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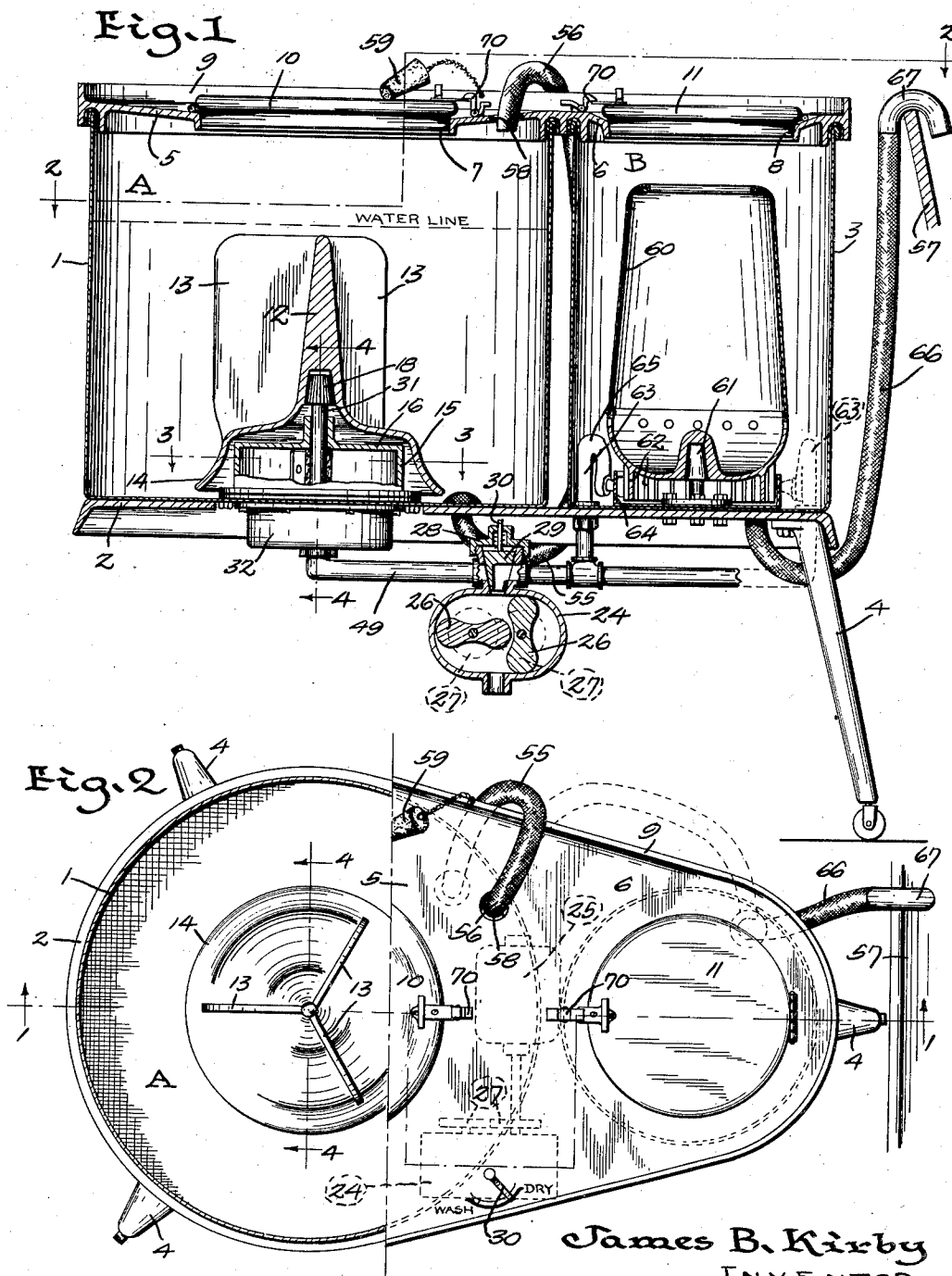
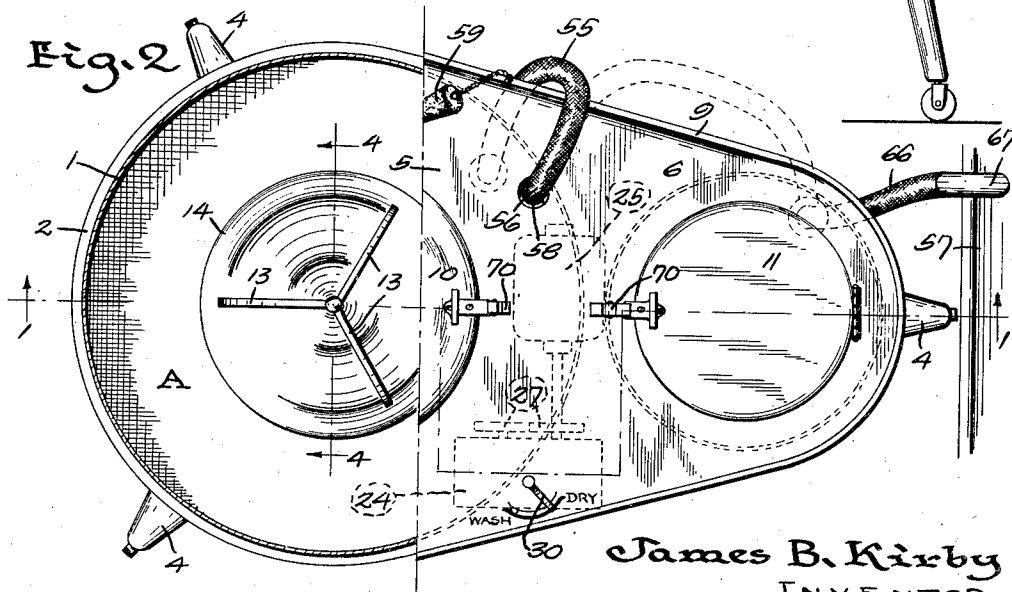
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2,137,775

LAUNDRY MACHINE AND METHOD

Filed May 16, 1930

2 Sheets-Sheet 1



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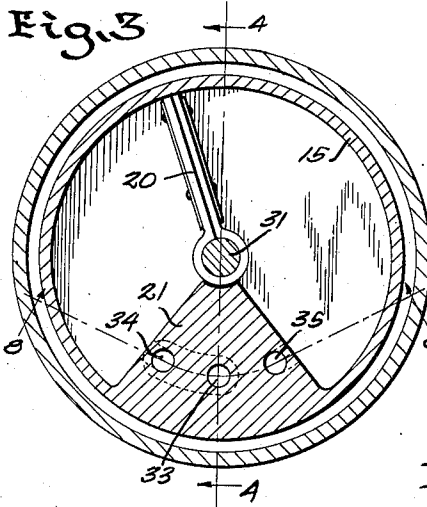
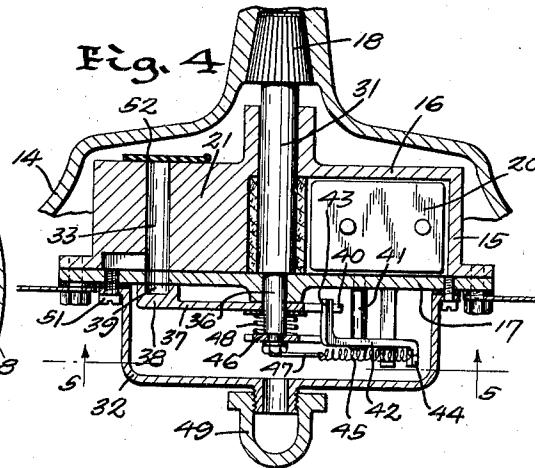
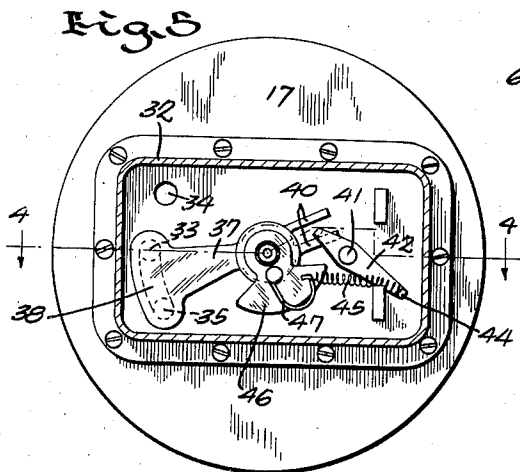
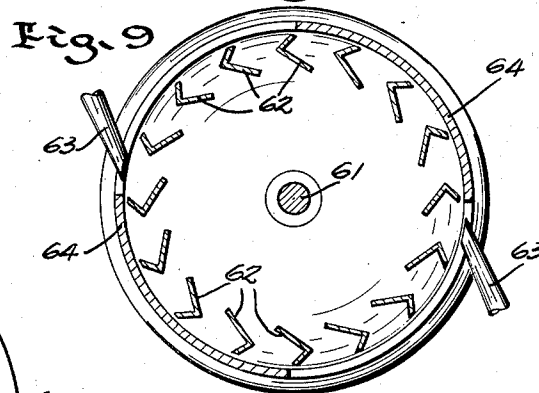
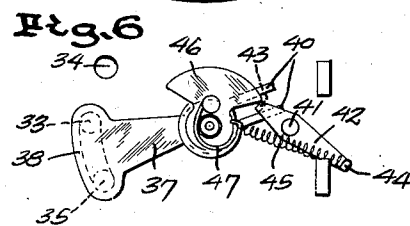
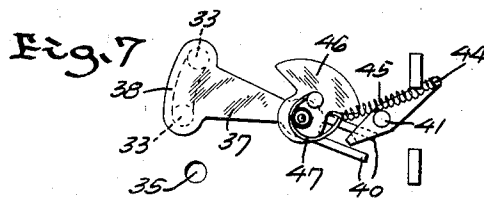
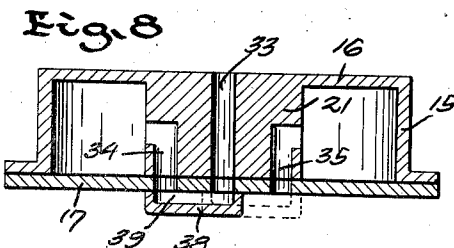
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LAUNDRY MACHINE AND METHOD

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,137,775

LAUNDRY MACHINE AND METHOD

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by mesne assignments, to The Apex Electrical
Manufacturing Company, Cleveland, Ohio, a
corporation of Ohio, as trustee

Application May 16, 1930, Serial No. 452,957

25 Claims. (Cl. 8—137)

This invention relates to laundry machines, by which term I mean to include clothes washing and liquid extracting devices, and has for its object the provision of new, improved, and simplified driving means for operating either or both a washing element and an extractor element. Heretofore it has been customary to operate washing and extracting machines by the use of electric motors, the power of the motor being communicated to the mechanism by way of suitable gearing or mechanical movements, excepting that in my application Serial No. 371,544, filed June 17, 1929, which matured on October 24, 1933, into United States Letters Patent No. 1,932,246, I described certain illustrative machines wherein this transmission of power was effected by means of fluid pressure mechanism. An important characteristic of the present invention is that this power is transmitted by pneumatic means, and an illustrative embodiment of my invention is shown in the annexed drawings, although it will be understood that these are not intended to limit me to the particular features of construction illustrated therein, either as regards the types of washing apparatus or the presence or nature of the extracting apparatus or the detail construction of the pneumatic apparatus.

In these drawings Fig. 1 is a sectional view corresponding to the broken line 1—1 of Fig. 2; Fig. 2 is a horizontal sectional view corresponding to the broken line 2—2 of Fig. 1; Fig. 3 is a horizontal sectional view corresponding to the line 3—3 of Fig. 1; Fig. 4 is a vertical sectional view corresponding to the line 4—4 of Figs. 1, 2, 3 and 5; Fig. 5 is a sectional view corresponding to the line 5—5 of Fig. 4 and looking upwardly; Figs. 6 and 7 are detail views of the same mechanism as shown in Fig. 5 but illustrating the position assumed thereby at different stages of its operation; Fig. 8 is a sectional view corresponding to the line 8—8 of Fig. 3; and Fig. 9 is an enlarged horizontal sectional view taken on a line just below the bottom of the extractor container to show the details of the extractor driving turbine.

The particular washing machine chosen for the exemplification of my improvements comprises two separate compartments A and B. The compartment A in the present embodiment consists of a cylindrical, sheet-metal, casing 1 set on a base plate 2, and the compartment B consists of a second, smaller casing, 3, set on the same base plate 2, the whole supported by legs 4. Tightly secured to the upper ends of the casing walls is a horizontal top plate having a web portion 5 above the compartment A and a web por-

tion 6 above the compartment B, each of these web portions slanting inwardly and downwardly from the rim to the apertures 7, 8, respectively, and preferably formed with a single, up-standing, marginal flange 9 surrounding both apertures. 5 The aperture 7 is provided with a cover 10 by which the same may be tightly closed, and the aperture 8 is likewise provided with a cover 11 by which it can be tightly closed.

The compartment A is the washing-compartment and contains the washing element, which in the present embodiment consists of a dasher or liquid agitator dolly 12 oscillatable about a vertical axis and having a plurality of wings or vanes 13 which may be of any desired conformation, and preferably also terminating in a circular disk 14 adjacent the bottom of the compartment. Carried by the casing-bottom beneath this dasher or washing element, which is preferably hollowed out somewhat for the purpose, is the operating 20 element which consists of a reciprocating pneumatic motor. In the form here shown this comprises a casing having a cylindrical wall 15 with a flat top 16, and a flat removable bottom plate 17. Journaled in the top and bottom is a vertical 25 rock-shaft 31 having at its upper end a fluted head 18 which tightly receives a suitable socket of the dasher in supporting and operating relation. Carried by the side of this shaft inside the motor-casing is a rigid blade 20 adapted to sweep 30 back and forth past the wall 15; and formed at one side of this casing is a radial partition 21 which is here shown as having a considerable angular extent.

Carried by the bottom plate 2 is an air pump 35 24, and connected to said air pump in driving relation is an electric motor 25. The particular air pump here shown comprises two complementary rotor elements 26, located side by side on parallel shafts and forced to rotate at equal speed by intermeshing spur gears 27. This pump will produce a motion of the air therethrough in either direction, depending upon the direction of rotation, but in the present embodiment is assumed to be rotated in a direction to deliver positive 45 pressure to the valve 28, whence it is delivered either to the washing element or to the extracting element depending upon the position of the valve member 29, which is determined by a handle 30 located above the top plate. It will be obvious 50 to those skilled in the art that many other types of pump could be used or that this pump could be rotated in a direction to produce negative pressure, provided only that certain well known changes in valves and piping were made. I find

some practical advantages in the use of positive pressure, but many of the advantages of my improvements can be enjoyed by the use of negative pressure so that I do not limit myself except where special considerations exist.

To convert the pneumatic pressure produced by this pump (whether greater or less than atmospheric) into an oscillatory motion of the shaft 31 requires the employment of a proper valve mechanism, many examples of which are known. The particular mechanism I have shown in this application is taken from a commercial pneumatic motor device and the following description of its construction and mode of operation is given solely to render my application technically complete and not because this particular valve-mechanism constitutes a part of my invention or has any particular advantage as compared with numerous other valve-mechanisms that can equally well be employed.

Secured to the bottom face of the bottom plate 17 is a second hollow casing 32, which may be called a valve casing since it houses the valve-mechanism. Formed in the partition 21 are three spaced ducts 33, 34, 35. Duct 33 opens through the plate 17 and extends to the top of the casing 16, (see Fig. 4) while ducts 34 and 35 traverse the plate 17 and then open sidewise through the opposite faces of partition 21 as shown in Figs. 3 and 8. The bottom end of shaft 31 is reduced in size as shown at 36 and also projects through the plate 17 where it is surrounded by a valve arm 37 having at its free end a head 38 which is hollowed out underneath (as shown at 39 in Figs. 4 and 8) so as to connect the duct 33 to either of the ducts 34 or 35 depending upon the position which said head occupies, the other of said ducts meanwhile opening directly into the valve casing 32. The opposite end of the arm 37 is extended to produce two spaced fingers 40. Pivoted on a stud 41 at one side of the extension 36 is a button 42 having one of its ends bent vertically to constitute a finger 43 which projects between the fingers 40—40. The opposite end of said button is bent in the opposite direction to form a finger 44 to which is attached a spring 45. The arm 37 is journaled on the extension 36 so as to be readily movable about the axis thereof. Tightly secured to the end of this extension 36 is a plate 46 of greater angular extent than the partition 21 and so located as to swing in a plane which shall bring it into contact first with one face and then with the other face of the finger 43. A suitable hook 47 is carried by this plate and one end of the spring 45 is attached thereto. A spring 48 is also shown as interposed between the plate 46 and arm 37 for the purpose of holding the valve head 38 in sliding contact with the plate 17.

The valve 29 being properly set and air under pressure being conveyed from the pump 24 to the casing 32 by way of the pipe 49, this air will pass through the open port, (such as port 34 in Fig. 5) to the interior of the casing 15 and force the blade 20 in the appropriate direction, while the air at the other side of said blade escapes into compartment A by way of duct 33. This motion proceeds until the plate 46 is brought into contact with the finger 43 as shown in Fig. 6 and onward, carrying button 42 until (by the movement of the button in one direction and the hook 47 in the opposite direction) the spring 45 has been carried past the post 41, whereupon the spring quickly completes

the movement of the button which, by the interaction of fingers 43 and 40, shifts the valve head 38 from the position shown in Fig. 6 to that shown in Fig. 7, and the motion of the blade 20 is reversed.

Obviously provision could be made to discharge the waste air outside of the casing, (for example by removing the screw 51, Fig. 4) which change would also enable the use of negative instead of positive pressure. But my preference is to make this dasher in the form of an imperforate air-bell and allow the waste air to escape beneath its rim 14. This construction serves to maintain the water level around the casing 15 always below the shaft bearing and dispenses with the need of any packing. In order to prevent escape of the washing liquid through the pneumatic system in case the dasher be removed before the liquid, or the casing filling before introducing the dasher, the top of the casing is preferably provided with a loose rubber flap 52 to act as a check valve.

During the operation of the pneumatic motor the dasher is driven with a reversely rotary movement and the vanes 13 of the dasher throw the liquid in the tub outwardly therefrom whereupon it flows in a turbulent manner back to the source of agitation; this cycle being repeated continuously as is customary in machines of the type employing an oscillatable dasher of the type disclosed. During the time the liquid in the tub is thus mechanically circulated, the air escaping from around the edge of the disk 14 bubbles upwardly through the moving liquid, aerating the liquid and articles being washed and at the same time providing a second means for agitating the liquid contents of the tub. The escaping air also prevents the articles being washed from working underneath the dasher.

To empty the casing a hose 55 is attached to a suitable outlet connection at the bottom of the compartment A and provided at its free extremity with a goose-neck 56 adapted either to be hooked over the rim of a discharge sink 57 or to be supported by the rim 9 of the top plate. The web 5 is provided with an aperture 58 for the escape of the waste air, and a plug 59 is provided by which this aperture can be closed, whereupon the entire liquid contents of the casing are expelled through the hose, which is one of the incidental advantages of positive pressure over negative pressure.

Mounted in the compartment B is the container element 60 of a centrifugal extractor. This in the present embodiment is rotatably mounted upon a rigid stud 61 projecting upwardly from the bottom of the compartment. Carried by the bottom of this container are a plurality of turbine blades or vanes 62, and mounted in the lower part of this container are suitable nozzles 63, here shown as two in number adapted to impinge upon said blades the pressure fluid which issues therefrom. I have shown the bottom of the container as provided with segmental shields 64 covering those blades which are nearest the respective nozzles. This ability to drive an extractor is another advantage of using positive pressure.

It is my preference to locate the respective pneumatic motors wholly inside the respective compartments and thereby dispense with the necessity of having any moving part projecting through the bottom of either compartment. In this way leakage of liquid is prevented. Accidental leakage of liquid through the nozzle 63 is

prevented by forming goosenecks 65 in the pipes which shall constitute air-traps.

A drainage hose 66 is connected in communicating relation with the bottom of the compartment B. The end of this hose is bent in a gooseneck 67 adapted to be hooked either over the rim 57 of the waste sink or into the aperture 58 of the compartment A in case it be desired to return the liquid thereto. The cover 11 being closed, and the web 6 imperforate, as it is, the air pressure collecting in the container B will very shortly expel the entire liquid contents thereof through this hose. Not until these liquid contents have been expelled will rotation of the container 60 commence, which constitutes a very satisfactory safe-guard against injury to the operator, since a certain amount of liquid is generally carried over into this compartment from the washing compartment, and even though the valve 29 be set as shown in Fig. 1, rotation of the container 60 will not ordinarily commence until the cover 11 has been closed, whereupon the liquid lying in the bottom of compartment B is first discharged, after which the rotation commences and high speed is easily obtained.

Owing to the large area of the covers 10 and 11 catches 70 are desirable to prevent their flying open. This mode of liquid ejection is both simpler and more satisfactory than any liquid pump since neither suds nor lint can impede it and since this air pressure evacuates the entire hose as well as the casing, leaving no liquid residue to freeze or decompose. The reason for employing a hole 58 and plug 59 is to prevent the unintentional ejection of the liquid contents.

It will be understood that I do not limit myself to the type of washing element herein shown since fluid pressure operating mechanism can be applied to other types; and I do not limit myself to laundry machines having extractors, nor do I limit myself to the type of fluid pressure pump here shown, nor to the type of fluid pressure motor, nor to the use of air as a working fluid nor in any other wise except as specifically recited in my several claims which I desire may be construed separately, each independently of limitations contained in other claims.

Having thus described my invention what I claim is:

1. In a washing machine, a liquid holding casing, a pneumatic motor inside said casing near the bottom thereof, said motor having a vertical shaft, a supply pipe for air under pressure traversing the casing bottom and connected to said motor and an agitating element operatively connected to said shaft, said agitating element having its lower part hollowed out for said motor and said motor discharging its waste air into said hollowed-out portion.

2. In a washing machine, a container for liquid and articles to be washed, impeller means oscillatable about a vertical axis for creating violently flowing currents of movement of the tub contents away from and back to the source of agitation while at the same time maintaining the articles to be washed freely suspended in the cleansing liquid as they are circulated therewith, and means for simultaneously aerating the contents of said container.

3. In a washing machine, a container for liquid and articles to be washed, impeller means oscillatable about a vertical axis for creating violently flowing currents of movement of the tub contents away from and back to the source of agitation while at the same time maintaining the

articles to be washed freely suspended in the cleansing liquid as they are circulated therewith, and means for forcing a gas through the contents of said container.

4. In a washing machine, a container for liquid and articles to be washed, an agitator oscillatable about a vertical axis and extending upwardly from the bottom of said container for creating violently flowing currents of movement of the tub contents away from and back to the source of agitation while at the same time maintaining the articles to be washed freely suspended in the cleansing liquid as they are circulated therewith, and gaseous means for effecting the ebullition of the liquid contents of said container.

5. In a laundry machine, a container adapted to hold liquid and articles to be washed, a centrally disposed, vaned clothes washing element inside said container and spaced inwardly a substantial distance from the side walls of the container so as to define a space for the circulation of the liquid and the articles being washed, means comprising a pneumatic expansible-chamber type motor for driving said clothes washing element in a to-and-fro manner, the operating fluid of said motor exhausting into the lower part of said container and assisting in the washing operation, and means for supplying a fluid under pressure to said motor.

6. In a laundry machine, a container adapted to hold liquid and articles to be washed, a centrally disposed, vaned clothes washing element therein spaced inwardly a substantial distance from the side walls of the container so as to define a space for the circulation of the liquid and the articles being washed, means comprising a pneumatic expansible-chamber type motor for driving said clothes washing element in a to-and-fro manner, the operating fluid of said motor exhausting into the lower part of said container and assisting in the washing operation, and means carried by said machine for compressing and supplying the operating fluid of said motor.

7. In a laundry machine, a container adapted to hold liquid and articles to be washed, a centrally disposed, vaned clothes washing element spaced inwardly a substantial distance from the side walls of the container so as to define a space for the circulation of the liquid and the articles being washed and a pneumatic expansible-chamber type motor for driving said element in a to-and-fro manner both located inside said container and operatively connected together, the operating fluid of said motor exhausting into the lower part of said container, means for supplying a fluid under pressure to said motor, and a valve-controlled connection between said means and said pneumatic motor.

8. In a washing machine, a liquid containing casing, an air pressure-driven expansible-chamber type motor located inside said casing, a centrally disposed, vaned liquid agitating element operatively connected to said driving mechanism and spaced inwardly a substantial distance from the side walls of said casing so as to define a space for the circulation of the liquid and the articles being washed, said air pressure-driven motor exhausting air into the lower part of said casing and assisting said element in agitating the liquid therein, means carried by said machine underneath said casing to create the air pressure to operate said mechanism and element, and stationary conducting means for air under pressure traversing the casing bottom and connecting said

pressure creating means to said pressure-driven mechanism.

9. In a washing machine, a liquid holding casing, a fluid pressure motor inside said casing and fixedly secured to its bottom, said motor having a vertical rock-shaft, an agitating dasher secured to and carried by said rock-shaft, said dasher having a hollow bell-shaped base spaced above and surrounding said motor, the rim of said base closely approaching the tub to prevent the articles being washed from working thereunder, and a fluid-pressure supply pipe traversing the casing bottom and connected to said motor.

10. In a washing machine, a tub, an agitator therein comprising a dasher having a circular hollow base and blades extending above the same, in combination with a fluid pressure motor located inside said base in spaced relation thereto and having a shaft operatively connected to said agitator, and means for securing said motor to the bottom of the tub with said blades projecting above and outside the same, the base of said dasher closely surrounding said motor to prevent cloth articles in the tub from wrapping about the shaft of said motor during the operation of the machine.

11. A laundry machine having a compartment for clothes and washing fluid, an expansible-chamber type pneumatic motor with a to-and-fro moving driven element inside said compartment and having an outlet port for waste air discharging into said compartment, a pneumatic pump outside said compartment and operatively connected to said motor, an oscillatably driven vaned agitator inside said compartment and operatively connected to the driven element of said pneumatic motor, said motor exhausting into the lower part of said casing and assisting in the washing operation, and an electric motor outside said compartment and operatively connected to said pneumatic pump.

12. The method of washing clothes and other fabric articles in a liquid container which comprises immersing the articles to be cleaned in a detergent liquid in the container, and aerating the container contents while at the same time creating violently flowing currents in the container moving away from and back to a source of agitation and a source of aeration continuously and rubbing and scrubbing the clothes as they are circulated whereby the fabric articles are at all times freely suspended in the detergent liquid and washed while so suspended.

13. The method of washing clothes and other fabric articles in a liquid container which comprises immersing the articles to be cleaned in a detergent liquid in the container, and bubbling a gas in the container contents while at the same time creating violently flowing currents in the container moving away from and back to a source of agitation and a source of aeration continuously and rubbing and scrubbing the clothes as they are circulated whereby the fabric articles are at all times freely suspended in the detergent liquid and washed while so suspended.

14. The method of washing clothes and other fabric articles in a liquid container which comprises immersing the articles to be cleaned in a detergent liquid in the container, and aerating the container contents while at the same time creating violently flowing currents in the container moving away from and back to a source of agitation and a source of aeration continuously and rubbing and scrubbing the clothes as they are circulated, certain of such currents being in a

direction opposite to the movement of the water through the container contents whereby the fabric articles are at all times freely suspended in the detergent liquid and washed while so suspended.

15. In a domestic washing machine of the class described, including a tub for containing water and clothes to be washed, an agitator within the tub rotatable on a vertical axis and having a downwardly flared portion adjacent the bottom of the tub for agitating the water and clothes, a pumping mechanism mounted on the machine, means connecting the pump with the interior of the agitator for introducing gas thereto, and means providing for the escape of the gas from the agitator into the body of water.

16. In a washing machine, a casing for liquid and articles to be cleansed, an agitator mounted for oscillation about a vertical axis and having a base, the lower margin of which approaches the tub bottom, and means discharging air beneath the base of said agitator.

17. In a washing machine comprising driving power means, the combination of a tub for containing a cleansing liquid and materials to be washed, a liquid agitator dolly, mechanism mounted in said tub adjacent the bottom thereof driven by said power means for oscillating said agitator dolly, said agitator dolly having means whereby, when the same is oscillated, air is simultaneously emitted therefrom into said water while the water is forced laterally first in one and then in an opposite direction toward the interior of the tub, so that the materials being cleaned will be circulated by the movement of the water and the aerated water forced towards, through and around the materials to cleanse the same, and means to supply said air to said agitator dolly.

18. In a washing machine, a tub having bottom and side walls, a bladed agitator, instrumentalities for movably mounting the agitator in the tub and for actuating the same in a horizontal plane in immersed relationship to the water in the tub to impel the water outwardly towards the side of the latter, a forced air supply having a discharge passage to permit emission of air in immediate adjacency to the agitator to commingle with the water agitated thereby.

19. In a clothes washing machine, a tub for water and clothes to be washed, a dolly adapted to be submerged in the water in the tub, means for actuating the dolly to correspondingly agitate the water and clothes, and means operatively associated with said means and said dolly for discharging air near the bottom of the dolly into said agitated water and clothes.

20. In a washing machine, a tub, a winged dolly adapted to be submerged in the water in the tub, means for actuating the dolly in a horizontal direction to correspondingly agitate the water and move its contents, and means for discharging air outwardly from the dolly into said water and towards said contents.

21. In a clothes washing machine, a tub for water and clothes to be washed, a winged dolly adapted to be submerged in the water in the tub, means for actuating the dolly in a horizontal plane to correspondingly agitate the water and move the clothes immersed in the water, and means for forcibly discharging air into the lower portion of said tub adjacent to said dolly so that the air tends to urge the clothes away from the dolly.

22. In a clothes washing machine, a tub for water and clothes to be washed, a dolly in the lower portion of the tub and an air conduit

adapted to discharge at a point in adjacency to the dolly, means for actuating the dolly to correspondingly agitate the water and clothes, and means for forcing air through the air conduit
5 and within said agitated water and clothes.

23. In a washing machine, a tub, an oscillating winged dolly formed and arranged to be submerged in water in the tub, and an air supply means arranged to discharge air into the water
10 from a point located within a zone defined by the bottom of the tub and a horizontal plane through the upper edge of the dolly.

24. In a washing machine, a tub, a horizontally oscillating winged dolly formed and arranged to
15 be submerged in water in the tub, means for

maintaining the dolly in position near the bottom of the tub, and an air supply means arranged to discharge air into the water from a point in close proximity to the dolly and at a substantial distance below the top thereof.

25. In a clothes washing machine, a tub for washing fluid and clothes, a vaned agitator mounted in said tub for oscillation about a vertical axis, the bottom of said agitator being adjacent to the bottom of the tub, and means for
10 discharging air into the washing fluid from a point adjacent to the bottom of the agitator and radially outwardly of the outermost portion thereof.

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