

April 10, 1934.

L. PIERCE

1,954,261

LAUNDRY MECHANISM AND METHOD

Filed Oct. 2, 1928

4 Sheets-Sheet 1

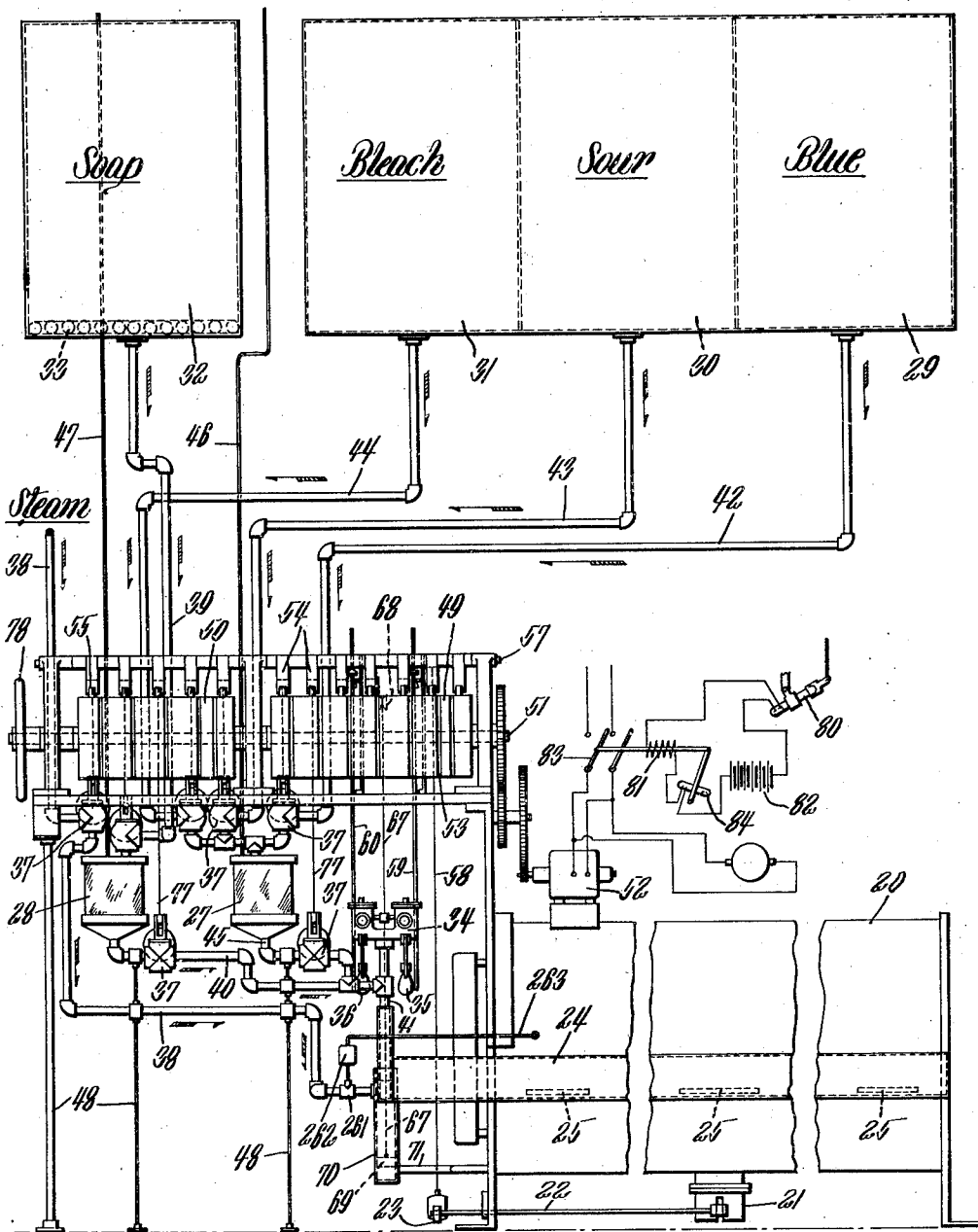


Fig. 1.

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4 Sheets-Sheet 2

Fig. 2.

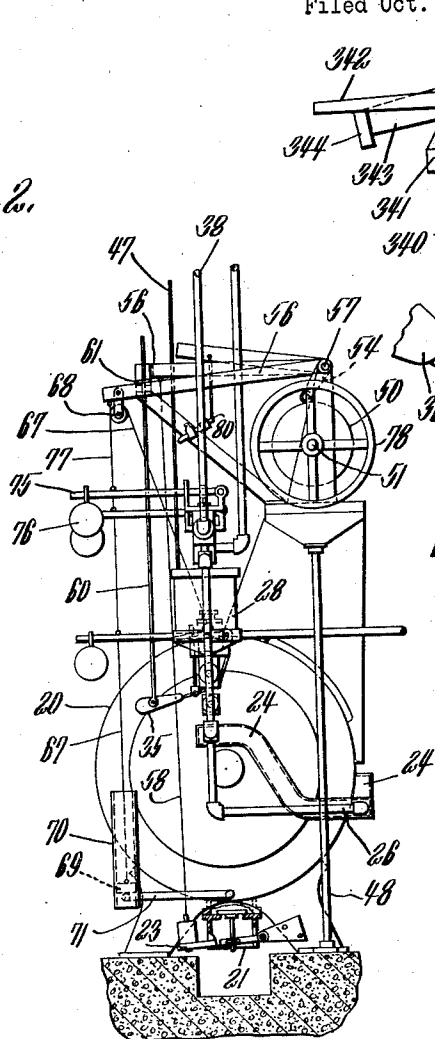


Fig. 3.

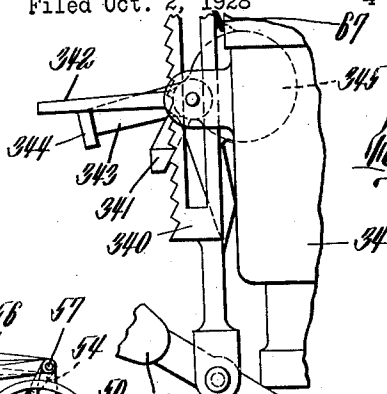


Fig. 4.

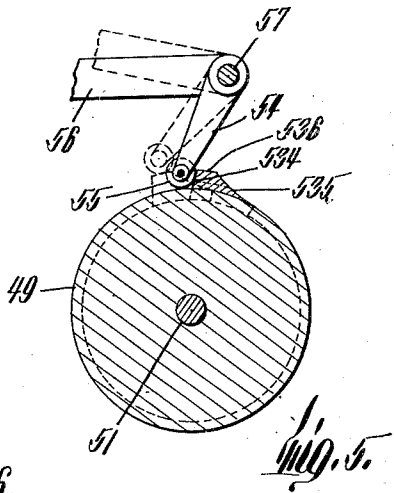
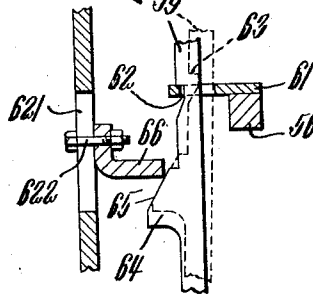
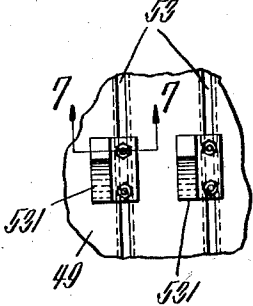


Fig. 5.

Fig. 6.



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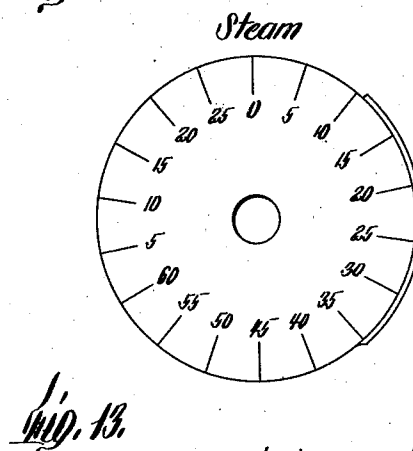
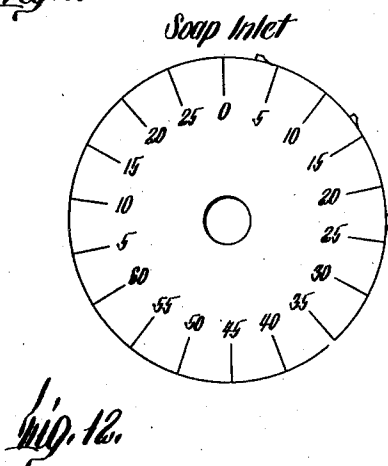
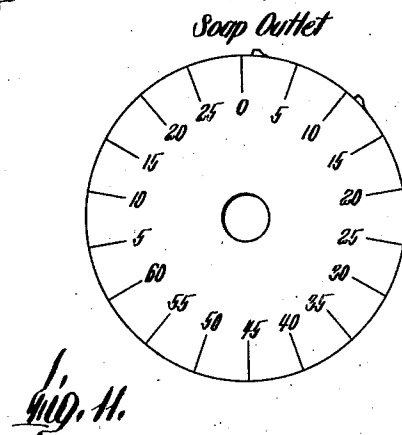
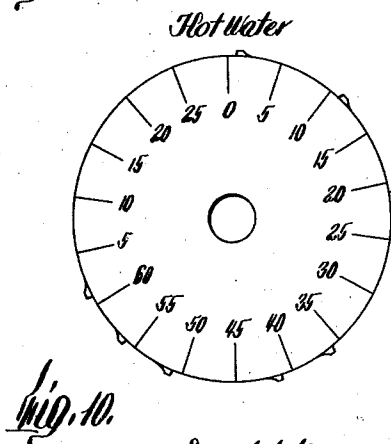
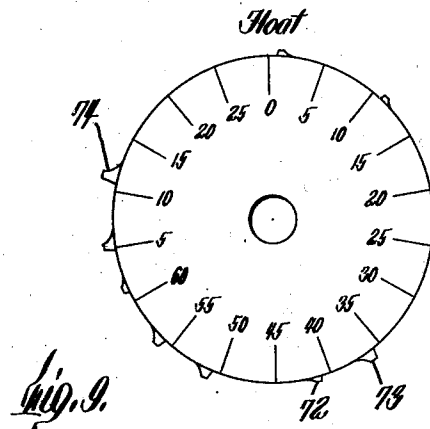
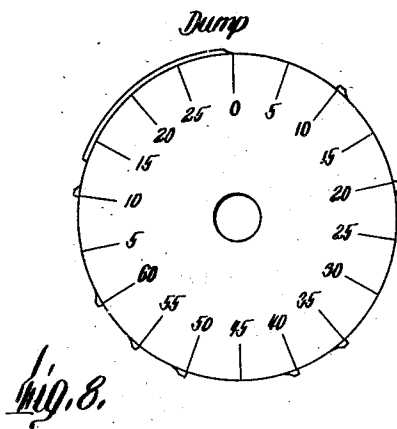
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4 Sheets-Sheet 3



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LAUNDRY MECHANISM AND METHOD

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4 Sheets-Sheet 4

Bleach-Sour-Blue-Outlet

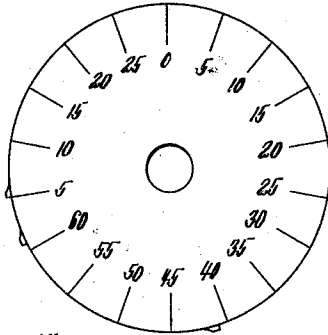


Fig. 14.

Bleach Inlet

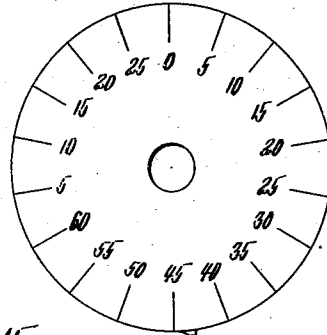


Fig. 15.

Sour Inlet

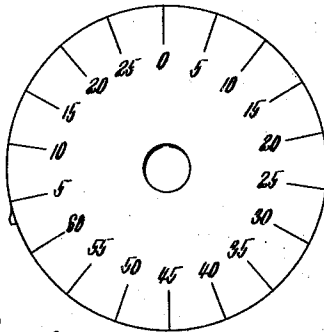


Fig. 16.

Blue Inlet

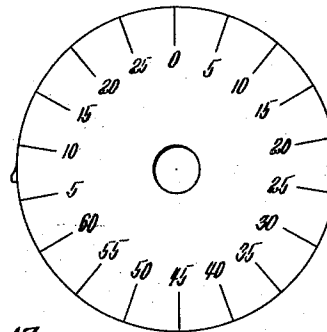


Fig. 17.

Cold Water

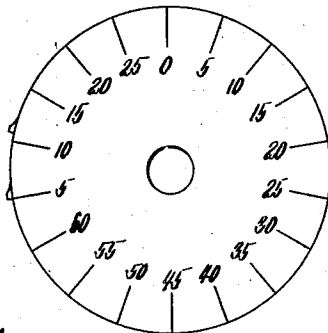


Fig. 18.

Stop Cam

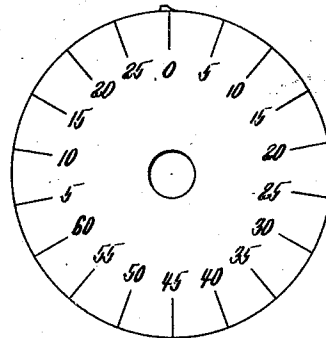


Fig. 19.

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UNITED STATES PATENT OFFICE

1,954,261

LAUNDRY MECHANISM AND METHOD

Lucien Pierce, Malden, Mass., assignor, by direct and mesne assignments, of one-half to George W. Hooper, Salem, Mass., and one-half to Family Laundry Company Malden, Malden, Mass., a corporation of Massachusetts

Application October 2, 1928, Serial No. 309,701

4 Claims. (Cl. 68—18)

This invention relates to mechanism for automatically regulating the various steps required for the washing of fabrics, such as clothing, bedding and the like. While the invention is applicable to washing machines of domestic or commercial type, it is disclosed hereinafter as applied to a commercial type of washing machine such as is generally used in power laundries. In the washing of a batch of fabrics in a power laundry, many separate steps are required for uniform and satisfactory results. These steps require frequent changes of water and the introduction from time to time of other laundering agents such as soap, bleach, sour, blue, and the like. According to the customary practice, these substances are severally inserted into a washing machine in separate steps of the washing cycle, the machine being operated to tumble the fabrics within the washing cylinder for given periods of time, at the end of each of which an alarm may ring to notify the attendant that the clothes are ready for the next step. If the attendant is busy with another machine, this means that the process in the first machine goes on after the alarm has sounded, using unnecessary power and consuming unnecessary time. By my invention, I provide means for automatically operating the washing machine through all the various steps of washing a batch of fabrics, and for stopping the entire machine at the end of a washing cycle, this means being adjustable to vary the periods of operation for the different steps to suit the particular circumstances, such as the condition of the clothes to be washed. By my invention, I secure a more thorough and uniform washing of fabrics and at the same time effect this result with a saving of time through the proper regulation of time for each step, of temperatures of the washing, and of the amounts of materials used. These desirable results are brought about by novel mechanism which controls the introduction and removal of the washing substances and insures a thorough admixture of the various laundering agents with the charges of wash water before their introduction into the machine, also by automatic regulation of the successive periods of time during which these washing processes are carried on.

For a more complete understanding of the invention, reference is had to the description thereof which follows and to the drawings, of which,—

Figure 1 is a rear elevation of a washing machine together with apparatus for automatically

controlling the series of steps required for the washing of a batch of clothes.

Figure 2 is an end elevation of a portion of the mechanism shown in Figure 1.

Figure 3 is a fragmentary side elevation of mechanism for operating a water valve.

Figure 4 is a fragmentary portion of certain mechanism included in the machine.

Figure 5 is a transverse section of the cam drum.

Figure 6 is a fragmentary elevation of the surface of the cam drum, showing a pair of adjustable cam lugs thereon.

Figure 7 is a section on the line 7—7 of Figure 6.

Figures 8—19 inclusive are diagrammatic views showing an illustrative arrangement of lugs for controlling each individual element which is employed in the washing process.

Referring to the drawings in detail, 20 represents a commercial washing machine of the horizontal cylinder type such as is commonly used in power laundries. This machine is conventionally indicated on the drawings since the structure of such machines is well known. The inner perforated cylinder which is within the casing and which contains the fabrics to be washed may be rotated by any desired power means (not shown). A dump valve 21 is provided for the purpose of emptying the casing of liquids therein when desired. This valve is preferably of relatively large cross section to permit the wash waters to run out quickly when the valve is opened, and may be operated by a rock shaft 22 to which is attached a crank arm 23, the latter being automatically controlled as will be hereinafter described. For the introduction of wash waters and other washing fluids into the machine, I may provide a suitable conduit 24 extending along one side of the casing 20 and connected thereto by a series of slots 25 or other convenient apertures spaced along the casing 20 and preferably slightly above the highest water level customarily employed within the casing. This location of the conduit insures that all the wash water which is admitted through the valve controlling the water supply, enters the washing compartment and is used therein. This construction avoids the waste, incurred where water supply pipes enter the casing below the operating water-line, of idle water which stands in the pipes during the washing operation and drains unused through the dump valve with the used water in the casing. Where large supply pipes are employed and there are frequent changes of water in a machine through-

out the working day, this saving of water is considerable. In order to control the temperature of the wash water as desired, I may run a steam pipe 26 to the conduit 24 or direct to the casing 20. In the steam line 26 I may insert a suitable valve 261 controlled by a thermostat 262 in a manner well known in the art. The thermostat may be connected as by a suitable tube 263 to a heat-responsive element within the casing 20.

10 The various washing materials which are used in washing a batch of fabrics are preferably introduced into the stream of water which is entering the casing 20. This insures a thorough mixing of these ingredients with the water before they enter the casing. The spaced openings 25 insure the immediate and substantially uniform distribution of these substances through the wash at the very beginning of the washing period. This is a great practical improvement over the practice of introducing a quantity of soap, blue or other ingredient into the machine at one point and allowing this material to diffuse itself through the solution by the motion of the cylinder within the machine. Where such methods are used, it often takes a considerable portion of the washing period for such ingredients to become evenly distributed throughout the wash so that their effect on the fabrics is varied, some of the fabrics getting too much and others too little. In order to regulate the quantity of each ingredient for a washing operation, I may introduce each ingredient through a measuring receptacle which for convenience I will term a doser. As shown, I provide two such dosers 27, 28, the former being for the blue, sour, bleach, and other cold ingredients. The doser 28 is provided to measure the soap which is preferably supplied hot in order to maintain it in liquid form for easy handling. Suitably positioned at a level above the machine, I supply a series of receptacles or storage tanks 29, 30, 31 and 32, these tanks as shown being respectively for blue, sour, bleach, and soap. It is to be understood that the number of tanks shown herein is merely by way of illustration and that I do not limit myself to this or any other definite number, but may use as many tanks as the ingredients desired for a complete washing operation. Since the doser 27 is of fixed capacity, I preferably regulate the actual quantities of blue, sour, and the like, to enter the machine for each batch of washing by suitably diluting the solutions of these ingredients so that the doser when filled will contain a solution having the correct amount of ingredient therein for one batch. Suitable heating means 33, such as steam pipes, or the like, may be provided in the tank 32 to maintain the soap in suitably liquid condition. The doser 28 and the piping associated therewith may also be lagged or supplied with a heating jacket as desired in order to maintain the soap hot as it descends from the tank 32 to the machine 20.

The admission of water, steam, soap, and other ingredients into the machine 20 may be regulated by a number of suitable valves. As indicated in Figure 1, the hot and cold water is supplied through an automatic valve 34 which is preferably of a type well known in the art, by which the flow of the hot and cold water may be independently regulated by the manipulation of separate handles 35, 36. The flow through each of these valves may be regulated by the height to which its operating handle is raised. A rack 340 or similar device is attached to each operating handle and is caught by a pawl 341 when raised so that its valve is held open until

the pawl is disengaged. Both pawls 341 for the hot and cold water valves may be mounted on bell-cranks having outwardly extending arms 342. In order to trip both pawls at once, a lever arm 343 may be arranged between the arms 342 and may be provided with a cross-piece 344 adapted to engage the lower faces of both arms. Thereupon the handles 35, 36 descend under their own weight and close both the hot and cold water valves. For the control of the other ingredients, I may supply a number of valves 37 which may be of any desired type actuatable preferably by the reciprocation of a stem projecting from the valve casing. Valves of this type are well known in the art and need not be described in detail. The steam may be supplied to a suitable pipe 38 which passes through one of the valves 37 and the thermostatically controlled valve 261 and enters the conduit 24 in such a way as to project a jet of steam along this conduit toward the openings 25. The soap tank 32 may be connected with the doser 28 as by a pipe 39 through a valve 37, the doser in turn being connected to another valve 37 and a pipe 40 to a pipe 41 which leads from the water valve 34 to the conduit 24. The connection of the pipe 40 with the pipe 41 is preferably made in such a way that the stream of water flowing through the pipe 41 acts as an aspirator and assists in the flow of the soap through the pipe 40. The supply tanks for blue, sour, and bleach, may be connected respectively by pipes 42, 43 and 44 to the doser 27, each of these pipes having a valve 37 therein. The doser 27 in turn is connected as by a pipe 45 through a valve 37 to the pipe 40 which as previously mentioned enters the pipe 41 and the conduit 24. In order to permit the escape of air from the dosers 27 and 28 and to facilitate the rapid and complete filling of these dosers, each may be supplied with a suitable vent, preferably of small cross section. These vents 46 and 47 may be connected respectively with the tops of the dosers 27, 28 and rise above the tops of the storage tanks so that overflows through these vents is prevented. The cubic capacity of these vents is negligible so that a change of level in a tank does not appreciably affect the quantity of ingredient measured from that tank by the doser. This system of valves and piping may be supported as by suitable standards 48 or any other desired means.

The action of the various valves 37 and the valves 34 and 21 may be controlled by any suitable mechanism. I may, for example, provide a number of cams mounted on one or more cylinders. As shown, a pair of cylinders 49, 50 are provided mounted on a common shaft 51 which is preferably rotated by a suitable constant speed motor 52. This motor may be suitably geared down or otherwise connected with the shaft 51 so as to turn the shaft relatively slowly. I do not limit myself to any particular speed but for the purpose of illustration will describe a control mechanism making one revolution in somewhat more than the maximum period of time which would ordinarily be required for a complete washing operation. As illustrated on the drawings, the shaft 51 may make a revolution every ninety minutes, or an hour and a half. This period is more than ample for any ordinary wash if the various steps of the operation are carried out successively without waste of time in between. If desired, however, the period of revolution of the shaft and drums may be longer or shorter. The drums 49, 50 may be provided

with a series of circumferential grooves 53 in which are carried one or more cam members 531 having portions projecting radially outward beyond the cylindrical surface of the drum. These cam members are preferably secured in the grooves 53 in such a way as to be adjustably movable about the periphery of the drum so that the particular operation which each cam controls may be performed at any desired time in the cycle of operations. To this end grooves 53 may be undercut, as shown for example in Figure 6, each cam member being provided with a suitable block 532 with radially extending bolts 533 by which the cam member may be adjustably secured to the drum. As shown in Figures 2 and 4, each cam member may cooperate with a bell crank lever arm 54, at the end of which is preferably mounted a suitable roller 55 adapted to engage the cam members and to be moved thereby so as to rock the arm 54 and thereby to raise a lever arm 56 which is rigidly connected therewith, the arms 54 and 56 being rockably mounted on a suitable shaft such as 57. The forward face 534 of each cam member 531 is preferably steep so that in spite of the slow motion of the drums, a roller 55, upon meeting a cam member, climbs quickly up its face. As shown in Figure 5, the rear face 535 of each cam member 531 may be curved with a radius substantially equal to the arm 54 so that when the roller 55 reaches the end of the top face 536, it rolls quickly down the rear face 535, thus causing a quick operation of the valve or other instrumentality controlled by the cam member. As shown in Figure 1, one of the bell cranks 54, 56 is connected as by a wire or suitable tension member 58 to the lever 23 which controls the dump valve. Another bell crank is connected to the cold water valve handle 35 as by a rod or other connecting member 59. Another bell crank is connected to the hot water handle 36 as by a rod or other connecting member 60. While a washing cycle may be carried through with either hot or cold water alone for each of the successive steps, it may be desired in some cases to mix the hot and cold for some of the steps in order to obtain water of desired intermediate temperature. To this end the hot and cold water valves should be opened to admit desired proportions. This may be accomplished by a releasing mechanism as illustrated in Figure 4. As shown the arm 56 has attached thereto an end member 61 provided with a perforation 62 through which the upper end portion of the rod 59 extends. A similar device may be provided for the rod 60, as shown in Figure 1. The rod 59 is notched so as to provide a shoulder 63 which rests on the upper surface of the member 61. Below the member 61 the rod 59 may be provided with a projecting portion 64 having a sloping cam face 65 which bears against a fixed lug 66 supported by the frame of the mechanism. The sloping face 65 rides against the lug 66 when the rod 59 rises to a sufficient height, and the rod is thus pushed laterally so that the shoulder 63 slips off the member 61 and the rod 59 is released from the arm 56. This limits the extent of opening of the valve which is held open by a ratchet and pawl mechanism adapted to be tripped by float-actuated mechanism as hereinafter described. As the location of the lug 66 determines the point at which the valve rod 59 or 60 is released from its arm 56, the amount of opening of the valve may be readily adjusted by shifting the lug up or down on the slot 621

over which it is secured as by a bolt 622 and nut. In order to shut the valve 34 and thus to stop simultaneously the flow of hot and cold water into the machine 20 the tripping lever may be provided with a counterweight 345 which is heavy enough to swing the lever 343 up to disengage the pawls 341. A suitable cord or chain 67 may be secured at one end to the weight 345, this cord or chain being passed over a pulley 68 and secured at its other end to a float 69 in a vertical cylinder 70 which is connected to the container 20 as by a pipe 71 entering the container near its bottom so that the water level in the cylinder 70 is the same as that in the container 20. The free weight of the float 69 is sufficient to hold up the counterweight 345 and thus to maintain the pawls 341 in engagement with their racks 340. When the water in the container 20 and the cylinder 70 rises sufficiently to buoy up the float 69, the tension on the chain 67 is relaxed and the weight 345 is permitted to operate the trip lever 343, thus causing both valves to close. In order to provide for various quantities of water for different steps of a washing cycle, the pulley 68 over which the chain 67 passes may be secured to an arm 56 so as to be raised to different heights by suitable cams as and when desired. Since the water level will have to reach the float before the water valves are closed, the container 20 may thus be filled to any desired level by the use of cams of proportional heights and of sufficient lengths to hold the pulley in its elevated position long enough to allow the water to reach the desired levels. For example in Figure 9 cam members of three different heights are illustrated, but it is understood that cams of other heights may be introduced if desired to obtain other levels of water in the tank 20. As shown, certain of the cam members 72 will elevate the arm 56 a short distance so that a relatively small amount of water will be admitted into the machine before the valve 34 is closed. Cam members 73 are somewhat higher and permit a higher level in the tank before the valve 34 closes. A still greater amount of water is admitted by a higher cam member 74 as is desirable for the final rinse. These cams are preferably adjusted on the drum to operate just before the water valves are opened. The lowest cams 72 may be omitted by regulating the length of the chain so that the float 69 will be suspended at water-level of the minimum charge of water which is to be put into the machine, when the corresponding cam follower 55 rests on the surface of the drum itself. In such case, the heights of the cams 73 and 74 will thus be determined by the differences between the higher levels desired and the minimum level.

In order to control the supply of the various washing ingredients to the machine, movable cam control arms 56 may be provided for each of the valves 37. These valves as previously stated are preferably of a type actuable by a reciprocating stem projecting from the valve casing. This stem as shown in Figure 2 may be connected to a horizontal lever arm 75 supplied with a weight 76 for the purpose of closing the valve 37 when the arm 75 is released. In order to open each valve 37, a tension element 77 may be employed to connect each valve arm 75 with its corresponding cam-actuated arm 56. Thus there is a separate cam-actuated arm 56 corresponding to each of the valves 37 between the supply tanks 29, 30, 31 and the doser 27. There is also a separate cam-actuated lever 56 for the valve 37 between

the doser 27 and the conduit 24. In like manner, the valves 37 between the soap tank 32 and the soap doser 28, between the doser 28 and the conduit 24, and between the steam supply and the conduit 24, are each independently operated by a separate set of cams. Figures 8 to 19 inclusive illustrate diagrammatically the arrangement of the several sets of cams for operating the various valves which are employed in carrying out the successive steps of a complete washing operation. The drums 49, 50 may be set at the zero mark as by a convenient hand wheel 78 at the beginning of a washing operation. When the batch of fabrics is in the washer 20, the motor 52 may be started and the washing operation will proceed automatically as controlled by the cams on the drums 49 and 50. An illustrative washing operation will be described, it being understood that I do not limit myself to this or any other sequence of steps but that the cam members may be arranged as desired to carry out any washing operation desired. Starting with the cam drums set at the zero mark, it will be seen from Figure 8 that the dump valve 21 is closed. The float is thereupon elevated by the raising of the pulley 68 so as to engage the pawls and ratchets of the valve 34 to be ready to hold the handles 35, 36 elevated. As hereinbefore stated, the length of the chain 67 may be such that the pawls and ratchets of the valve 34 are always engaged when the level of the water in the container is below that of the minimum charge. The hot water side of the valve 34 is immediately opened as indicated in Figure 10 and the valve 37 connecting the soap doser with the conduit 24 is likewise opened. This permits an inflow of hot water for the first step in the washing operation. After washing for about ten minutes with hot suds, the dump valve is opened for a sufficient time to allow the first wash water to drain out. The hot water may be supplied at the temperature desired for several of the steps of the washing process, or at any other convenient temperature, steam or cold water being used as required to regulate the temperature in the container. After the first water has been drained, the second supply of hot water is admitted to the machine, the float being raised in order to hold the valve 34 open until the water in the machine reaches the proper level. As indicated in Figure 12 during the first washing operation, the soap inlet valve between the soap tank 32 and the doser 28 is opened so as to permit the doser to be refilled before the second step of the washing operation begins. As the second supply of hot water is admitted, the doser 28 is opened as shown in Figure 11 to mingle with the hot water and enter through the openings 25 in the form of suds. In the example of a washing cycle illustrated, a higher temperature may be desired for the second and third waters. To this end the steam supply is turned on as the second wash water enters the machine, the steam supply being regulated during these steps as by a thermostat 262 to maintain the desired temperature in the machine.

After about ten minutes of washing, the dump valve is again opened and the second wash water is drained. The steam is kept on in order to keep the temperature elevated during this change. The hot water is again turned on with a fresh supply of soap as shown in Figures 10 and 11. During the succeeding washing operation, the soap doser 28 is again refilled from the tank 32. At the end of about fifteen minutes of washing, the third step is ended by opening the dump

valve and draining the suds from the machine. Hot water is again admitted for the fourth time to rinse the fabrics. After a short period of rinse, about five minutes, this water is drained and a fifth charge of hot water is admitted, accompanied by a charge of bleach from the doser 27. It will be noted from Figure 9 that the cam member 73 elevates the pulley 68 and float 69 to a level higher than for the other supplies of water thus far. In other words, a greater quantity of water is admitted for the rinsing step than is admitted for the various washing steps. The bleaching operation is carried on for about ten minutes whereupon the bleach water is drained from the machine. The sixth and seventh charges of water, as indicated in Figure 10, are clear for rinsing the bleach from the fabrics. As shown in Figure 9, these supplies of water may be up to the second level in the machine. The eighth supply of water is also hot and to it is added a supply of sour as shown in Figure 14. This sour has been admitted to the doser during the previous washing step as indicated in Figure 16. This washing step is carried on for about five minutes and the sour is then drained from the machine. The ninth step consists in the admission of cold water accompanied by blue to the second level in the machine, the actuation of the cold water valve being indicated in Figure 18 and the opening of the doser being indicated in Figure 14. As shown in Figure 17, the doser has during the previous washing step been filled with blue from the tank 29. The final washing step is a cold rinse with cold water admitted to a still higher or third level in the machine. This is a brief rinse, say three minutes, after which the dump valve is opened and the machine may be automatically stopped. The stopping mechanism may comprise an electric switch 80 mounted for operation by a cam-actuated lever 56. When the cycle of washing operations is completed, a cam member 531 may be mounted to actuate a switch closing lever 56. Closing of the switch 80, as shown in Figure 1, completes a circuit through a solenoid 81 and a suitable source of energy 82. The armature of the solenoid may be connected to a main switch 83 in such a way that energization of the solenoid opens the main switch, stopping the motor 52 which drives the cam drums, and the motor which drives the washing machine itself. If the machine is belt driven, the solenoid armature may be connected to a suitable belt-shifter in a manner well known in the art. In order to avoid waste of current from the battery or other energy source 82, the solenoid may be arranged to open a switch 84 in its own circuit simultaneously with the opening of the main switch 83. In starting the machine on its next cycle, the cam drums may first be turned as by a hand wheel 78 to the zero mark. Then the machine and automatic mechanism are started by hand, and the cycle proceeds automatically. The movable mounting of the cam members permits any desired variation of the steps recited as illustrative of a complete washing operation. Any of the periods can be shortened or lengthened at will.

Having thus described certain embodiments of this invention, it should be evident to those skilled in the art that various changes and modifications might be made therein without departing from its spirit or scope as defined by the appended claims.

I claim:

1. In combination with a container for wash-

ing-fluids and fabrics to be washed, means for supplying quantities of water to said container at predetermined times during a washing cycle, and mechanism for supplying measured amounts of other laundering agents with some of said quantities of water, said mechanism including a measuring receptacle, a plurality of storage tanks for said other laundering agents, pipes leading from said tanks to said receptacle and from said receptacle to said water supply means, valves in all said pipes, means for automatically operating said valves to fill said receptacle successively with said other laundering agents and to drain said agents into said water supply means at times definitely related to the times of introduction of said quantities of water into said container.

2. A method of supplying to a washing machine predetermined quantities of washing substances for washing purposes, which comprises preparing separate solutions of said substances of such strength that like volumes of the several solutions contain the desired amounts of the respective substances therein for the batch of articles to be washed, successively collecting in and discharging from said machine successive charges of water for the several steps of a washing cycle, and introducing into respective charges of water

for certain of said steps of the washing cycle like volumes of corresponding washing substances, each said substance being introduced into the respective charge of water prior to the entry of said water into the machine.

3. A method of supplying quantities of washing substances for washing purposes, which comprises preparing separate solutions of said substances of such strength that like volumes of said solutions contain therein the desired amounts of the respective substances for a single batch of washing, measuring a volume of one solution into a stream of water, collecting said water and solution into a pool of predetermined depth, and similarly forming other successive pools each containing said measured volume of a selected solution.

4. A method of supplying predetermined quantities of washing substances for washing purposes, which comprises preparing separate solutions of said substances of such strength that like volumes of solutions of the several substances contain the desired amount of the respective substances for a single batch of washing, and measuring into successive pools of water of suitable size for washing purposes like volumes of selected solutions.

LUCIEN PIERCE.

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