Aug. 28, 1923. 1,466,397

A. GRAYDON

WASHING MACHINE

Filed Jan. 27, 1920 3 Sheets-Sheet 1

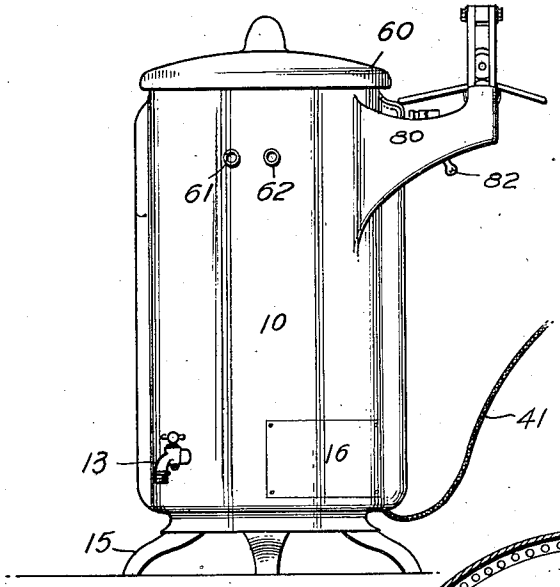



Fig. 1.

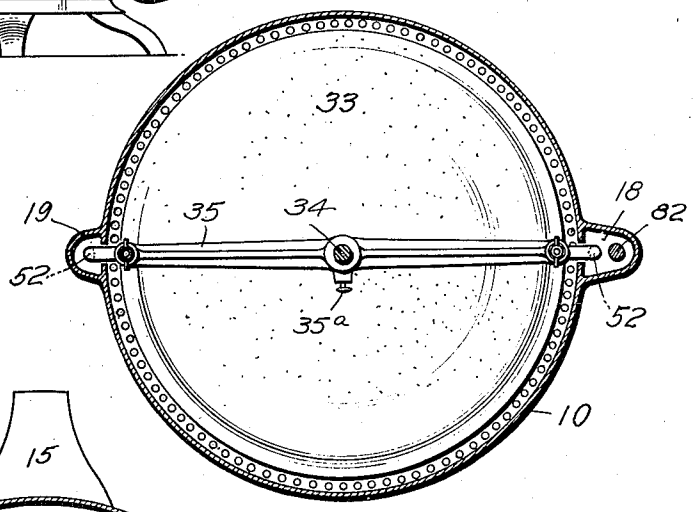



Fig. 4.

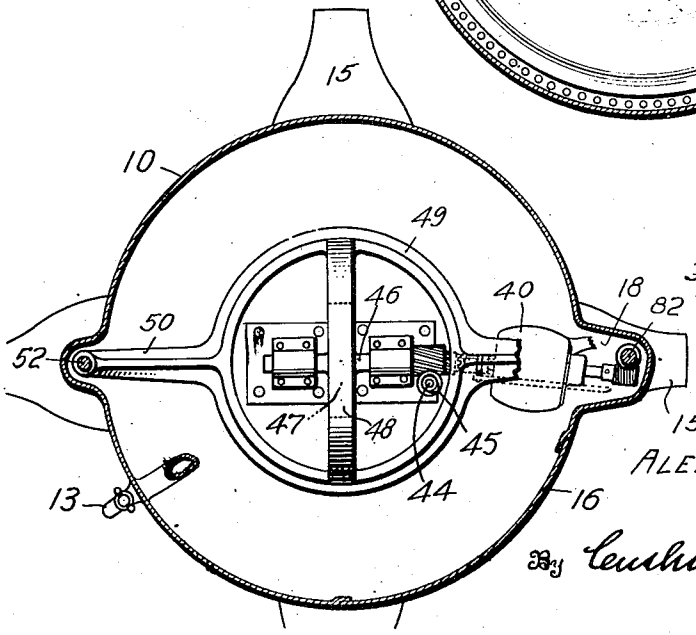



Fig. 5.

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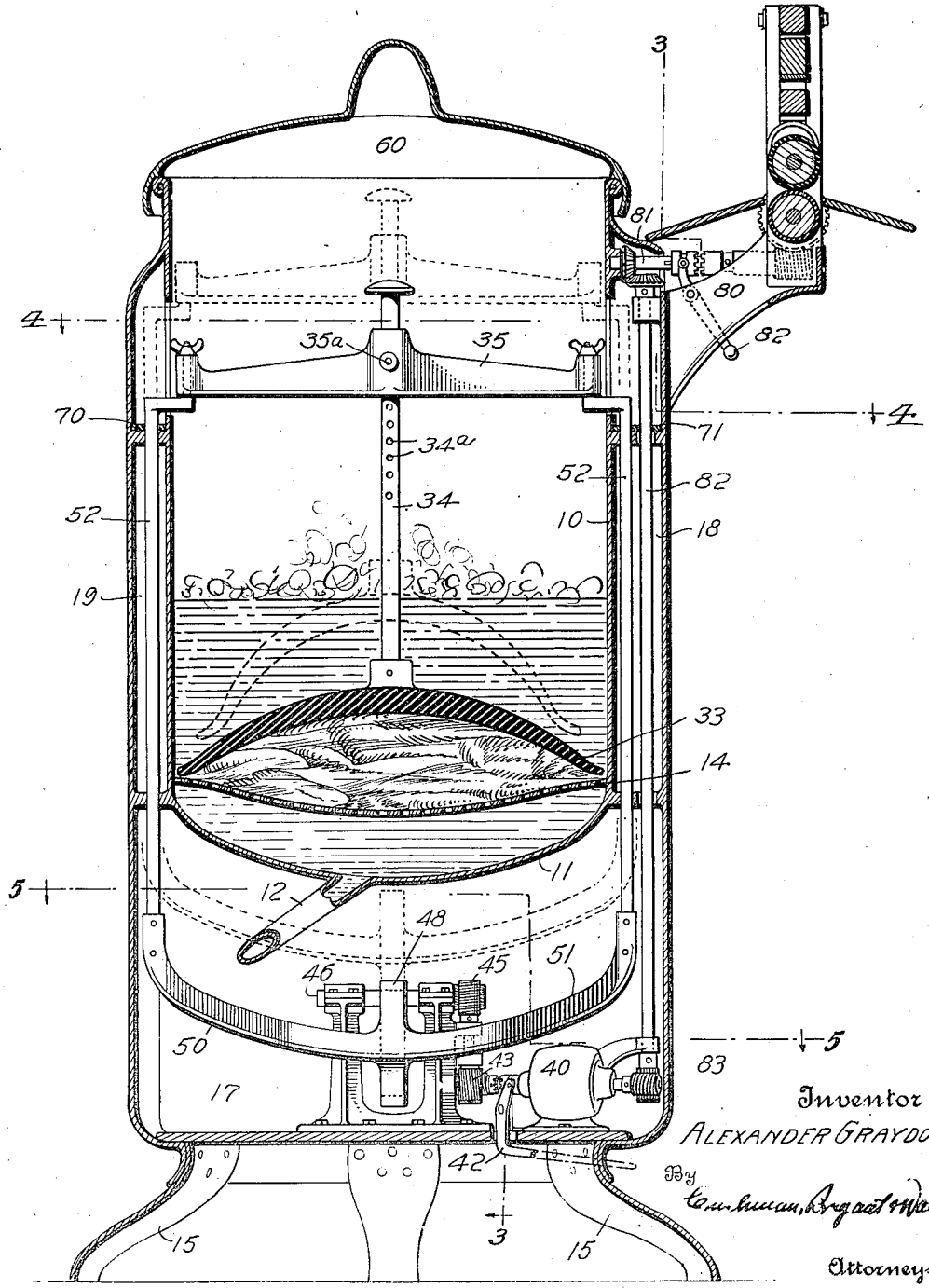
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WASHING MACHINE

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Fig. 2.




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WASHING MACHINE

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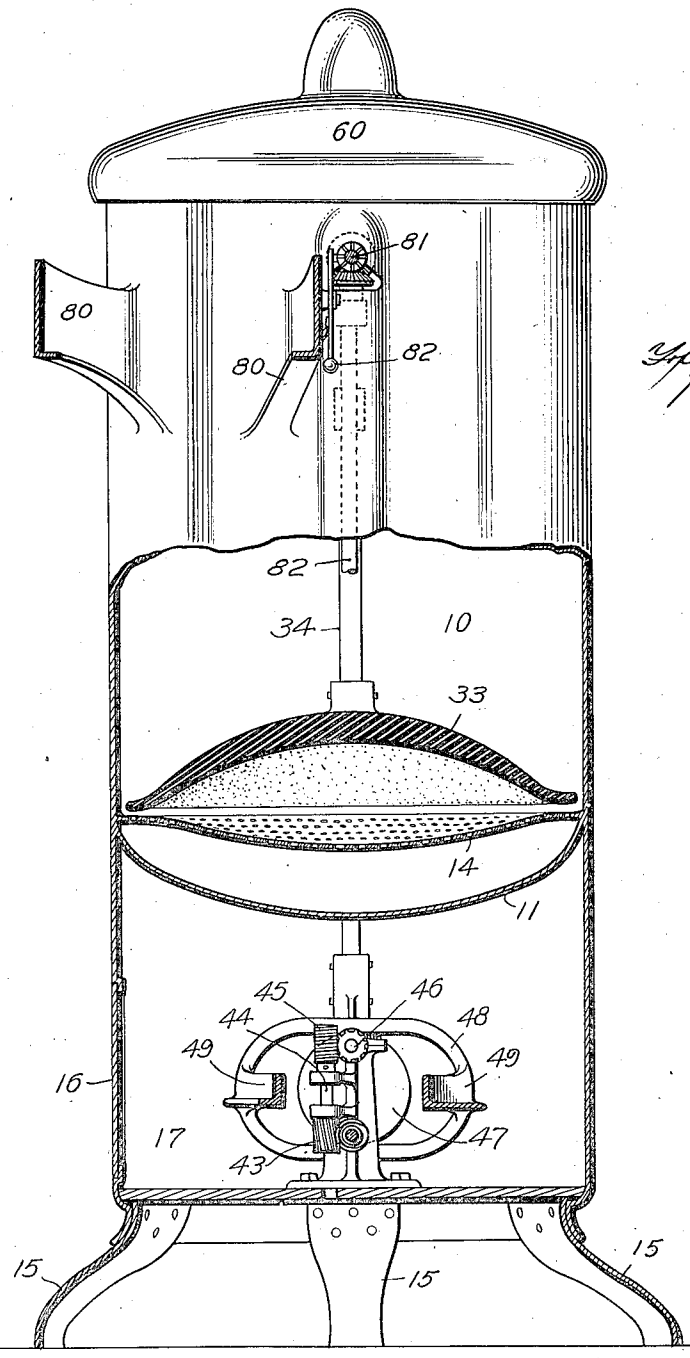



Fig. 3.

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Patented Aug. 28, 1923. 1,466,397

# UNITED STATES PATENT OFFICE.

ALEXANDER GRAYDON, OF BERKELEY, CALIFORNIA.

## WASHING MACHINE.

Application filed January 27, 1920. Serial No. 354,412.

*To all whom it may concern:*

Be it known that I, ALEXANDER GRAYDON, a citizen of the United States, residing at Berkeley, in the county of Alameda and State of California, have invented new and useful Improvements in Washing Machines, of which the following is a specification.

The present invention relates to improvements in machines particularly adapted for washing clothes, fabrics and similar materials.

The object of the invention is to provide a durable and compactly arranged mechanism in which all of the moving parts will be enclosed within a casing so as to be protected from injury or from coming in contact with parties using the machine.

A further object of the invention is to provide a machine in which the cleansing is effected by alternately drawing the washing fluid through the articles to be cleansed without using any scrubbing means or mechanically agitating the clothes so the washing of delicate fabrics may be accomplished without injuring them.

In the accompanying drawings—

Figure 1 is an elevation of a washing machine constructed in accordance with the present invention;

Figure 2 is a vertical sectional view, on an enlarged scale, of the machine;

Figure 3 is a side elevation, with part of the casing broken away, substantially on the line 3—3 of Figure 2;

Figure 4 is a horizontal section, substantially on the line 4—4 of Figure 2;

Figure 5 is a similar section substantially on the line 5—5 of Figure 2.

Referring to the drawings, in which corresponding parts in the several views are designated by similar reference characters 10 denotes a tub or receptacle in which the articles to be washed are placed. This receptacle is preferably made of metal, although it may be constructed of any suitable material, and is of such design that it can be readily spun or cast. Preferably it is enameled so as to provide a smooth sanitary surface. As shown, the receptacle 10 is of circular form in cross section, although obviously it may be square, octagonal, or of any desired cross section. The bottom 11 of the receptacle is preferably sloped downwardly to give a good drain conformation, such bottom 11 in the present instance being sloped or inclined to a central point from which a drain pipe 12 leads to a draining faucet 13 outside the casing and which faucet may be provided with means for ready attachment of a hose to carry the drainings to the proper place. In case the invention is embodied in a stationary or set fixture the drain pipe 12 would, of course, lead to a suitable waste or sewer outlet and properly positioned to meet the needs of the installation.

Within the receptacle 10, is arranged a false bottom 14 shown as consisting of a perforated or apertured plate which is suitably connected with the side wall of the receptacle, as by being brazed or otherwise attached thereto. The apertures or perforations in the false bottom 14 permit the free passage therethrough of water.

The side wall of the receptacle 10 is extended downwardly below the bottom 11 and, as shown, suitable legs 15 are riveted or otherwise secured to the lower portion thereof so as to constitute a stand or support for the mechanism. Access to the chamber or space beneath the washing receptacle is effected through a suitable opening in the downwardly extended wall, said opening being shown as covered by a detachable plate 16.

Within the chamber or space 17 beneath the washing receptacle are arranged the power devices, that will be hereinafter more particularly described and these are connected by means extending through passages 18, 19, provided on the exterior of the receptacle 10, with a suitable agitator within the washing receptacle.

As shown, the agitator is in the form of a reciprocating plunger, comprising a suction cup or head 33, preferably made of resilient material so that it will tend to expand and contract as it is moved vertically, and an upwardly extending stem 34. The suction cup 33 is preferably made of rubber designed and molded to give the necessary strength and is of a diameter slightly less than the interior of the receptacle or tub 10, so that in every position of the agitator a fluid passage will be provided between the outer edge thereof and the inner surface of the receptacle 10. By providing a suction cup which is formed of rubber or other resilient flexible material the danger of tearing or mutilating the clothes or articles to be washed is materially minimized, since during the upward stroke of the plunger

the same contracts, as shown in dotted lines in Figure 2, and should any clothes become lodged between the periphery of the plunger and the wall of the receptacle during either the upward or downward strokes of the former, the plunger will flex or bend in order to release the article thus caught. Adjacent its upper end the agitator stem 34 is connected with a suitable cross head 35 by means permitting of relative vertical movement of said parts so that the effective length of the agitator stem may be varied as desired. As shown, a series of holes 34ª are formed in the stem 34 and a cross pin 35ª is adapted to be positioned in any one thereof so that the distance between the cross head 35 and the suction cup 33 may be varied. The ends of the cross head 35 are in alinement with suitable, diametrically opposite, slots formed in the wall of the washing receptacle and opening into the aforesaid passages 18, 19, through which the connections to the power devices in the lower chamber 17 extend.

In the embodiment of the invention illustrated an electric motor 40 is employed as the source of power, such motor being arranged on a suitable base within the chamber 17 and being supplied with power through a conductor 41. The motor shaft has loosely mounted thereon a worm gear which engages a worm 43 secured on the lower end of a shaft 44 that is supported in ears or brackets extending laterally of a bearing that is arranged within the chamber 17. By means of a suitable clutch controlled by a lever 42 the motor can be caused to drive the worm 43 and shaft 44. On the upper end of the shaft 44 is a worm 45 that meshes with a worm on a shaft 46 mounted in the aforesaid bearings and on this main, power shaft, is secured an eccentric 47.

The eccentric 47 is surrounded by a ring member 48 that is in turn connected to a member 49 provided with laterally extending diametrically opposite arms 50, 51, which extend into alinement with the aforesaid vertical passages 18, 19, formed on the exterior of the washing receptacle. Rods 52 connect said arms 50, 51, with the arms of the cross head 35 and, therefore, as the shaft 46 and eccentric thereon are rotated by the motor, reciprocation will be imparted to the plunger within the receptacle 10.

The cross head arms 35 are detachably connected with the power rods 52 so that the entire agitator may be removed from the receptacle 10 when desired. Preferably, as shown, the passages 18, 19, are formed by elongated bosses integral with the exterior of the receptacle 10 and it will be seen that all of the power devices are arranged within and concealed by the casing.

A cover 60 is provided to close the upper end of the washing receptacle.

If desired, the machine may be provided with inlet pipes 61, 62, adapted to be connected to suitable sources of supply for hot and cold water or, of course, the water to be used may be introduced through the open top of the receptacle when the cover 60 is removed. By using the supply pipes 61, 62, and connecting the drainage pipe 12 with a waste pipe the machine is made a permanent or stationary fixture but it is not necessary to employ such connections and that the machine may be readily moved from place to place if desired.

The slots through which the connections between the cross head arms 35 and the rods 52 extend are of sufficient length to accommodate the maximum amount of movement of agitator, under the action of the eccentric 47 and it will be seen that said slots are completely closed on the outside by the bosses or enlargements of the exterior wall of the receptacle 10 which constitute guards. To prevent any possibility of water escaping through said slots and passing into the lower chamber of the machine, below the bottom of the washing receptacle, washers 71 may be fitted about the connecting rods 52.

It is preferable to provide a machine of this character with a wringer, and according to the present invention such an addition is adapted to be positively driven from the motor 40. As shown, the wringer is supported by brackets 80 extending outwardly from the casing and adapted to be driven by a shaft 81 which extends into the upper end of the aforesaid passage 18. Within this passage 18 the shaft 81 is shown as provided with a bevel pinion which meshes with a similar pinion at the upper end of the shaft 82 which is provided at its lower end with a worm 83 adapted to be rotated by a worm gear on a shaft of the motor 40. By means of a suitable clutch controlled by a handle 82 rotary movement of the shaft 82 can be transmitted to the wringer rolls.

In operation the articles to be washed will be placed in the receptacle 10, with suitable amount of water or other cleansing fluid and the agitator placed in position therein with its arms 35 connected to the power rods 52. The lid or cover can then be applied to the upper end of the receptacle. Current being supplied to the motor 40 and the clutch lever 42 properly manipulated to effect rotation of the shaft 46 will cause the agitator to be reciprocated within the receptacle 10.

As the resilient member 33 is forced downwardly it will force the washing fluid through the clothes and the apertured bottom 14 and the water displaced by such downward movement will flow outwardly toward the wall of the receptacle 10 and upwardly through the space separating such

wall from the resilient member. In its downward movement the member 33 will assume the form indicated in full lines in Figure 2 and on the upward movement of the plunger will assume the form shown in dotted lines. As said member 33 moves upwardly it will exert a suction and operate to draw water up through the clothes, the body of water moving downwardly through the space separating the margin of the suction head from the wall of the receptacle 10.

The result of this action is that the body of water or washing fluid is alternately displaced by the suction head and through such displacement is forced through the clothes or fabrics in opposite directions so as to effectively wash them. It will be seen that the present construction differs from ordinary plunger or pounder washers in that the parts are so combined that the washing fluid is confined to certain definite channels. It is forced downwardly as a body through the clothing and can escape only in the form of a relatively thin film past the edge of the descending member 33, such upward movement occurring only after it has been carried down through the clothing to the perforated bottom 14. On the return movement of the member 33 the water escapes downwardly through the ring-like channel between the edge of the member and the wall of the tub or receptacle and by the suction of the member 33 is drawn upwardly through the clothing. This is accomplished without any mechanical agitation of the clothes which are subjected only to downwardly and upwardly moving currents of washing fluid.

By employing the inlet pipes 61 and 62, it will be seen that water may be supplied to the machine without removing the lid and, after the initial washing, the tub may be drained through the pipe 12 and rinsing water let in through said inlets.

After the washing and rinsing operations are completed the lid or cover 60 is removed and the plunger withdrawn from the tub or receptacle. By properly manipulating the clutches 42 and 82 the wringer can be set in operation and the washed clothes readily moved from the receptacle to position to be engaged by the wringer rolls.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:—

1. In a washing machine, the combination of a casing having therein a washing receptacle that opens through the top of the casing, a partition in said casing forming a bottom for said receptacle, a cover for closing the washing receptacle, a reciprocable agitator supported within said receptacle, a motor and power transmitting devices for actuating said agitator arranged entirely within said casing and located below said partition, and connections between said power devices and said agitator located entirely within the casing.

2. In a washing machine, the combination of a casing having therein a washing receptacle that opens through the top of the casing, a partition on said casing forming a bottom for said receptacle, a cover for closing the washing receptacle, a reciprocable agitator supported within said receptacle, a motor and power transmitting devices for actuating said agitator arranged entirely within said casing and located below said partition, and connections between said power devices and said agitator located entirely within the casing, said connections extending upwardly between the wall of the casing and the wall of the receptacle, none of said connections or power devices extending through the bottom of the receptacle.

3. In a washing machine, the combination of a casing having an interior washing receptacle that opens through the top of the casing, a partition in said casing affording a bottom for said receptacle, the receptacle being of less depth than the casing and having at least a portion of its side wall separated from the wall of the casing, an agitator within the receptacle, a cover for closing the receptacle, a motor within the casing below said partition, and means connecting the motor and agitator, all arranged within the casing.

4. In a washing machine, the combination of a casing having an interior washing receptacle that opens through the top of the casing said receptacle being of less depth and of less width in one direction than the casing so that its bottom and diametrically opposite portions of its side wall are separated from the casing, an agitator within the receptacle, a cover for closing the receptacle, a motor within the space between the casing and receptacle, and means connecting the motor and agitator all arranged within the casing.

5. In a washing machine, the combination of a casing having an interior washing receptacle that opens through the top of the casing said receptacle being of less depth and of less width in one direction than the casing so that its bottom and diametrically opposite portions of its side wall are separated from the casing, an agitator within the receptacle, a cover for closing the receptacle, a motor within the space between the bottom of the receptacle and the casing, and connections between the motor and agitator extending through the diametrically opposite passages between the casing and receptacle.

6. In a washing machine, the combination of a casing, having an interior washing and clothes receptacle that opens through the top of the casing, said receptacle being of less depth than the casing and being of

less width than the casing in one direction so that portions of its side wall are spaced from the side wall of the casing to form vertical passages between the receptacle and the casing, a reciprocable agitator within said receptacle, a motor below said receptacle within the casing, connections between the motor and agitator extending upwardly through the passages formed between the receptacle and casing, and independent connections from the motor extending through at least one of said passages and adapted to drive a wringer, said motor and driving connections all being located entirely within the casing.

7. In a washing machine, the combination of a casing having an interior washing and clothes receptacle that opens through the top of the casing, a partition in said casing forming a bottom for said receptacle, said casing having passages formed between the wall of said receptacle and said casing whereby a space is formed within the casing below the bottom of the receptacle and at its sides, a vertically movable agitator within the receptacle, a cover for the receptacle, a motor within the casing below said receptacle, and connection between the motor and agitator extending through the passages between the receptacle and casing walls, said connections being adapted to permit the removal of said agitator.

8. In a washing machine, the combination of a casing, having an interior washing receptacle that opens through the top of the casing, the receptacle being of less depth than the casing, and having a portion of its side wall spaced from the casing so that a space is formed below the casing bottom and a passage extends upwardly from said space to near the top of the receptacle, the latter having an opening in its side wall that communicates with said passage, a vertically movable agitator within the receptacle, a cover for the upper end of the receptacle, a motor within the space below the bottom of the receptacle and enclosed by said casing, and connections between the motor and agitator extending through said passage and the opening in the side wall of the receptacle.

9. In a washing machine, the combination of a casing, having an interior washing receptacle that opens through the top of the casing, the receptacle being of less depth than the casing and having portions of its side wall spaced from the casing so that a space is formed below the casing bottom and passages extend upwardly from said space to near the top of the receptacle, the latter having openings in its side wall that communicate with said passages, a vertically movable agitator within the receptacle, a cover for the upper end of the receptacle, a motor within the space below the bottom of the receptacle and enclosed by said casing, and connections between the motor and agitator extending through said passages and the openings in the side wall of the receptacle.

10. A washing machine comprising a casing having an interior chamber adapted to serve as a clothes containing and washing receptacle, said casing having vertically extending passages therein between its side wall and the side wall of said chamber, a motor within the casing beneath said chamber, a plunger adapted to reciprocate within the chamber, connections between the plunger and motor extending through the passages formed between the chamber and casing, and a cover for the upper end of the chamber.

11. A washing machine comprising a casing having an interior chamber which opens through the upper end of the casing, the casing having therein a vertically extending passage between its side wall and the side wall of the chamber, a plunger adapted to reciprocate within the chamber, a motor within the casing beneath the chamber, and connections between the motor and agitator arranged below the chamber and extending through the passage between the chamber and the side wall of the casing, said connections being adapted to permit the removal of the plunger.

12. A washing machine comprising a clothes containing receptacle, an agitator having a resilient disc-like head having a diameter slightly less than that of the receptacle so that it is spaced from the wall of the receptacle by a narrow peripheral passage, said head being adapted to flex when articles become lodged between the head and the wall of the receptacle, and means for reciprocating the agitator, whereby in downward movement of the agitator the body of water beneath it will be obliged to travel upwardly through said narrow passage between the resilient head and the receptacle and in the upward movement of the agitator water will be forced to travel down through said passage.

13. A washing machine comprising a receptacle adapted to contain a body of water and the clothes to be washed, a perforated clothes support within the receptacle above the bottom thereof, a reciprocable agitator above the support comprising a head consisting of a resilient disc of concavo-convex cross section and having a diameter slightly smaller than that of the receptacle, whereby it will be separated from the receptacle by a relatively narrow channel, a stem attached centrally and extending from said disc, and means for reciprocating said disc, said disc being adapted to flex when articles become lodged between the disc and the wall of the receptacle.

14. In a washing machine, the combination of a receptacle for clothes and water, a reciprocable plunger within said receptacle having a resilient head of a diameter slightly less than the diameter of the receptacle, said head being adapted to flex when articles become lodged between the head and the wall of the receptacle, and means for reciprocating said plunger.

15. In a washing machine, the combination of a receptacle for clothes and water, a reciprocable forcing and suction plunger within the receptacle having a resilient head closely fitting the receptacle and provided with a concave under-face, said head being adapted to flex when articles become lodged between the head and the wall of the receptacle, and means for reciprocating said plunger.

16. In a washing machine, the combination of a receptacle, a foraminous clothes support extending across and spaced from the bottom of said receptacle, a reciprocable forcing and suction plunger within the receptacle having a resilient head of a diameter slightly less than the diameter of the receptacle, the periphery of the head being separated from the wall of the receptacle in all positions by a relatively narrow channel and the head being adapted to flex when articles become lodged between the head and the wall of the receptacle, and means for positively reciprocating said plunger.

17. A washing machine comprising a casing having a clothes containing receptacle, a reciprocable agitator in the receptacle having a yielding concavo-convex suction plunger, the periphery of which is separated from the wall of the receptacle in all positions by a relatively narrow channel, said plunger being adapted to bend when articles become lodged between the plunger and the wall of the receptacle, and means for reciprocating said plunger.

18. In a washing machine, the combination of a casing having therein a washing receptacle that opens through the top of the casing, a partition in said casing forming a bottom for said receptacle, a foraminous clothes support above and spaced from the bottom of said receptacle, a removable cover for closing the receptacle, a removable reciprocable agitator supported within said receptacle, a motor and power transmitting devices for actuating said agitator arranged entirely within said casing and located below said partition, and connections between said power devices and said agitator located entirely within the casing.

In testimony whereof I have hereunto set my hand.

ALEXANDER GRAYDON.