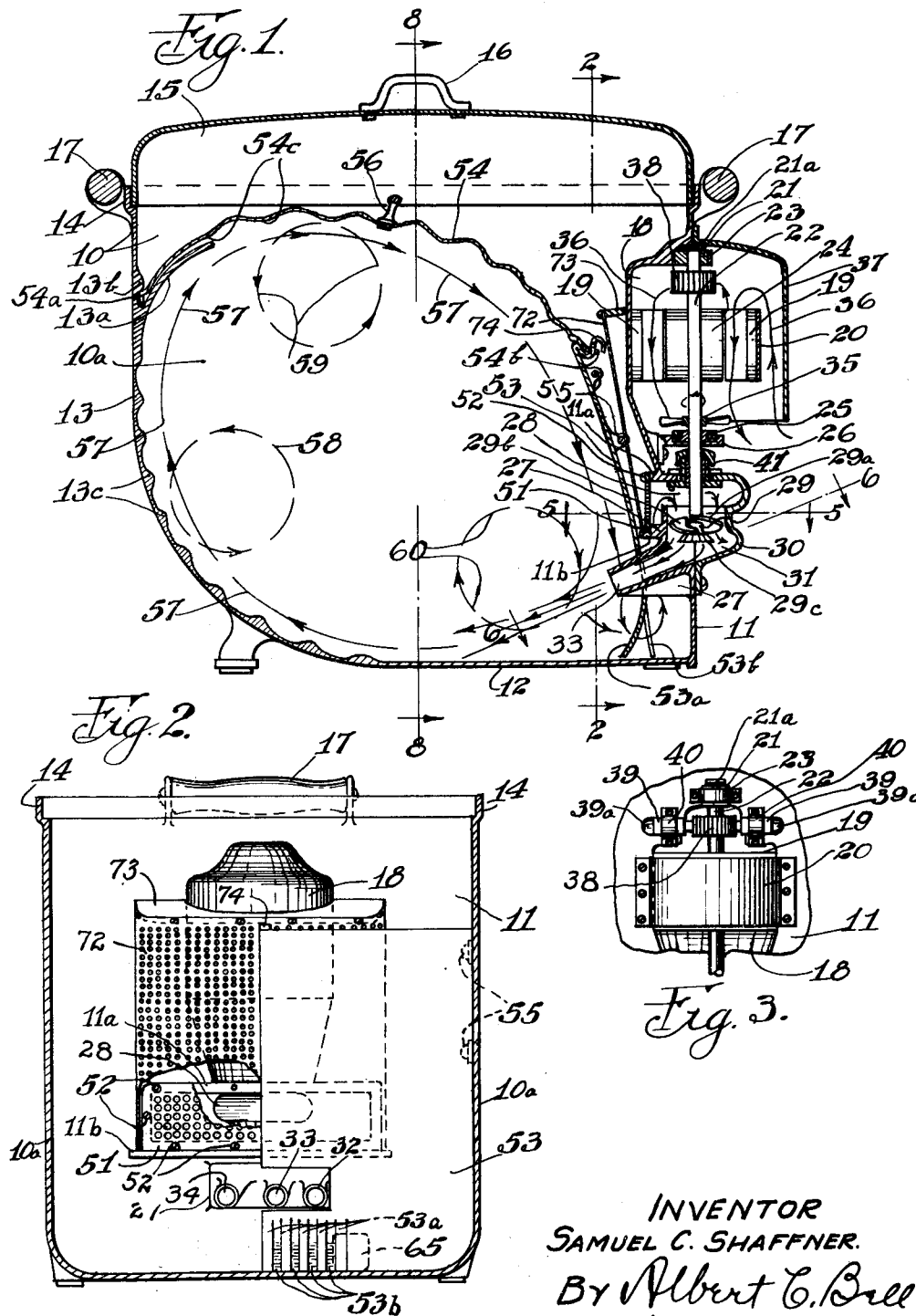


1,986,019

WASHING MACHINE

Filed Feb. 9, 1931

2 Sheets-Sheet 1



Jan. 1, 1935.

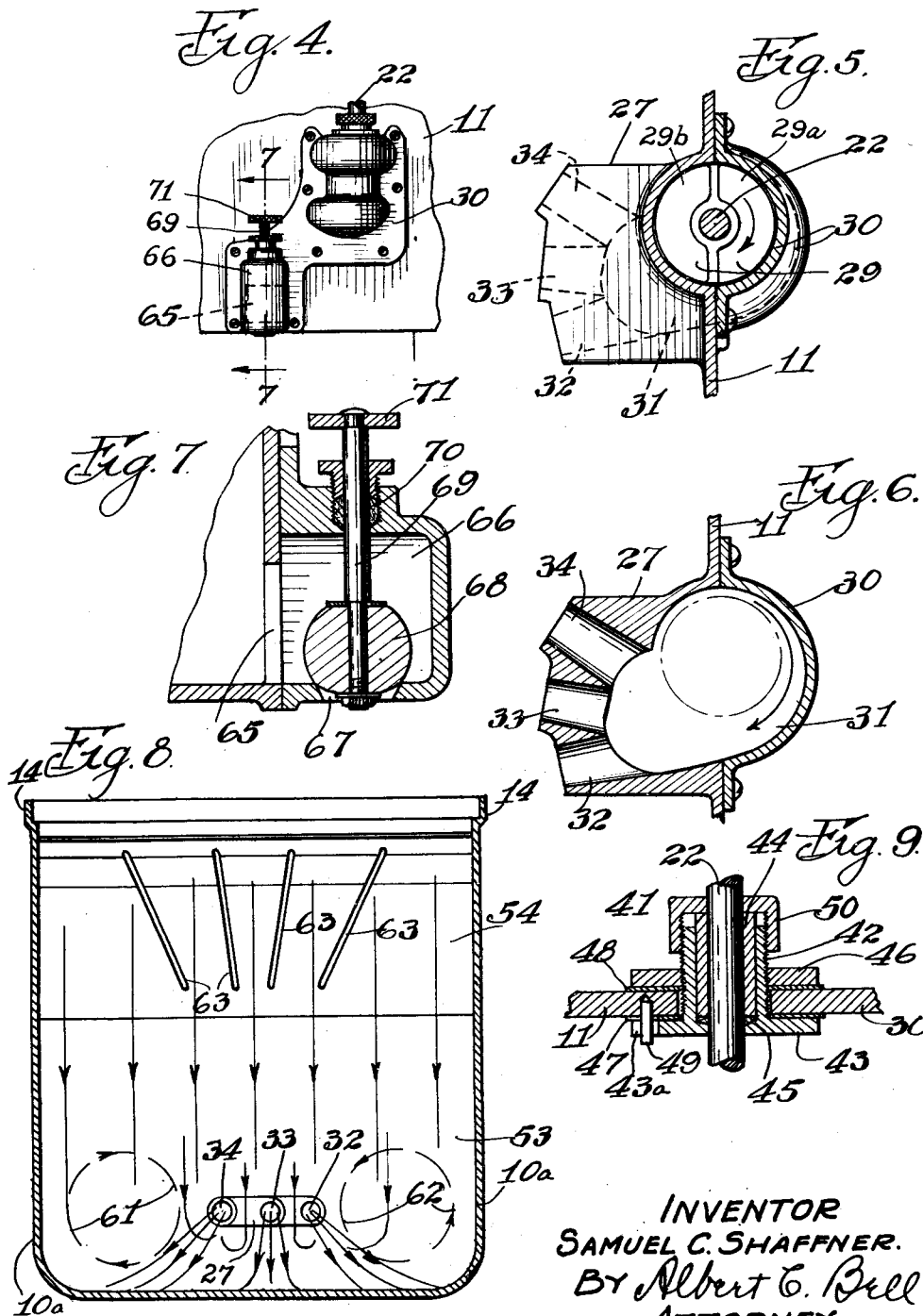
S. C. SHAFFNER

1,986,019

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2 Sheets-Sheet 2



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1,986,019

WASHING MACHINE

Samuel C. Shaffner, Chicago, Ill.

Application February 9, 1931, Serial No. 514,453

8 Claims. (Cl. 259—95)

My invention relates to an improved construction of machine for washing clothes and the like, by which the entire movement and agitation of the articles being washed, is effected by jets of liquid projected with considerable velocity by means of a nozzle construction, in such directions and in such a manner that the articles being washed have alternately imparted to them movements in different directions, with the result that matting of the articles into a ball or roll is prevented, the articles are maintained in loosened condition throughout the washing operation, and the washing material carried by the liquid is thoroughly and effectively communicated to all parts of the articles being washed with the result that the articles are thoroughly cleaned.

While my improved machine may be made in any desired size and may be used for the washing of any articles that are susceptible of being washed by means of washing machines, I find it is particularly adapted for the washing of fine and delicate fabrics of any kind and material, since no moving mechanical parts engage the articles being washed at any time, and the only instrumentality employed to agitate the articles in the machine during their washing, is the moving liquid in the machine, which carries the washing or cleaning media.

My invention consists essentially of a casing for containing the liquid employed and the articles to be cleaned, a curved partition or deflector in the casing for imparting to the liquid and articles being cleaned, a general path of travel in the machine effecting movement of the articles alternately in reversed directions, and liquid projecting means carried by one wall of the casing to receive liquid from the casing and project it at high velocity through a nozzle construction into the washing compartment to effect the general path of travel referred to. My invention also includes a novel form of liquid impelling or projecting means, by which a considerable pressure is developed upon the liquid as it enters the nozzle construction, to effect the forcible projection of the liquid from the nozzle construction into the washing compartment. More specifically, my invention includes an impeller mechanism having rotary movement about the axis of a supporting shaft, by which the impeller first exerts a considerable thrust on the liquid axially of the shaft and then deflects the liquid radially and projects it centrifugally with high velocity into the admission chamber of the nozzle construction, from which chamber the nozzles extend in directions to effectively receive the liquid

from the admission chamber and project it at high velocity into the washing compartment. A further feature of my invention consists of providing in the casing of the machine, a partition wall extending generally vertically, through which the nozzle construction extends at an appreciable distance above the bottom of the casing, the lower part of the partition below the nozzle construction, being provided with openings permitting the flow of the liquid through said openings from the washing compartment into a compartment between the partition and an adjacent wall of the casing, which directs the liquid to the admission opening of the impeller mechanism. In this manner, the liquid entering the impeller is required to flow through the washing compartment and across the plane of the nozzles, before said liquid can enter the compartment communicating with the admission opening of the impeller. As a result, the articles being washed are positively carried by the moving liquid in the washing compartment, into the path of the high velocity jets of liquid issuing from the nozzle construction, which jets acting upon the articles being washed, impart movement to said articles in a different direction or directions, from the movement otherwise imparted to said articles in their path of travel through the washing compartment.

A further feature of my invention consists of providing an electric motor connected with the impeller shaft, and mounting the parts of the motor construction directly on the casing of the machine without the use of a motor casing or housing. To accomplish this, I provide a wall of the casing of the machine, with recesses for receiving and supporting the field magnet of the motor, the brushes, where brushes are used, and the bearings of the motor shaft, together with supporting or clamping members or bands for holding the said parts securely in the recesses provided for them in the wall of the casing, all of these parts being preferably disposed so that the motor shaft is in vertical position, with the impeller at the lower end of said shaft. By my invention I also provide a protective cap for the motor construction, which may conveniently be secured to the casing wall and removed therefrom if desired, for inspection and repair of the motor, which cap is provided with a clearance space around the motor parts, as a result of which air may be circulated through the cap and between the field magnet and armature of the motor by a fan carried by the motor shaft, to ventilate the motor, the lower end of the cap being open to facilitate this operation. By my

invention I provide a second cap secured to the said casing wall, which second cap constitutes a part of the housing of the impeller and a part of the admission chamber for the nozzle construction, so that by removing the two caps, the entire motor and impeller mechanism may be readily removed, if desired. The second cap preferably is extended to contain a drain passage and to contain a valve for controlling the flow of liquid through the drain passage.

My invention will best be understood by reference to the accompanying drawings showing a preferred embodiment thereof, in which

Fig. 1 is a vertical, sectional view through my machine extending transversely of the washing compartment and through the axis of the impeller shaft,

Fig. 2 is a sectional view of the parts shown in Fig. 1 taken along the line 2—2,

Fig. 3 shows in side elevation, the electric motor construction with its protective cap removed,

Fig. 4 is a side elevation of the cap constituting a part of the impeller housing and carrying the drain valve,

Fig. 5 is a sectional view to an enlarged scale, of a part of the construction shown in Fig. 1 taken along the line 5—5,

Fig. 6 is a sectional view to an enlarged scale, of a part of the construction shown in Fig. 1 taken along the line 6—6,

Fig. 7 is a sectional view to an enlarged scale of a part of the construction shown in Fig. 4, taken along the line 7—7,

Fig. 8 is a sectional view of the construction shown in Fig. 1 taken along the line 8—8, and

Fig. 9 is a detailed sectional view to an enlarged scale, of the stuffing box construction employed on the motor shaft immediately above the impeller.

Similar numerals refer to similar parts throughout the several views.

As shown in Fig. 1, my washing machine consists of a casing 10 having substantially parallel end walls 10a, a vertical side wall 11, and a bottom wall 12 which is substantially horizontal adjacent the side wall 11 and curved at its other edge to merge into the curved side wall 13 of the casing, the upper part of the side wall 13 being substantially vertical. The upper edge of the casing is provided with a flange 14 entirely surrounding it, forming a seat for a cover 15 which may be put in place and removed as desired by means of a handle 16. Main handles 17, 17 are secured to the casing 10 as indicated, to facilitate moving the machine from one location to another.

The side wall 11 is provided centrally and in its upper portion with a recess 18 projecting into the casing, to contain and provide a seat for the bored field magnet 19 of the motor, which field magnet is held in place on said seat by a retaining band 20 as more clearly indicated in Fig. 3, so that the axis of the field magnet is vertical and substantially in the plane of the outer surface of the side wall 11. The recess 18 at its upper portion, also provides a seat for a bearing 21 for the upper end of the shaft 22 of the motor, which bearing, as more clearly shown in Fig. 3, is held in place on its seat by a clamping band 23. The recess preferably also contains a disk 21a of fibrous material, for example felt, above the bearing 21, to hold oil to lubricate the bearing 21. The shaft 22 carries the motor armature 24 in the bore of the field magnet 19, and

extends below the field magnet, and its lower portion is supported by a ball bearing 25 carried by a bracket 26 secured in the lower portion of the recess 18. Below the bracket 26, the wall of the recess 18 extends horizontally and outwardly in spaced relation vertically from the upper portion of the nozzle construction 27, to form an inlet opening 28 for the impeller 29 carried by the lower end of the shaft 22. The admission opening 28 is covered where it extends through the side wall 11, by the upper portion of a cap 30 secured to the side wall 11 as indicated, which cap in conjunction with the nozzle construction 27 forms a vertical throat or housing closely adjacent the impeller 29, to the end that liquid entering the admission opening 28 may be effectively engaged by the impeller and vigorously projected downwardly by rotation of said impeller. Below the impeller 29, the cap 30 is somewhat enlarged and in conjunction with the nozzle construction 27 forms a discharge compartment 31 for the impeller, which also constitutes a nozzle admission compartment by which liquid delivered downwardly and outwardly by the impeller 29, finds its way with a minimum of flow resistance, to the nozzles of the nozzle construction. The plane of separation between the cap 30 and the side wall 11 extends substantially through the axis of the shaft 22.

The nozzle construction 27, as more clearly shown in Figs. 5 and 6, consists of an extension projecting into the casing 10 from the side wall 11, which is preferably integral with said side wall, in which the nozzle admission compartment 31 is formed in part, from which compartment, the bores 32, 33 and 34 constituting the nozzles, extend downwardly and preferably in substantially the same plane, so that jets of liquid delivered from the nozzles will be projected against the bottom wall 12 of the casing substantially where its upward curvature begins. The axes of the nozzles diverge laterally in their common plane, so that the liquid jets delivered from the nozzles, will be distributed throughout the lower portion of the liquid in the casing 10, thus effectively moving the entire liquid in the casing, and yet at the same time leaving comparatively undisturbed areas between the jets and outside of the outer jets. The bores of the nozzles are preferably slightly convergent outwardly to effectively deliver the jets at high velocity. While the impeller 29 may have any desired conformation that will draw liquid through the admission opening 28 and project it forcibly into the nozzle admission chamber 31, I find that the form of impeller shown in the drawings is particularly effective for this purpose, consisting of a worm or helical portion, the vanes 29a and 29b of which, each constitutes practically half a full thread, these vanes being parallel and in spaced relation similar to a multiple thread screw, the proportions being such that the liquid delivered to the impeller is effectively engaged by its rotation and projected forcibly downwards by it into the nozzle admission compartment. In addition to the helical vanes described, the impeller 29 is also provided with a lower spreading member 29c comprising a conical portion which acts upon the stream of liquid projected downwardly by the vanes 29a and 29b, to force it outwardly radially from the impeller with considerable velocity angularly in the admission compartment 31, in the direction of rotation of the impeller. This outward and whirling movement of the liquid in the compartment 31 develops a substantial pres-

sure on the liquid projected into the nozzles 32, 33 and 34 and causes the jets delivered by the nozzles to have a high velocity flow.

Between the ball bearing 25 and the armature 24, the shaft 22 carries a fan 35 which by rotation of the shaft 22, draws air through the field magnet 19 around the armature 24, along the lines of flow indicated by the arrows 36. The motor construction described is preferably surrounded by a protective cap 37 secured to the side wall 11 in any convenient manner, and preferably spaced somewhat from the clamping band 20 to permit free flow of the ventilating and cooling air currents indicated by the arrows 36. While any desired type of motor may be employed, I find it advisable in general to use a motor of the so-called universal type, which may be operated either by direct or alternating current and with a motor of this kind, the shaft 22 carries a commutator 38 between the bearing 21 and the armature 24, which commutator, as more clearly shown in Fig. 3, is engaged by brushes 39 held in place in recesses 39a in the side wall 11, by clamping bands 40. The windings and wiring of the motor are not shown, as they may be of any well known kind, desired or required for any particular case.

Where the shaft 22 enters the admission chamber 28 above the impeller 29, a novel form of packing construction 41 is employed. As more clearly shown in Fig. 9, this packing construction consists of an externally threaded sleeve 42 having an integral flange 43 at its lower end and extending through a clearance opening in the adjacent edges of the side wall 11 and of the cap 30. The shaft 22 extends through the sleeve and flange as indicated, and the sleeve is counter-bored from its upper end nearly to the lower outer surface of the flange, to contain a plain sleeve 44 of heavy metal, for example lead, with a free enough fit so that the weight of the sleeve will tend to hold it downwardly against a small amount of packing material 45 with sufficient pressure to prevent leakage upwardly around the shaft 22. The sleeve 44 extends somewhat above the upper end of the sleeve 42. The threaded portion of the sleeve 42 is engaged above the adjacent edge portions of the side wall 11 and cap 30, by a thin nut 46 which is screwed tightly against the adjacent portions of the side wall 11 and cap 30, to tightly clamp said portions between the flange 43 and said nut, with thin rings 47 and 48 of packing material between them. The flange 43 is preferably provided with a slot 43a in its edge to engage a pin 49 projecting downwardly from the edge portion of the side wall 11, so that engagement between the flange 43 and the pin 49 prevents turning of the flanged sleeve 42, when the nut 46 is turned on said threaded sleeve. The upper end of the sleeve 42 has threaded upon it a cap 50 which presses against the upper end of the sleeve 44, to hold it with a desired degree of pressure downwardly against the packing material 45.

It will be understood that in assembling the motor on the side wall 11, this must be accomplished with the cap 30 removed from said side wall, so that the motor parts and bearing 25 may be properly located. As a result, the packing construction 41 cannot be in final relation at this time, and the nut 46 must be separated from the flange 43 sufficiently to permit the edge portion of the side wall 11 to enter freely between the packing rings 47 and 48. In assembling the parts with the nut and flange so separated, the pin 49

is entered in the slot 43a and the motor and parts driven by it may be completely assembled on the casing side wall 11, and the relation of the impeller to its co-operating compartments may be checked and definitely determined before the cap 30 is put in place. When the motor is completely assembled as described, the edge portion of the cap 30 is inserted between the packing rings 47 and 48, the cap is secured to the side wall 11, then the nut 46 is tightly screwed towards the flange 43, and then the cap 50 is screwed down on the sleeve 42 until a desired packing pressure on the sleeve 44 is secured. In this manner the inner part of the packing construction is not only prevented from rotating, but at the same time, the entire packing construction is permitted to accurately align itself with the shaft 22, relatively to the edge portions of the side wall 11 and the cap 30.

To insure liquid flow and circulation in the casing 10, along desired paths, I employ the following construction: Within the casing 10, I support a relatively coarse screen 51 in the path of liquid flow from the casing to the admission opening 28, on flanges 11a and 11b extending into the casing from the wall 11, this screen being rectangular in form, as more clearly shown in Fig. 2, and secured in place by screws 52. In Fig. 2, a part of the screen 51 is broken away to more clearly show the admission opening 28, and half of the said screen is shown back of a curved deflector plate 53, employed to impart a desired path of travel to liquid in the casing and to articles being cleaned. The deflector plate 53 consists preferably of a sheet of metal extending the full width of the machine between the end walls 10a, 10a, provided with an aperture in its lower central portion to receive the nozzle construction 27, the deflector plate being preferably separated a small distance from the screen 51. The deflector plate 53 is imperforate above the nozzle construction 27 and on either side thereof; below said nozzle construction, it is preferably provided with apertures permitting liquid flow from adjacent the bottom wall 12 towards and through the screen 51 as follows: The lower portion of the deflector plate is provided with parallel slits forming a plurality of tongues, alternate ones 53a of which, are curved towards the side wall 13, and intermediate ones 53b of which, are bent slightly towards the side wall 11, as a result of which the tongues 53a tend to direct the liquid flow in the casing towards the side wall 13, while the separation between the tongues 53a and 53b permits the free flow of liquid through the lower portion of the deflector plate and to the screen 51. The upper edge of the deflector plate 53 is preferably formed to receive the lower edge of a removable deflector plate 54, and the deflector plate 53 is rigidly secured in place in any convenient manner, for example by screws 55. But half of the deflector plate 53 is shown in Fig. 2, to more clearly show the screen 51 back of it in said figure, and also a second screen 72 below described.

While the screen 51 effectively prevents articles of appreciable size from entering the liquid admission opening 28, even if they are small enough to find their way back of the deflector plate 53, and the deflector plate 53 effectively prevents articles being washed from engaging and clogging the screen 51, in some cases the articles being washed may deliver lint and ravelings to the washing liquid, which, unless prevented from doing so, will find their way into the admission

opening 28 and be wound on the shaft 22 and the impeller 29 and either clog the impeller or seriously decrease its efficiency. To prevent this, I provide a fine mesh screen 72 of large area relatively to the screen 51, resting at its lower edge on the flange 11b between the screen 51 and the deflector plate 53, and bent so that its vertical edges are adjacent the inner surface of the wall 11 on either side of the recess 18. The upper edge of the screen 72 is secured to a reinforcing plate 73 shaped to closely fit the inner surface of the wall 11 and recess 18, and the screen and plate may readily be removed from the casing for cleaning when necessary, since they are not attached in any way to the casing. A bent tongue 74 is preferably extended from the upper edge of the mid-portion of the deflector plate 53, to hold the screen 72 in place. The screen 72 may be used or not, depending on the nature of the articles being washed, and when used, the shape of the screen requires all liquid entering the admission opening 28 to pass through it, its relatively large area compensating for the fineness of its mesh and avoiding appreciable flow restriction due to its use.

The removable deflector plate 54 extends preferably the full length of the machine between the end walls 10a, 10a, and at its lower edge adjacent the deflector plate 53, it extends downwardly and is substantially in a continuation of the plane of the deflector plate 53; above its lower edge portion, it curves generally over towards the side wall 13 and downwardly, being curved more sharply at its edge portion adjacent the side wall 13, over a similarly curved flange 13a extending into the casing from the upper portion of the side wall 13, in which position it may be retained by a lug 13b extending inwardly from the side wall 13 over a rib 54a on the deflector plate. The lower edge of the deflector plate may be provided with tongues 54b extending through corresponding slots in the groove construction along the upper edge of the deflector plate 53, constituting a separable hinge connection between the deflector plate 54 and the deflector plate 53. The deflector plate 54 may conveniently have secured to it a handle 56, by which the plate 54 may be moved from its position indicated in Fig. 1, to its open position after the removal of the cover 15, to place liquid and articles to be washed in the machine and remove said articles from the machine when desired.

As a result of the construction described, the liquid jets delivered at high velocity from the nozzles 32, 33 and 34 move the entire liquid in the casing 10 rapidly in the direction of the arrows 57, with considerable pressure outwardly against the side wall 13, as a result of which a rotary motion is imparted to articles being washed, for example as indicated by the circular arrows 58. If desired, this action may be increased and made more vigorous by providing the inner surface of the wall 13 with ridges 13c, which may be formed integrally with said wall. Were it not for the curved flange 13a and the deflector plate 54, the action described would vigorously project the liquid and articles being washed upwardly adjacent and above the wall 13 and without beneficial action. This is avoided by the curved formation of the flange 13a and of the deflector plate 54, which turn the liquid moving rapidly adjacent the side wall 13, over against the curved surface of the deflector plate 54, so that the turning effect on the articles being

washed is continued, as indicated for example by the circular arrows 59. The flange 13a and the deflector plate 54 thus insure a definite path of travel of the liquid and articles in the machine, so that a maximum washing effect will be secured with a minimum pressure on the liquid jets delivered by the nozzle construction. When the articles moving as described, reach the lower part of the fixed deflector plate 53, as a result of the general direction of liquid flow produced by the jets from the nozzle construction, and as a result of the spread of the jets flowing from the nozzles, the articles being washed are necessarily engaged by the rapidly moving liquid of the jets delivered from the nozzles, with the effect that a rapid turning movement is imparted to the articles as indicated by the circular arrows 60, which it will be noted are oppositely directed to the circular arrows 58 and 59. In Fig. 8 another phase of the action of the liquid flow is illustrated, this figure being an illustration of the downward flow of the liquid adjacent the deflector plate 53. As shown in Fig. 8, this downward flow is generally uniform over the entire extent of the deflector plate until the liquid flow and articles being washed come within the influence of the more rapidly moving jets delivered by the nozzles. When this occurs, since the outer jets are projected towards the end walls 10a, 10a, rotary movement is imparted by the jets to the liquid and to the articles being washed, in other directions than indicated by the circular arrows 60 in Fig. 1, for example as shown by the circular arrows 61 for the jet delivered from the nozzle 34 and by the circular arrows 62 for the jet delivered from the nozzle 32. The result of these reversals of whirling movement, and the different directions of whirling movement imparted to the articles being washed, is to prevent their matting together in any way and to maintain them in thoroughly loosened condition throughout the entire washing operation, and to insure that the washing media will be vigorously and rapidly brought into contact with every part of each article being washed.

As shown in Fig. 8, the portion of the deflector plate 54 above the deflector plate 53, has slots 63 formed through it, which are preferably inclined to each other as indicated, by which the operator may see whether the articles being washed are circulating properly and whether the water level is correct to insure the proper washing of any particular batch of articles that may be in the machine at the time. The inclined relation of the slots 63, insures against the articles catching in the slots and interfering with the washing operation, and moves the articles being washed, towards the mid-portion of the deflector plate 53, thus insuring their effective engagement by the jets from the nozzles. If desired, the deflector plate 54 may be provided with corrugations 54c as indicated to make more positive the whirling effect illustrated by the arrows 59, than would be the case if the corrugations were not employed.

When the maximum washing capacity of the machine is employed, the liquid level with the motor at rest is preferably in line with the lower portion of the flange 13a, less liquid being required where a less quantity of articles is being washed. In many cases, I find that the deflector plate 54 may be removed, and that the flange 13a effectively imparts to the liquid and articles being washed, the path generally indicated by the arrows 57 from said flange to adjacent the

upper portion of the deflector plate 53, particularly where the machine is being used at less than maximum capacity, and that in such cases, there is no overflowing or spilling of liquid from the casing, even when the cover 15 is not in place on the casing.

Whatever may be the depth of liquid used in the machine, as long as it is sufficient to effectively cover the admission opening 28, operation of the motor produces movement of the liquid along the path indicated by the arrows 57, so that the depth of the liquid adjacent the side wall 13 is greater than the depth of said liquid adjacent the deflector plate 53. In any event, there is practically no liquid flow from the washing compartment between the side wall 13 and the deflector plate 53, to the compartment between the deflector plate 53 and the side wall 11, excepting between the tongues 53a and 53b on the deflector plate. As a result, the liquid level in said last mentioned compartment, drops below the liquid level in the washing compartment, until the difference in level is sufficient to cause liquid flow between said tongues with sufficient velocity to deliver to the admission opening 28, the full quantity of liquid required by the impeller. The liquid between the deflector plate 53 and the side wall 11 thus constitutes a compensating medium for any irregularities that may occur from time to time in the movement of the articles through the washing compartment, and in the liquid flow between the deflector tongues. In this manner, the load on the impeller and motor is maintained substantially uniform, during any particular washing operation.

As shown in Fig. 4, the cap 30 is preferably extended downwardly to carry a drain valve construction for draining liquid from the machine through an outlet opening 65 illustrated in Figs. 2, 4 and 7, when desired. As more clearly shown in Fig. 7, the lower part of the cap 30 is extended to form a compartment 66 in open communication with the outlet opening 65, and having in its lower wall a discharge aperture 67, normally closed by a valve member 68. The valve member 68 is preferably of resilient material and carried by a valve rod 69, extending upwardly through a stuffing box 70 carried by the upper wall of the compartment 66. The upper end of the rod 69 has rigidly secured to it a disk 71 by which the rod and valve member 68 may be raised or lowered as desired. In this manner a convenient drain valve is provided for the machine, which is positive and may be quickly operated, and which the liquid in the machine tends to hold in its closed position, when the machine is in use.

While the machine described may be made of any size and for any purpose adapted to washing articles by machines, I find it particularly useful in small sizes, for washing fine and delicate articles of wearing apparel, fine curtains, and similar fabrics, since in such sizes it may be of light weight, for example from ten to fifteen pounds, permitting its ready and easy movement for use and for storage. In such sizes, it may be conveniently and effectively used on kitchen sinks, in bath tubs, or other locations equipped with drains, avoiding the need for special drain piping extending from the machine.

While I have shown my invention in the particular embodiment above described, it will be understood that I do not limit myself to this exact construction as I may employ equivalents known to the art at the time of the filing of this appli-

cation without departing from the scope of the appended claims.

What I claim is:

1. In a washing machine, the combination of a casing having substantially parallel end walls, a first substantially vertical side wall, a bottom wall substantially horizontal adjacent said side wall, and a second side wall substantially vertical at its upper portion and of cylindrical curvature throughout its lower half merging with the similarly curved adjacent half of said bottom wall, a liquid impeller, a cap secured to said first side wall around the outer part of said impeller, said side wall and said cap constituting a throat around said impeller directing liquid flow therethrough and constituting also an impeller admission chamber opening through said side wall into said casing, a nozzle construction below said impeller and above said bottom wall and directed obliquely downwardly into said casing towards the bottom of said second side wall, said cap and said first side wall constituting also a nozzle admission compartment in open communication with said throat, and a cylindrically curved deflector plate extending upwardly from the upper portion of said second side wall and through the upper portion of said casing and then downwardly adjacent said first side wall, whereby liquid and articles being washed in said casing are moved by jets from said nozzle construction in a closed path across said bottom wall, upwardly along said second side wall, and across and downwardly in said casing against said deflector plate into the path of said jets, said nozzle construction consisting of a plurality of nozzles in substantially the same plane and diverging from each other inwardly in said plane.

2. In a washing machine, the combination of a casing having substantially parallel end walls, a first substantially vertical side wall, a bottom wall substantially horizontal adjacent said side wall, and a second side wall substantially vertical at its upper portion and of cylindrical curvature throughout its lower half merging with the similarly curved adjacent half of said bottom wall, a liquid impeller, a cap secured to said first side wall around the outer part of said impeller, said side wall and said cap constituting a throat around said impeller directing liquid flow therethrough and constituting also an impeller admission chamber opening through said side wall into said casing, a nozzle construction below said impeller and above said bottom wall and directed obliquely downwardly into said casing towards the bottom of said second side wall, said cap and said first side wall constituting also a nozzle admission compartment in open communication with said throat, a cylindrically curved deflector plate extending upwardly from the upper portion of said second side wall and through the upper portion of said casing and then downwardly adjacent said first side wall, whereby liquid and articles being washed in said casing are moved by jets from said nozzle construction in a closed path across said bottom wall, upwardly along said second side wall, and across and downwardly in said casing against said deflector plate into the path of said jets, and a second deflector plate extending downwardly from said first named deflector plate below said nozzle construction and provided adjacent said bottom wall with openings for liquid flow from said casing to said impeller admission chamber, whereby liquid flowing to said impeller from said

casing crosses the plane of jets from said nozzle construction.

3. In a washing machine, the combination of a casing having substantially parallel end walls, a first substantially vertical side wall, a bottom wall substantially horizontal adjacent said side wall, and a second side wall substantially vertical at its upper portion and of cylindrical curvature throughout its lower half merging with the similarly curved adjacent half of said bottom wall, a liquid impeller, a cap secured to said first side wall around the outer part of said impeller, said side wall and said cap constituting a throat around said impeller directing liquid flow there-through and constituting also an impeller admission chamber opening through said side wall into said casing, a nozzle construction below said impeller and above said bottom wall and directed obliquely downwardly into said casing towards the bottom of said second side wall, said cap and said first side wall constituting also a nozzle admission compartment in open communication with said throat, a cylindrically curved deflector plate extending upwardly from the upper portion of said second side wall and through the upper portion of said casing and then downwardly adjacent said first side wall, whereby liquid and articles being washed in said casing are moved by jets from said nozzle construction in a closed path across said bottom wall, upwardly along said second side wall, and across and downwardly in said casing against said deflector plate into the path of said jets, a second deflector plate extending downwardly from said first named deflector plate below said nozzle construction and provided adjacent said bottom wall with openings for liquid flow from said casing to said impeller admission chamber, whereby liquid flowing to said impeller from said casing crosses the plane of jets from said nozzle construction, and a screen between said first side wall and said second deflector plate and in the path of liquid flow to said impeller.

4. In a washing machine, the combination of a casing having substantially parallel end walls, a first substantially vertical side wall, a bottom wall substantially horizontal adjacent said side wall, and a second side wall substantially vertical at its upper portion and of cylindrical curvature throughout its lower half merging with the similarly curved adjacent half of said bottom wall, a liquid impeller, a cap secured to said first side wall around the outer part of said impeller, said side wall and said cap constituting a throat around said impeller directing liquid flow therethrough and constituting also an impeller admission chamber opening through said side wall into said casing, a nozzle construction below said impeller and above said bottom wall and directed obliquely downwardly into said casing towards the bottom of said second side wall, said cap and said first side wall constituting also a nozzle admission compartment in open communication with said throat, a cylindrically curved deflector plate extending upwardly from the upper portion of said second side wall and through the upper portion of said casing and then downwardly adjacent said first side wall, whereby liquid and articles being washed in said casing are moved by jets from said nozzle construction in a closed path across said bottom wall, upwardly along said second side wall, and across and downwardly in said casing against said deflector plate into the path of said jets, a second deflector plate extending downwardly from said first named deflector plate below

said nozzle construction and provided adjacent said bottom wall with openings for liquid flow from said casing to said impeller admission chamber, whereby liquid flowing to said impeller from said casing crosses the plane of jets from said nozzle construction, said second deflector plate being stationary and hinged to said first named deflector plate, and a handle on said first named deflector plate for moving it to open and closed positions.

5. In a washing machine, the combination of a casing having substantially parallel end walls, a first substantially vertical side wall, a bottom wall substantially horizontal adjacent said side wall, and a second side wall substantially vertical at its upper portion and of cylindrical curvature throughout its lower half merging with the similarly curved adjacent half of said bottom wall, a liquid impeller, a cap secured to said first side wall around the outer part of said impeller, said side wall and said cap constituting a throat around said impeller directing liquid flow therethrough and constituting also an impeller admission chamber opening through said side wall into said casing, a nozzle construction below said impeller and above said bottom wall and directed obliquely downwardly into said casing towards the bottom of said second side wall, said cap and said first side wall constituting also a nozzle admission compartment in open communication with said throat, and a cylindrically curved deflector plate extending upwardly from the upper portion of said second side wall and through the upper portion of said casing and then downwardly adjacent said first side wall, whereby liquid and articles being washed in said casing are moved by jets from said nozzle construction in a closed path across said bottom wall, upwardly along said second side wall, and across and downwardly in said casing against said deflector plate into the path of said jets, said deflector plate having slots through its lower portion inclined downwardly towards the midportion laterally of said plate.

6. In a washing machine, the combination of a casing forming a washing compartment, and liquid delivering mechanism having nozzles opening into said casing in proximity to and in substantially the same plane horizontally and directed towards and across and spaced from the bottom of said casing, to deliver liquid at high velocity across the bottom of said casing and upwardly therein, said casing having a liquid outlet opening adjacent and below the plane of said nozzle and communicating with said mechanism to supply the latter with liquid, whereby liquid flowing into said outlet opening is shielded by high velocity jets issuing from said nozzles.

7. In a washing machine, the combination of a casing forming a washing compartment, and nozzle mechanism extending through a side wall of said casing in proximity to and directed towards and across and spaced from the bottom of said casing, whereby liquid is projected at high velocity from said nozzle mechanism across the bottom of said casing and upwardly therein, said casing having a liquid outlet opening adjacent and below said nozzle mechanism to supply liquid to said nozzle mechanism, whereby articles being washed are carried away from said outlet opening by liquid projected from said nozzle mechanism and engagement between said articles and said outlet opening is prevented.

8. In a washing machine, the combination of a casing forming a washing compartment, a plurality of diverging nozzles for producing high ve-

locity flow and extending through a side wall of said casing in substantially the same plane horizontally and sufficiently above the bottom of the casing to accommodate an outlet opening in said side wall below said nozzles, said casing having a liquid outlet opening in its said side wall adjacent its bottom and below said nozzles to supply liquid to said nozzles, said nozzles being above and adjacent to said outlet opening, and means connected with said nozzles and said outlet opening and supplying said nozzles with liquid from said outlet opening.

SAMUEL C. SHAFFNER.

CERTIFICATE OF CORRECTION.

Patent No. 1,986,019.

January 1, 1935.

SAMUEL C. SHAFFNER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 5, second column, line 63, claim 2, for "sail" read said; page 6, second column, lines 47 and 48, claim 6, strike out the words "in substantially the same plane horizontally and" and insert the same after "nozzles" in line 46; and claim 6, line 53, for "nozzle" read nozzles; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 17th day of September, A. D. 1935.

Leslie Frazer

Acting Commissioner of Patents.

(Seal)