

Oct. 10, 1933.

E. S. RUSSELL

1,929,993

AUTOMATIC WASHER

Filed May 17, 1930

4 Sheets-Sheet 1

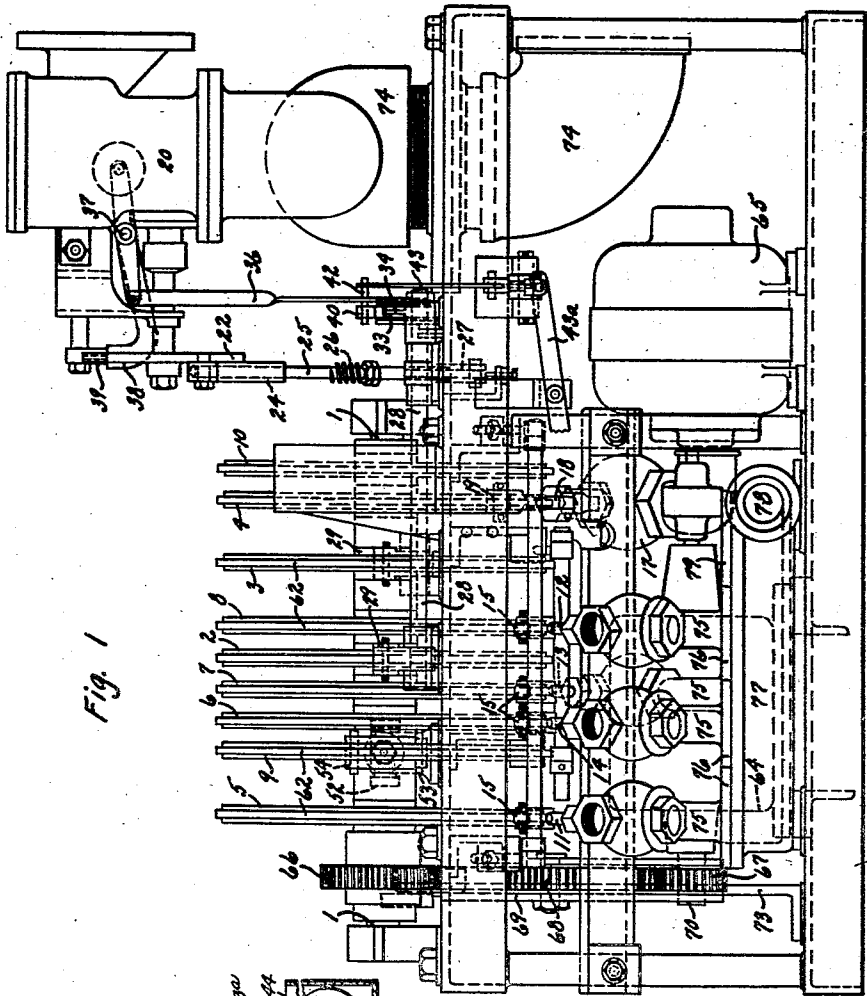
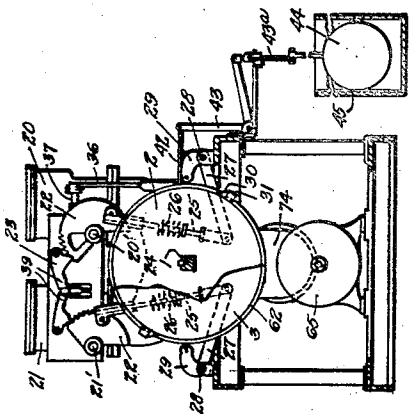


Fig. 1

Fig. 9.



INVENTOR
Ernest Stuart Russell
BY
Brockett, Hyde, Hixley & Meyer
ATTORNEYS

Oct. 10, 1933.

E. S. RUSSELL

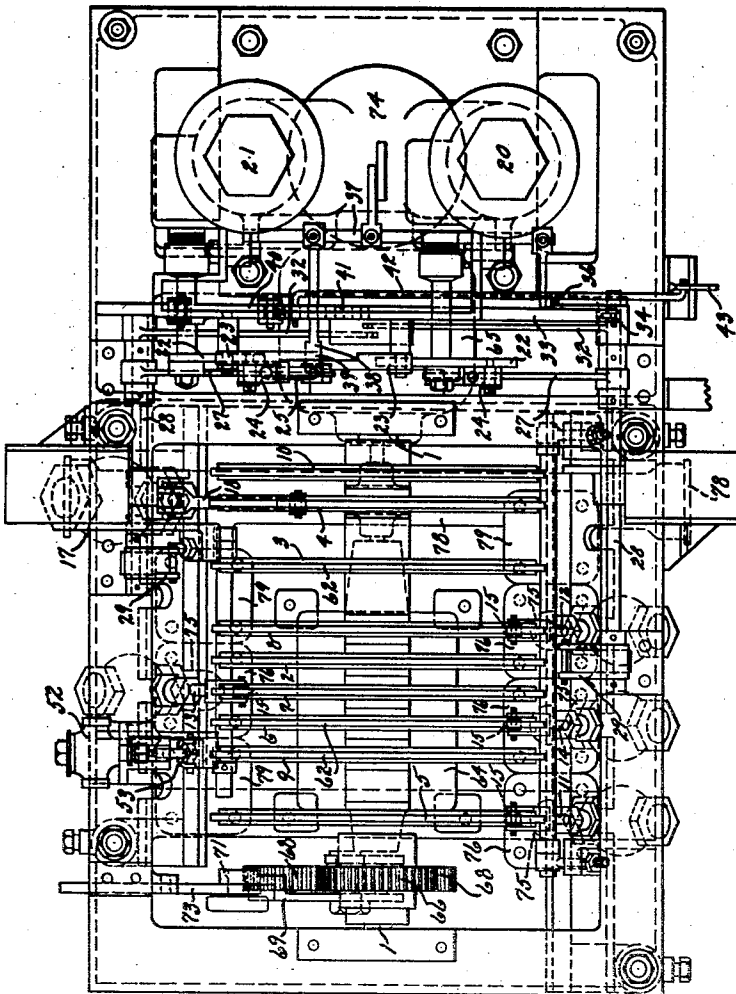
1,929,993

AUTOMATIC WASHER

Filed May 17, 1930

4 Sheets-Sheet 2

Fig. 2



INVENTOR
Ernest Stuart Russell
BY
Brockett, Hyde, Higley & Meyer
ATTORNEYS

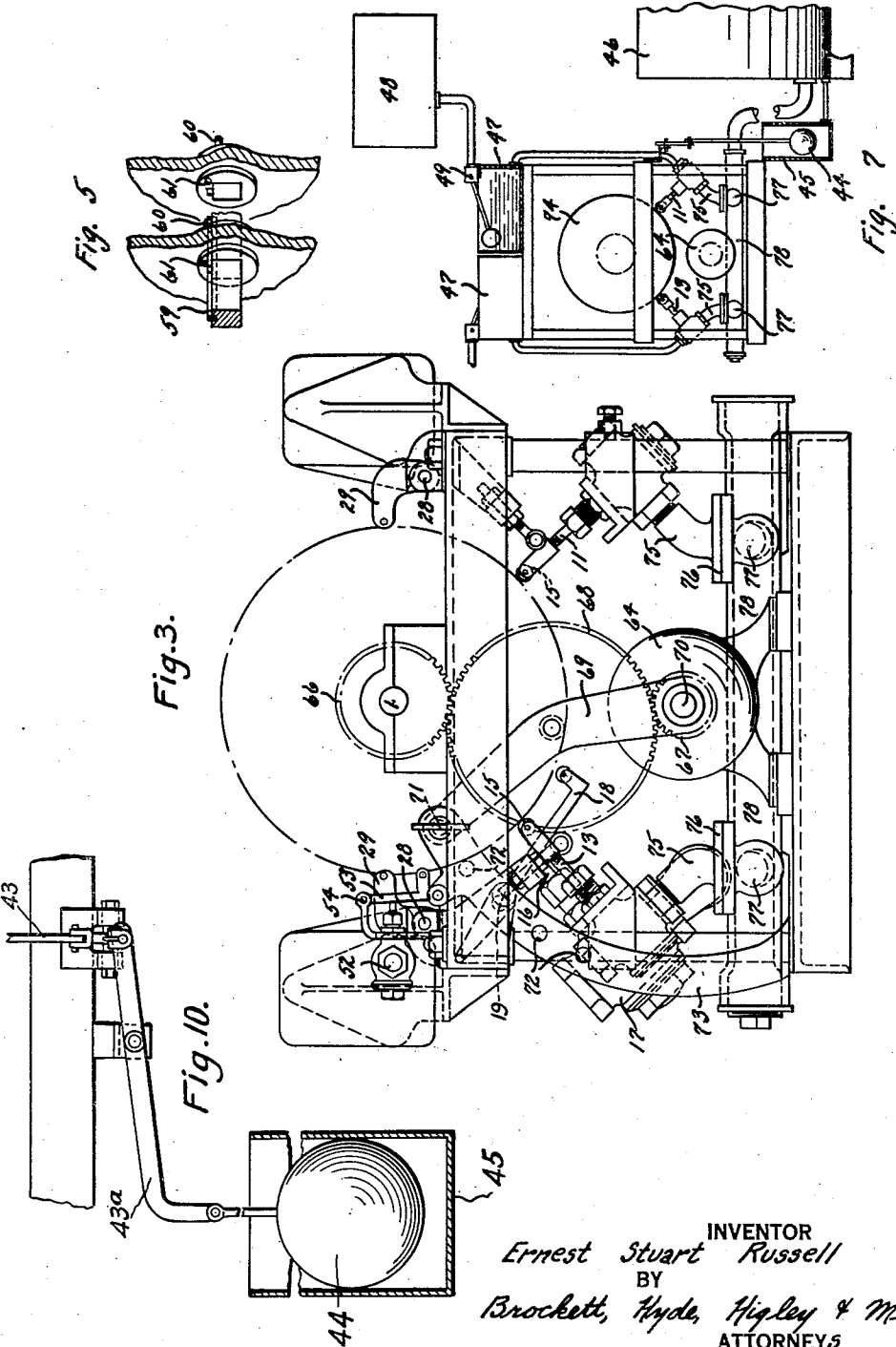
Oct. 10, 1933.

E. S. RUSSELL
AUTOMATIC WASHER

1,929,993

Filed May 17, 1930

4 Sheets-Sheet 3



INVENTOR
Ernest Stuart Russell
BY
Brockett, Hyde, Higley & Meyer
ATTORNEYS

Oct. 10, 1933.

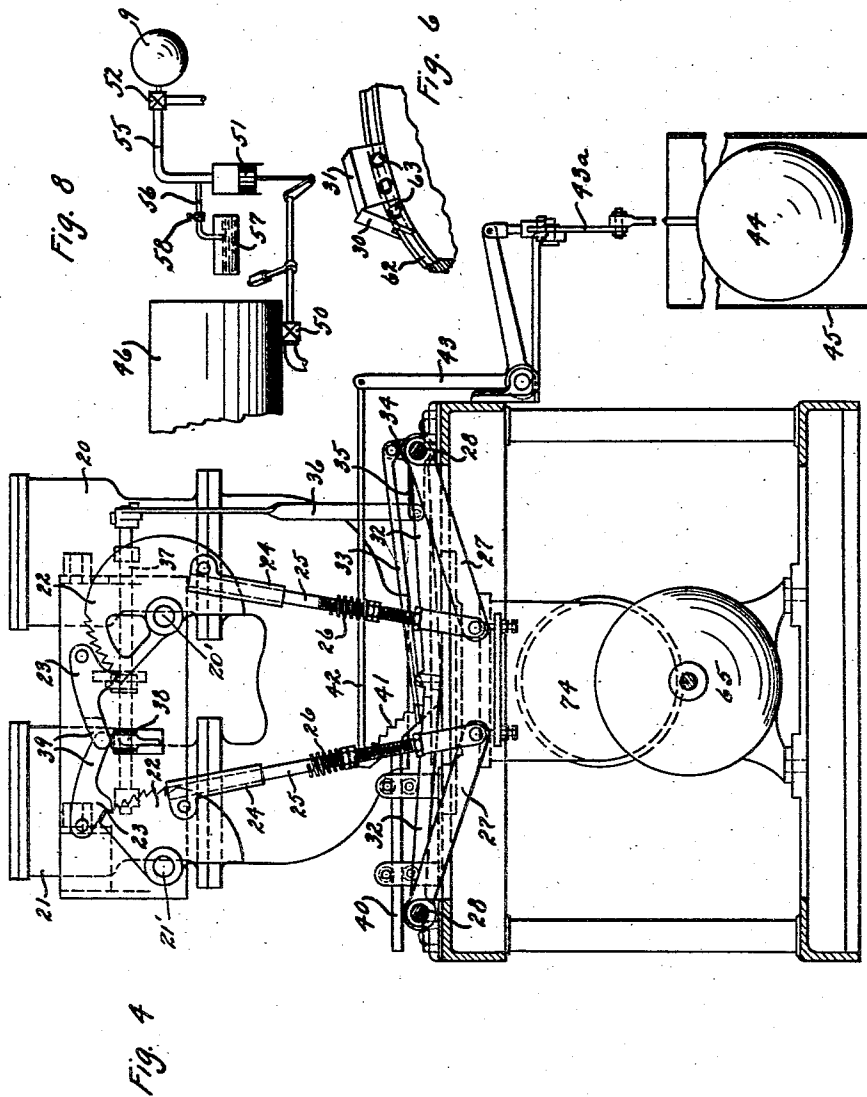
E. S. RUSSELL

1,929,993

AUTOMATIC WASHER

Filed May 17, 1930

4 Sheets-Sheet 4



Ernest Stuart Russell
INVENTOR
BY Brockett, Hyde, Higley & Meyer
ATTORNEYS

UNITED STATES PATENT OFFICE

1,929,993

AUTOMATIC WASHER

Ernest Stuart Russell, London, England, assignor
to The American Laundry Machinery Com-
pany, Cincinnati, Ohio, a corporation of
Ohio

Application May 17, 1930, Serial No. 453,254,
and in Great Britain November 5, 1929

9 Claims. (Cl. 68—18)

This invention relates to improvements in laundry machinery.

One feature of this invention relates to laundry machinery of the kind in which the supplies of washing material to the machine are automatically controlled.

In some cases the control valves of machinery of this kind have been operated from cams controlling mechanical or electrical relays which in turn controlled the operation of power mechanism for operating the valves.

According to one feature of the present invention, there is provided control mechanism, such as a cam or cams, for directly actuating the valves (i. e. without the intervention of a relay system).

In automatic washing machines, moreover, the quantity of washing fluid delivered is determined by opening the control valves for a predetermined period of time: such an arrangement, however, possesses the disadvantage that the quantity of fluid delivered during the interval of time varies with the pressure of the fluid and hence it is not possible to ensure the delivery of the correct quantity by this method.

According to a further feature of the present invention, the time at which the control valves of an automatic washing machine are closed is controlled by a float or the like actuated by the fluid delivered to the machine. It will be seen that in such an arrangement, the quantity of fluid delivered can accurately be predetermined, since the control valve is not closed after a predetermined period of time but only when the fluid has reached a predetermined level.

In carrying out this feature of the invention, the means for controlling the actuation of one or more valves comprises power operated cams for opening the valves, detent mechanism for retaining the valves in their open position, and float mechanism for releasing said detent mechanism, said cams being replaceable or comprising adjustable portions for controlling the level at which the float mechanism will release said detent mechanism.

Preferably also means are provided for varying the rate of actuation of the cams, whereby the time period of the washing operation can be varied.

According to a further feature of the invention, which is applicable in general to the controlling of valves for washing machines, the power actuated means for operating a valve comprises a piston, vane or the like, a valve for controlling the admission of fluid, such as steam or air, to said piston or vane, and a member having

a small aperture, preferably adjustable, forming a leak for the fluid.

With such an arrangement, it will be seen that when the valve is opened and fluid is thereby supplied to the piston or vane, the rate of movement of said piston or vane depends upon the rate at which fluid leaks through the orifice, and also that when the fluid supply valve is closed, the fluid leaks away and in the case of steam also condenses, thus permitting the piston or vane to return to its normal position.

The invention is illustrated in the accompanying drawings wherein Fig. 1 is a side elevation showing an automatic washer embodying a control means constructed in accordance with my invention; Fig. 2 is a plan view of the washer and control means shown in Fig. 1; Fig. 3 is an end elevation showing particularly the washer operation control means; Fig. 4 is a transverse section of Fig. 1 which shows particularly the water inlet and outlet valves and the control means therefor; Fig. 5 is a view showing the shaft on which the controlling cam disks are mounted; Fig. 6 is a detail perspective view showing the type of cams carried by the cam disks; Fig. 7 is a diagrammatic view showing the level responsive device for controlling the amount of treating material in each separate container which delivers to the washer; Fig. 8 is a diagrammatic view showing the control means for the dump valve of the washer; Fig. 9 is a transverse section of Fig. 1 showing the connections between the cam means and the hot and cold water inlet valves; and Fig. 10 is a view showing a part of the mechanism of the liquid level responsive valve release device in detail.

The valves for controlling the admission of soap, soda, blue and bleach are indicated at 11, 12, 13 and 14 respectively. The stem of each valve is arranged radially with respect to the axis of the cam shaft 1, and each stem is provided with a roller 15 in engagement with a cam secured to the corresponding cam disc.

The stem 16 of a steam control valve 17 is engaged by a lever 18 pivotally mounted at 19 and having a roller in engagement with the cam disc 4.

The stems 20' and 21' of the valves indicated at 20, 21, for controlling the supply of hot and cold water, are each fast with a ratchet wheel 22 normally engaged by a pawl 23 (Fig. 4). Pivotally mounted on each ratchet wheel is a sleeve 24 in which is slidably mounted a rod 25, provided with a buffer spring 26 and the ends of the rods 25 remote from the sleeves, are pivotally

mounted on arms 27 fast with rocker shafts 28. Also fast with the shafts 28 are actuating arms 29 (Figs. 2 and 3) having at their ends a roller 29', the rollers of the arms of the hot and the cold water control valves each being adapted to be engaged by cams on the cam discs 2, 3. The cams for the hot and cold water control valves are formed with two stepped portions 30, 31, see Fig. 6, the highest portion 30 being referred to hereafter as the "valve opening" portion.

Also fast with the rocker shafts 28 are additional arms 32 (Fig. 4) which extend towards one another and at their ends are turned upwardly and support the end of a release arm 33, pivotally mounted on one arm 34 of a bell crank lever loosely mounted on one rock shaft 28 whose other arm 35 is connected by a link 36 to a rock shaft 37 having a striker 38 adapted to engage extensions 39 on the pawls 23.

The release arm 33 preferably has a bifurcated end disposed around and adapted to be engaged by a sliding member 40 having a number of steps 41 increasing in distance from the end of the release arm, and the member 40 is connected by a link 42 to a bell crank lever 43 in turn connected through a two armed lever 43a to a float 44 in a chamber 45 in communication with the interior of the treating compartment 46 of the washing machine, the usual rotatable perforated drum being mounted in the casing.

In the operation of the parts so far described, when the rollers on the actuating arms 29 are engaged by the valve opening portion 30 of the cams, the said arms are rocked, and the motion is transmitted to the ratchet wheels through the compression springs 26. The rotation of the ratchet wheels opens the valves, and the ratchet wheels are retained in this position by the pawls 23 in engagement therewith. Continued rotation of the cams present the other stepped or lower portions 31 thereof to the rollers, which drop into engagement therewith; this motion allows the rods 25 partially to slide out of the sleeves 24, and the parts, including the releasing arm 33 and the arms 32 supporting this latter, are retained in this position by the said stepped portions of the cams.

As the sliding member 40 moves toward the right, Fig. 4, and when the float 44 rises to the predetermined level, one or the other of the stepped portions 41 of the member 40, depending on the degree of opening of the valves, connected to the float comes into contact with and moves the release arm 33 to the right in Fig. 4, so that the bell crank levers 34, 35 are rocked to cause the striker 38 to engage and raise the extensions 39 on the pawls 23; the pawls are thus moved out of engagement with the ratchet wheels 22 and the valves are allowed to close by their own weight or their weight plus the fluid pressure against which they are preferably opened.

The rotation of the cam shaft 1 has also caused the cams on the cam discs 5, 8, 7 and 6 thereon to engage with the rollers on the stems of the valves for controlling the supply of soap, soda, blue and bleach, and to open these valves and keep them open for a time dependent on the shape or length of the cam, various shapes of cam being provided for this purpose. In order to ensure a constant pressure of supply of soap, soda, blue and bleach, these materials are preferably supplied each from a separate container 47 supplied from a tank 48 capable of delivering the material at a rate greater than that at which it is delivered from the container, the flow

from the tank 48 to the container 47 being controlled by a float operated valve 49.

It will be seen that the extent of opening of the hot and cold water valves 20, 21, depends upon the height of the valve opening portion 30 of the cams, and that the time at which the float 44 causes the actuation of the release arm depends upon the position in which the arms 32 supporting the release arms 33 are supported by the stepped portions 31 of the cams, i. e. if the portions 31 of the cams are located farther from the axis of the cam shaft, the arms 32 will be held thereby at a greater height and the release member will be held in line with a higher stepped portion 41, and consequently a greater extent of sliding movement of the stepped member (and therefore a greater rise in level of the float) will be necessary before the release member is engaged by the sliding member. Cams 30 and 31 of various heights are provided for this purpose.

Thus it will be seen that the quantity of fluid supplied to the casing 46 can readily be altered by varying the shape of the operating cam.

The discharge of fluid from the casing 46 of the machine is controlled by a valve 50 (see Fig. 8), opened by a piston 51 coupled thereto by suitable link connections, the piston being operated by steam whose supply is controlled by a valve 52 arranged to normally remain and tend to move to its closed position. As a valve operating means, the stem of the valve 52 is engaged by an arm 53 pivotally mounted at 54 and provided with a roller in engagement with the cam disc 9 (Fig. 3).

A pipe 55, leading steam from the valve 52 to the piston 51, is provided with a branch 56 which extends into a water tank or the like 57, the branch pipe being provided with an adjustable valve 58 by which a greater or lesser amount of steam is allowed to escape from the pipe 55 and upper surface of the piston 51 (Fig. 8). However, this escapement is not sufficient to prevent actuation of the piston by pressure from the supply through the main line or pipe 55.

In operation, when the cam on the cam disc 9 opens the valve 52, steam is admitted to the piston and actuates this latter to open the valve 50 through its link connections therewith. During this operation, a certain quantity of steam leaks past the valve 58, the rate of movement of the piston to open the valve 50 depending upon the rate at which steam is allowed to leak by the valve.

When the cam allows the steam control valve to return to its normal closed position wherein steam is no longer supplied to the piston, the steam in the pipe 55 and above the upper surface of the piston which would normally hold the piston in actuated position and thus the valve 50 open leaks away through the valve and condenses in the tank 57, thus allowing the piston to be moved to its original unoperated position by closure of the drain valve 50 which is preferably of the type opened against resistance of fluid in the washer and its own weight.

If desired, air under pressure may be employed to actuate the valve 50, the rate at which air is allowed to escape by the valve 58 determining the rate of movement of the piston both to operated and unoperated position as hereinbefore described.

In order to enable the valve control to be varied, all cams are either adjustable or are replaceable by cams having differently arranged stepped portions.

In an arrangement in which the cam discs are replaceable, the cam shaft 1 is square along its central portion (see Fig. 5) and is provided with a locating key 59, and the cams are also provided with an aperture correspondingly shaped. Each disc is provided with a location pin 60, the pin on one disc being angularly displaced with respect to those in the other discs, and the pin on one disc is adapted to enter correspondingly positioned holes 61 formed in adjacent discs. With such a construction, the correct positioning of the cams is ensured.

In place of, or in addition to, this method of mounting the cam discs on the shaft 1, the cams themselves may be detachable, as shown in Fig. 6. In the arrangement shown in this figure, the cam discs are formed with a peripheral ridge 62 which receives forked cam pieces, bolts 63 being provided which draw the links of the fork into firm engagement with the ridge 62.

The cam shaft 1 is driven through a reduction gearing from an electric motor 65. In order to vary the time period of the washing operation, means are preferably provided for varying the speed of rotation of the cam shaft. In the construction shown in the drawings (see Fig. 5), the squared shaft 1 is adapted to receive any one of a number of gear wheels 66 of different diameters, and a gear wheel 67 driven by the reduction motor 65 is constantly in mesh with a pinion 68 carried by an arm 69 freely mounted on the spindle 70 of the reduction gearing. The arm 69 is provided with a pin 71 adapted to enter any one of a series of holes 72 formed in a quadrant 73. Thus, when it is desired to vary the time period, the arm 69 is released and rocked to move the pinion thereon out of mesh with the existing gear wheel 66 which is removed and replaced by one of the desired size. The arm 69 is then rocked to move the pinion into mesh with the substituted gear wheel and the arm locked in position by the pin 71.

Preferably, as is shown in the drawings, the hot and cold water valves are located in pipes which discharge into a common header 74 connected to the casing 46 of the machine, while the valves for the soap, soda, blue and bleach are each connected to elbows 75 having flanges 76 which seat on longitudinally flanged pipes 77, both of which communicate with a transverse header 78 of similar construction at each end. Thus, the connection from the header to the casing can be made at the most convenient end of the header, and the other end plugged, as in Fig. 3. When it is desired not to employ as many control valves as there are openings in the pipes 77, the unrequired openings can be sealed by cover plates 79 (Fig. 1).

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling the supply of washing fluids to said compartment, cam means for moving the valves to open position, locking means effective to maintain said hot and cold water inlet valves in open position, means movable in response to the level of liquid in said treating compartment, and motion transmission mechanism between said last named means and said locking means for releasing said locking means in response to the liquid level in said treat-

ing compartment to thereby permit said hot and cold water inlet valves to close.

2. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling the supply of washing fluids to said compartment, cam means for moving the valves to open position, locking means effective to maintain said hot and cold water inlet valves in open position, means movable in response to the level of liquid in said treating compartment, and a motion transmission mechanism between said last named means and said locking means for releasing said locking means in response to the liquid level in said treating compartment to thereby permit said hot and cold water inlet valves to close, said motion transmission mechanism being variable in response to the degree of opening of said hot and cold water inlet valves.

3. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling the supply of washing fluids to said treating compartment, cam means effective on said valves for moving the valves to open position, each of said cam means having more than one effective cam surface whereby they may be effective both as an opening means for said valves and as a holding means for maintaining said valves in open position, locking means effective to maintain said hot and cold water inlet valves in open position, means movable in response to the level of liquid in said treating compartment, and motion transmission mechanism between said last named means and said locking means for releasing said locking means in response to the liquid level in said treating compartment to thereby permit said hot and cold water inlet valves to close.

4. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling the supply of washing fluids to said treating compartment, cam means effective on said valves for moving the valves to open position, each of said cam means having more than one effective cam surface whereby they may be effective both as an opening means for said valves and as a holding means for maintaining said valves in open position, locking means effective to maintain said hot and cold water inlet valves in open position, means movable in response to the level of liquid in said treating compartment, and motion transmission mechanism between said last named means and said locking means for releasing said locking means in response to the liquid level in said treating compartment to thereby permit said hot and cold water inlet valves to close, said motion transmission mechanism being variable in response to the degree of opening of said hot and cold water inlet valves.

5. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling the supply of washing fluids to said compartment, separate cam means mounted on and driven in timed relation by a single shaft for moving said valves to open position, locking means effective to maintain said hot and cold water inlet valves in open position, means movable in response to the level of liquid in said treating compartment, and motion transmission mechanism between said last named means

and said locking means for releasing said locking means in response to the liquid level in said treating compartment to thereby permit said hot and cold water inlet valves to close.

- 5 6. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling the supply of washing fluids to said compartment, separate cam means mounted on and driven in timed relation by a single shaft for moving said valves to open position, each of said cam means having more than one effective cam surface whereby they may be effective both as an opening means for said valves and as a holding means for maintaining said valves in open position, locking means effective to maintain said hot and cold water inlet valves in open position, means movable in response to the level of liquid in said treating compartment, and motion transmission mechanism between said last named means and said locking means for releasing said locking means in response to the liquid level in said treating compartment to thereby permit said hot and cold water inlet valves to close.

- 25 7. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling the supply of washing fluids to said compartment, separate cam means mounted on and driven in timed relation by a single shaft for moving said valves to open position, motor means for driving said cams, means arranged for interchange of cam driving parts whereby the speed of movement of said cams may be varied without changing the motor speed, locking means effective to maintain said hot and

cold water inlet valves in open position, means movable in response to the level of liquid in said treating compartment, and motion transmission mechanism between said last named means and said locking means for releasing said locking means in response to the liquid level in said treating compartment to thereby permit said hot and cold water inlet valves to close.

8. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling flow of water through said inlets, cam means for opening said valves, locking means effective to maintain said valves in open position, means movable in response to the level of liquid in said treating compartment, and motion transmission mechanism between said last named means and said locking means for releasing said locking means in response to the liquid level in said treating compartment to thereby permit said inlet valves to close.

9. In a washing machine, a fabric treating compartment, sources of supply of washing fluids for said compartment including hot and cold water inlets, valves for controlling flow of water through said inlets, cam means for opening said valves, locking means effective to maintain said valves in open position, means movable in response to the level of liquid in said treating compartment, and motion transmission mechanism between said last named means and said locking means for releasing said locking means in response to the liquid level in said treating compartment to thereby permit said inlet valves to close, said motion transmission mechanism being variable in response to the degree of opening of said valves.

ERNEST STUART RUSSELL.

CERTIFICATE OF CORRECTION.

Patent No. 1,929,993.

October 10, 1933.

ERNEST STUART RUSSELL.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, after line 91, insert the following paragraph:

I is a cam shaft preferably of squared shape along its central portion for reasons hereinafter apparent having cam discs 2, 3, 4, 5, 6, 7 and 8 for controlling the supplies of hot water, cold water, steam, soap, bleach, blue and soda respectively, a cam disc 9 for controlling the discharge of liquid from the washing machine, and a cam disc 10 for controlling the starting and/or stopping of the machine, and, if desired, for ringing a bell and/or lighting lamps at the end of and/or at any time in the sequence of the washing operation.

And that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of December, A. D. 1933.

F. M. Hopkins

(Seal)

Acting Commissioner of Patents.