

April 16, 1935.

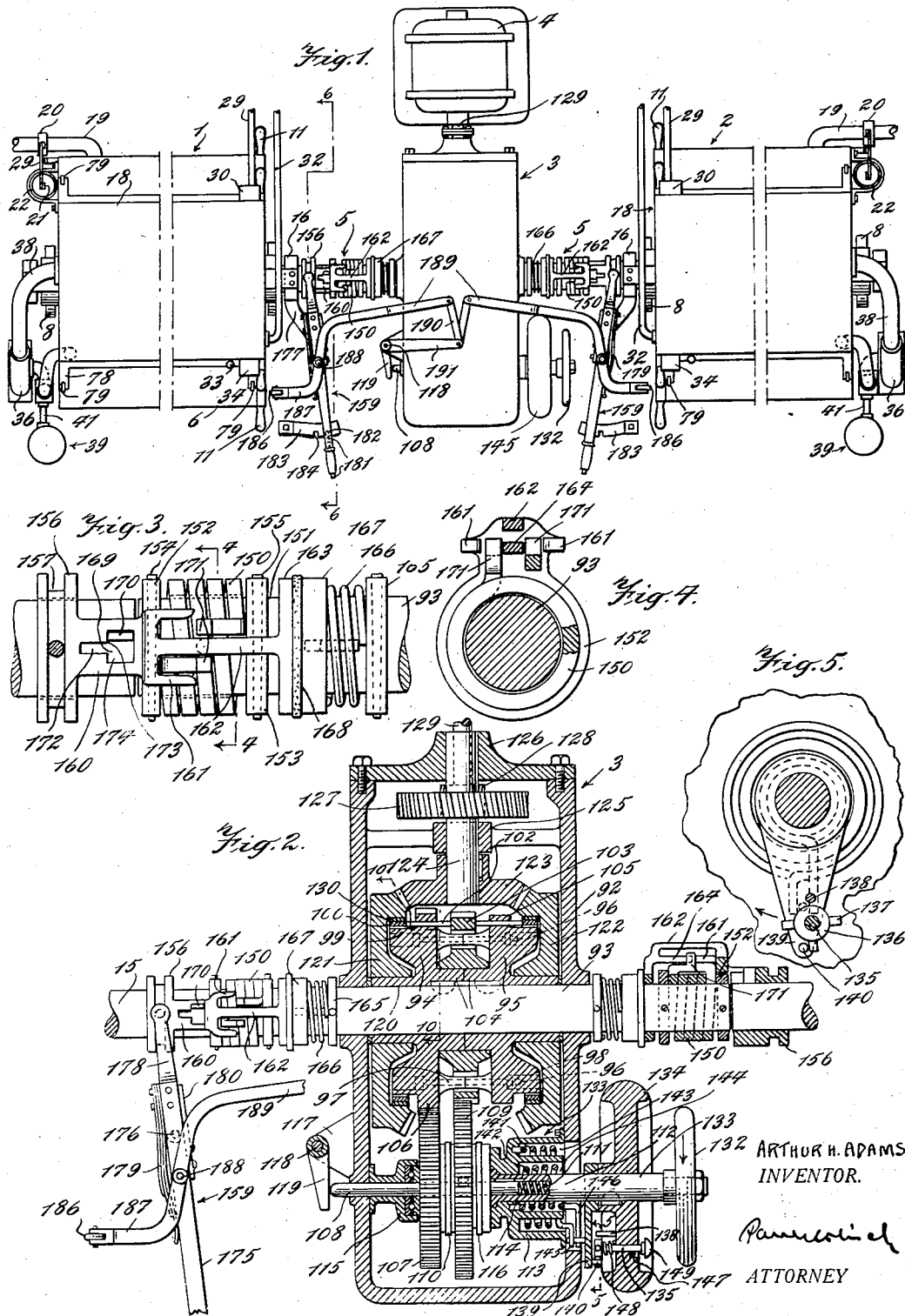
A. H. ADAMS

1,997,990

WASHING MACHINE

Filed Sept. 25, 1923

4 Sheets-Sheet 1



April 16, 1935.

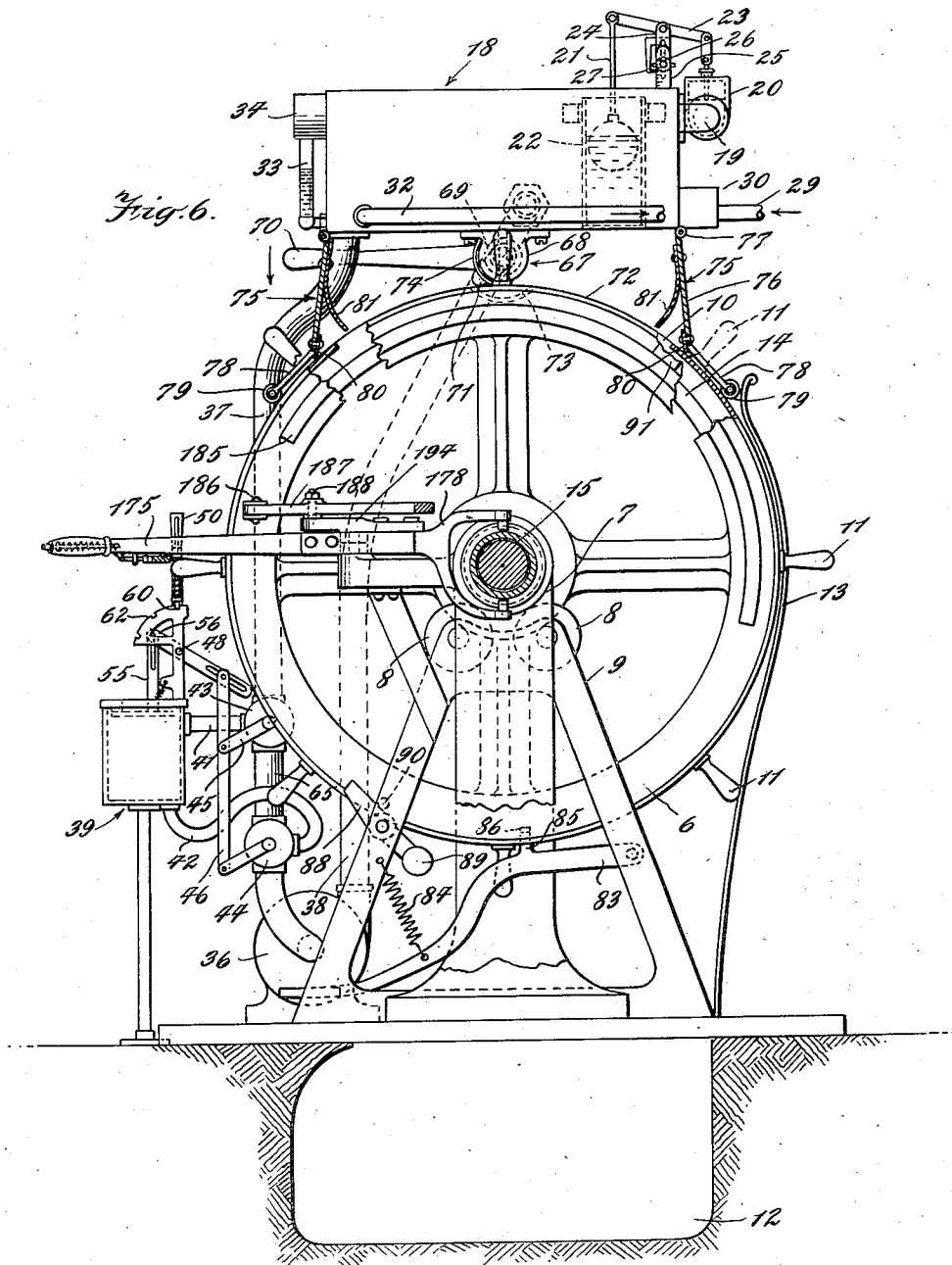
A. H. ADAMS

1,997,990

WASHING MACHINE

Filed Sept. 25, 1923

4 Sheets-Sheet 2



ARTHUR H. ADAMS
INVENTOR.

BY *Parsons*
ATTORNEY

April 16, 1935.

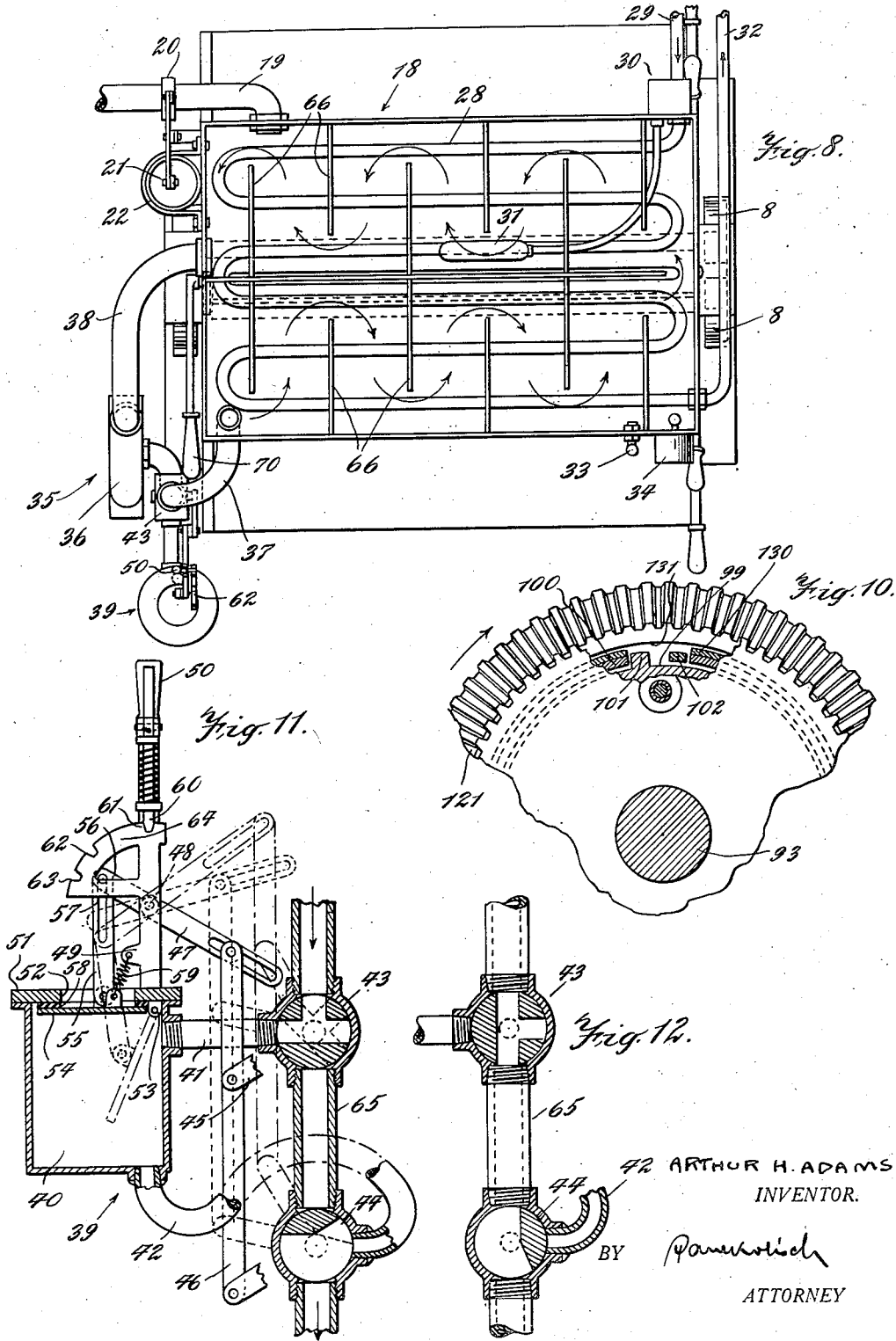
A. H. ADAMS

1,997,990

WASHING MACHINE

Filed Sept. 25, 1923

4 Sheets-Sheet 4



ARTHUR H. ADAMS
INVENTOR.

BY *Panovich*
ATTORNEY

UNITED STATES PATENT OFFICE

1,997,990

WASHING MACHINE

Arthur H. Adams, Yonkers, N. Y., assignor, by
mesne assignments, to American Machine and
Metals, Inc., New York, N. Y., a corporation of
Delaware

Application September 25, 1928, Serial No. 308,162

14 Claims. (Cl. 68—18)

This invention relates to washing machines, particularly to washing machines suitable for use in commercial laundries.

It is an object of my invention to provide a washing machine comprising two units connected to a single power means by a transmission including reversing mechanism and safety mechanism, whereby the two units may be used to carry out successively the various steps necessary in the washing of clothes.

Another object is to provide an improved form of washing machine unit having an open top enclosing drum rotatably mounted so that the water can be emptied from the machine merely by rotating the drum.

Further objects are to provide the above mentioned washer unit with accessories including a chemical supply tank, special heating coil, pump, valve and various safety means.

In accordance with my invention, I construct a washing machine comprising two similar washing units, each of said units being interconnected with a common power source by means of a special transmission. The transmission comprises a drive pinion for rotating in opposite directions two driving gears, either of which through suitable clutches may be interconnected with the common drive shaft of the washer units at will. The means for operating the clutches, and hence for interconnecting the driving source with the washer units, comprises a servo-mechanism arrangement including a hand operable means whereby the clutches may be positively connected or semi-connected, as desired. The hand operable means for interconnecting the clutches provides an extremely efficient form of inching or spotting mechanism which may be used to advantage in positioning the cylinders of the washer units opposite the openings in the outer shell or drum when it is desired to insert or remove clothes from the cylinders. For interconnecting each of the washer units with the main drive shaft of the transmission, I provide specially arranged clutches comprising a safety arrangement which permits a clutch to be engaged only at the moment when the drive shaft is moving very slowly.

In order to insure that power cannot be applied to one of the washer units when the cylinder of that unit is freely accessible to the operator, I incorporate interlocking safety means for disconnecting at the transmission the driving source from the unit. On top of each washer unit is mounted a mixing tank into which water may be admitted through a supply pipe having a float operated valve which shuts off the supply of water when the tank has been filled to any desired predetermined point. Interconnected with this mixing tank is a circulating system comprising a pump and a chemical supply tank. This

chemical supply tank may be disconnected from the circulating system at will by means of suitable valve gear. In the mixing tank is positioned a thermostatically controlled steam heating coil which serves to warm the water to be used in washing and for admitting water from the mixing tank to the washer drum a quick operating pump valve is provided. In order to insure that the pump valve will be operated only when the washer drum is in the proper position to receive the water a lock is furnished which prevents the valve from being opened when the drum is in any other than the safe position.

In the drawings, Fig. 1 shows in plan view a washer constructed in accordance with my invention.

Fig. 2 is a sectional plan view of the transmission of the washer shown in Fig. 1.

Fig. 3 is a detail view of one of the clutches interconnecting the washer units with the transmission.

Fig. 4 is a sectional view of the clutch shown in Fig. 3 taken along section lines 4—4.

Fig. 5 is a detail view of a portion of the reversing mechanism of the transmission.

Fig. 6 is a view in elevation of one of the units of the washer taken along section line 6—6 of Fig. 1.

Fig. 7 is a front elevation view of the washer shown in Fig. 1.

Fig. 8 is a plan view of one of the washer units illustrated in Fig. 1.

Fig. 9 illustrates in detail a portion of the clutch mechanism for shifting the clutch shown in Fig. 3.

Fig. 10 is a detail view partly in section taken along section line 10—10 of Fig. 2.

Figs. 11 and 12 are detail views of the chemical supply tank and associated valves for interconnecting it with the washer unit.

Referring more particularly to the drawings, reference numerals 1 and 2 indicate washer units interconnected through transmission 3 with a common driving motor 4. Each of the units 1 and 2 is connected with the transmission 3 by suitable clutching mechanism 5 by means of which either one or both of the units can be connected with the driving motor at will.

The washer units

The two washer units 1 and 2 are identical and comprise an enclosing drum or shell 6 for holding the washing water, this drum being supported through a journal 7 by means of a pair of roller bearings 8 rotatably mounted on a frame 9. The enclosing drum 6 is provided with a large opening 10 in the top side thereof through which water can be introduced into the drum and out of which water can be dumped from the drum. For rotating the drum during the dumping process a

series of hand grips or projections 11 are provided. By means of these hand grips the operator is enabled to turn the drum right-handedly, as viewed in Fig. 6, thereby carrying the opening 5 10 around toward the bottom and causing water in the drum, which might ordinarily fill it one-third full or thereabouts, to flow out of the opening into a drain 12 provided in the floor under the washer. In order to insure that water shall not 10 splash out on the floor during the dumping process and to guide it into the drainage gutter 12, a shield or baffle plate 13 is positioned adjacent the back of the machine. Water, as it is dumped from the drum 6 through the opening 10, strikes 15 against the baffle 13 and is directed into the gutter 12. Positioned within the enclosing drum 6 is the usual form of laundry containing cylinder 14 within which the clothes to be washed are placed, the washing of the clothes being carried out by rotating the cylinder 14 successively several turns in one direction and then several turns in the 20 opposite direction. The cylinder 14 is supported by a shaft 15 which interconnects through the clutching mechanism 5 with the transmission 3. This shaft may be supported by suitable standards 25 16 and 17 placed at the ends of the drum.

Positioned above the top of the enclosing drum 6 is a mixing or tempering tank 18 in which the washing water and solution is thoroughly mixed 30 before being passed into the drum. This mixing or tempering tank 18 is provided with a water inlet pipe 19 having a controlling valve 20 operated by a float 21 positioned in a chamber 22 interconnected with the tank 18. The float 21 is connected with the valve 20 through a lever 23 35 to which both the stem of the valve 20 and the stem of the float 21 are pivotally connected. This lever 23 is pivoted to a support 24 adjustably secured to an arm 25 attached to the side of the 40 mixing tank 18. The connection between the support 24 and the arm 25 is made through elongated slots in the two members through which a connecting bolt 26 is passed. This bolt may be provided with a wing nut so that it can be loosened and the support 24 moved with respect to 45 the arm 25 in order that the water in the tank will act on the float 21 at a greater or lesser height as desired. By means of this arrangement the amount of water necessary to be in the mixing tank 18, in order to shut off the water supply valve 20, may be adjusted. This amount of water may 50 be indicated in gallons or other suitable measure by means of an indicating finger 27 attached to the support 24 and pointing toward measuring marks on the arm 25. For heating the water in 55 the circulating tank 18 a steam coil 28 is provided. This steam coil is interconnected with a steam supply pipe 29 through a valve 30 automatically controlled by a thermostatic arrangement 31. As this valve may be of any ordinary type 60 well known to the art, further description of it is believed to be unnecessary. The steam entering from the pipe 29 passes through the steam coil 28 heating the water surrounding the coil, and then flows out through an outlet pipe 32. In 65 order to indicate the amount of water in the mixing tank an ordinary form of gage glass 33 may be used. The temperature of the water may be determined by means of an ordinary form of thermometer 34. 70

In the washing of clothes various chemicals are mixed with the water to make a washing solution and in order to supply this chemical and thoroughly to mix it with the water, a circulating 75 ing system 35 is provided. This circulating sys-

tem comprises a pump 36, which draws water from the tank 18 through a pipe 37 and returns it to the tank through another pipe 38. Interconnected in the pipe line 37 between the mixing tank 18 and the pump 36 is provided a chemical supply unit indicated generally by the reference numeral 39. This chemical supply unit includes a chemical supply tank or injector pocket 40 having an inlet pipe 41 and an outlet 5 pipe 42. The inlet pipe interconnects with the pipe line 37 through a two-way valve 43 and the outlet pipe 42 interconnects with the same pipe line through a two-way valve 44. Each of the valves 43 and 44 is operable by means of an arm 10 45 pivoted to a common operating rod 46. This rod 46 is connected to a slotted lever 47 pivotally attached at 48 to a standard 49 secured to the chemical supply tank 40. Lever 47 is operatively secured to a hand lever 50 by means of which the lever 47 can be rocked and the valves 20 43 and 44 correspondingly operated. The chemical supply tank 40 has a cover plate 51 which has an aperture 52 therein. Secured to the end side of the cover plate 51 at pivot point 53 is a flap valve or closure 54. This flap valve 54 has pivotally secured thereto a link 55 slotted at 57 and interconnected with an extension 56 of the slotted 25 lever 47. Flap valve 54 is provided with a gasket 58 of rubber, leather or other suitable material, and in order to keep the valve in a closed position a tension spring 59 is provided. A hand lever 30 50 has the usual form of catch mechanism 60 which cooperates with a plurality of notches 61, 62 and 63 in an arcuate member 64 forming a part of the standard 49. When the catch mechanism 60 of the hand lever 50 is positioned in the notch 61 the valves 43 and 44 are in the positions shown in full lines in Fig. 11 and consequently the flow of water or solution is directed 35 by the valves through the chemical tank 40 and the section 65 of the pipe 37 is by-passed. When the hand lever 50 is moved so that the catch mechanism 60 coacts with notch 62 the valves 43 and 44 assume the positions shown in dotted lines in Fig. 11. In this position of the lever it 40 45 will be noted that the valve 43 is closed and the valve 44 is open, hence, no water or solution can enter the chemical tank 40, but the tank itself will be drained by the suction of the pump 36 acting through the pipe 37, to which the tank 40 is connected by the open valve 44. It will be noted that the valve 54 will open under the pump suction to admit any air that is necessary. When 50 the lever 50 is moved still farther so that the catch mechanism 60 coacts with the notch 63, the two valves 43 and 44 occupy the position shown in full lines in Fig. 12. The water or solution now passes straight through the pipe 37 and section 65 thereof and the chemical tank is entirely 55 by-passed. When the lever is in this position the flap valve 54 of the tank can be opened and chemicals inserted therein. It will be noted that the spring 59 keeps the flap valve normally shut but that, due to the slotted link 55, the flap valve can be pushed open by hand without interference 60 65 from the extension 56 of the lever 47 to the position shown in dotted lines in Fig. 10. In the filling operation the flap valve is held open and the chemicals inserted in the tank, then the valve is released and at once is snapped shut by the spring 59. Upon the water or solution being caused to circulate through the chemical tank in response to movement of the hand-lever 50 to the vertical position, as shown in full lines in 70 Fig. 11, the pressure of the fluid in passing 75

through the chemical tank 40 presses the flap valve 54 against the cover plate 51, thus insuring a tight leak-proof joint.

In preparing a solution to be used in the washing of clothes the mixing tank 18 is first filled with water controlled by the valve 20, then a quantity of chemical soap washing fluid or the like is placed in the chemical tank 40 and the hand lever 50 moved to the position shown in full lines in Fig. 11 and the circulating pump 36 started. The pump 36 circulates water through the mixing tank 18, which may be provided with baffle plates 66, if desirable, in the direction shown by the arrows, carrying the chemicals from the tank 40 up into the mixing tank and circulating them with the water in such manner as to bring about a thorough mixture. Should it be necessary to put in more than one tank full of chemicals it is necessary merely to move the hand lever 50 to the notch 62 and hold it there momentarily to drain the chemical tank, then to move the handle to the position 63 which entirely closes the tank off from the pipe 37 and the circulating water, place the necessary chemicals in the tank, move the hand lever back to the position 61, as shown in Fig. 11, whereupon the fresh supply of chemicals will be circulated with the water through the mixing tank 18. In order to admit water from the mixing tank to the drum a dump valve 67 is provided. This valve may be of the spigot type, as illustrated most clearly in Fig. 6 and is positioned in the bottom of the tank 18 extending the entire length thereof. The valve comprises an outer shell or stationary portion 68 within which is rotatably mounted a slotted internal member 69. The valve is substantially similar to any spigot type valve except that it is very long and hence, when the valve is open the solution in the tank 18 passes to the drum 6 in the form of a long sheet. The reason for making the valve in this manner is to insure that water will pass quickly from the tank to the drum and still not splash very much upon striking the cylinder 14. The valve is provided with an operating lever 70 and is open when the lever is in the horizontal position shown in full lines in Fig. 6. When it is desired to shut the valve the lever 70 is moved downwardly in the direction indicated by the arrow in Fig. 6. It is preferable to have the valve operate in this manner so that if it should become loose the weight of the operating lever would tend to close it rather than open it. In order to prevent the valve from being opened when the opening 10 of the drum 6 is at any other than the top position, a safety stop 71 is attached to the end of the slotted member 69. This safety stop 71 strikes against the rim 72 of the drum 6 in all positions except the correct position of the drum, that is, the position of the drum where the opening 10 is at the top, when the stop is adapted to enter a depression 73 in the rim 72 and permit the valve to be opened. In order to catch drops of fluid when the valve is shut and prevent the dripping solution from falling on the surface of the drum 6, which may be then in some position other than with its opening 10 at the top as illustrated in Fig. 6, a catch gutter 74 is provided. This gutter 74 may be attached to the end of the slotted internal member 69, as shown, or may be attached to the operating lever 70, if desired. This catch gutter, when the valve is open, is carried with the operating lever and slotted internal member to a position out of line with the path of the water through the valve, but as the valve is shut the gutter is rotated to a position directly be-

neath the valve opening so that it will catch any drippings therefrom. This gutter 74 may be open at one end and tilted so as to carry off the drop if there is any appreciable amount of it, or may be closed at both ends so that any slight amount of fluid that may leak through the valve will be retained until the valve is next opened, when this retained fluid will be spilled out. For preventing splashing of the washing water while the washing operation is being carried out, due to the rotating of the cylinder 14 and the attendant agitation, a pair of flaps 75 is provided. Each of the flaps 75 comprises a metal portion 76, hinged at 77 to the tank 18. At each end of the metal portion 76 is an extension 78 provided with a roller 79 which rides on the rim 72 of the drum 6. These extensions and rollers serve to keep the metallic portion 76 spaced slightly away from the periphery of the drum 6. In order to make a relatively tight joint with the drum and prevent leakage of water which may be spilled against the inside of the metal portion 76 a piece of rubber or similar material 80 is secured to the edge of the metal portion. Attached to the inside of the metal portion 76 is a baffle plate 81 which directs any large amount of splash water back into the drum away from the flaps 75 and prevents this water from running down between the edge of the drum 6 adjacent the opening 10 and the rubber 80. In order to hold the drum 6 in its operating position, as shown in Fig. 6, a catch means 82 of any suitable type may be provided, for example, a foot operative mechanism comprising a lever 83 held in upward position by a spring 84 and having a projection 85 for engaging a notch 86 in the rim 72 of the drum. When it is desired to rotate the drum 6 to dump the water therein or for some other reason it is necessary merely to step on the lever 83, thus releasing the catch mechanism, and then turn the drum by means of the hand grips 11. The frame members 9 are so constructed as to place the drum 6 high enough away from the floor level to permit a lift truck to be run underneath the drum to place a basket in position to take clothes out of the machine.

Taking out of the clothes is accomplished by turning the drum 6 around so that the opening 10 is at the bottom and then turning the cylinder 14 so that the door therein coincides with the opening, thus dumping the clothes directly into the basket carried by the truck positioned under the drum. As I have shown in Fig. 7, a pair of rails 87 may be bridged across the gutter 12 for supporting the truck, which is indicated in dotted lines in the figure. When it is wished to load the clothes the drum 6 is turned in a left-hand manner, when viewed as in Fig. 6, so that the opening 10 is at a proper height to be accessible to the operator. Then the cylinder 14 is turned around so that the cover therein coincides with the opening 10 in the drum. The cover of the cylinder is then opened and clothes trust in. In order to hold the drum in the correct position for dumping the wash a stop pawl 88 is pivotally secured to the frame 9. This stop pawl is weighted at 89 so as normally to assume the position shown in Fig. 6, in which position it is held by a stop pin 90 on the frame. This pawl 88, when the drum is in the dumping position engages a projection 91 on the edge of the drum and prevents the drum opening from turning to the back position where

the power can be thrown on to rotate the cylinder, as described more fully hereinafter.

The transmission

5 The transmission 3 comprises a housing 92 within which is coupled a main drive shaft 93, having keyed thereto two driving gear members 94 and 95 interconnected with each other by means of bolts 96 passing through bosses 97 and positioned in recessed holes 98. Each of the driving members 94 and 95 is provided with a clutch band supporting portion 99 around which is encircled a clutch band 100. At a point in the periphery of the band supporting surface 99 is provided a projection 101 against which one end of the clutch band 100 can be forced. The band is made slightly shorter than the periphery of the band supporting portion 99 so that there is a space between the projection 101 and one end of the band 100. Into this space extends a finger 102 joined to a clutch controlled gear 103 journaled on sleeves 104 of the driving members 94. The gear 103 has a plurality of apertures 105 through which the bosses 97 of the driving members project. The apertures are made larger than the bosses so that there is a certain amount of freedom of rotation between the driving members 94 and 95 and the gear 103. The member 94 is provided with a gear portion 106 which meshes with a gear 107 borne by a jack shaft 108, one end of which is journaled in the housing 92. Mounted on the jack shaft 108 and keyed thereto is another gear 109 which is slightly larger than the gear 107 and which meshes with the gear 103. Between the gears 107 and 109 is positioned a friction disc 110. The other end of the jack shaft 108 is feather keyed in an opening 111 in a shaft 112 journaled in the housing 92 and in a member 113 attached to the housing. Between the end of the shaft 108 extending in the end of the opening 111 is placed a compression spring 114 which tends to thrust the shaft 108 in a left-handed direction carrying with it the gear 109 which is keyed to the shaft, forcing the friction disc 110 against the gear 107, which gear is in turn forced against a thrust bearing 115 cooperating with the housing 92. On the inner face of the member 113 is provided a friction disc 116. Attached to the outside of the housing 92 is a bracket 117 in which is journaled a shaft 118 carrying a finger 119 which engages the end on the shaft 108. The finger 119 is adapted to be rocked through the agency of the shaft 118 by means described hereinafter and when the finger is rocked in a counter-clockwise direction as viewed in Fig. 2, the shaft 108 is thrust endwise in a right-hand direction carrying with it gear 109, thereby releasing the frictional contact between the gear 107 and 109 and forcing the gear 109 against the stationary friction disc 116.

Rotatably mounted on sleeve 120 of the driving members 94 and 95 are bevelled drive gears 121 and 122 respectively. These drive gears are rotated in opposite directions by means of bevelled drive pinion 123 secured to a power shaft 124 supported by a bearing 125 and journaled in the housing 92 and 126. This shaft 124 has secured thereto a gear 127 which meshes with a spur gear 128 secured to a shaft 129 journaled in the housing 92 and coupled to a source of power such as electric motor 4. As the clutch band 100 encircles the driving member 94 and has one end thrust against the projection 101 of the driving member and has coacting with its

other end the finger 102 of the gear 103, it will be seen that if it is desired to expand the band it is necessary merely to move the finger 102 against the end of the band with which it co-operates, thus causing the band to expand, as it cannot slide around the driving member because it is held by the projection 101. Upon expansion of the band the friction surface at 130 thereof engages the inner braking surface 131 of the drive gear 121 (see Fig. 10). This engagement of the clutch band with the drive gear effectually interlocks the gear 121 with the driving member 94 so that the driving member is turned in unison with the gear. The movement of the finger 102 necessary to cause the expansion of the band and the resultant engagement with the drive gear 121 is but a small amount and is slightly less than the freedom of movement with the gear 103 as with respect to the driving member 94 because of the difference in size between the bosses 97 and the aperture 105. The clutch band associated with the driving member 95 can be operated in similar fashion. The two driving members 94 and 95 are exactly similar regarding the relation of the projection 101 of each to each and hence, as the two driving members face each other, upon movement of the gear 103 the finger 102 associated with the band 100 of the driving member 94 will be moved away from the projection 101 so as to expand the band, while the finger 102 associated with the band 100 of the drive member 95 will be moved toward the projection away from the coacting end of the band and will not expand the band but will leave it its normal size. From this it will be seen that if the gear 103 is rotated in one direction the drive gear 121 will be locked with the driving member 94 and if the gear is moved in the opposite direction the drive gear 122 will be locked with the drive member 95. As the two gears 121, 122 are normally rotating in opposite directions by the motor 4 acting through the gear mechanism described heretofore and as drive members 94 and 95 are keyed to the main drive shaft 93, it will be seen that in order to cause rotation of the main drive shaft 93 in either right-hand or left-hand manner, it is necessary merely to rotate the gear 103 in the proper direction so that the proper one of the drive gears 121, 122 will be interlocked through one of the driving members 94 and 95 to the clutch control shaft. In order to rotate the drive gear 103 which is inaccessible and not adapted to be gripped directly by the hands, a hand-wheel 132 is provided. This hand-wheel is secured to the shaft 112 which is journaled in the member 113, as stated heretofore. As the shaft 112 is feather-keyed to the jack shaft 108 carrying the gear 109, rotation of the hand-wheel slightly in either direction causes rotation of the gear 103, and as a result of such rotation one of the clutch bands 100 is expanded and one of the drive gears 121 and 122 locked with the main drive shaft 93.

As the driving gears are rotating all the time at a constant speed under power derived from the driving motor 4, it will be seen that unless the control gear 103 is continually rotated that the band 101 will not be held in an expanded position and hence that the main drive shaft 93 will not remain locked to the drive gear. This may be more readily understood by reference to Fig. 10. The rotation of the main drive gear 121 is indicated by the arrow to be right-handed as viewed in this figure, and hence the rotation of

the control gear 103 carrying the finger 102 must also be right-handed in order to cause the clutch band to continue to be expanded. Now, if the gear 103 is turned to the right the finger 102 will be pushed against the coacting end of the clutch band, causing the band to be expanded. Upon expansion of the band the clutching portion 131 of the drive gear 121 is engaged, causing a locking action of the drive gear through the band and projection 131, with the driving member 94. The driving member 94 is therefore rotated in a right-handed direction and it will be seen that if the finger 102 is not also moved in a right-handed direction that the expanding force on the band will immediately be released, as the projection 101 will move toward the finger 102, which is the equivalent of moving the finger 102 away from the cooperating end of the band 100. The clutch is therefore a self-releasing one and hence, in order to keep the drive shaft 93 rotating at all times under the influence of the driving motor 4 it will be necessary to keep the control gear 103 also rotating all the time. The force necessary to move the finger 102 against the band 100 and expand the band to cause the interlocking between the drive gear 121 and the member 94 is relatively small and hence I have in the apparatus described a sort of force magnifier by means of which the small turning effort of the human hand can be made to control the turning motions of a drive shaft carrying a large amount of power. As the gear 103 need only be rotated in one direction or the other to cause the main drive shaft 93 likewise to be rotated in one direction or the other, it is evident that in order to cause rotation of the main drive shaft in one direction it is necessary merely to rotate the hand-wheel 132 in a corresponding direction. Due to the particular construction outlined heretofore, it is possible for one to cause but a fraction of a rotation of the main drive shaft 93 by turning the hand-wheel 132 a corresponding portion of a rotation, as upon slight movement of the hand-wheel, a clutch band is expanded and upon expansion of the band the drive gear immediately turns the driving member so that the band is automatically contracted. Likewise, in order to cause rotation of the drive shaft 93 at a speed slower than its normal driving speed, it is only necessary to rotate the hand-wheel at a corresponding speed. From this it will be seen that we have an excellent inching or spotting mechanism by means of which any mechanism attached to the shaft, which mechanism is in this case a laundry machine cylinder, may be turned exactly to any desired angular position.

As it would not be practical to have an attendant on hand at all times to rotate the hand-wheel 132 a feed-back or regenerative gearing has been devised. This regenerative gearing comprises the gear portion 106, gear 107, gears 109 and 103, and a friction disc 110 which have already been described in detail heretofore. By reference to Fig. 2, it will be seen that if the hand-wheel 132 is initially rotated in, say, a left-handed direction, as indicated by the arrow, that the control gear 103 will be rotated in a right-hand direction, carrying with it finger 102, as shown more clearly in Fig. 10, and causing the band 100 to be expanded. Upon expansion of the band the driving gear 121 immediately seizes the driving member 94 and rotates the same. Upon rotation of the driving member 94 the gear portion 106 thereof rotates likewise the

gear 107 which through the friction member 110 turns the gear 109 which in turn rotates the control gear 103 in the same direction as that in which it was initially turned by the hand-wheel. The gear 109 being of greater diameter than the gear 107 the tendency of the gear portion 106 is to turn the gear 103 at a faster speed than that at which the driving member 94 turns. As the clutch band 100 obviously cannot be expanded more than a certain amount the gear 103 cannot be rotated at any greater speed than that at which the driving member 94 turns. There must therefore be a slippage between the driving members 106 and 103, and this slippage is taken care of by friction disc 110 through which the gear 107 drives the gear 109. As the regenerative effect of the gearing above mentioned is dependent upon the gear 107 driving the gear 109, in order to stop the regenerative effect, and hence to disconnect the main drive shaft 93 from the driving gears 121, 122, the finger 119, already described, is provided. When this finger is rotated in a direction indicated by the arrow in Fig. 2, the shaft 108 is thrust endwise against the compression of spring 114 carrying with it the gear 109 and releasing the pressure of the gear 109 through the friction disc 110 against the gear 109, which pressure is entirely due to the compression spring 114. The action of this finger in thrusting the shaft endwise and stopping the regenerative effect of the gearing is made use of in a manner to be described more fully hereinafter.

The transmission reversing mechanism

For bringing about the reversing of the rotation of the main drive shaft 93 in a periodic fashion so that it will make a certain predetermined number of revolutions in one direction, then reverse and make a like number of revolutions in an opposite direction, reversing mechanism is provided. This reversing mechanism comprises a fly wheel 134 keyed to the shaft 112 and having mounted therein a pin member 135. This pin member carries at one end a counting disc 136 having attached thereto fingers 137. This structure is shown most clearly in Fig. 5. A stop 138 is fastened to the fly wheel in such manner as to engage fingers 137 upon rotation of counting disc 136. Because of the relative position of the counting disc with respect to the stop, the disc may be rotated for a portion of a revolution determined by the angle between the finger 137 with which the stop 138 cooperates. Rotatably mounted on the shaft 112 is an arm 139 which has at its outer end a projection 140 which is so positioned as upon relative rotation of the fly-wheel with respect to the arm to engage the fingers 137 of the counting disc 136 and cause rotation of the disc, that is to say for each rotation of the fly-wheel with respect to the arm the projection 140 strikes a finger 137 and causes a portion of a revolution of the counting disc 136. Where three pins are used, as illustrated in Fig. 5, it will be seen that two revolutions of a fly wheel will cause one of the two pins 137 between which the stop 138 is positioned, to strike the stop and thus prevent any further rotation of the counting disc. When the counting disc is in the position shown in Fig. 5 and is moving in the direction indicated by the arrow, one finger has already been turned and the projection 140 is engaging a second or middle finger. As the rotation of the fly wheel continues from the position shown in this figure the second or middle finger will be turned, thus causing the finger indicated by 137

to strike against the stop 138. For holding the arm 139 in a neutral position helical springs 141 and 142 are provided. These springs are positioned respectively in chambers 143 and 144 of the member 113. These two springs are anchored at their inner ends in the member 113 and at their outer ends are provided respectively with bent portions 145 and 146. By this arrangement, the arm 139 is held in a neutral position under spring tension, and in order to move it away from neutral position it is necessary to tension either one or the other of the two helical springs.

The operation of the reversing mechanism is as follows:

The main drive shaft 93 is first set into rotation in one direction by giving the hand-wheel 132 a twist. As soon as the main drive shaft starts to rotate the regenerative action of the gears 107, 109 is initiated. Consequently, the main drive shaft continues to rotate. The fly wheel 134 being secured to the shaft 112 which is feather-keyed to the jack shaft 108 driven by the gear 107, is rotated in step with the rotation of the main drive shaft. As the fly-wheel rotates, in this case two revolutions from a normal position, the counting disc turns so that one of the fingers 137 engages the stop 138 thereby preventing any further turning of the disc. During rotation of the shaft 112 the fly-wheel has gained a certain momentum and upon the finger 137 being turned against the stop 138 the momentum of the fly-wheel is expended in tensioning one of the springs 141 or 142. The fly-wheel therefore turns to a certain angular position at the same time tensioning one of the springs until the momentum of the fly-wheel is used up and the spring is tensioned so much as to prevent the gear 107 from driving the shaft 108 through the friction disc 110. The shaft 108 then comes momentarily to rest and consequently the gear 103 through the action of the gear 109 is likewise brought to rest. This action causes the clutch band which has heretofore been expanded to contract and free the main drive shaft 93 from the gear which has been driving it. Upon the stopping of the fly-wheel 134 the kinetic energy stored in it during rotation thereof has been transformed into potential energy in the tensioned spring. This potential energy of the spring causes the fly wheel, after a momentary stoppage, to be thrown into reverse rotation. This reverse rotation of the fly-wheel causes a reverse rotation of the shaft 112 which results in the expansion of the other clutch band 100, and the consequent interlocking of the main drive shaft 93 with the driving motor for rotation in the opposite direction.

This operation is cyclically repeated in the manner described and as a result of it the main drive shaft 93 turns first a predetermined number of revolutions in one direction and then a predetermined number of revolutions in the opposite direction. In order to change the number of revolutions the number of fingers 137 on the counting disc 136 may be changed. Due to the difference in size between the gear portion 106 and the gear 107 the fly-wheel 134 is not necessarily turned at the same speed as the main drive shaft and hence two revolutions of the drive shaft would not mean two revolutions of the fly wheel. However, a constant ratio would obtain and hence the number of fingers on the counting disc could be correspondingly adjusted. In order that the reversing mechanism may be rendered inactive the pin member 135 has been provided with a catch 147 and a spring 148. The spring 148

serves to hold the counting disc in operative position and in order to place the disc in inoperative position the pin member 135 is withdrawn against the action of the spring and turned slightly so as to hold it in a retracted position. In order to facilitate gripping of the pin member a head 149 is provided. It will be understood that the hand-wheel 132 is not absolutely necessary as the fly-wheel 134 could be fashioned in such manner as to be used as a hand-wheel.

While I have shown a particular kind of counting mechanism and spring arrangement for converting the kinetic energy of the fly-wheel into potential energy and causing reversing of the driving gear, it will be understood that other mechanism might be used in place thereof. For example, in place of the counting disc arrangement might be used any other form of counting mechanism well known to the art, such as a screw and travelling nut.

The clutch mechanism

For interconnecting the drive shaft 15 of the units 1 and 2 with the main drive shaft 93 of the transmission 3, the clutch mechanism 5 is employed. This clutch mechanism comprises a helical spring 150 mounted on the end 151 of the shaft 93 in such manner as to fit the same quite closely. This spring is positioned between two collars 152 and 153 secured to the shaft by pins 154 and 155. Mounted on the shaft 15 and freely rotatable with respect thereto, is a sleeve 156 grooved at 157 for engagement by yoke 178 of the clutch throw-out lever 159. Sleeve 156 has a projecting portion 160, providing a pair of spaced fingers 161 and having an upwardly and forwardly extending connecting arm 162 to which is joined a collar 163. Extending back beneath the arm 162 from the collar 163 is a third finger 164. Pinned to the shaft 93 is a stop member 165 against which a spring 166 acts. Coacting with the spring 166 is a friction collar 167 feather-keyed to the shaft 93 and between the collar 163 and the friction collar 167, a disc of friction material 168 is provided. The projecting portion 160 has an aperture 169 therein within which is positioned a key 170 secured in the shaft 15. The aperture 169 consists of three key retaining portions 172, 173 and 174 within which the key 170 can rest. When it is desired to disengage the drive shaft 15 from the main drive shaft 93, the sleeve 156 is held in the position shown in Fig. 3. When the sleeve is in this position the third finger 164 is positioned between the two upwardly turned ends 171 of the helical spring 150. The main drive shaft 93 which is now rotating, through frictional engagement with the helical spring 150 tends to turn the spring and consequently the finger 164 which is inserted between the ends of the spring. However, as the helical spring is turned even a small amount the finger 164, being held relatively stationary by its connection with the shaft 15, causes the spring to be uncoiled slightly and hence reduces the gripping action between the spring and the main drive shaft 93 to an inoperative value. When it is desired to engage the shaft 15 with the main drive shaft 93 the sleeve 156 is moved in a right-handed direction after being rotated slightly to center the key 170 in the portion 172 of the aperture 169 as explained hereinafter. When the sleeve is in this position the fingers 161 engage the outside of the end portions 171 of the helical spring and upon turning of the spring through friction engagement with

the main drive shaft 93, causes the coils of the spring to be tightened about the end of the shaft, thus increasing the frictional engagement therewith and causing the main drive shaft to drive, through the spring 150, fingers 161, sleeve 156 and key 170, the shaft 15. It will be noted that as there are two of the fingers 161 that the clutch will work equally well in both directions. The fingers may be made in such manner as slightly to pinch the ends of the springs together so as to tighten the spring about the shaft, or may be made so as to slide freely on both sides of the end portions of the spring.

In order to throw the clutch into and out of engagement, a lever 159 is provided. This lever comprises a hand portion 175 pivotally mounted on shaft 176 supported by a bracket 177 attached to the frame 9. Hinged to the hand portion 175 is a yoke member 178 which has connected thereto a leaf spring 179 which tends to keep the hand portion 175 aligned with the yoke member 178. In order to prevent the hinge between the hand-portion 175 and the yoke member 178 from being broken in the direction opposite the spring 179, a stop arm 180 is secured to the hand portion 175. This stop arm permits the hand portion 175 to be moved in a left-handed direction, as viewed in Fig. 2, relative to the yoke member 178 but prevents it from being moved in a right-handed direction with respect to the yoke member. When it is desired to throw the clutch from a disengaged position to the engaged position the hand portion 175 which has been held by a catch mechanism 181 in the notch 182 of a sector 183 is moved to the notch 184 with which the catch mechanism 181 engages and holds the lever in position. Now, if the main drive shaft 93 has been turning in one direction, say, such a direction as would cause the key 170 to occupy the position shown in Fig. 3, that is, to rest in the key retaining notch 173, the yoke member 178 will not have been able to move in step with the hand portion 175 and hence the leaf spring 179 will have been tensioned. Friction collar 167, always rotating with shaft 93, is pressed against the friction disc 163 by spring 165. Collar 167 thus tends to drag collar 163, by friction, together with the attached parts 162, 161, 160, and 156 which are mounted on the stationary shaft 15 in the same direction of rotation as shaft 93 until the projecting portion 150 of the sleeve 156 is stopped by key 170. At each reversal of the oscillatory shaft 93 shifter collar 156 is thus rocked back and forth so that key 170 alternately assumes positions 173 and 174. Upon the reversing of the rotation of the shaft 93, the key 170 will be moved out of the key retaining slot 173 into alignment with the notch 172. When it has reached this aligned position the sleeve 156 will be thrust to the right, as viewed in either Fig. 1 or Fig. 2, under the action of the leaf spring 179. As the sleeve moves to the right the fingers 161 engage the end portions 171 of the helical spring 150 and cause the same more strongly to grip the drive shaft 93, and through the projecting portion 160 of the sleeve, and the key 170, to drive the shaft 15. From this it will be seen that the clutch shifts from a disengaged to an engaged position only at the instant when the shaft 93 starts to reverse its direction of rotation, regardless of when the hand portion 175 was shifted.

The reason for making the clutch in this manner is to prevent undue strains such as would occur if the clutch were thrown into engagement

while the drive shaft 93 was rotating at full speed. The washer cylinder is a relatively heavy affair and hence due to its inertia would throw a heavy strain on the clutch and perhaps damage it. At any rate a larger and stronger clutch mechanism would be needed than that required with the present arrangement. When the clutch is to be thrown from the engaged to the disengaged position the hand portion 175 is moved from notch 184 to notch 182 and in so moving, through the stop arm 180, moves with it the yoke member 178, thus accomplishing immediate disengagement of the clutch.

As the washer drum is provided with a large opening which serves as a door and which is normally in an upward position, when the opening is turned toward the front there is danger that the operator might thrust his hand in upon the cylinder 14 which might be revolving at the time; likewise there is danger that when the drum opening is in the down or dumping position that the cylinder might be started accidentally with the wash half dumped. For the purpose of safety an automatic arrangement is provided for releasing whichever clutch band of the transmission 3 may be at the moment operating. This safety mechanism comprises a cam 185, see Fig. 6, secured to or forming a portion of the end wall of the drum 6, which cam cooperates with a roller 186 fastened in the end of a double bell crank shaped member 187 pivotally supported at 188 on an extension 194 of the yoke member 178. This bell crank is provided with an offset portion 189, see Fig. 1, which is pivotally interconnected with a link 190 in turn pivotally attached to an arm 191 secured to a vertical shaft 118 journaled in the bracket 117 secured to the transmission 3. This shaft, it will be remembered, carries at its lower end the finger 119 which coacts with the end of the jack shaft 108. Each of the two washer units 1 and 2, as has been stated heretofore, is exactly similar and each therefore is provided with identical safety mechanism which work through the common arm 191 to operate the finger 119. As it is impossible for the operator to thrust his hand through the opening in the drum except when the drum is in a front position, the cam 185 extends around the end of the drum just far enough to cause the bell crank 187 to be rocked and the finger 119 thereby moved to thrust the jack shaft 108 on end and prevent the regenerative gearing from maintaining the drive shaft 93 in constant driving engagement, only while the opening in the drum is in the front and accessible or down and dumping position. When the opening is either at the top or back position the bell crank 187 is in its inactive position and the regenerative gearing in the transmission consequently connected to maintain the drive shaft 93 in driving engagement all the time. As the bell crank is pivoted on the extension 194 of the yoke member 178, when the yoke member is thrown to the notch 182, corresponding to the disengaged position of the clutch mechanism 5, the roller 186 is moved out of engagement with the cam 185 so that the opening in the shell of the inactive washing unit can be moved to the front and accessible position without stopping the drive shaft 93 which is meanwhile driving the other washer unit from rotation.

The making of the washing machine in two units operated by a common drive has many advantages and these advantages will appear more clearly in a description of a method of operating the washing machine which will be de-

scribed hereinafter. As the shell has no doors, or may be considered in itself as a sort of revolving door, it is extremely easy to dump dirty washing solution, it being necessary merely to

turn the shell to the back and down in order instantly to spill out all the solution therein and then to turn it to the front to get at the cylinder doors in order to load the cylinder, or to turn it to the front and down to dump the wash from the cylinder into a truck positioned underneath the machine. The spotting of the cylinder door to coincide with the opening in the shell when it is desired to load the clothes or to dump them is very easily accomplished by the force magnifier arrangement described heretofore. The operator simply has to turn the hand-wheel in the direction corresponding to that in which it is desired that the cylinder should turn and the cylinder, due to the force magnifier connection, turns exactly a step therewith. Likewise, when the machine is turning and it is desired to stop it the operator just has to seize the hand-wheel thereby instantly stopping the cylinders of both units.

The clutch mechanism 5 is used to cut off one washer unit for dumping, loading, etc. while the other unit is still running, and thereby save loss of time which would occur if both units had to be shut down in order for the operator to work on one unit. Accidental starting of the cylinder with the clothes partly dumped, which might occur if the shell were permitted to swing from the opening-forward to the opening-down position, is avoided by means of the ratchet stop 88 described in the preceding description.

Operation

In order to make the operating features of my machine clear a detailed account is given of a typical series of operations in handling the two units in the most economical way which I term the alternative cycle operation.

Assuming both units emptied at the start and with their shells in normal position, i. e. openings up, the manner of procedure is as follows:

Put break chemicals in injector pocket.
Start the mixing tank filling by opening the water valve.

Set adjustable float lever for gallons desired.
Throw circulating pump into action if not running.

Set thermostat at temperature wanted if solution is to be warmed.

Open steam valves to mixing tank coil.
Calling one washer unit the A unit and the other the B unit for distinguishing them, next:

Turn the shell of the A unit so its opening is front for loading. It should here be noted that even if the drive motor is running the transmission is in "neutral" and cannot rotate either the A or B cylinder because the A shell is open to the front and the safety mechanism associated therewith consequently operated. Start the motor of the drive unit if it is not already started.

This motor would probably be normally running all the time unless the two washer units are to be shut down for some time.

Put the wash in the cylinder.

For facilitating dumping of the wash it will be remembered that the cylinder is mounted slightly higher than usual. To make the loading convenient the shell door and the cylinder door should be lower than is usual, measuring from the center of the cylinder or at the usual height from the floor. The ability to raise and

lower at will the position of the door of the shell, as well as that of the cylinder makes possible the higher setting of this machine and thus makes possible the dumping of wash directly in the trucks. If the operator finds that he cannot get as much wash as he would like into the cylinder in the low position he may inch the opening in the cylinder up by the center before putting in the last few handfuls of wash.

Close the cylinder door.

Turn the shell opening up.

The movement of the opening in the shell to an upward position releases the safety mechanism and permits the transmission to drive the washer unit.

Open the dump valve in the mixing tank. It will be remembered that this could not be done until the shell opening was in its proper position because of the safety feature.

Start the drive unit. This might be started before opening the dump valve, as the operator chooses. To start the drive merely turn the hand control wheel a few degrees either way. The cylinders of the A and B units will now start rotating, B unit as yet being empty, or B unit might be unclutched from the drive unit, if desired.

Put soap, etc. in the injector pocket.

Start the mixing tank filling.

Set the float and thermostat as before.

A unit is now washing on the break solution and a soap solution is being made up and warmed. Due to the circulating feature of the mixing tank no strong concentrations of any soap or chemicals can injure the wash as all of the chemicals are thoroughly mixed with the water before being dumped into the washer shell.

Start the B tempering tank break solutions just as outlined above.

Turn B shell to the front. This, due to the safety arrangement necessarily throws the drive unit into neutral, stopping the cylinders of both units, but causing only a slight loss of time on the A unit.

Inch the B cylinder into alignment with the opening.

Unclutch the B unit from the drive unit.

Start the drive again by a touch on the hand wheel.

Open the B cylinder door, load and close door.

Turn B shell up and discharge break solution into it.

Clutch B cylinder back on to the drive unit. If desired, this could have been done as soon as the B shell was up and before discharging break solution into the shell. However, this is a question of the desirability of having the cylinder turning or not while the break solution is being run through and over it. Both A and B units are now washing on break solution.

Start B tank on the first soap solution in the same manner as outlined above for the tank. After the A unit has run enough on the break solution turn the A shell back until the solution runs into the drain. It will be noted that this does not put the drive unit into neutral as the shell opening is at the back and consequently the safety mechanism does not operate. As the drive unit is still running the cylinder continues to tumble the wash while the solution is being drained off.

Turn the A shell by going up the back with the opening so as not to stop the drive unnecessarily. Dump in A the tempered soap solution. Start next solution in the A tank.

Turn the B shell up. Dump in B the soap solution.

The above outlined operations are repeated cyclically at proper intervals on A and B alternately until the A shell has been turned back and the last rinse water dumped. Both cylinders are still going. Turn the A shell to the front. This will cause the drive stop on both A and B units. Inch the A cylinder door to front and open it.

Turn A shell down. This is the forward down position reached by lowering the shell down front until the ratchet stop is struck. If this stop were not short the shell might be turned too far so as to get into the back position where the safety device would no longer prevent the drive from acting. If so, the cylinder would start with its door open and might damage some of the clothes.

Place a truck under the A shell door.

Inch the A cylinder until the door is down and the wash falls into a truck positioned under the unit. Unclutch the A unit and start the drive again in order to complete the operation of the B unit unless the B unit is finished rinsing and further tumbling is not necessary. The wash dumping steps just outlined in connection with the A unit would be repeated on the B unit at the proper time, thus leaving both units empty and ready to start a new cycle of operations following the above outlined steps.

While I have disclosed a particular embodiment of my invention for the purpose of illustration, it will be understood that various modifications and adaptations such as would occur to one skilled in the art may be made without a departure from the spirit of my invention, as set forth in the appended claims.

What I claim is:

1. In a laundry machine, a driving unit comprising a power shaft and a main drive shaft, a self releasing clutch for interconnecting the two shafts, means for operating said clutch, and feed-back means interconnecting said main drive shaft with the clutch operating means for maintaining said clutch in driving condition.

2. In a laundry machine, a driving unit comprising a power shaft, a drive pinion mounted on said shaft, a pair of drive gears intermeshed with said pinion so as to be rotated in opposite direction, a main drive shaft, a clutch for connecting each of said drive gears to said main drive shaft, operating means for said clutches comprising a control shaft, hand means for turning said control shaft and feed-back gearing for interconnecting said control shaft with one of the first mentioned shafts.

3. In a laundry machine, a driving unit comprising a pair of oppositely rotating power gears, a main drive shaft, a clutch for each of the power gears for interconnecting the same with said main drive shaft, a control shaft for operating either of said clutches at will, hand means for operating said control shaft and feed-back means interconnected between said main drive shaft and said control shaft for maintaining a clutch, when operated, in operated condition.

4. In a laundry machine, a reversing drive unit comprising a power shaft, a main drive shaft, means including two self releasing clutches mounted on said main drive shaft for interconnecting said main drive shaft with said power shaft for rotation in either direction at will and means responsive to rotation of said main drive shaft for engaging said clutches alternately to

cause periodic reversals of the direction of rotation of said main drive shaft.

5. In a reversing drive unit, a power shaft, a main drive shaft, means for interconnecting said power shaft with said drive shaft to rotate said drive shaft in one direction and means for interconnecting said power shaft with said drive shaft to rotate said shaft in the opposite direction, a manually operable control shaft for actuating said interconnecting means, friction means connecting said drive shaft to said control shaft to maintain operation thereof and means comprising a flywheel for operating said control shaft to cause said interconnecting means to be actuated alternately.

6. A reversing drive unit according to claim 5 wherein the flywheel is keyed to the control shaft and is provided with a counting means for connecting said flywheel with an energy storing spring adapted to stop and then produce a reversal of rotation of said flywheel.

7. In a laundry machine, a rotatably mounted enclosing drum having an opening in the side thereof, a laundry container inside of said drum, power means for driving said container, and safety means responsive to rotation of said drum to an unsafe position for rendering said driving means ineffective.

8. A laundry machine according to claim 7 wherein the safety means comprises a cam on the enclosing drum and a lever interconnected with the driving means.

9. A laundry machine according to claim 7 wherein the driving means comprises a self releasing clutch and a feed-back means for maintaining said clutch in engagement and said safety means comprises means for rendering said feed-back means ineffective.

10. In a laundry machine, a rotatably mounted enclosing drum capable of being turned to a safe and unsafe position, a washing device inside of said drum, power means for driving said device, said device being connected to said power means through a clutch, safety means responsive to rotation of said drum to an unsafe position for rendering ineffective said power means, and means responsive to disengagement of said clutch for rendering ineffective said safety means.

11. In a laundry machine, a driving unit comprising a power shaft and a main drive shaft, a drive pinion keyed to said power shaft, a pair of drive gears rotatably mounted on said main drive shaft and adapted to be rotated in opposite directions by said pinion, a self releasing clutch mounted on said main drive shaft for each of said drive gears for interconnecting the gear with said drive shaft, a rotatable control shaft for operating said clutches, and feed-back means comprising two gears mounted on said control shaft for maintaining a clutch in operated condition, the first of said gears being keyed to said shaft and the second of said gears being rotatably mounted on said shaft and held in frictional engagement with said first gear by means of a spring.

12. A driving unit according to claim 11 wherein means is provided for moving said first and second gears out of frictional engagement.

13. In a laundry machine, a rotatably mounted enclosing drum capable of being turned to a safe and unsafe position, a washing device inside of said drum, power means for driving said device, said device being connected to said power means through a clutch, safety means responsive to rotation of said drum to an unsafe position for

rendering ineffective said power means, and manual means adapted to render said power means intermittently effective to inch said washing device to any desired position.

- 5 14. Clutch mechanism for driving laundry machinery from an oscillating drive shaft, comprising, in combination, a drive shaft and a driven shaft, a main clutch and a pilot clutch which affects the engagement of the main clutch, said
10 main clutch including a sleeve revolving with the

driven shaft and slidable thereon, and a spring loosely encircling the driving shaft connected with said sleeve and capable of frictional engagement with the driver by the movement of said sleeve, the pilot clutch being a slip clutch always in engagement, one of whose elements is connected to the driver and the other to the sleeve, and serving to rock the sleeve past the engagement position of the main clutch at each oscillation.

ARTHUR H. ADAMS.

5

10