying a worm screw 13 in mesh with a worm gear 14 keyed to a vertical shaft 15. The gear mechanism 13–14 is suitably housed in a housing 16 bolted to and forming part of one of the supporting legs of the washing machine.

Between the motor 5 and the gear mechanism 13–14 extends an aluminum belt guard 17 which encases the belt 9 and pulleys 10 and 11, the guard having a flange 18 extending over the upper lap of the belt and the pulley 10. By this means accidental contact with the driving belt 9 and pulleys 10 and 11 is prevented. The guard has a hub portion 19 by which it is pivotally supported upon a part of the shaft 12 between the bearings 20 and 21 formed in the housing 16. To an intermediate part of the guard is fastened a pivot stud 22 upon which is idly and rotatably carried a belt tightener roller 23. It will be noted that this guard is supported only by the shaft 12 and the roller 23 bearing upon the upper lap of the belt 9, so that the guard is capable of an upward and downward swinging movement about the axis of the shaft 12 as the belt becomes taut or slack. The amount of the tautness given the belt, as the roller 23 presses against it, is derived from the combined weight of the guard, with the parts carried by it, and a tension spring 24 connected between and to the guard 17 and the platform 4, the tension of the spring adding to the weight of the guard to maintain the roller 23 in tightening contact with the belt.

In vertical alinement with the shaft 15 is a second shaft 25, rotatably supported in suitable bearings 26 and 27 respectively, forming parts of the crank and gear housings 28 and 29. Said housing 28 is rigidly connected to the tub by means of a bracket 30 and bolts 31 and 32 and includes the top and intermediate members 33 and 34 of the housing 16. The housing 29 is rotatably sup-

ported upon a ledge 35 rigidly bolted to the side of the tub 1 and also made fast to the top of the tub through a bolted bracket 35'. A tube 36 is connected between the members 33 and 29 and houses the shaft 25. The shaft 25 drives a wringer 37 through the medium of clutches 38, 39 and 40, and gears 41, 42 and 43, which may be manually and selectively controlled through the handle 44 for causing the operating of the wringer in any direction desired and in whatever position the wringer may be relative to the tub. The wringer is capable of swinging into different positions with respect to the tub about the axis of the shaft 25, and to be held in any of its positions by a spring pressed locking pin 45 cooperative with recesses in the ledge 35. The details of the mechanism for operating the wringer do not form part of this invention, and therefore, further description thereof is deemed unnecessary.

The tub 1 is preferably substantially square in horizontal cross-section and is shallow with respect to its horizontal dimensions. It has a central bottom portion 46, an inclined portion 48 and vertical side walls 49. It may, however, be of other form than square and the inclined portion 48 may be omitted.

For the purposes of exemplifying my invention, the gyrator or impeller is disclosed and described as mounted on the tub for support. Herein it is shown as projecting upwardly through the bottom of the tub, but it must be evident that all desirable arrangements are within the contemplation of this invention, such, for instance, as the mounting of the impeller so as to depend into the liquid from the upper portion of the tub, thereby bringing about the consequent reversal in the flow of the fluid through the tub. Thus, as modified, the flow will be radially outwardly and thence downwardly, and then inwardly and upwardly toward the center of the gyrator. In the present disclosure the bottom 46 of the tub 1 has a circular opening which is normally closed by a plate 47 bolted to the bottom 46. The radially extending portion 48 at the bottom 46 inclines upwardly toward the vertical side of walls 49 of the tub for a purpose hereafter described. The plate 47 supports the gyrator 51, the packing means for the gyrator shaft 52 and part of the operating mechanism for the gyrator.

The gyrator is metal, or other suitable material, and is of generally circular form when viewed in plan. It comprises an annular, trough-like or dish-shaped portion 54, the central or inner portion of which merges in a continuous concave curve into a central upstanding stem portion 53 which tapers upwardly and terminates in an upper rounded end. The outer peripheral edge of the trough-like portion 54 extends outwardly and upwardly in a concave curve 55 which is continuous with the dished curve of the portion 54. The gyrator is provided with liquid impelling means, one form and arrangement of which is illustrated in the drawings.

Extending in spaced position radially from the central stem or dome 53 are a plurality of flat, vertically projecting blades, wings or flanges 56 of the shape shown in Fig. 4 of the drawings. The projecting surfaces of these blades taper or incline inwardly in a general direction from their outer edges to the trough-like portion of the gyrator. They extend from the outer edge of the upwardly inclined portion 55, across the portion 54, thereof, and thence upwardly vertically along the sides of the central upstanding stem 53 to a point approximately half way up the sides thereof. At this point the blades merge into the upper rounded end of the stem. The remaining or upper part of the stem is free of blades and forms a smooth, continuously flowing curve at the apex 57.

These blades 56 are of substantial height at their outer portions, so as to project well into the cleaning fluid. The blades incline or curve downwardly and inwardly toward the central axis of the agitator, that is, to the sides of the stem where they merge into the stem. As shown in Fig. 4, the blades extend across the dish-shaped member at the lower ends in lobe-shaped form and the upper surfaces of the wings or blades extend considerably above the dish-shaped member to provide sufficient blade surface to impart a considerable force or throw to the water in the direction outwardly and somewhat parallel to the axis of rotation of the gyrator, as hereinbefore described. It is to be noted that the outer inclined portion 55 of the dish-shaped member assists in this movement and that this directional flow is augmented by the inclined walls 48 of the surrounding trough or tub. The force imparted to the water is sufficient to cause the water to flow upwardly toward the top of the tub, as shown in dotted lines, Fig. 1. The downward flow at the upper central portion of the tub prevents the overflow of suds. In the embodiment shown there are four of these blades, but any other number may be used as desired. Within the central stem portion 53 and depending from the apex 57 thereof is a hollow pyramidal socket 58, preferably square in horizontal section. It is adapted to fit upon a square pyramidal block or step 59 socketed to fit upon the upper end of the shaft 52 and secured to said shaft, to positively rotate therewith, by a cross pin 60 extending transversely through the shaft. At the upper end portion of the step 59 is formed an annular groove 61 in which reposes a spring lock ring 62 adapted, when the gyrator is forceably moved downwardly upon the step 59, to expand into an annular groove 63 formed in the apex portion 57 of

the gyrator. The uppermost end 64 of the step is squared to fit into a like aperture formed into the apex 57. The lower end of the socket may be provided with notches into which the ends of the cross pin 60 may extend, if desired. The various gyrator portions, namely, the apex, trough, peripheral, blade and pyramidal portions all are preferably integral. While this embodiment illustrates the invention, it is to be understood that the gyrator may be located at the top of the tub and in depending position from the top or cover thereof.

The shaft 52 is fixed to a pinion 65 by means of a key 66, and has bearings 67 and 68 respectively formed in the plate 47 and in a bracket 69 bolted to the underside of the plate 47. These bearings have bushings 70 and 71, preferably of brass or bronze. The pinion 65 is in thrust bearing with the ends of the bearings 67 and 68, and clamping bolts hold the bracket 69 in place such that the pinion 65 has no loose play, yet it is permitted to freely rotate or oscillate. The lower end of the shaft 52 has a grease cup 72 operative to supply a lubricant through bores 73, 74 and 75 to the bearing surface between the shaft 52 and bushings 70 and 71. The bracket has an arm 76 upon which rests and freely slides reciprocating rack 77 adapted to mesh with the drive pinion 65, the other end or crank arm portion 81 of the rack being pivotally connected to a crank pin 78 fixed to crank arms 79 and 80 fastened to the ends of the shafts 15 and 25.

The rack 77 may be thrown into or out of operative engagement or mesh with the pinion 65 at will. This is accomplished by the mechanism shown in Fig. 3. Upon the end of the arm 76 is pivotally supported a bell crank lever 83 carrying at one of its ends a roller 84 bearing against the rear face of the rack 77 and being apertured at its other end to receive a bent end of a link 85 running to a crank arm 86 having its free end also apertured to receive the other bent end of the link, the link being thus pivotally connected to said lever 83 and arm 86. The arm is fast to a vertical shaft 87 rotatably supported in bearings 88 and 89 respectively rigidly secured to a leg 2 and the side of the tub 1 (see Figs. 3 and 1). To the upper end of the shaft is fastened a handle 90 by which the lever 83, through the media of link 85, arm 86 and shaft 87 may be forced against the rack to cause the latter to engage with the pinion 65. A spring 91 is connected to the end of the rack 77 and a fixed part of the washer, as a leg 2 thereof, for the purpose of automatically disengaging the rack from the pinion and to hold the rack away from the pinion when the handle 90 is shifted to throw the lever 83 out of operation and thus stop the oscillation or rotation of the gyrator. The spring constantly tends to hold the rack away from the pinion and against the roller 84, the rack being thrown into mesh with the pinion only when the lever 83 and roller 84 are moved to positively shift the rack into enmeshment. The rotation of the crank 79–80 will cause a reciprocation of the rack over the arm 76 whether or not the rack be in engagement with the pinion. When the rack is moved into mesh with the pinion, the later is caused to alternately rotate and through the medium of shaft 52 impart such movement to the gyrator in the tub.

For the purpose of packing the gyrator shaft 52 the plate 47 and the bracket 69 are provided with communicating chambers adapted to hold a packing material 92, preferably composed of chopped or shredded and comminuted asbestos, graphite and oil. The packing space comprises an annular chamber 93 surrounding the shaft 52 between the bearing 67 and bushing 70, and a washer or packing 94, preferably of leather, in the opening at the top of the chamber 93 and located between the bottom end 95 of the step 59 and the packing material in the chamber 93. The chamber 93 extends through a passage 96 to a plunger chamber 97. The lower portion 98 of the latter has a screw threaded aperture in which operates a screw plunger 99 having at its outer end a winged finger piece 100 which may be manually rotated to feed the plunger into the chamber 97 against the packing 92. The packing 92 is somewhat plastic and is in a sort of fluidal state so that the stress applied to it by the forceful entry of the screw plunger into the chamber 97 will cause the packing 92 to flow through the passage 96 to the chamber 93 and completely fill the space of the latter. In this way compensation for any loss of packing owing to wear, leakage and otherwise is readily made. Leakage of wash water or cleansing fluid from the tub around the shaft 52 is prevented by this novel packing means.

The open top of the tub is normally closed by a cover 101 having a hinge 102 at one side and a finger grip piece 103 at the other side.

At one side of the tub is secured a liquid soap dispenser comprising a reservoir 104 fastened to the wall 48 by bolts 105 and adapted to contain a relatively large supply of soap. To this chamber is connected a measuring pump 106 into the upper portion of which a charge of fluid soap is drawn by the piston on piston rod 107, and upon a downward movement of the piston and rod, discharged into the tub through a discharge tube or nozzle 108 so located that the ejected charge will be in the general direction of the movement of the mass of material and cleansing solution within the tub during the washing operation.

When the gyrator is alternately rotated or oscillated, with materials to be cleansed and the cleansing liquid in the tub, the liquid is given a radially outward and upward movement toward the upper part of the tub, then an inward movement, then a downward movement toward the cone 53 of the gyrator, the liquid also progressing, in its whirling action, about the tub first in one direction and then in an opposite direction so that the resultant motions are substantially gyratory ones, as helical movements about a ring having a circular cross-section. In this way the washing and washable materials are given a turbulent swirling action. As a result of this action imparted to the cleansing liquid by the gyrator, the water in turn imparts a similar action to the fabrics. Goods are thus whipped, whirled and dashed around in the sieving, whirling, turbulent action set up by the gyrator. Thus the fabrics are given a quick, snappy, sieving, whirling, reversing double action, produced by the gyrator, doubling the clothes first one way and then the other until every thread in the fabric is acted upon an untold number of times, somewhat like the cracking of a whip-lash in all directions. While it is very difficult to describe the action of the water and the movement of the clothes therein produced by the rapid reciprocation of the gyrator or impeller in the container, whereby the materials are thoroughly cleansed while held in suspension by the peculiar and novel movement and action of the water, I believe that the foregoing description will easily enable anyone skilled in the art to readily construct and operate my invention and fully utilize the herein disclosed method. At or before the start of the operation, and during the operation of the machine, as desired, charges of liquid soap may be ejected into the moving mass in the tub.

The plate 47 has a drain port 109 with which may be connected a hose normally supported at its free end at one side of the machine but which may be lowered to drain the tub of its contents. The plate 47 is formed with a shallow depression 110 surrounded by the flange 50 and having an inclined bottom 111 extended from one side to the other of the shaft 52 and chamber 93, in order to permit efficient drainage of the fluids in the tub through drain port 109.

It is of course understood that the specific description of structure set forth above may be departed from without departing from the spirit of my invention as set forth in this specification and the appended claims.

Having now described my invention, I claim:

1. The method of cleansing fabrics in a tub consisting in agitating a washing fluid in such a way as to create positively driven violently flowing currents moving away from and back to the plane of the source of agitation, and also around the tub in one direction in a plane approximately parallel with the plane of agitation, and then causing it to move away from and back to the plane of the source of agitation and in a reverse direction in a plane approximately parallel with the plane of agitation so as to bodily and forcibly cause the fabrics in the tub to travel in substantially the same paths as the fluid, whereby thorough cleansing of the fabric is effected without substantial contact with rubbing surfaces.

2. A washing machine comprising in combination, a container having a substantially uninterrupted inner surface, a rotary reciprocatory disk-like impeller near the bottom of the container having upstanding flanges thereon so arranged as to violently force water in the container laterally and upwardly in one gyratory direction and then laterally and upwardly in an opposed direction, whereby the materials being washed will be substantially suspended by the water and thoroughly cleaned while thus suspended, and motor-driven means extending through the bottom of the container to rotatably reciprocate the impeller.

3. A washing machine comprising in combination, a container having a substantially uninterrupted inner surface, a rotary reciprocatory disk-like impeller mounted adjacent the bottom of the container, so constructed and arranged that when water and materials to be cleaned are placed in the container and the impeller is reciprocated, the water will first be violently forced laterally and upwardly in one gyratory direction and then laterally and upwardly in an opposed gyratory direction, so that the materials being cleaned will be suspended by the movement of the water, and the water forced through and around the materials to thoroughly cleanse them, while said materials are substantially out of rubbing contact with the mechanical parts of the machine, and motor-driven means for rapidly driving the impeller.

4. In a washing machine the combination of a tub for containing a cleansing substance and the materials to be cleansed, said tub having an outwardly and upwardly inclined portion, an impeller cooperating with the said inclined portion of the tub to force said cleansing substance and materials to be cleansed outwardly in a direction substantially parallel with said inclined portion, and power means for oscillating said impeller.

5. In a washing machine the combination of a tub adapted to contain wash water and goods to be washed, said tub having a flared portion, a liquid impeller in said tub, having a depressed portion, said liquid impeller cooperating with said flared portion to swirl said wash water and goods with a substan-

tially gyratory movement, and power means to alternately rotate said liquid impeller.

6. In a washing machine comprising driving power means, the combination of a tub for containing a cleansing substance and materials to be cleansed, a liquid impeller mechanism driven by said power means for oscillating said liquid impeller, said liquid impeller having flanges and a radially depressed portion operative to upwardly swirl said cleansing substance and material.

7. In a washing machine comprising a driving power means, the combination of a tub for containing washing and washable materials, a liquid impeller, means operable to alternately rotate said liquid impeller, said liquid impeller being provided with upstanding flanges and a depressed portion on each side of each of said flanges and operative to swirl said materials with a substantially gyratory movement.

8. In a washing machine comprising driving power means, the combination of a tub for containing a cleansing substance and materials to be cleansed, a liquid impeller, mechanism driven by said power means for alternately rotating said liquid impeller, said liquid impeller having upwardly and radially extending flanges and a radially depressed surface operative to upwardly swirl said cleansing substance and materials.

9. In a washing machine comprising driving power means, the combination of a tub adapted to contain washing and washable materials, a liquid impeller in said tub and operated by said means, said liquid impeller having a centrally raised portion and radially depressed portion, and operable to swirl said materials with a substantially gyratory movement.

10. In a washing machine having driving power means, the combination of a tub adapted to contain washing and washable materials, a liquid impeller in said tub and operated by said means, said liquid impeller having a centrally raised portion, a radially depressed portion and flanges extending radially from said centrally raised portion, said liquid impeller operable to swirl said materials with a substantially gyratory movement in said tub.

11. In a washing machine having driving power means, the combination of a tub adapted to contain washing and washable materials, a liquid impeller in said tub and operated by said means, said liquid impeller having a central conodial portion, an inclined peripheral portion and an intermediate trough portion, said liquid impeller operating to swirl said materials with a substantially gyratory movement in said tub.

12. In a washing machine comprising driving power means, the combination of a tub for holding a cleansing fluid and materials to be cleansed, a drain plate at the bottom of said tub and having a sloping bottom portion extending from one side to the other of the center of said tub, and an eccentrically located drainage connection attached to said inclined portion, a shaft extending through said plate and a liquid impeller on said shaft for giving said substance and material turbulent motion.

13. In a washing machine comprising a driving power means, a tub, an alternating rotary liquid impeller having a plate formed with an annular depression, a raised central portion and upstanding flanges in said depression, said plate, depression, central portion and flanges operating on the contents of the tub to give the contents a gyratory movement.

14. An agitating member for a washing machine comprising a cup-shaped disk having a frusto-conical portion rising from the center thereof, the vertical elements of which are concave so that the surface of said portion merges into the surface of said disk, and a round upwardly tapering portion projecting above said frusto-conical portion and terminating in a rounded surface, and narrow radial wings projecting from said latter portion and extending along the sides thereof and across the surface of said disk and having rounded outer edges merging into the concave surface of said disk.

15. An impeller for a washing machine comprising an annular trough, a stem rising centrally from said trough and having a plurality of circumferentially spaced radial wings projecting therefrom and extending along its sides and across the surface of said trough, the top surface of said wings above said trough curving downwardly and inwardly.

16. A rotatable impeller for a washing machine adapted to be disposed in a liquid containing receptacle comprising a dish-shaped member having a central upstanding tapered stem with a rounded upper end, ribs extending across said dish and upwardly along the side of said stem and having rounded upper edges merging into the rounded surface of said stem.

17. In a washing machine, a tub for containing wash water and goods to be washed, an oscillatory disk-like agitator in said tub near the bottom thereof and having a plurality of upstanding water-impelling projections extending from one face thereof, said projections being of substantial height contiguous to the periphery of the agitator and decreasing in height toward the center whereby side faces of substantial area are provided, and while the agitator is oscillated the water and goods will be vigorously forced laterally upwardly in gyratory paths to violently force the water through, between and around the goods and thoroughly cleanse them while

they are sustained in the water free from any substantial contact with rubbing surfaces, and motor-driven means for oscillating the agitator.

18. In a washing machine an agitator and power means for imparting alternate rotative movement thereto, said agitator consisting of a substantially disk-like imperforate body and a plurality of liquid impelling projections extending from one face thereof, said projections being of a maximum depth contiguous to the periphery of said body and having their free edges inclined inwardly to the center of the agitator, leaving the central portion of said body free of water impelling projections.

19. In a washing machine, a tub having side walls and a bottom, a driving shaft extending through said bottom into the tub, an agitator fixed to said shaft to oscillate therewith, power means for oscillating said shaft and agitator, said agitator comprising a substantially circular base having an upstanding central portion, blades extending upwardly from the upper face of said base, the blades being of greatest height adjacent the marginal edge of the base, decreasing in height toward the center and merging into said upstanding central portion, the union between the agitator and the shaft permitting removal of the former from the latter by an upward movement, the oscillation of the agitator causing the blades to set up violent movements of the fluid and tub contents outwardly away from the agitator, upwardly, inwardly and then back toward the agitator, there also being superposed on this circulatory movement a movement of the fluid and tub contents first in one direction circumferentially of the tub and then in the other, so that the articles being washed will be thoroughly cleansed without any material rubbing of the blades thereagainst.

20. In a washing machine, a tub, a driving shaft extending into the tub, an agitator secured to said shaft to oscillate therewith, power means for oscillating said shaft and agitator, said agitator comprising a substantially circular body portion having blades extending therefrom on the face presented to the material being washed, the blades adjacent the marginal edge of the body portion being of a substantial dimension in a direction at right angles to the body portion, said body portion being free of any holes or openings of substantial dimensions, said blades and adjacent portions of the body portion of the agitator when the agitator is oscillated throwing the fluid in the tub, and material being washed, violently outwardly from the edge of the agitator whereby it will flow in circulatory paths away from the agitator, along the sides of the tub, then inwardly and back toward the agitator, this cycle being continuously repeated.

21. In a washing machine, a tub having a substantially uninterrupted inner surface and adapted to contain cleansing liquid and materials to be washed, the bottom of the tub merging smoothly into the sides, an oscillatory liquid impeller mounted adjacent the bottom of the tub, having on its upper surface upstanding wing-like means of substantial height and length so constructed and arranged that when the impeller is given a rapid rotary oscillatory movement the cleansing liquid and materials to be washed will be violently forced laterally from the impeller then upwardly along the side of the tub, then away from the tub side and back toward the impeller, this cycle being continuously repeated to force the cleansing liquid through and around the materials to be washed to thoroughly cleanse them while they are substantially out of rubbing contact with the impeller, and motor-driven means for imparting to said impeller a rapid rotary oscillatory movement.

22. A washing machine comprising in combination, a tub for containing cleansing liquid and materials to be cleansed, said tub having a bottom portion, and an upwardly extending wall portion the interior surface of which is free from rubbing projections, the juncture of the bottom portion with the upwardly extending portion being inclined to facilitate the movement of currents outwardly and upwardly and along the interior surface of the tub, a rotary reciprocatory impeller mounted in the tub adjacent its bottom, the upper surface area of which is considerably less than the horizontal cross-sectional area of the tub through its upwardly extending portion, the margin of said impeller being spaced a substantial distance away from the upwardly extending portion of the tub, a rotary reciprocatory drive shaft extending upwardly through the bottom of the tub into the interior thereof, the impeller being mounted upon said shaft for movement therewith in a fixed plane, said impeller having on its upper surface a plurality of upstanding wing-like blades, each of which is of substantial height and length, and provided with lateral impelling faces of substantial area, the impeller and tub being so constructed and arranged relative to each other as to cooperate while the impeller is reciprocated for whipping the fluid and violently forcing it first in one and then in an oppositely upward circulatory direction against the interior of the tub and through and around the materials being washed, and substantially suspending the materials in the fluid by the moving fluid, and means for imparting a rapid rotary reciprocatory motion to the said shaft and impeller.

23. A washing machine comprising in combination, a tub for containing cleansing liquid and materials to be cleansed, said tub hav-

ing a bottom portion and an upwardly extending wall portion, the interior surface of which is free from rubbing projections, a rotary reciprocatory impeller mounted in the tub adjacent its bottom, having a base and a plurality of blades, each of which is of substantial height and lateral area, and a central portion projecting upwardly from the base, the upper surface area of the base being considerably less than the horizontal cross-sectional area of the tub through its upwardly extending portion, the margin of said base being spaced a substantial distance away from the upwardly extending portion of the tub, said tub and impeller being so constructed and positioned relative to each other that when the impeller is rapidly reciprocated each blade and its adjacent portion of the impeller base will simultaneously drive the cleansing fluid in one and then an opposite outward upward circulatory direction toward and around the clothes, and act in cooperation with the interior of the tub to cause violently flowing opposed currents of liquid to meet and flow inwardly and downwardly toward the central portion of the tub, and substantially suspend the materials in the fluid while being washed, a rotary reciprocating drive shaft extending upwardly through the bottom of the tub into the interior thereof for supporting the impeller for movement in a fixed plane, and power means for rapidly reciprocating the shaft and impeller for the purposes set forth.

24. In a washing machine, a tub adapted to contain a washing fluid and materials to be cleansed, a rotatively reciprocatory driving shaft extending through the bottom of the tub at the center thereof, a liquid impeller mounted on said shaft near the bottom of the tub, the outer portion of the impeller being spaced a considerable distance from the interior side surface of the tub and rotatively reciprocatory with the shaft, said impeller comprising a base, a central portion projecting upwardly therefrom and a plurality of uniform blades projecting upwardly from the base and equally spaced and extended radially from the central portion, each blade being of greater area at a position contiguous to the edge of the base than at the center thereof, and means for imparting rotary reciprocatory motion to said shaft and the impeller mounted thereon, the impeller and the tub being so constructed and relatively positioned as to cooperate while the impeller is reciprocated to cause the liquid to be violently forced laterally and upwardly against and in one direction, circumferentially around the inner surface of the tub, and laterally and upwardly against and in an opposite direction, circumferentially around the inner surface of the tub whereby the materials will be thoroughly cleansed while substantially suspended in the water.

25. A washing machine comprising in combination, a tub, said tub having a main body portion, the interior of which is substantially free of scrubbing projections, and a bottom portion, a rotary reciprocatory liquid impeller mounted for operation in a fixed plane in the tub, the outer portion of which is spaced a considerable distance from the body portion of the tub and having a plurality of blades projecting therefrom, said tub and impeller being so constructed and positioned relative to each other that when the impeller is rapidly reciprocated each blade and its adjacent portion of the impeller base will simultaneously drive the cleansing fluid in one and then an opposite outward circulatory direction away from the plane of the impeller through and around the clothes, and act in cooperation with the interior of the tub to cause violently opposed currents of fluid to meet and flow inwardly and in a general vertical direction toward the impeller, whereby the materials are substantially suspended in the fluid and cleansed while thus suspended, a driving shaft extending into the tub on which the impeller is mounted for movement therewith, and power means for rapidly reciprocating the shaft and impeller.

26. In a washing machine for cleansing fabrics by forcing cleansing fluid through them while substantially suspended by the action of the fluid, as distinguished from pulling or pushing the fabrics through the fluid or against scrubbing surfaces, or otherwise scrubbing them by mechanical means, a tub, a substantially imperforate rotary reciprocatory impeller mounted to operate in a fixed plane having blades of substantial height and area projecting therefrom in a direction toward the fabrics while they are being cleansed, said tub and impeller being so constructed and arranged as to cooperate while the impeller is in operation for whipping the fluid and violently forcing it outwardly, upwardly and in a general vertical and circulatory movement and circumferentially of the tub first in one and then in an opposite direction and through and around the materials, and substantially suspending the materials in the fluid while being washed, and power means for rapidly reciprocating the impeller.

27. A washing machine comprising in combination, a tub having an inner surface free from rubbing projections, said tub having a vertical portion and a bottom portion inclined outwardly and upwardly toward and merging with the vertical portion, an imperforate rotary reciprocatory impeller mounted for operation in a fixed plane near the bottom of the tub, the outer portion of which is spaced a considerable distance from the interior of the vertical portion of the tub, said impeller comprising a base of substantial area, a plurality of uniform radially dis-

posed and equally spaced blades projecting upwardly at substantially right angles from the base, each blade being of substantial height and lateral area, and a central portion projecting upwardly from the base, a driving shaft extending through the bottom of the tub on which the impeller is mounted for movement therewith, and means mounted beneath the tub for imparting to the shaft and impeller a rapid rotary reciprocatory motion.

28. In a washing machine, a tub having a substantially smooth inner surface free from rubbing projections, adapted to contain cleansing liquid and materials to be cleansed, said tub having a vertical portion and a portion inclined downwardly and inwardly from the vertical portion and merging therewith, an imperforate rotary reciprocatory impeller mounted near the bottom of the tub, the outer portion of which is spaced a considerable distance from the interior of the vertical portion of the tub, comprising a base of substantial area and a plurality of uniform equally spaced radially disposed blades projecting upwardly from the base, each blade being of substantial height and lateral area at its outer end and decreasing in its lateral area toward its inner end, and a central portion projecting upwardly from the base into which the inner end of each of said blades merges, a driving shaft extending through the bottom of the tub on which the impeller is mounted for movement therewith, and means mounted beneath the tub for imparting to said shaft and impeller a rapid rotary reciprocatory motion.

29. In a washing machine, a tub adapted to contain cleansing liquid and materials to be cleansed, a rotary reciprocatory impeller mounted adjacent the bottom of the tub, comprising a substantially imperforate base of substantial area and blades of substantial height and lateral area projecting from the body of the impeller toward the materials while being washed, said impeller and tub being so constructed and arranged that they will cooperate, when the impeller is rapidly reciprocated, to cause the liquid to be positively forced outwardly, upwardly and circumferentially along the interior of the tub in one general direction, and then outwardly, upwardly and circumferentially along the tub in the opposite general direction, whereby the materials being washed will be cleansed, the change in direction of movement of the impeller being accomplished suddenly and forcibly to whip the liquid and vigorously force it first in one direction and then in the opposite direction through and around the materials while substantially suspended therein by the action of the liquid, and power means for rapidly reciprocating the impeller.

30. In a washing machine, a tub having its bottom merging smoothly into its side portion to facilitate the movement of laterally upward circulatory currents, and having the interior of its side portion substantially smooth and free from rubbing elements, for containing a cleansing fluid and materials to be cleansed, a rotary reciprocatory impeller mounted near the bottom of the tub, said tub and impeller being so constructed and arranged as to act in cooperation while the impeller is in operation, for whipping the fluid and violently forcing it first in one and then in an opposite laterally upward circulatory general direction against the interior of the tub and through and around the materials, and suspending the materials in the fluid by the moving fluid while being washed, said impeller comprising a substantially imperforate base and blades of substantial height and area projecting upwardly therefrom, and motor driven means extending through the bottom of the tub for imparting to the impeller a rapid rotary reciprocatory motion, substantially as described.

31. In a washing machine, a tub having a substantially smooth interior free from rubbing elements for containing a cleansing fluid and materials to be cleansed, a rotary reciprocatory impeller mounted near the bottom of the tub, said tub and impeller being so constructed and arranged as to cooperate while the impeller is operated for violently forcing the fluid first in one and then in an opposite outwardly and upwardly circulatory general direction against the interior of the tub and through and around the materials, and substantially suspending the materials in the fluid while being washed, said impeller comprising a substantially imperforate base and blades of substantial height and area projecting upwardly therefrom, and motor driven means extending through the bottom of the tub for imparting to the impeller a rapid rotary reciprocatory motion.

32. In a washing machine for cleansing fabrics by forcing cleansing fluids through them while substantially suspended by the action of the fluids as distinguished from pulling or pushing fabrics through fluids or against scrubbing surfaces or otherwise scrubbing them by mechanical means, a tub, a rotary reciprocatory impeller mounted for normal operation in a fixed plane, said tub and impeller being so constructed and arranged to cooperate while the impeller is in operation for whipping the fluid and violently forcing it first in one and then in an opposite outward, axial and circulatory general direction against and approximately parallel to the interior of the tub and through and around the materials and substantially suspending the materials in the fluid while being washed, said impeller comprising an imperforate base and blades of substantial height and area projecting therefrom in a direction toward the materials being cleansed, and power

means for rapidly reciprocating the impeller.

33. In a washing machine, a tub substantially free from scrubbing projections for containing a cleansing fluid and materials to be cleansed, a rotary reciprocatory impeller mounted near the bottom of the tub, said impeller comprising an imperforate base and blades of substantial height and area projecting upwardly therefrom, said tub and impeller being so constructed and arranged as to act in cooperation while the impeller is operated for whipping the fluid and violently forcing it first in one and then in an opposite outwardly upwardly circulatory general direction, against the interior of the tub and toward and through the materials, and substantially suspending the materials in the fluid while being washed, and power means for rapidly reciprocating the impeller.

34. In a washing machine, a tub whose interior is free from substantial scrubbing elements adapted to contain a cleansing fluid and materials to be cleansed, a driving shaft extending into the tub through the bottom thereof, an impeller on said shaft to oscillate therewith, power means for oscillating said shaft and impeller, the impeller comprising an imperforate body portion, and blades extending from said body portion on the face presented to the materials being cleansed, the blades being of a substantial dimension in a direction at right angles to the body portion, said tub, blades and adjacent portions of the body portion of the impeller being so constructed and arranged in the tub relative to its interior that when the impeller is oscillated the fluid in the tub will be thrown violently outward against and around the interior of the tub, from the edge of the impeller, first in one and then in the opposite general direction, whereby the fluid will be driven in circulatory paths away from the impeller, along the sides of the tub in opposed directions, then inwardly and toward the impeller, this cycle being continuously repeated while the materials are substantially suspended by the fluid and out of substantial scrubbing contact with the impeller or tub.

35. A washing machine comprising in combination, a tub for containing water and goods to be washed, said tub being substantially free from rubbing projections, a rotary reciprocatory impeller in the tub having flange-like means extending therefrom of substantial height and lateral area, said tub and impeller, together with its flange-like means, being so constructed, proportioned and arranged with respect to each other that while the impeller is in operation the fluid will be rigorously moved about in devious paths within the tub, and the resultant general direction of the movement of the cleansing fluid and the materials to be cleansed is normally radially outward from the central portion of the tub, then vertically, and a general rotary progression about the inside of the tub first in one and then an opposite direction, and then inwardly toward the impeller whereby the fabrics will be cleansed while substantially sustained by the action of the fluid, and will be freely and continuously driven about in the fluid by the movements thereof in a turbulent manner, and in devious paths, and motor driven means for rapidly reciprocating the impeller for the purposes set forth.

36. In a washing machine, a tub free of scrubbing elements for containing a cleansing fluid and materials to be cleansed, an imperforate rotary reciprocatory impeller, blades on the impeller, said tub and impeller together with its blades being so constructed and arranged with respect to each other that while the impeller is in operation the fluid will be rigorously moved about in devious paths within the tub, and the resultant general direction of the movement of the cleansing fluid is normally radially outward from the central portion of the tub, then vertically and in a general rotary progression about the inside of the tub, first in one and then in an opposite direction, and then inwardly toward the impeller, whereby the fabrics will be cleansed while substantially sustained by the action of the fluid and will be freely and continuously driven about in the fluid by the movements of the fluid in a turbulent manner and in devious paths, and power means for imparting reciprocations to the impeller.

37. In a washing machine, a tub for containing fluid and materials to be cleansed, a rotary reciprocatory impeller mounted for oscillation in a substantially fixed plane having a substantially imperforate base and a plurality of blades, said tub and impeller being so constructed and positioned relative to each other that when the impeller is rapidly reciprocated each blade and its adjacent portion of the impeller base will simultaneously drive the cleansing fluid in one and then an opposite outward, upward, circulatory direction and act in cooperation with the interior of the tub to cause violently opposed currents of fluid to meet and flow inwardly and downwardly toward the central portion of the tub and substantially suspend the materials in the fluid while being washed, and power means for rapidly reciprocating the impeller.

38. The method of washing fabrics by forcing cleansing liquid through and around them while substantially suspended by the action of the fluid, as distinguished from pulling fabrics through the fluid against scrubbing corrugations, or otherwise scrubbing them by mechanical means, comprising immersing the fabrics in a washing fluid in a container, then vigorously and rapidly impelling the washing fluid in one and then in an opposite outward circulatory direction away from the plane of the source of impul-

sion and through the fabrics and circumferentially along the interior of the container in rapid succession, and causing these violently opposed currents of fluid to meet and flow inwardly and toward the central portion of the container, and toward the source of impulsion thereby substantially suspending the fabrics in the fluid and cleansing them while thus suspended.

39. The method of washing fabrics by forcing cleansing fluid through them while substantially suspended by the action of the fluid, as distinguished from pulling fabrics through the fluid against scrubbing corrugations, or otherwise scrubbing them by mechanical means, comprising immersing the fabrics in a washing fluid in a container, then vigorously agitating the washing fluid and rapidly forcing it toward the fabrics and away from the plane of the source of agitation vertically along the interior surface of the container first in one and then in an opposite circumferential direction, back and forth through and around the fabrics, and causing the violently moving opposed currents of liquid to meet and flow inwardly and vertically toward the source of agitation whereby the fabrics are caused to be freely moved about by the action of the fluid and cleansed while thus moved.

In witness whereof, I hereunto subscribe my name to this specification.

HOWARD F. SNYDER.

DISCLAIMER

1,866,779.—*Howard F. Snyder*, Newton, Iowa. WASHING MACHINE. Patent dated July 12, 1932. Disclaimer filed February 23, 1937, by the assignee, *The Maytag Company*.

Hereby enters its disclaimer of claims 1 and 38 of said Letters Patent.

[*Official Gazette April 6, 1937.*]

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