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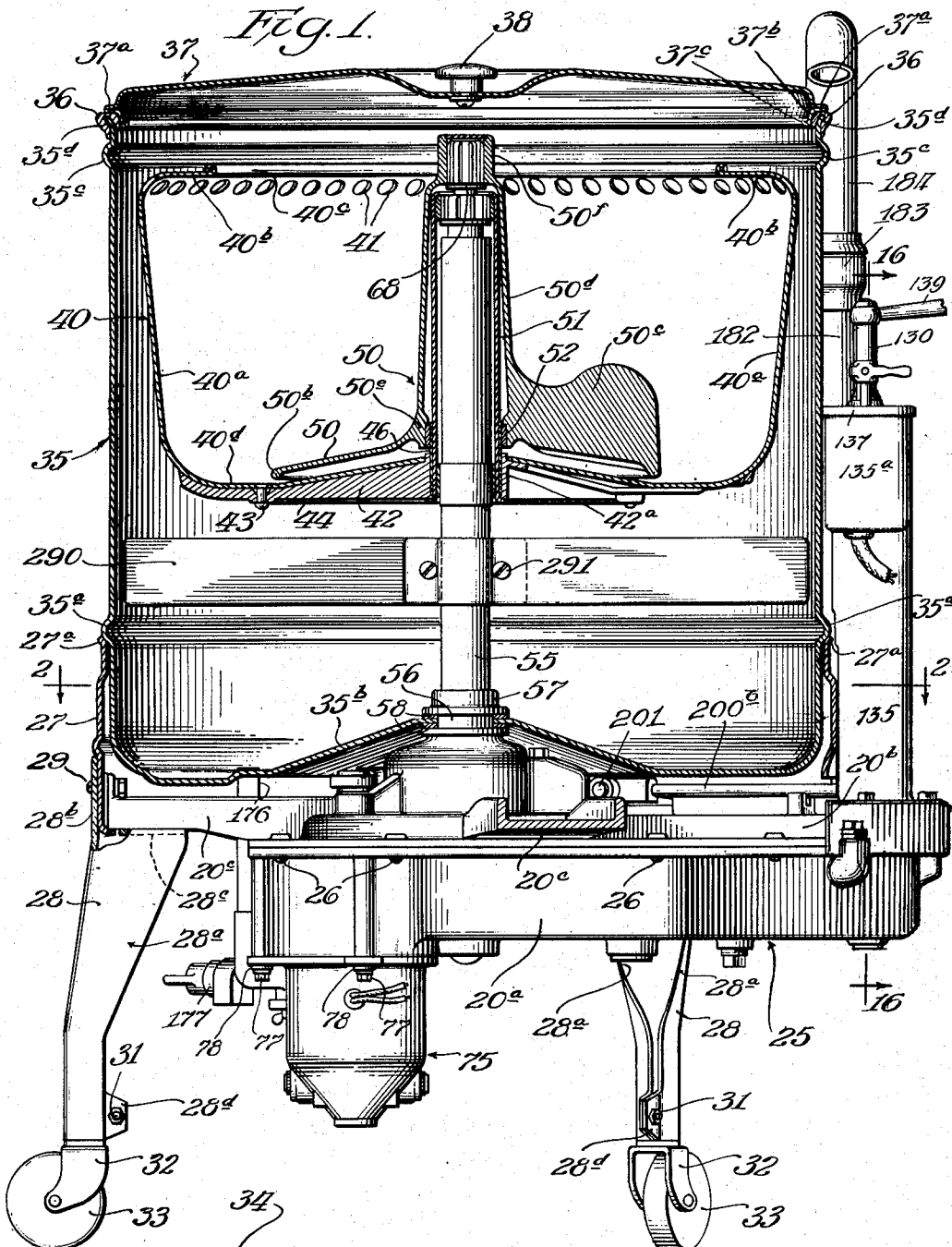
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2,082,108

WASHING MACHINE

Filed Nov. 13, 1930

10 Sheets-Sheet 1



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Fig. 2.

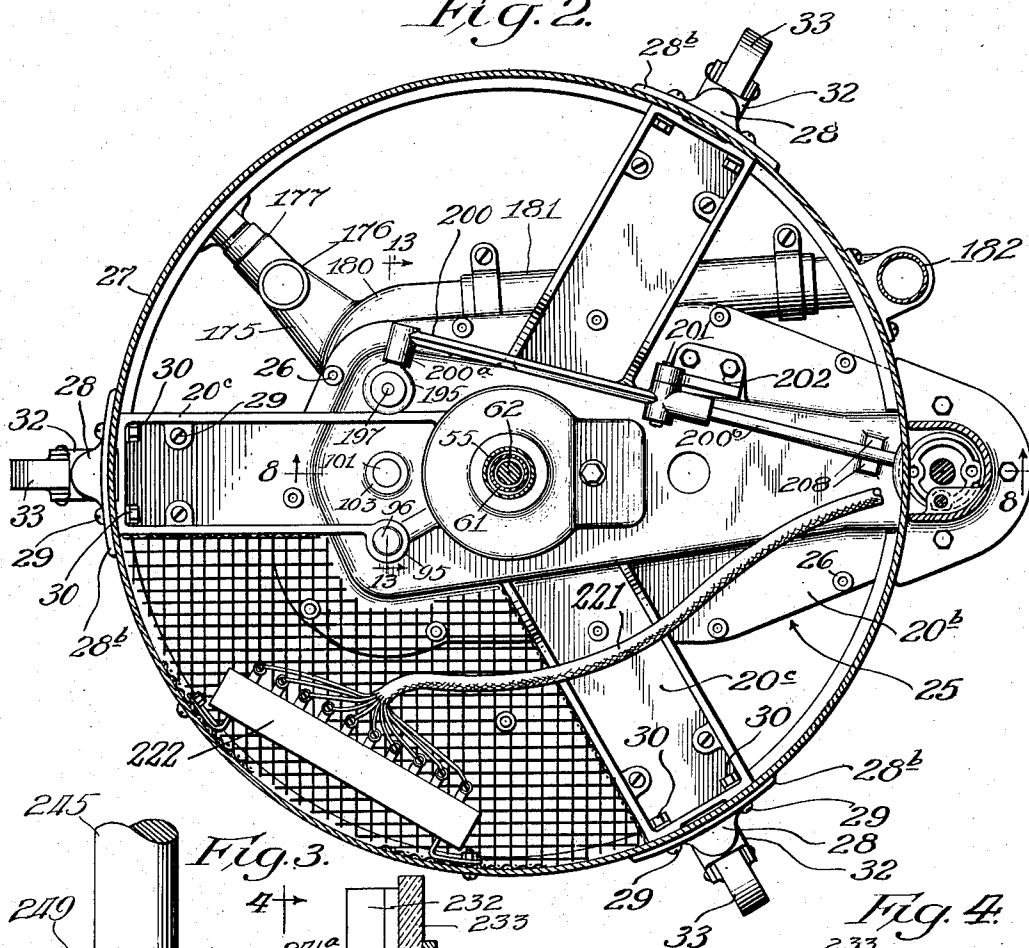


Fig. 3.

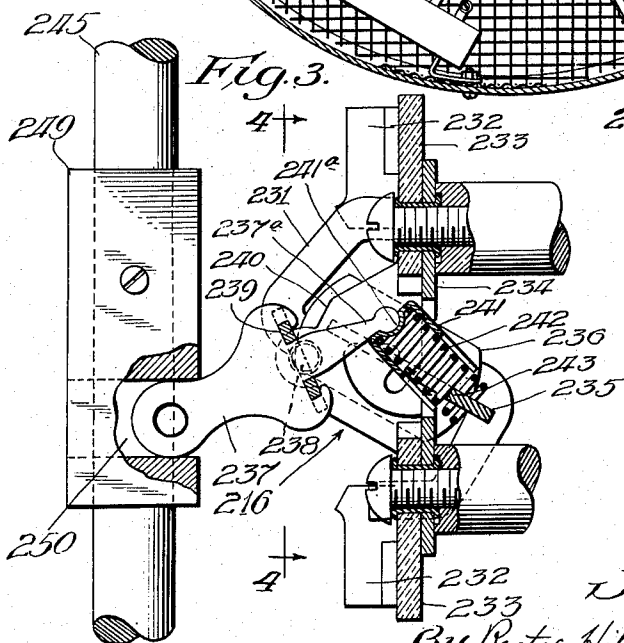
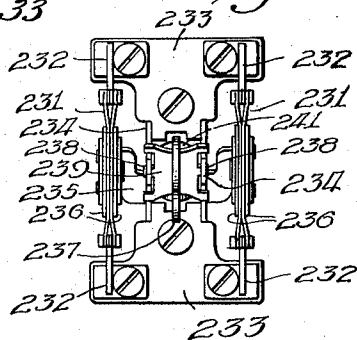


Fig. 4.



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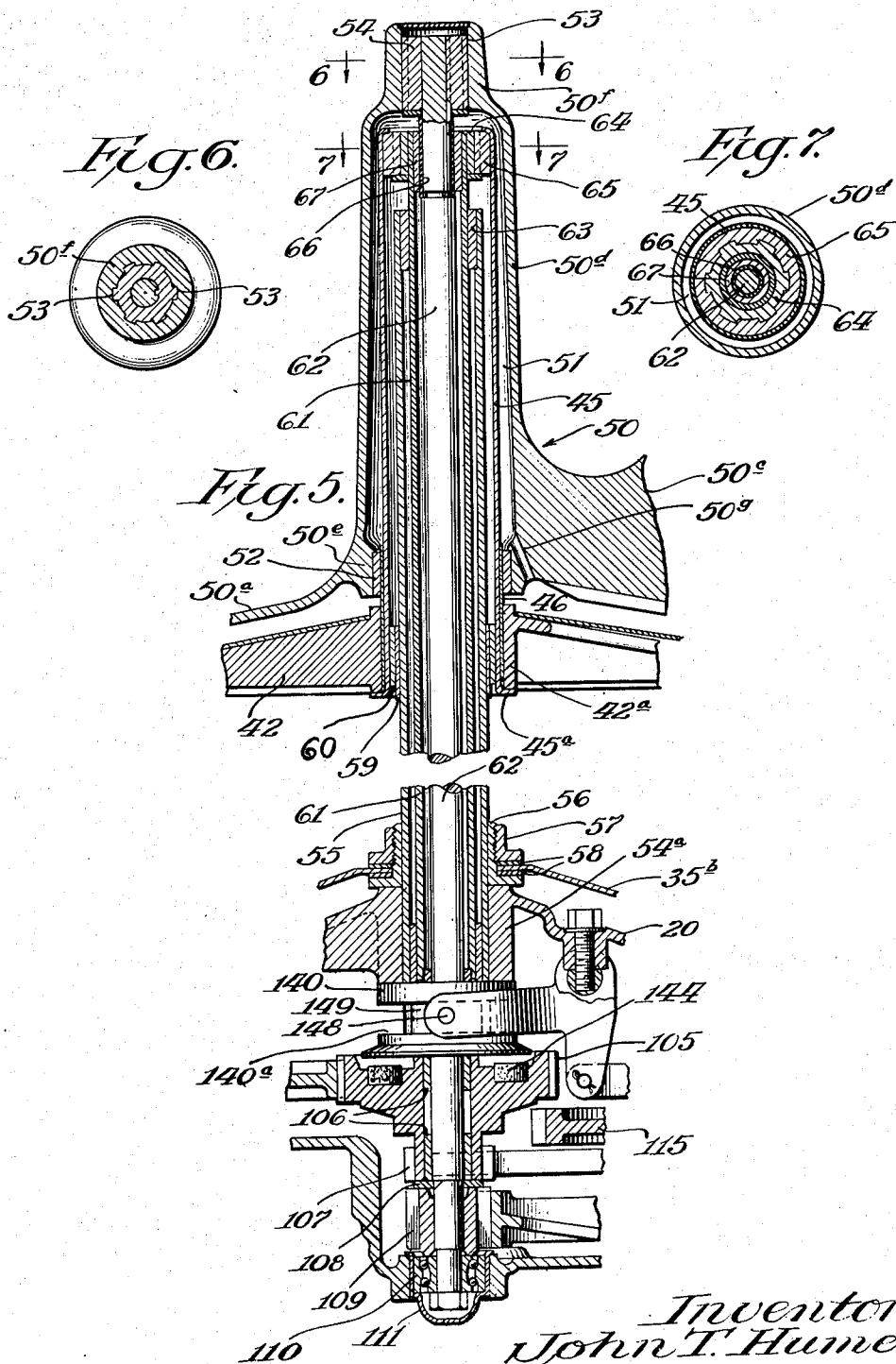
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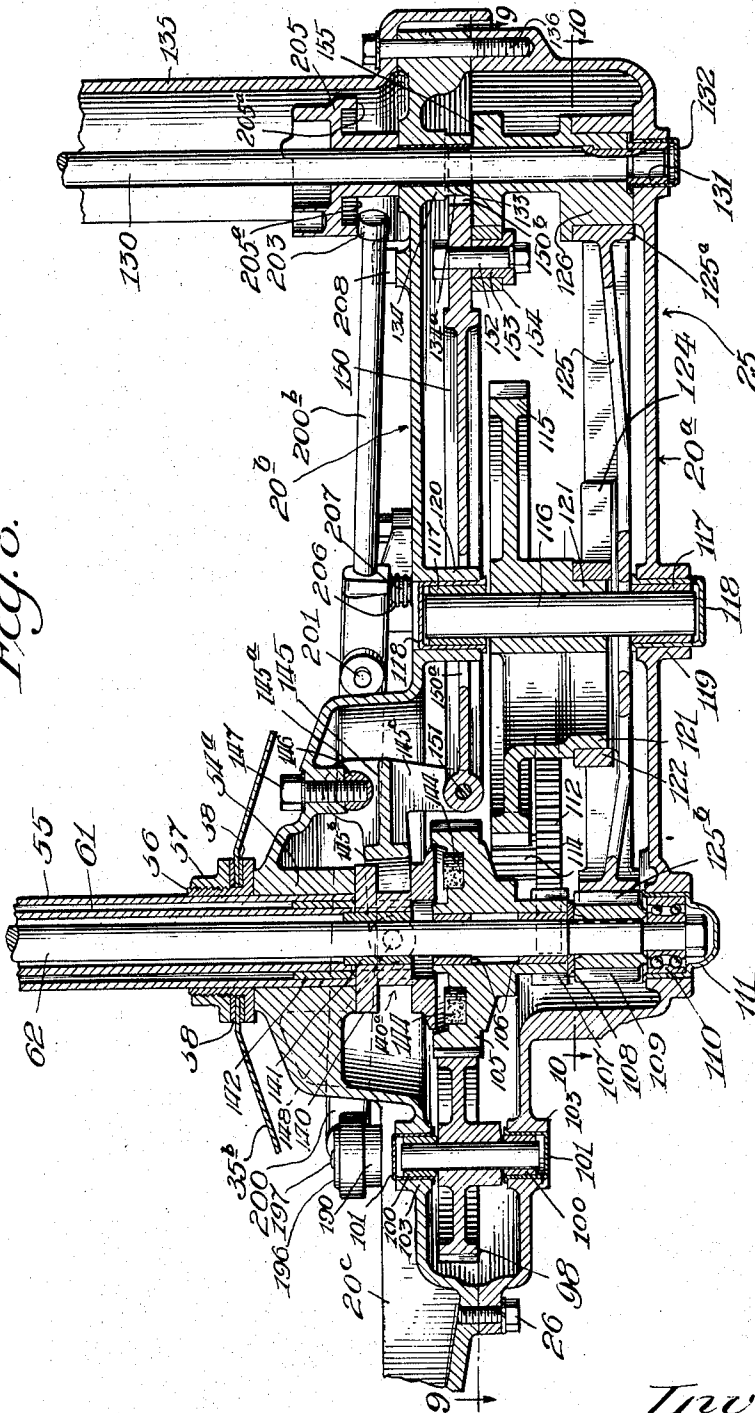
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Fig. 8.



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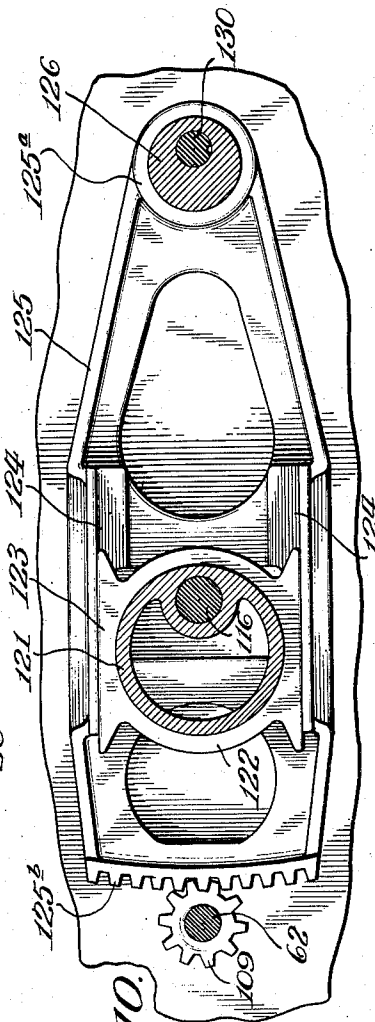
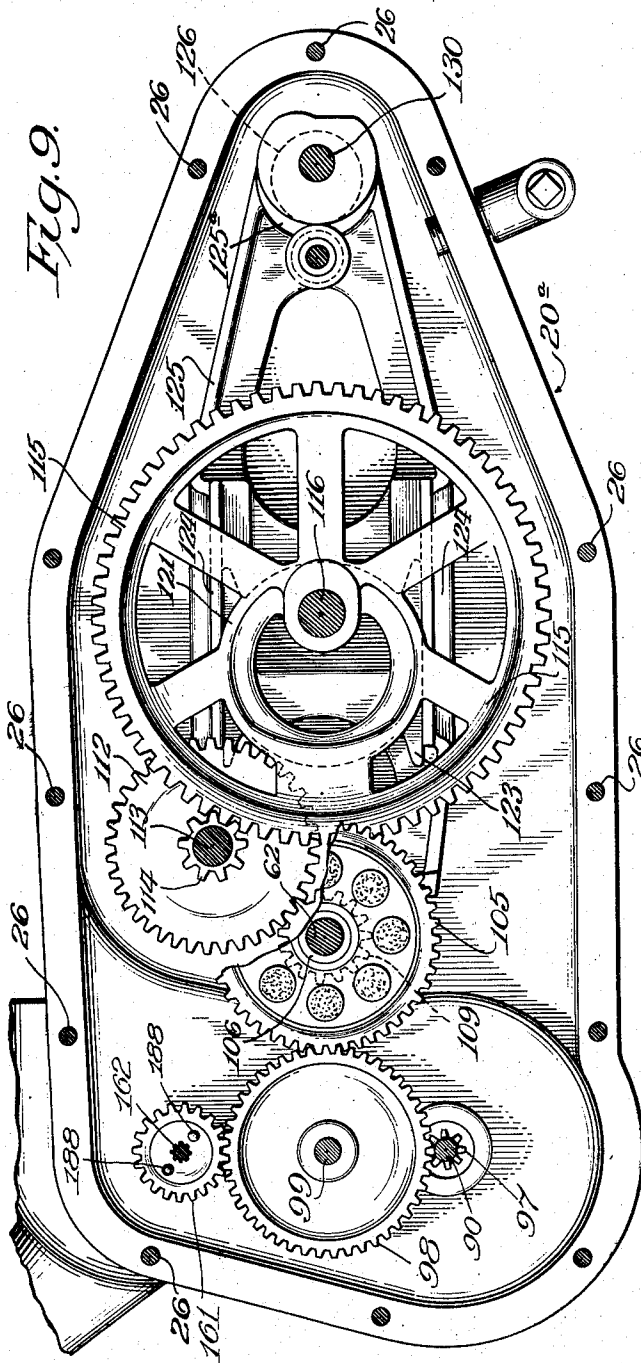
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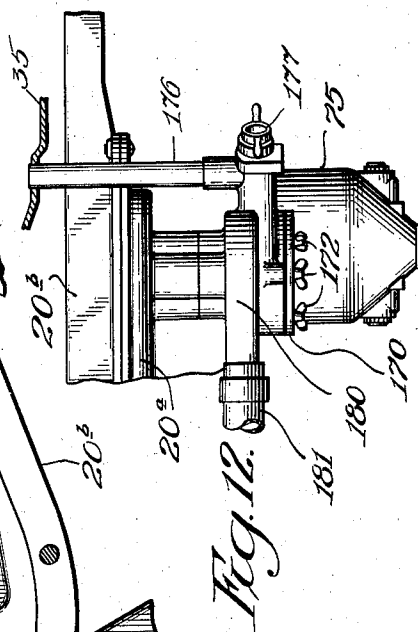
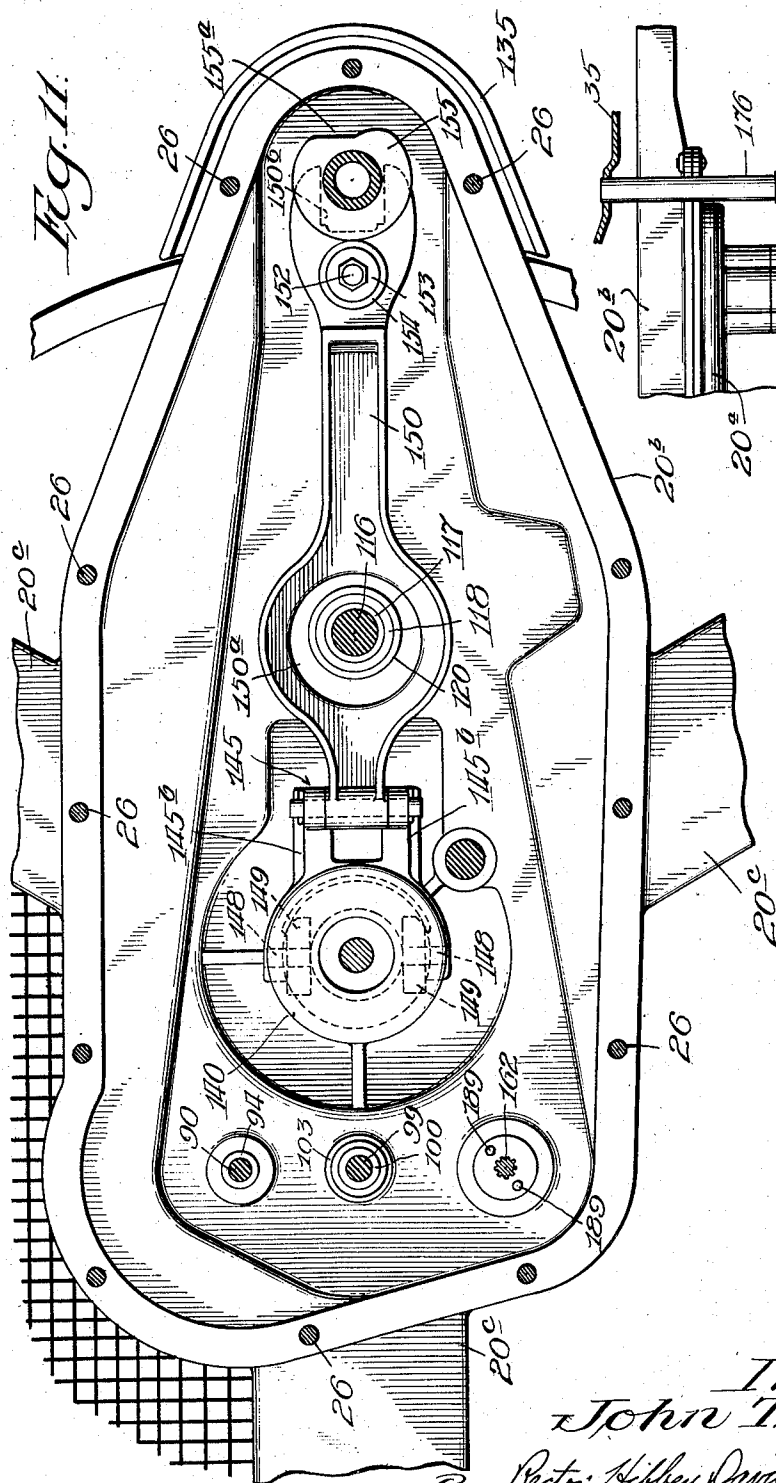
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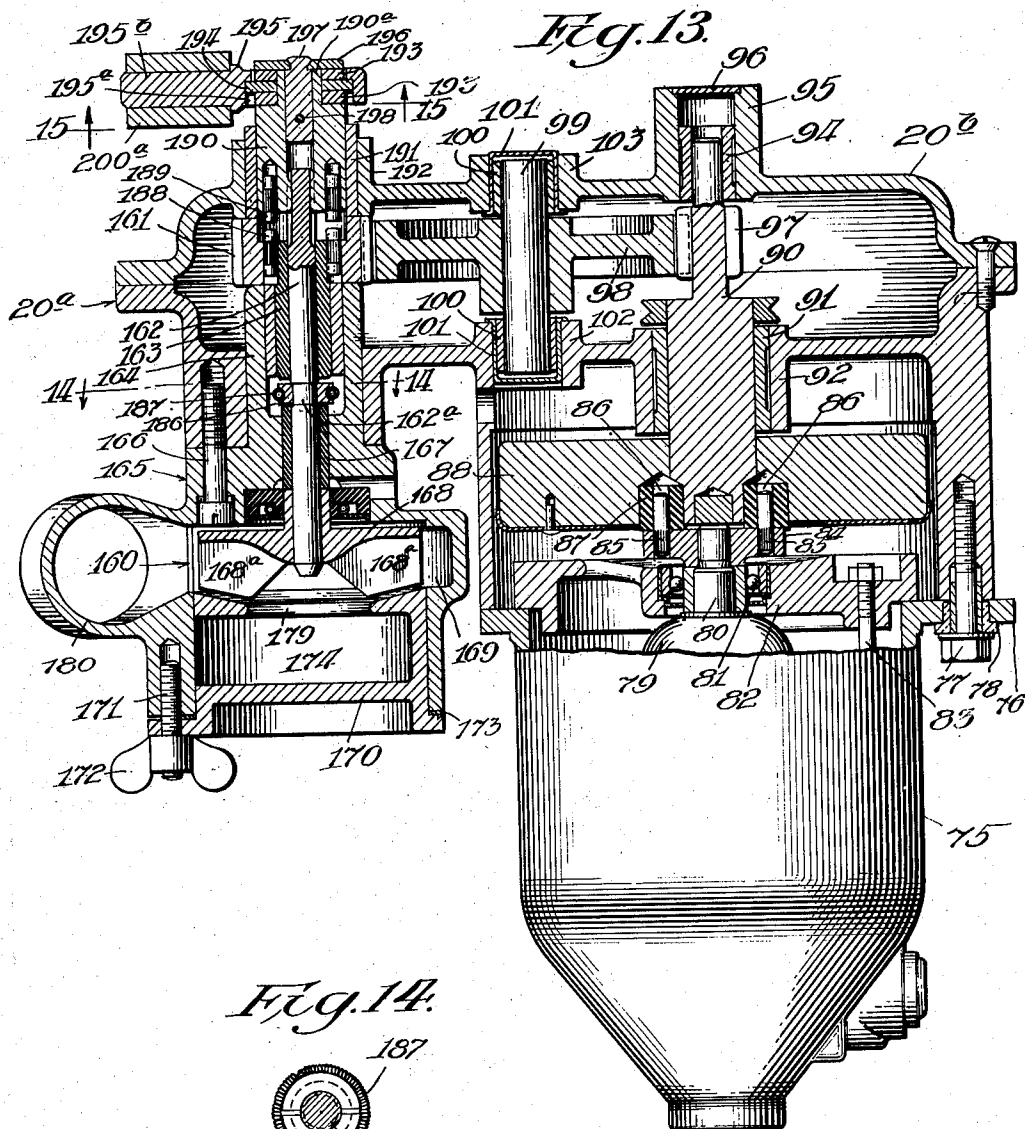


Fig. 14.

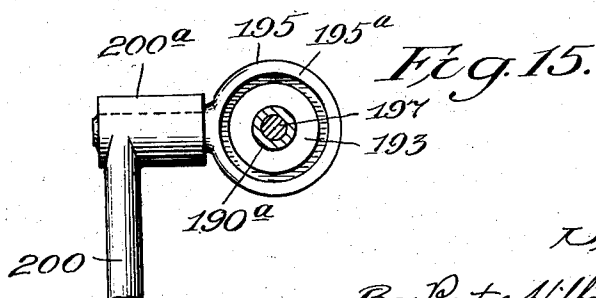
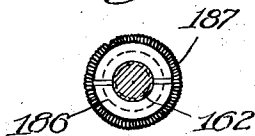


Fig. 15.

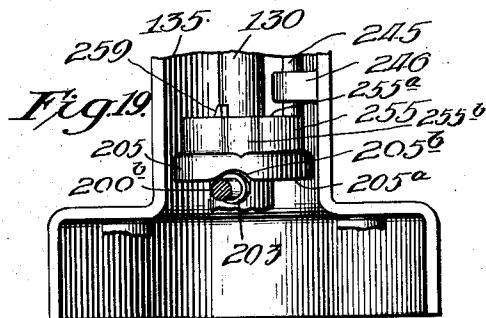
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WASHING MACHINE

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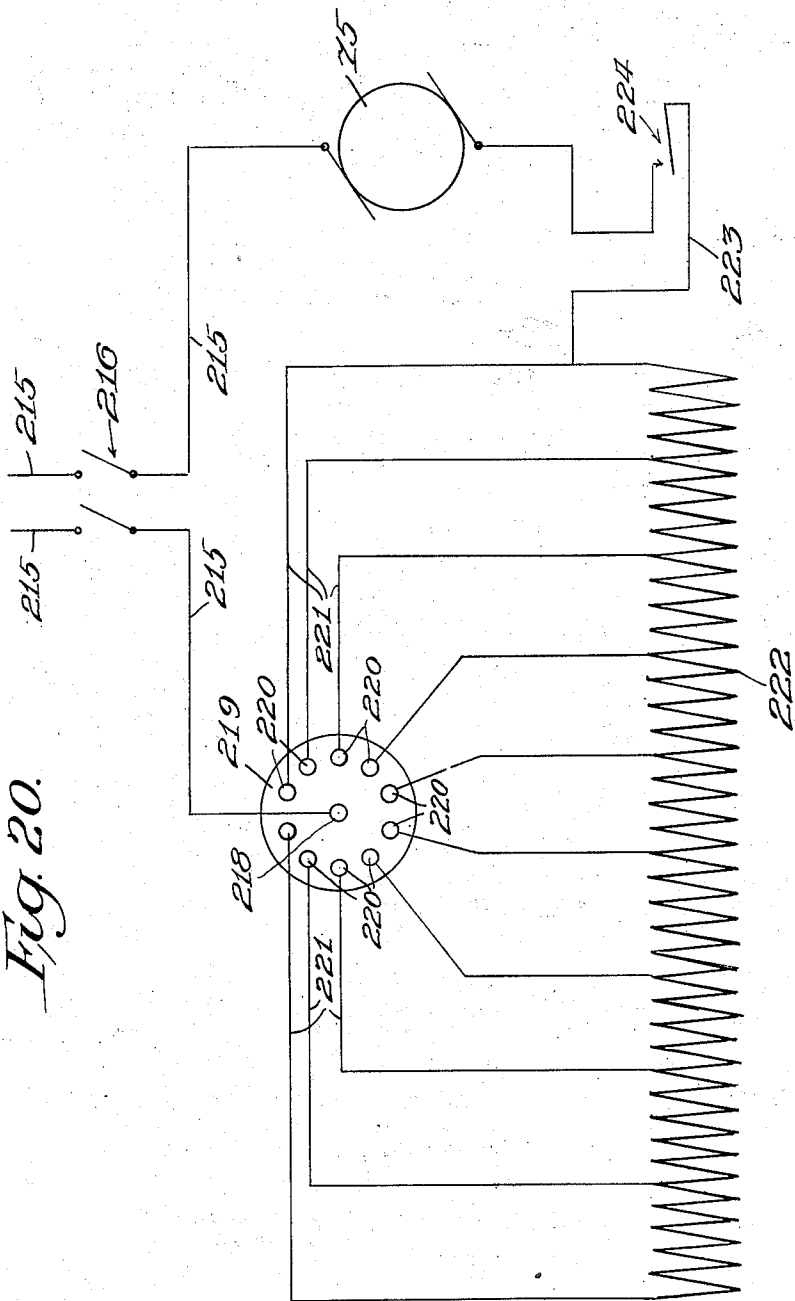
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Fig. 20.



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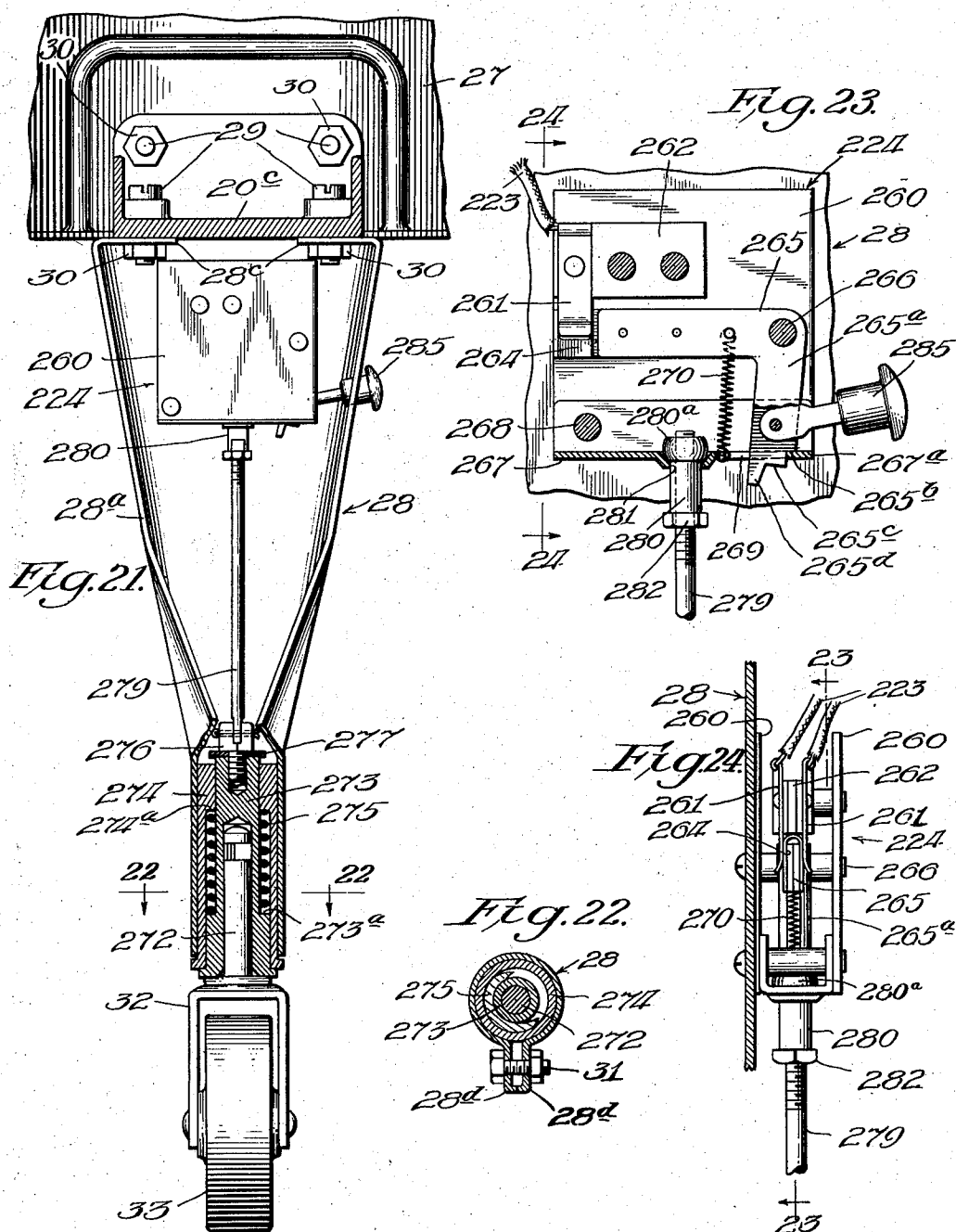
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10 Sheets-Sheet 10



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UNITED STATES PATENT OFFICE

2,082,108

WASHING MACHINE

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Application November 13, 1930, Serial No. 495,444

11 Claims. (Cl. 68—15)

This invention relates to improvements in washing machines of the tub type wherein a clothes drying basket and a clothes agitator are located within the tub and one of its objects is to provide improved mechanism for actuating the agitator and the basket. Another object is to provide a washing machine having a clothes agitator and a clothes drying basket located within a vessel for containing washing fluid in combination with means for actuating the agitator and the basket and means for pumping fluid to and from the vessel in combination with improved means for controlling the operation of the pump and the driving means for the basket and agitator. Still another object is to provide a washing machine comprising a vessel for containing washing fluid and a clothes drying basket located therein with means for rotating the basket at high speed and means for automatically retarding the speed of rotation of the basket in the event that excessive vibration is set up by its rotation. A further object of the invention is to provide means for preventing the swirling of the washing fluid in the washing vessel of a washing machine during the rotation of a drying basket located therein. Another object of the invention is to provide a washing machine embodying a rotary clothes drying basket with motor driven means for rotating the basket and automatic means operated upon excessive vibration of the machine for automatically arresting the operation of the motor.

Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings, in which one embodiment is illustrated. In the drawings,

Fig. 1 shows an axial vertical section through a washing machine embodying the improvements of the present invention;

Fig. 2 shows a horizontal section on the line 2—2 of Fig. 1 looking in the direction of the arrows, illustrating a top plan view of the casing in which the operating mechanism is mounted;

Fig. 3 shows an enlarged vertical detail section through a portion of the auxiliary casing on one side of the machine, showing the structure of the electric switch by which the starting and stopping of the machine is effected in normal operation;

Fig. 4 is a detail section taken on the line 4—4 of Fig. 3;

Fig. 5 shows an enlarged central vertical sec-

tion taken through the axis of the machine, illustrating the structure of the parts by which the clothes agitator and clothes basket are directly driven and the connection therewith of the driving mechanism;

Fig. 6 is a detail horizontal section taken on the line 6—6 of Fig. 5;

Fig. 7 is a detail horizontal section taken on the line 7—7 of Fig. 5;

Fig. 8 shows an enlarged vertical section taken on the line 8—8 of Fig. 2, illustrating the means for oscillating the clothes agitator and rotating the basket and a portion of the controlling means therefor;

Fig. 9 shows a horizontal section taken on the line 9—9 of Fig. 8 with the top portion of the casing removed;

Fig. 10 is a horizontal sectional view taken on the line 10—10 of Fig. 8, showing a plan view of the oscillatory arm by which the clothes agitator is actuated;

Fig. 11 shows a bottom plan view of the operating mechanism within the casing with the bottom cover portion of the casing removed;

Fig. 12 is a detail vertical section showing the inlet and outlet passages leading to and from the pump;

Fig. 13 is a vertical section taken on the line 13—13 of Fig. 2, showing the structure of the driving motor and the connected pump;

Fig. 14 is a detail section taken on the line 14—14 of Fig. 13;

Fig. 15 is a detail section taken on the line 15—15 of Fig. 13;

Fig. 16 is a detail vertical section on the line 16—16 of Fig. 1, illustrating, in elevation, a portion of the auxiliary casing at one side of the machine and the means contained therein for controlling the operation of the clothes agitator, drying basket and pump, and the switch by which the starting and stopping of the machine is controlled;

Figure 17 shows a top plan view of the auxiliary casing illustrated in Fig. 16;

Fig. 18 is a detail section taken on the line 18—18 of Fig. 16;

Fig. 19 is a view in elevation of the controlling means illustrated in the lower part of Fig. 16 with the cam operating shaft locked against rotation by the plunger which is connected to the motor controlling switch;

Fig. 20 is a diagrammatic view showing the circuit connections by which the electric motor is driven and of the rheostat by which the motor is controlled;

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Fig. 21 shows an enlarged elevation of one leg of the machine with the lower part thereof cut away to reveal in vertical section the means by which the circuit of the motor is automatically controlled through means connected to one of the supporting rollers of the machine when excessive vibration is encountered during the rotation of the drying basket;

Fig. 22 is a detail section taken on the line 22—22 of Fig. 21;

Fig. 23 shows an enlarged front elevation of the electric switch illustrated in Fig. 21 as being mounted within the supporting leg, with the front cover of the switch casing removed; and

Fig. 24 is a detail vertical section taken on the line 24—24 of Fig. 23.

As illustrated in the drawings, the invention is embodied in a washing machine comprising a hollow frame or casing 25 having a removable lower part 20^a which is attached to the upper part 20^b by means of cap screws 26 engaging the projecting flanges around the edges of these parts. The upper part 20^b of the casing is provided with three radially extending arms 20^c which are spaced apart uniformly and which are united at their outer ends with a circular metallic frame member 27. The ends of the arms 20^c are also connected to supporting legs 28 which are formed of sheet metal and which are bent to have a substantially U-shaped cross-section with side walls 28^a extending inwardly beneath the arms of the frame or casing. The outer portion of each leg has an outwardly extending flange 28^b which lies in contact with the circular frame member 27 and the side walls 28^a are provided at their upper ends with flanges 28^c which underlie the arms 20^c of the casing 20. The flanges 28^b and 28^c are secured to the respective arms 20^c of the casing by means of bolts 29 and nuts 30, as shown particularly in Figs. 1 and 21. The lower portion of each leg 28 is bent into circular form with the meeting ends united by means of projecting flanges 28^d and the bolts 31. These lower cylindrical portions of the legs serve as bearings for the trunnions of the casters 32 which are provided with rollers 33 adapted to rest upon the floor or other support 34. The casters are thus free to turn about vertical axes and permit the machine to be moved about radially on its support.

Within the upper portion of the circular frame member 27 is located the lower part of the tub or vessel 35 which is adapted to contain the washing fluid. The outer cylindrical wall of this tub is provided with an annular bead 35^a which is adapted to rest upon the upper edge portion 27^a of the circular frame so that the tub is removably positioned on the frame with its bottom wall 35^b spaced somewhat above the frame or casing 20 which contains the driving mechanism. The outer cylindrical wall of the tub is provided with another bead 35^c adjacent its upper end and the extreme upper edge is turned outwardly as shown at 35^d and embedded in an annular ring 36 of rubber or the like which serves as a seat for the removable cover 37. This cover is provided with a central depression having a handle 38 secured therein and the outer edge portion of the cover is reversely bent upon itself to form a double flange 37^a which rests upon the ring 36. A flange 37^b extends downwardly from the flange 37^a in contact with the ring 36 and terminates in an annular bead 37^c.

A basket 40 adapted to contain the clothes to be washed and dried is located in the upper part of the tub or vessel 35. This basket has an outer

annular wall 40^a which is preferably flared upwardly and which has its upper edge turned inwardly as shown at 40^b with a plurality of apertures 41 located just below this curved portion so that when the basket is rotated at high speed, the water in the clothes is carried by centrifugal force up the incline wall 40^a and thence outwardly through the openings 41 into the vessel 35. The curved portion 40^b terminates in a bead 40^c which surrounds the opening through which clothes are inserted into or withdrawn from the basket. The lower wall 40^d of the basket is tapered upwardly toward its center and is secured to the arms of a spider 42 by means of rivets 43. The spider 42 is provided at its center with a hub 42^a which is secured to a vertically extending sleeve 45. This sleeve has its lower end 45^a turned outwardly beneath the hub of the spider and a bushing 46 is interposed between the sleeve and the hub with a portion thereof extending upwardly beyond the spider, as shown particularly in Fig. 5.

A clothes agitating device 50 is located within the basket 40 and it comprises a downwardly and outwardly flared flange or skirt 50^a which is adapted to oscillate immediately above the central inclined portion of the lower wall 40^d of the basket. This skirt has an enlarged rib 50^b around its outer edge and its upper side is formed integrally with the lower part of three vertically extending vanes 50^c. These vanes and the inner part of the skirt portion 50^a are integrally united with a center column 50^d which encloses the sleeve 45 of the basket with an annular space 51 between them. The lower part of the column 50^d of the agitator is provided with an annular inwardly extending rib 50^e, as shown in Fig. 5, which carries a bushing 52 arranged to turn on the upper portion of the bushing 46 carried by the basket. A number of openings 50^f extend downwardly through the outer portion of the rib 50^e to permit the escape of any water which may collect within the annular space 51. The upper end of the column 50^d terminates in a hub portion 50^g of reduced diameter having splines or keyways 53 on the inner side thereof for establishing a driving connection with the driving member 54 and at the same time permitting the agitator to be removed when desired from its position within the basket.

For the purpose of actuating the clothes agitator and rotating the basket, driving connections are established through the lower walls of the basket and tub. As shown particularly in Fig. 5, the upper portion of the casing 20 is provided with a hub 54^a having secured therein a hollow center post 55. This post extends upwardly through an opening in the lower wall 35^b of the tub and a fluid-tight connection is established by means of two collars 56 and 57, one of which contacts with the center post while the other collar 57 surrounds and threadedly engages the first collar so that the two collars may be caused to compress the gaskets 58 which are located above and below the bottom wall 35^b of the tub when one collar is screwed downwardly on the other, each collar being provided with an outwardly extending flange which engages one of the gaskets. The center post 55 extends upwardly into the sleeve 45 of the basket 40 and is provided within the hub 42^a of the spider 42 with a fixed annular bearing member 59 on which revolves a bushing 60 carried by the sleeve 45 of the basket. Within the center post 55 there is located a hollow shaft 61 and within this hollow shaft there is positioned a solid shaft 62. The

upper end of the post 55 is provided with a bushing 63 which serves as a bearing for the upper part of the hollow shaft 61 and this shaft extends above the center post with its upper end secured to the driving member 64 which is splined within a driving block 65 secured within the upper end of the sleeve 45 of the basket so that when the hollow shaft 61 is rotated, the basket is rotated at the same speed. The shaft 62, which drives the agitator 50, has a hard metal bearing member 66 secured to the upper part thereof to revolve within a bushing 67 which is carried by the upper end of the hollow shaft 61 and the solid shaft 62 projects above this bearing with its upper end keyed within the driving block 64, previously described, so that a driving connection is thereby established between this shaft and the agitator. A collar 68 surrounds the shaft 62 immediately above the annular bearing member 66 and serves to limit the downward movement of the hub portion 50' of the agitator upon the driving block 64. During the operation of washing the clothes within the basket, the shaft 62 is adapted to have an oscillatory motion imparted thereto and during the subsequent drying of the clothes, the shaft 62 is adapted to remain stationary while the hollow shaft 61 is rotated at high speed to effect a corresponding rotation of the basket.

The shafts by which the basket and the agitator are actuated are driven, through intermediate mechanism, by an electric motor 75 shown particularly in Figs. 1 and 13. The casing of this motor is provided with an outwardly extending flange 76 which is secured to the lower part 20^a of the casing 20 by means of cap screws 77 passing through the insulating bushing 78. The armature 79 of this motor has its shaft 80 journaled in a ball bearing 81 which is secured within a bearing plate 82 which serves as one end of the motor casing and which is secured in place by bolts 83. Immediately above the ball bearing 81, the shaft 80 of the motor is provided with a fixed collar 84 which is provided with a number of upwardly extending pins 85 arranged to engage apertures 86 formed in the blocks 87 which are embedded in a flywheel 88. This flywheel is adapted to maintain the uniform operation of the motor independently of sudden shocks which may be imparted to the clothes basket or the clothes agitator during the operation of the machine. The flywheel has a driving connection with an enlarged vertical shaft 90 which is mounted to revolve in a bushing 91 secured within a hub 92 which is carried by the lower part of the casing 20. The upper part of this shaft 90 is reduced in diameter and is journaled in a bushing 94 mounted in a hub 95 which is carried by the upper part 20^b of the casing. The upper end of this hub is closed by a cover plate 96. A pinion 97 is secured on the shaft 90 below the bushing 94 and this pinion meshes with an intermediate gear 98 which is secured on a shaft 99. This shaft is arranged to revolve in bushings 100 which are mounted within the cups 101 secured within hubs 102 and 103 carried by the lower and upper parts of the casing, respectively.

The gear 98 rotates continuously when the motor 75 is in operation and it is arranged to mesh continuously with another gear 105 which rotates about the lower end of the shaft 62, as shown particularly in Figs. 5, 8 and 9. Bushings 106 are secured within the hub of the gear 105 to rotate upon the shaft 62. The lower portion of the gear 105 is formed integrally with a pinion 107 and the lower end of the gear rests upon a collar 108 which

in turn is supported by a pinion 109 keyed on the lower end of the shaft 62. The extreme lower end of the shaft 62 is mounted to revolve in a ball bearing unit 110 which is located within a cup 111 adapted to prevent the leakage of oil from the lower part of the casing 20 in which it is secured. The pinion 107 is adapted to drive a train of mechanism which imparts an oscillatory motion to the pinion 109 and for this purpose the pinion 107 is arranged to mesh continuously with a gear 112 shown particularly in Figs. 8 and 9. This gear is mounted on a shaft 113 which is journaled in bearings carried by the upper part of the casing 20 and this shaft has also secured thereon a pinion 114 which meshes continuously with a large gear 115. The latter gear is secured upon a shaft 116 which is journaled in bushings 117 mounted within the oil-retaining cups 118 which are secured within hubs 119 and 120 carried by the lower and upper parts of the casing 20, respectively. The hub of the gear 115 is provided with an eccentric bearing portion 121 which is mounted to revolve in an annular bearing 122 formed in a sliding block 123. This block is adapted to slide longitudinally in guides 124 which are carried by an oscillatory arm 125. This arm is provided at one end with a hub 125^a adapted to oscillate upon a bearing 126 and at its other end it is provided with a gear sector 125^b which meshes with the pinion 109, previously described, so that when this arm 125 is oscillated about the bearing 126, the gear sector imparts an oscillatory motion to the pinion 109 and shaft 62 to effect a corresponding oscillatory motion of the agitator 50 within the basket 40. This driving mechanism for imparting an oscillatory motion to the clothes agitator is described and claimed in my co-pending application Serial No. 338,456, filed February 8, 1929, which has now matured into United States Patent No. 2,021,785, dated November 19, 1935.

In order that the gear sector of the oscillatory arm 125 may be engaged with and disengaged from the pinion 109, the bearing 126, upon which it oscillates, is eccentrically mounted upon an operating shaft 130, as shown in Figs. 8 and 16. The shaft 130 is keyed within the eccentric bearing 126 and its lower end is journaled in a bushing 131 which is secured within the oil-retaining cup 132 mounted in an aperture formed in the lower wall of the casing 20. The shaft 130 is also journaled at an intermediate point in a bushing 133 which is mounted within a hub 134 formed in the upper wall of the casing 20. The shaft 130 projects above the casing 20 and extends upwardly at the side of the tub 35 within an auxiliary housing 135 which is attached to the casing 20 by cap screws 136. At its upper end, the casing 135 is enlarged as shown at 135^a and this enlarged part has a cover plate 137 secured thereon. The shaft 139 projects through a bearing 138 formed in this cover plate and the upper end thereof is provided with a relatively fixed handle 139 by which it may be turned in order to effect the desired angular movement of the bearing 126 and thereby move the gear sector 125^b of the oscillatory arm into or out of engagement with the pinion 109. By shifting the oscillatory arm 125 longitudinally, the motion of the continuously rotating gear 115 may be utilized through the eccentric 121 and the sliding block 123 to effect an oscillatory movement of the arm 125 and a similar motion of the clothes agitator 50.

For the purpose of rotating the basket 40 at high speed for drying purposes, when the clothes

agitator 50 is in operation, the continuously rotating gear 105, previously referred to, is adapted to be connected to the lower end of the hollow shaft 61. This driving connection is established through a friction clutch member 140 mounted to revolve about the bushing 141 which is secured to the shaft 61 and serves as a bearing for the lower part of the shaft 61. This lower part of the shaft 61 is spaced from the lower end of the center post 55 by means of a bushing 142, in which it revolves, and the clutch member 140 is splined upon the lower extremity of the shaft 61 so that it has a driving engagement therewith while being permitted to move longitudinally of the shaft 62. When the clutch member is moved downwardly, its lower flat face is adapted to engage a number of friction blocks 144, of cork or the like, which are secured in recesses formed in the upper side of the gear 105 so that a driving connection is thereby established between this gear and the hollow shaft 62 for the purpose of effecting the rotation of the basket 40. When the clutch member 140 is elevated, as shown in Fig. 8, the gear 105 continues to rotate about the shaft 62 without effecting the rotation of the basket. The vertical movement of the clutch member 140 is effected through a bell crank lever 145 which is provided with a pair of ears 145^a journaled on the ends of a shaft 146 secured to the top wall of the casing 20 by a stud 147. The bell crank lever 145 is provided with a horizontally extending bifurcated arm 145^b, parts of which extend on opposite sides of the clutch member 140 with their extremities pivotally connected by pins 148 to the blocks 149 which are mounted in the annular groove 140^a of the clutch member. The rocking of the bell crank lever 145 about the shaft 146 is therefore adapted to raise or lower the clutch member on the shaft 62 and this rocking movement is effected by means of a shifter arm 150 which is pivoted at 151 to the depending arms 145^c of the bell crank lever. The shifter arm is provided with a central aperture 150^a to receive the hub 120 previously described and it extends horizontally in the casing 20 with the outer end thereof provided with a notch 150^b, thus forming a forked end on the shifter arm which is adapted to straddle the reduced portion 134^a of the depending hub 134 formed on the upper wall of the casing. At a point adjacent this end of the shifter arm, it is provided with a bolt 152 carrying a bushing 153 upon which a roller 154 is mounted to revolve. This roller bears against the peripheral surface of a cam 155 which is formed integrally with the eccentric bearing 126 previously described and spaced upwardly therefrom, as shown in Fig. 8. The cam 155 is provided on one side with a recess 155^a, shown in Fig. 11, so that when it is turned to bring this part of the cam into engagement with the roller 154, the shifter arm 150 moves toward the right, as viewed in Figs. 8 and 11, to permit the clutch member 140 to fall by gravity into engagement with the friction blocks 144 and thereby establish a driving connection between the gear 105 and the clutch member. When the cam 155 is rotated to the position shown in Fig. 8, the shifter arm 150 is pushed toward the left, as viewed in Figs. 8 and 11, so that the bell crank lever 145 is rocked to elevate the clutch member 140 and thereby permit the gear 105 to rotate freely without actuating the shaft 61 by which the basket 40 is driven. The depression 155^a in the cam 155 is so located with respect to the eccentricity of the bearing member 126 that it is impossible to

move the clutch member 140 into engagement with the friction blocks of the gear 105 at the same time that the gear sector 125^b of the oscillatory arm 125 is in mesh with the pinion 109. The operator of the machine is thus prevented from effecting the simultaneous operation of both the clothes agitator and the drying basket.

The gear 98, driven by the motor 75, which serves through the connections described above to oscillate the clothes agitator 50 and to rotate the basket 40, also serves as the driving means for a pump 160 by which washing and rinsing fluids and the like are pumped to and from the pump 35. Referring particularly to Figs. 9 and 13, it will be seen that the gear 98 meshes with a pinion 161 which is mounted to revolve about a vertical pump shaft 162. This shaft is journaled in the hub of the pinion 161 which extends downwardly and is in turn mounted to revolve within a bushing 163 secured within the upwardly extending hub member 164 which is formed as a part of the pump casing 165. The pump casing is secured to the casing 20 by cap screws 166 and the lower part of the hub 164 is provided with another bushing 167 in which the lower part of the pump shaft 162 is journaled. The shaft 162 extends below the bushing 167 and has the pump impeller 168 secured thereon within the pump chamber 169. The lower part of the pump casing 165 is provided with a removable hollow cap 170 which is normally secured in place by bolts 171 and wing nuts 172 with a gasket 173 interposed between the flange of the cap and the end of the pump casing in order to provide a fluid-tight closure. The cap 170 has a chamber 174 which communicates with the outwardly extending conduit 175, shown particularly in Figs. 12 and 13. This conduit communicates with an upwardly extending pipe 176 which has a fluid-tight connection with the bottom of the tub 35 and it also communicates with a drain cock 177 which may be opened to permit the contents of the tub 35 to drain outwardly. Assuming that water or other fluid is to be drawn inwardly from the tub 35 through the conduit 175 by the action of the pump, this fluid passes through the chamber 174 and thence upwardly through the inlet opening 179 of the pump. It is then discharged outwardly by the radiating vanes 168^a of the impeller 168 into the discharge conduit 180 of the pump. This conduit is connected through a flexible tube 181 with a pipe 182 which is secured to the side of the tub 35 and which is connected through a packing joint 183 with a rotatable nozzle 184. This nozzle may be turned from the position shown in Fig. 1 to a position where its mouth overlies the tub and the basket 40 so that fluid may be pumped upwardly from the tub and discharged into the basket.

In order to retain the shaft 162 and the pump 168 in their proper vertical positions, the shaft is grooved between the bushings 163 and 167, as shown at 162^a, and this grooved portion has a split collar 186 secured thereto by an encircling coil spring 187, as shown in Figs. 13 and 14. This collar is adapted to engage the upper end of the bushing 167 to limit the downward movement of the pump shaft and the impeller. Since the pinion 161 is freely rotatable on the pump shaft 162, means must be provided for establishing a driving connection in order to operate the pump and this is brought about by a series of clutch teeth 188 which project upwardly from the pinion 161 and which are adapted to mesh with similar clutch teeth 189 projecting downwardly from a

clutch member 190 which is splined upon the upper end of the pump shaft 162 and which is adapted to slide vertically and to revolve within a bushing 191 which is secured within the hub 192 formed as a part of the upper portion of the casing 20. The vertical reciprocation of the clutch member 190 is effected through a connection which is made to the clutch member by means of a pair of washers 193 which are seated upon the upper end of the clutch member around the reduced portion 190^a thereof. A disk 194 is seated between these washers and the outer edge of the disk is adapted to engage a cup-shaped recess 195^a formed in the member 195. The washers and the disk 194 are retained in place by a cap 196 which is secured to a pin 197 extending downwardly into the bore of the clutch member and secured in place by a transverse pin 198. The member 195 may thus be lifted off of the clutch member but is normally held in engagement therewith by the frictional contact of the disk 194 with the wall of the recess 195^a. The member 195 is provided with a trunnion 195^b which is rotatably mounted in a hub 200^a carried at the end of the clutch rod 200, as shown particularly in Figs. 13 and 15. The clutch rod is pivoted at 201 on a bracket 202 which is secured to the upper side of the casing 20, as shown in Fig. 2, and the outer end of the reduced portion 200^b of the clutch rod is provided with a roller 203 which is adapted to contact with the lower face 205^a of a cam 205. This cam is secured on the operating shaft 130, previously described, by which the cam 155 and the eccentric bearing 126 are rotated. This cam is provided on its under side with a recess 205^b into which the roller 203 may project and thereby allow the clutch member 190 to be lowered so that the clutch teeth 188 and 189 will mesh with each other and permit the pump to be driven by the motor. This movement of the clutch rod 200 is insured by a coil spring 206 which is mounted on a stud 207 projecting upwardly from the casing 20 and which is arranged so that its upper end engages the under side of the rod 200 at the right of its pivot 201, as shown in Fig. 8. A pair of lugs 208 project upwardly from the casing 20 on opposite sides of the free end of the rod 200 so that the lateral bending of the rod under the influence of the rotation of the cam 205 is prevented. The cam 205 is so positioned on the shaft 130 that the clutch member 190 is always elevated and the pump thereby rendered inoperative during the time when the cam 155 is actuated to effect the rotation of the basket 40 and during the time that the eccentric bearing member 126 is actuated to cause the oscillation of the agitator 50. On the other hand, when the shaft 130 is rotated to a position wherein the cam 205 permits the operation of the pump, the cam 155 and the eccentric 126 are rotated to positions where the oscillation of the agitator 50 and the rotation of the basket 40 are prevented. In order that these positions of the shaft 130 may be readily apparent to the operator of the machine, the cover plate 137 of the auxiliary casing 135 is provided with certain legends to indicate the required positions of the handle 139 in order to bring about the operation of the pump or basket or the clothes agitator. When the handle 139 is in the position shown in Fig. 17, it is immediately over the legend "Wash" which is inscribed on the cover plate 137, as shown at 210, and when it is moved to a rightangular position, it is over the legend "Pump" shown at 212. When the handle 139 is

turned 180 degrees from the position shown in Fig. 17, the shaft 130 is then in a position to effect the rotation of the basket 40, as indicated by the legend "Dry" shown at 213.

Referring now to the electric circuit by which the operation of the motor 75 is controlled, and particularly to Figs. 16 to 20, inclusive, it will be seen that the electric motor is supplied with current from a pair of line conductors 215 which have a double pole switch 216 connected therein and located in the casing 135. One of the conductors 215 leads to one terminal of the motor 75 and the other line conductor 215 leads to a contact 218 fixed on an insulating plate 219 which is secured within the upper enlarged part of the auxiliary casing 135. The plate 219 carries a number of other contacts 220 and a conductor 221 leads from each of the contacts 220 to some part of the resistor 222 of a rheostat. The connections of the wires 221 are spaced apart along the resistor 222 and one end of the resistor is connected by a conductor 223 through a switch 224 to the other terminal of the motor 75. The contact plate 225 of the rheostat extends outwardly from a central shaft 226 which is fixed to turn in contact with the central contact 218 of the rheostat and which extends upwardly through the cover plate 137 where it is engaged by a relatively fixed handle 227. By turning the handle 227, the plate 225 may be moved so that its outer extremity will engage any desired one of the contacts 220 so that one or more units of the resistor 222, shown in Figs. 2 and 20, may be included in the circuit of the motor, thus varying the speed of the motor to suit the requirements of the operator. In order that the speed may be indicated, the handle 227 is provided with a pointer 229 which is adapted to travel over the graduations 230 described on the cover plate 137, as shown in Fig. 17. In addition to the numbers indicating the different degrees of speed, the extreme limits are also indicated by the words "Fast" and "Slow" which appear at the ends of the graduations.

The opening and closing of the circuit of the motor is normally effected by the operator through the operation of the switch 216 which is mounted in the upper part of the auxiliary casing 135. This switch may be of any suitable form but is illustrated as a double pole switch having two pairs of double blades 231 the ends of which are adapted to extend on opposite sides of stationary contact blades 232, when the switch is closed, as shown in Figs. 3 and 4. The blades 232 are secured on an insulating plate 233 which also supports a central frame 234 about which the movable blades 231 are adapted to pivot. For this purpose, the blades 231 are mounted upon a plate 235 which is pivoted on the frame 234 and the blades 231 are separated from the plate 235 by suitable insulating members 236. The tilting of the plate 235 about its pivot is effected by a lever 237 which is pivoted on the frame 234 at the points 238. A plate 239 is carried by the lever 237 adjacent the axis of its pivotal movement and this plate 239 is adapted to engage the shoulders 240 formed on the frame 234 in order to limit the pivotal movement of the lever. The lever 237 has an inwardly extending arm 237^a provided with a rounded extremity which seats in a recess 241^a formed in a cylindrical cap member 241. This cap member is mounted upon one end of a coil spring 242 which has its other end seated over a lug 243 formed on the tilting plate 235. The spring 242 is thus

adapted to oscillate about the lug 243 so that it may assume a position at either side of the plane of the plate 235. When the lever 237 is turned about its pivot, the part 237^a compresses the spring 242 and rocks it until it assumes a position wherein its axis is contained within the plane of the plate 235 and then upon a slight further movement of the lever, the spring 242 expands and causes the plate 235 and the switch plates 231 to snap to the other extreme position. This causes the switch to partake of sudden opening and closing movements after predetermined movements of the lever 237.

The operation of the lever arm 237 of the switch 216 is effected by means of a reciprocating switch rod 245 which is mounted to slide vertically in the cover plate 137 of the auxiliary casing and in a lug 246 which is formed on this casing adjacent the lower end thereof, as shown in Fig. 16. The rod 245 is provided at its upper end with a handle 247 by which it may be raised or lowered and this handle carries an arm 248 having a curved extremity which fits against the side of the shaft 130 so that the turning of the switch rod 245 is thereby prevented. The switch rod is provided within the housing 135 with a fixed block 249 having formed therein a recess 250 which is engaged by the rounded extremity of the outer portion of the lever 237. When the switch rod 245 is moved vertically, the lever 237 is therefore operated to open or close the switch 216. The rod 245 is normally held in its uppermost position by means of the switch. The purpose of extending the switch rod 245 into the lower part of the auxiliary casing 135 is to provide means for preventing the turning of the operating shaft 130 at certain times when the switch 216 is closed. This control is effected by the engagement of the lower pointed end 245^a of the switch rod with the upper part of the cam 205, previously described. This cam is provided with a cylindrical upwardly extending part 255 having a flat upper end surface 255^a and provided at intervals with bosses 255^b in which are located three downwardly extending recesses 256, 257 and 258. Adjacent two of the recesses 256 and 258, the member 255 is provided with upwardly extending lugs 259. The three recesses 256, 257 and 258 are positioned to correspond with the "Wash", "Pump" and "Dry" positions of the handle 139. The lower pointed end 245^a of the switch rod normally rides on the upper end surface 255^a of the member 255 and when the handle 139 is in one of the operating positions just described, the switch rod 245 is in registry with one of the recesses 256, 257 or 258 so that the switch rod may then be pushed downwardly to close the switch and set the motor in operation. When the handle is moved to the "Wash" position or the "Dry" position, the lower end of the switch rod engages one of the lugs 259 so that the proper positioning of the member 255 is automatically determined and the switch rod may then be pushed downwardly into one of the recesses 256 or 258. When the switch rod has been pushed downwardly into one of the recesses in the member 255, the handle 139 and the operating shaft 130 are then held against rotation so that the driving mechanism cannot be shifted from the connection for washing to the connection for drying or vice versa, or from either of these connections to the pumping connection without again opening the switch 216 and stopping the operation of the motor. On the other

hand, the motor cannot be started when the handle 139 and the operating mechanism are in any one of the intermediate positions which are brought about during the turning of the cams 155 and 205 or turning of the eccentric bearing member 126.

During the normal operation of the washing machine, the switch 224, illustrated diagrammatically in Fig. 20, is closed. The switch 224 is located within one of the hollow legs 20 of the machine, as shown particularly in Fig. 21. This switch is provided for the purpose of automatically opening the circuit and arresting the operation of the motor in case the vibration of the machine becomes excessive during the rotation of the basket 40 for drying purposes. This switch comprises a casing 260 which is secured in the upper end of the leg and which encloses a pair of contact blades 261 mounted on an insulating block 262 and each connected to a separate part of the conductor 223. The blades 261 are adapted to be connected by a movable contact member 264 which is movable to the closed position shown in Fig. 23 by the bell crank lever 265 upon which it is mounted. The bell crank lever is pivoted at 266 within the switch casing and is provided with a downwardly extending arm 265^a having at its lower end a pair of shoulders 265^b and 265^c, the latter of which is bounded on one side by the projecting tongue 265^d. The shoulder 265^b normally engages the ledge 267^a which is formed at one end of a lever 267, of U-shaped cross section, pivoted at 268 in the lower part of the casing 260. This lever 267 is provided with a slot 269 through which the lower end of the arm 265^a of the bell crank lever extends. A coil spring 270 connects the lever 267 with the upper horizontal arm of the bell crank lever 265 but the two levers are normally prevented from moving toward each other under the influence of this spring by the engagement of the shoulder 265^b with the ledge 267^a so that the lever 265 is normally not moved from the position wherein the movable contact 264 serves to connect the switch blades 261. This movement of the lever 265 to open the switch is adapted to be effected automatically, upon excessive vibration of the machine, by connections extending downwardly to the caster 32 upon which the leg 28 is mounted. This caster has a trunnion 272 which is journaled in a plunger 273 slidably mounted in a sleeve 274 secured within the lower tubular part of the leg 28. The upper part of the plunger 273 is reduced in diameter and a coil spring 275 is interposed between the shoulder 273^a which is thus formed on the plunger and another shoulder 274^a which is formed at the upper end of the enlarged bore of the sleeve 274. This spring is of such strength that the leg 28 and sleeve 274 are ordinarily permitted to occupy their normal position on the plunger 273, as shown in Fig. 21, during the normal operation of the machine. The upper end of the plunger 273 is threadedly engaged by a stud 276 which secures in place a washer 277 adapted to overlap the upper end of the bore of the sleeve 274. The head of the stud 276 is pivotally connected to a rod 279 which threadedly engages at its upper end a nut 280 having a rounded head 280^a. This nut engages an aperture 281 formed in the lower wall of the lever 267 and the rounded head 280^a is located on the upper side of the lever so that a connection is thereby established between the lever and the plunger 273. The effective length of the rod

279 may be varied by adjusting the nut 280 and then securing it in adjusted position by a lock nut 282. With this arrangement, the parts normally remain substantially as illustrated in Figs. 21, 23 and 24. Upon vibration of the machine, the leg 28 and sleeve 274 tend to move upwardly on the plunger 273 and when an excessive degree of vibration occurs, the upward movement of the leg and switch casing causes a relative separation vertically of the lever 267 and the switch casing and thus permits the ledge 267^a to move out of engagement with the shoulder 265^b. The bell crank lever 265 is then free of restraint at its lower end so that the spring 270 can pull the upper end of the arm of the lever 265 downwardly and open the switch while at the same time the ledge 267^a passes into engagement with the shoulder 265^c and the tongue 265^d limits the opening movement of the switch. The operation of the motor 75 is then automatically arrested and cannot be restored until the operator restores the switch 224 to closed position. This may be done by engaging with the fingers a handle 285 which is pivotally connected to the lower arm 265^a of the bell crank lever and which projects from the switch casing as shown in Figs. 21 and 23. This handle 285 may be manipulated to close the switch and permit the lever 267 to be restored to its normal position, bringing the shoulder 265^b again into engagement with the ledge 267^a.

In the lower part of the tub 35 beneath the basket 40, there is mounted a baffle plate 290 which is in the form of a flat plate mounted in a vertical plane and formed of two complementary parts which overlap the opposite sides of the center post 55 to which they are fitted by having their middle portions curved to form the sections of a hub. These parts which overlap the center posts are clamped together by screws 291 so that the baffle plate is held rigidly in place on the center post. It preferably extends substantially across the entire width of the tub and is located adjacent the normal upper surface level of the washing fluid in the bottom of the tub so that it effectively prevents a whirling motion of this fluid about the axis of the tub under the influence of the air currents set up by the rotating basket 40 during the drying operation. The baffle plate has the further advantage that in the event of excessive vibration of the washing machine during the drying operation, the water will tend to splash up over this baffle plate and engage the bottom of the basket and thereby automatically reduce the vibration through retarding the rotation of the basket.

Although one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments within the scope of the appended claims.

I claim:

1. The combination in a washing machine, of a tub, a center post extending upwardly from the bottom of said tub, a basket mounted in the upper part of said tub leaving a space beneath said basket for washing fluid, means for rotating said basket about said center post, and a vertically extending baffle plate detachably secured to and carried entirely by said center post and extending radially therefrom beneath said basket.

2. The combination in a washing machine, of a tub for containing washing fluid, a basket and a clothes agitator mounted in said tub, means for actuating said basket and said agitator, means

comprising an electric motor for operating said actuating means, an electric circuit for said motor, a switch for closing said circuit, means comprising clutch mechanism for controlling the operation of said basket and agitator actuating means, and operating means for the switch adapted to interlock with said clutch mechanism for preventing the operation of said clutch mechanism when said switch is closed.

3. The combination in a washing machine, of a tub for containing washing fluid, a basket and a clothes agitator mounted in said tub, a pump for pumping washing fluid into said tub, an electric motor, driving connections from said motor to said basket, said agitator and said pump, independent clutch devices in each of said driving connections, a common controlling member for operating said clutch devices, an electric circuit for said motor, a switch in said circuit, and actuating means for said switch comprising means having an operating connection with said controlling member for preventing the operation of said controlling member when said switch is closed.

4. The combination in a washing machine, of a tub for containing washing fluid, a basket and a clothes agitator mounted in said tub, a pump for pumping washing fluid into said tub, an electric motor, driving connections from said motor to said basket, said agitator and said pump, independent clutch devices in each of said driving connections, a rotatable controlling shaft, means comprising separate cams mounted on said controlling shaft for effecting the actuation of said clutch devices, said cams being arranged to prevent the closing of any two of said clutch devices simultaneously, an electric circuit for said motor, a switch in said circuit, and actuating means for said switch comprising means for preventing the rotation of said controlling shaft from any of its clutch engaging positions when said switch is closed.

5. The combination in a washing machine, of a tub for containing washing fluid, a basket and a clothes agitator mounted in said tub, a pump for pumping washing fluid into said tub, an electric motor, driving connections from said motor to said basket, said agitator and said pump, independent clutch devices in each of said driving connections, a controlling shaft extending vertically at the side of said tub, separate cams mounted on said controlling shaft for actuating each of said clutch devices, said cams being arranged to prevent the closing of any two of said clutch devices simultaneously, an electric circuit for said motor, a switch for controlling said circuit, actuating means for said switch comprising a reciprocating rod extending parallel to said controlling shaft, and a member carried by said operating shaft and having separate apertures each of which is adapted to be engaged by said rod when said switch is in closed position with said shaft in a position to cause the engagement of one of said clutch devices.

6. In driving mechanism for a washing machine having a tub, a pair of angularly movable devices in said tub and a hollow center post having a fluid-tight connection with the lower wall of said tub and extending upwardly therefrom, the combination of a hollow shaft journaled within said post for actuating one of said devices, a second shaft journaled within said hollow shaft for actuating the other of said devices, a driving motor, driving connections from said motor to each of said shafts, a disconnecting

device in each of said driving connections for making and breaking the driving connection, a controlling shaft, and means comprising cams mounted on said controlling shaft for operating each of said disconnecting devices.

5 7. In driving mechanism for a washing machine having a tub, a pair of angularly movable devices in said tub and a hollow center post having a fluid-tight connection with the lower
10 wall of said tub and extending upwardly therefrom, the combination of a hollow shaft journaled within said post for actuating one of said devices, a second shaft journaled within said
15 hollow shaft for actuating the other of said devices, a driving motor, driving connections from said motor to each of said shafts, a disconnecting
20 device in each of said driving connections for making and breaking the driving connection, a controlling shaft, and means comprising cams mounted on said controlling shaft for operating
each of said disconnecting devices, said cams being positioned on said shaft to prevent the simultaneous engagement of said disconnecting devices.

25 8. In driving mechanism for a washing machine having a tub, a pair of angularly movable devices mounted in said tub and a hollow center post having a fluid-tight connection with the
30 bottom of said tub and extending upwardly therefrom, the combination of a hollow shaft journaled within said post for actuating one of said devices, a second shaft journaled within said
hollow shaft for actuating the other of said devices, a gear mounted to rotate about the
35 lower end of said second named shaft, a pinion mounted to rotate with said gear, means for rotating said gear and pinion, means comprising a clutch for forming a driving connection between
40 said gear and said hollow shaft, means actuated by said pinion and including a disconnecting device for imparting a reciprocatory motion to said second named shaft, a manually operated controlling shaft, and means actuated by
said controlling shaft for operating said clutch and said disconnecting device.

45 9. In driving mechanism for a washing machine having a tub, a pair of angularly movable devices mounted in said tub and a hollow center post having a fluid-tight connection with the
lower wall of said tub and extending upwardly
50 therefrom, the combination of a pair of shafts

extending upwardly through said center post for actuating said devices, a motor mounted with its shaft extending vertically beneath said tub, a gear driven by said motor, a second gear driven by said first named gear and mounted to rotate
5 freely about the lower end of one of said shafts, means comprising a clutch for causing said second named gear to rotate the other of said shafts, a pinion rotatable with said second gear, and means actuated by said pinion for imparting a
10 reciprocatory motion to said shaft about which said second named gear rotates.

10. In driving mechanism for a washing machine having a tub, a pair of angularly movable devices in said tub and a hollow center post
15 having a fluid-tight connection with the lower wall of said tub and extending upwardly therefrom, the combination of a hollow shaft journaled in said post for actuating one of said devices, a second shaft journaled within said hollow
20 shaft for actuating the other of said devices, driving connections from said motor to each of said shafts, a clutch in one of said driving connections and disengageable gears in the other of said driving connections, a controlling shaft
25 extending upwardly at the side of said tub, and means comprising cams which are mounted on said controlling shaft for operating said clutch and engaging and disengaging said gears.

11. In driving mechanism for a washing machine having a tub, a pair of angularly movable
30 devices in said tub and a hollow center post having a fluid-tight connection with the lower wall of said tub and extending upwardly therefrom, the combination of a hollow shaft journaled in said post for actuating one of said devices, a
35 second shaft journaled within said hollow shaft for actuating the other of said devices, driving connections from said motor to each of said shafts, a clutch in one of said driving connections and disengageable gears in the other of said driving
40 connections, a controlling shaft extending upwardly at the side of said tub, and means comprising cams mounted on said controlling shaft for operating said clutch and engaging and disengaging said gears, said cams being positioned
45 on said shaft to prevent the engagement of said gears simultaneously with the engagement of said clutch.

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