O. G. PFEIFFER.

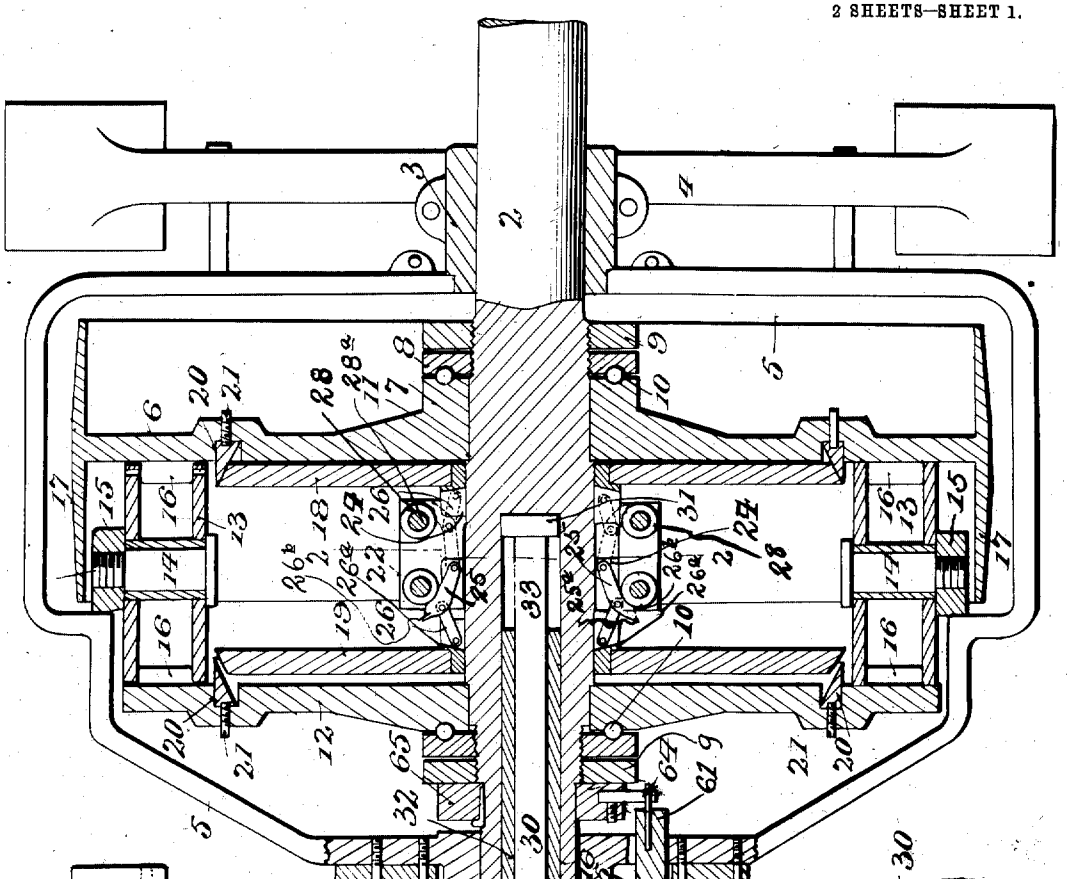
AUTOMATIC REVERSIBLE GEARING.

APPLICATION FILED JUNE 22, 1909.

991,359.

Patented May 2, 1911.

2 SHEETS—SHEET 1.



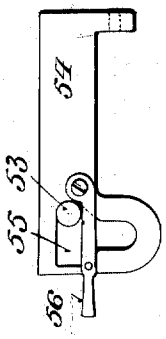


Fig. 5.

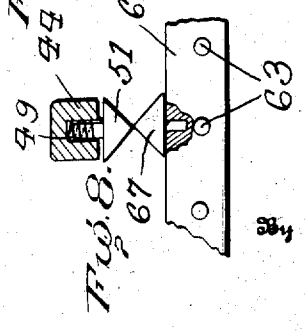


Fig. 8.

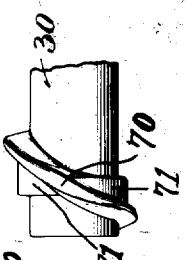


Fig. 7.

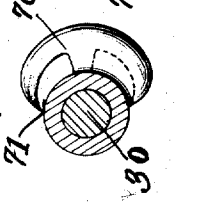


Fig. 6.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

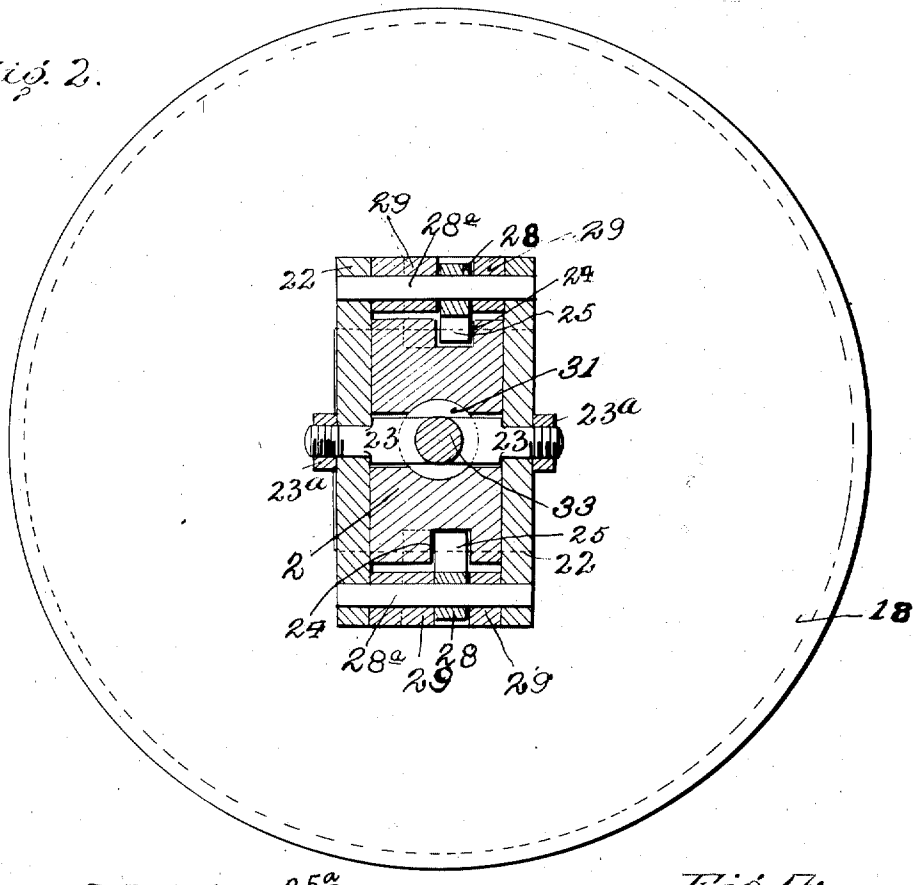


Fig. 3.

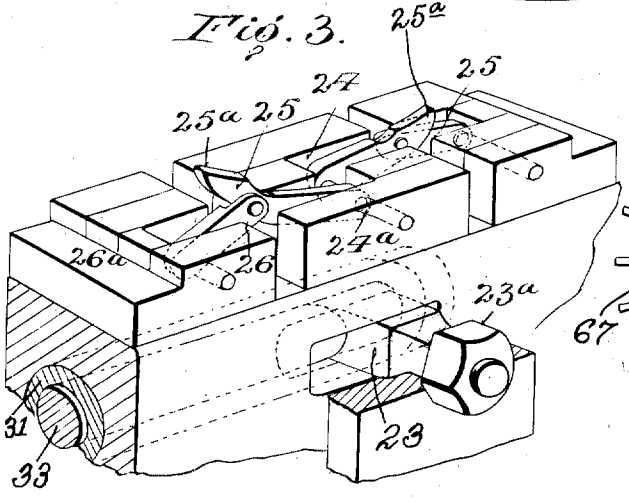
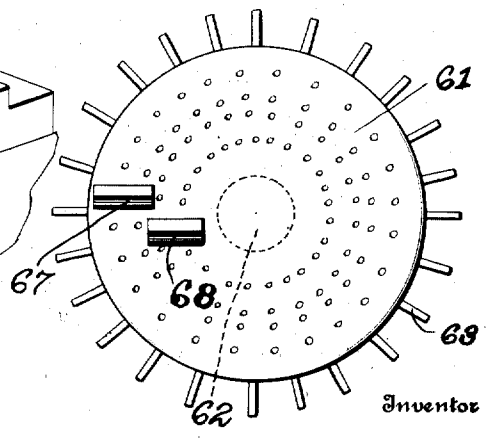


Fig. 4.



Witnesses

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AUTOMATIC REVERSIBLE GEARING.

991,359. Specification of Letters Patent. Patented May 2, 1911.

Application filed June 22, 1909. Serial No. 503,669.

To all whom it may concern:

Be it known that I, OTTO G. PFEIFFER, citizen of the United States, residing at Salt Lake City, in the county of Salt Lake and State of Utah, have invented certain new and useful Improvements in Automatic Reversible Gearing, of which the following is a specification.

This invention relates to gearing whereby a driven shaft is rotated in one direction for a certain number of revolutions and is then shifted so that it shall be rotated in a reverse direction for a predetermined number of revolutions, and the invention particularly relates to a construction of this character wherein the automatic mechanism may be so set that the driven shaft will make one to thirty or more revolutions before being reversed in its movement.

While my mechanism is adapted to be used in any machine where reversible motion is necessary yet it is peculiarly adapted for washing machines, wherein the washing drum revolves in one direction for a predetermined period and is then automatically reversed in direction. This is usually accomplished by means of counter-shafting, pulleys, belts and running gears.

In the accompanying drawings I have shown my automatic reversing mechanism disconnected from the washing machine but applied to the shaft thereof. Therein,

Figure 1 is a longitudinal section of my improved reversing gear supported on the extremity of a shaft. Fig. 2 is a section on the line 2—2 of Fig. 1. Fig. 3 is a perspective detail view of the upper portion of the shaft, a pair of toggle levers thereon, and the sliding plates. Fig. 4 is a plan view of the reversible disk with its adjustable pins. Fig. 5 is a plan view of the yoke whereby the shifting collar is held. Fig. 6 is an end view of the shaft showing the cam track, and Fig. 7 is a side elevation thereof. Fig. 8 is an enlarged fragmentary section of the reversing disk and the adjacent lever.

Corresponding and like parts are referred to in the following description and illustrated in all the views of the drawings by the same reference characters.

Referring to the drawings, 2 designates the driven shaft of any suitable machinery, as for instance, the main driven shaft of a washing machine extending into the drum or other casing, and actuating therein a series of paddles or other suitable washing mechanism. Said shaft 2 is supported in bearings 3 which in turn are supported by standards 4 of any suitable character. Rigidly mounted on the standards 4 or in any desired manner, is a casting 5 which acts as a support and inclosure for the mechanism now to be described and acts also as a means of supporting the outer end of the shaft 2 as will be later referred to.

Loosely mounted on the shaft 2 is the band pulley 6 whose hub 7 revolves loosely on the shaft 2 against a thrust collar 8 held in place by a set-nut 9. Between the end of the hub and the face of the thrust collar 8 are placed the anti-friction balls 10. The shaft 2 is of course shouldered at 11 so that the band pulley 6 is held in place on the shaft and prevented from any radial movement thereon after the thrust collar and set-nut are in place.

Opposed to the band pulley 6 is the friction disk 12 which also revolves upon the shaft 2 and is held in place by a shoulder formed on the shaft and by the thrust balls 10 and set-nut 9. This disk 12 also revolves freely upon the shaft in precisely the same manner as the band pulley 6. Motion is transmitted from the wheel 6 to the disk or wheel 12 by means of roller pinions 13 which are located between the two wheels and which are supported on stub shafts 14 carried on an inwardly projecting ring or inwardly projecting lugs 15 on the casting 5. These stub shafts are screw-threaded at their other ends and inserted into the ring or lug 15, the opposite end of the shaft being shouldered. The transmitting pinions in the form shown in the drawings consist of opposed disks carrying between them the anti-friction rollers 16. I do not wish to be limited to this as it is obvious that I might use any form of transmitting pinion between the two disks 6 and 12. There are as many of these transmitting pinions as may be desired.

The wheel or disk 6 is provided at its circumference with the pulley face 17 whereby power is transmitted to the disk 6 and from this to the disk 12. It will be obvious that the disk 12 will revolve reversely to the disk 6. My mechanism is so arranged that the movement of either one of the wheels or

disks 6 or 12 may be transmitted to the shaft 2 so as to accomplish a reverse movement of the shaft. Generally speaking, the means whereby the movement of the disks 6 or 12 is transmitted to the shaft consists of opposed friction disks 18 and 19, which are practically splined upon the shaft but may be forced outward against one or the other of the disks 6 or 12 so as to frictionally engage the same. The circumference of each of the disks 18 and 19 is beveled to engage with a beveled friction ring 20, set in an annular groove in the inner face of each of the disks. This friction ring is adjustable inwardly or outwardly by means of screws 21 so as to take up wear, or provide for more or less frictional engagement between the friction disks and the adjacent driving wheels 6 and 12.

Between the disks 18 and 19 the shaft is square in section and on the side are mounted the slide plates 22. The shaft 2 is slotted and a transverse two-part bolt 23 passes diametrically through the shaft and the ends of the bolt sections pass through the slide plates and are held by nuts 23^a (see Fig. 2). The opposed side faces of the shaft are slotted as at 24 and therein are located the opposed sets of toggle levers 25 each composed of a pair of links pivotally connected to a common pivot bolt 24^a at their inner ends, the extremity of the outer link of each set of toggle levers being connected to sliding plates 26 which are shouldered at 26^a to receive the plates 18 and 19. The toggle levers are of such length that when one pair are flat, the other pair are at an angle to each other, as shown in Fig. 1. Thus the meeting ends of one pair of toggle levers project up beyond the slot 24 while the other pair of toggle levers lie flat in the bottom of the slot. The opposed slide plates 22 carry at their upper and lower ends the transverse pins 28^a which carry upon them the rollers 28 and the spacing sections or sleeves 29. The rollers 28 are located in alinement with the slot 24 and the rollers project down slightly into the slot so that as the sliding plates are moved transversely across the space between the friction disks 18 and 19, the rollers will depress one set of toggle levers thereby lifting the other set of toggle levers. This depression of one set of toggle levers and the consequent elevation of the opposed set forces one of the disks 18 or 19 against its adjacent friction wheel or disk 6 or 12 and retracts the opposed disk 18 or 19 from the adjacent friction wheel. Thus the power transmitted from the pulley 6, will be delivered to one or the other of the friction disks 18 or 19 and from this friction disk to the shaft, depending upon the movement of the slide plates 22, to one side or the other longitudinally of the shaft. Preferably the inside links of each pair of toggle levers has a projecting stud or extension 26^a against which the rollers on the slide plates contact to depress the toggles.

As a means of shifting the slide plates with their rollers, I form the end of the shaft 2 tubular or hollow and provide therein the longitudinally shiftable rod 30. This rod projects beyond the shaft at one end and its inner end extends into the shaft sufficiently far that its head 31 is beneath the space between the disks 18 and 19. This enlarged head 31 engages with the bolt sections 23, as shown in Fig. 2, so that the reciprocations of the shaft 30 will reciprocate the slide plates 22. Preferably, I interpose between the rod 30 and the inner face of the shaft, the bushing or lining tube 32 which however terminates a distance sufficiently short of the head 31 to permit the rod 30 to be shifted a proper distance to move the slide plates 22 in one direction or the other, to operate the toggle levers. The casing 5 carries upon it the bearing 33 which surrounds the shaft 2 between the disk 12 and the extremity of the shaft and supports the extremity of the shaft.

It will be seen from the above description that a reciprocation of the rod 30 from one side to the other will cause the motion of the pulley 6 to be transmitted in either direction to the shaft 2. In one case the shaft 2 will move in the direction of the pulley, in the other, the motion of the pulley will be communicated indirectly, by the disk 12 which revolving in an opposite direction to the disk or pulley 6 will revolve the shaft in an opposite direction. As a means of causing an automatic reciprocation of this rod 30 I provide upon the extremity of the rod the opposed cones 35 and 36 of a ball-bearing, these cones being of course channeled to form raceways for the anti-friction balls 37. The extremity of the rod 30 is screw-threaded and carries upon it the nut 38 which holds in place a washer 39 which engages the cones 35 and 36 to hold them in place upon the shaft and against the extremity of the sleeve 32. The rod 30 and the shaft of course revolve together. Surrounding the opposed cones 35 and 36 is the shaft collar 40 which is formed on its interior with the annular rib 41 forming the dividing web between the two race-ways for the balls 37. The collar 40 is split or slotted longitudinally on its under side as at 42, the inner wall of this slot being inclined as at 43. Mounted within this slot in the collar 40 is the radially movable pivoted arm 44. This is pivoted at its outer end between the walls of the slot and its inner face is inclined or beveled to abut against the beveled or inclined wall 43 of the slot. This arm extends inwardly beyond the side face of the collar and is there provided with a pin 45 carrying the roller 46. The inner face of the arm 44 is formed

with a recess 47 which alines with a recess 47ª in the outer face of the collar 40. A spring 48 is placed within this recess which tends to force the arm 44 outwardly. The outer face of the arm is also recessed and a pin 49 is located in this recess and surrounded by a spring 50 which acts to force the pin outward. The pin is provided with a head 51 having inwardly beveled faces so that the head is V-shaped in cross-section, the axis of the head extending parallel to the axis of the shaft.

The upper face of the collar is formed with an upwardly extending pin 53 which provides means whereby the collar may be reciprocated by hand, to change the direction of motion of the parts when desired. This pin 53 is normally held to prevent the collar from turning by means of a yoke 54 which is in the form of an arm extending out from and attached to the casting 5. This yoke at its extremity is slotted as at 55, the slot at its rear portion being sufficiently wide to permit a movement of the pin 52 longitudinally along the yoke, in the direction of movement of the rod 30, thus permitting the pin and collar 40 to be reciprocated in order to change the motion as above described. The slot 55 in the yoke, however, is narrowed at its forward edge, so that when the collar is rotated and the pin placed within this narrowed portion it will be prevented from any longitudinal reciprocation, and thus the collar will be held in place. A gate 56 having the form of an arm pivoted at its rear end to the yoke and closing across the slot prevents the pin 53 from laterally moving when placed within the narrow portion of the slot. Thus, as long as the gate is closed and the pin in the widened portion of the slot 54 the pin can only move longitudinally. When, however, it is placed in the narrowed portion of the slot and the gate closed, the pin and collar cannot reciprocate nor can the pin move out of place.

Located beneath the shaft 2 and the collar 40 is the vertical bearing 60, supporting the disk 61 which is rotatable in a horizontal plane; this disk being formed with the spindle 62 which enters the bearing 60. The bearing may be supported in any convenient manner, but preferably, as shown, forms a part of the casting 5. The circumference of this disk 61 is provided with a series of projecting pins 63 forming teeth which are engaged by a tappet pin 64 projecting from a disk 65 or collar which is keyed fast to the shaft 2 just forward of the disk 12. The pin 64 is held in position by a set-screw or in any suitable manner whereby the pin may be adjusted. It will be evident that one complete rotation of the collar will cause the disk 61 to rotate a certain distance, and that each time in the course of its revolution that the pin 64 strikes one of the pins 63 the disk 61 will be correspondingly rotated. Thus a step-by-step intermittent rotative movement is secured for the disk 61. The face of this disk as shown in Fig. 4 is provided with a plurality of radially arranged holes, placed in two series. Placed in any one of these two series of holes are the adjustable headed pins 67 and 68. The heads of these pins are oppositely beveled so as to be V-shaped in section in the manner previously described for the head of pin 49, and these heads are arranged with their axes at right angles to the direction of rotation of the shaft 62. Thus it will be obvious that in the rotation of the disk 61 one of the heads 66 or 67 will contact with the head of the pin 49, and that when this contact takes place the lever 44 will be lifted to the position shown in Fig. 1, and held there until the two heads have passed each other, whereupon the lever will drop. Which of these pins 66 or 67 the head contacts with, depends upon the position of the collar 40 and the shifting of this collar depends upon the automatic cam mechanism now to be described.

It will be obvious that if the shaft were provided with a cam rib or cam slot extending spirally around the face of the shaft diagonal to the axis thereof with which the roller 46 was in constant engagement, that the roller following the cam track would give the collar 40 and the rod 30 a complete reciprocation upon each rotation of the shaft. My invention, however, is not to cause a complete reciprocation at each revolution but to shift the rod 30 in one direction, then allow it to remain in shifted position for a comparatively lengthy period and then again reversely shift the rod and allow it to again remain so shifted for another predetermined interval. Thus it is necessary that the roller 46 shall move along the cam track to a position wherein the rod 30 has been completely shifted, and that then the roller shall be moved out of its engagement with the cam track for a predetermined length of time until which period the rod 30 remains shifted and that then the roller 46 shall be again engaged with the cam track to shift the rod 30 in a reverse direction.

While I do not wish to limit myself to any particular means for securing a reciprocating movement of the roller 46 and the rod 30 connected thereto, I preferably provide the shaft 2 with a cam rib 70 which is in section of a spiral and extends around one-half of the shaft, as shown in Fig. 6, this cam rib merging into the shaft at 71. Shoulders 72 are formed on each side of the cam 70 which are extended at right angles to the axis of the shaft, these shoulders gradually rising toward the middle of the cam rib 70 and then merging into the rib.

It will be seen that as long as the roller 46 is held away from the cam rib by the action of the spring 48 the rotation of the shaft will have no effect upon the roller and the rod 30, but when the roller is raised by the head of the pin 51 on lever 44 coming in contact with the head of either pin 67 or 68, then it will engage with one or the other face of the cam rib and be moved in one or the other direction. The roller is lowered from its engagement with the cam rib at the limit of its path of travel. Thus when the rod 30 has been fully moved in either direction, the roller is lowered from its engagement with the cam track, and the rod 30 and the mechanism connected therewith remains stationary until the roller is again raised by the head 51 coming in contact with the headed pins 67 or 68.

The operation of my invention is as follows: Let it be assumed that the parts are in the position as shown in Fig. 1, that is, that the friction disk 18 is in engagement with the web 6 of the driving pulley. Under these circumstances the rod 30 will be drawn inward as far as it will go. The collar 40 will also be drawn inward as far as it will go, and the roller 46 will also be at the limit of its movement in an inward direction. Of course the friction disk 12 will be constantly revolved in an opposite direction to the disk or pulley 6, by the roller pinions 13. That set of toggle levers which are adjacent to the disk 19 will be flexed or inclined with each other as shown in the drawings. The disk 61 as before stated carries upon it the two headed pins 66 and 67, the pin 66 being inward of the pin 67. There are two series of holes 65 and each of the heads 66 or 67 is provided with two pins entering the two holes of each series so that the heads shall in turn be held in rigid radial position. It will be obvious, however, that those holes might be square for the same purpose. The heads 66 and 67 will, one or the other, come in contact with the head of the pin 49 depending upon whether the collar 40 is moved to its limit in one direction or the other. In Fig. 1, the collar is of course at its inward limit of motion and hence the head 51 of the pin 49 will come in contact with the head of the pin 66. Upon the incidence of the head of pin 66 with the head of pin 49 the lever 44 will be raised, thereby raising the roller 46 which will come in contact with the outer face of the cam rib. As the shaft rotates, therefore, the roller contacting with the outer face of the cam rib will be forced outward, thus moving the collar 40 outward which through its anti-friction bearing on the cones 35 and 36, will move the rod 30 outward. Upon the movement of the rod 30 the slides 22 will be likewise shifted toward the friction disk 19 and the rollers carried on the slide will depress the projecting end of the link of the toggle levers 25, thus forcing the disk 19 into engagement with the disk 12 and at the same time releasing the disk 18 from its frictional engagement with the pulley disk 6. Upon this shifting of engagement of course the shaft will be reversely rotated, the bevel faces of the friction disks 18 and 19 and the bevel faces of the rings 20 making a gradual frictional contact between the two, which will permit the gradual engagement of the two members and thus gradually check the motion of the shaft in one direction and frictionally engage it for motion in the reverse direction. There is thus no jar or shock upon the change of gear. To return to the movement of the roller 45 along the cam track it will be seen that the roller will be moved along the outer face of the cam rib 71, thus moving outwardly the collar 40 and the rod 30 as above described. When the roller reaches the limit of its outward movement, the disk 61 will be given rotation through a small arc of a circle by the pin 64 and the head 66 will pass from its registering position with the head 49, thus permitting the arm 44 to drop. The roller will now be disengaged from the cam track and hence the collar 40, the rod 30 and the friction plates will remain shifted outward. As the shaft rotates, it carries around with it the pin 64. Each time that this pin is carried around it contacts with one of the pins 63 and hence rotates the disk 61 one step. As it carries the disk about it will eventually bring the headed pin 67 again into registry with the pin 49 whereupon this pin will be raised, raising up the arm 44 and bringing the collar 46 into contact with the inner face of the cam rib, which will cause the roller to move inward or toward the friction clutches until it again reaches its innermost position, thus reversing the mechanism to the position shown in Fig. 1. At this point the two heads 49 and 67 will shift from engagement with each other whereupon the lever will drop, the roller 46 be moved out of engagement with the cam track 72 and the mechanism revolve in the direction first explained, until the headed pin 66 again comes in contact with the headed pin 49.

It will be obvious that the number of rotations which the shaft 2 will perform before a shifting of the clutch disks 18 and 19 and a change of direction of rotation of the shaft, will depend upon the distance apart of the headed pins 66 and 67. Thus in Fig. 4, these pins are shown as being nearly coincident with other. There will be as many step by step movements of the disk 61 before the heads 66 or 67 register with the head 49 as there are radial series of holes. Obviously if the head 66 is placed dia-

metrically opposite to the head 67 there will only be about half as many revolutions of the shaft before the heads 66 or 67 will register with the head 49 and the reverse movement of the clutch disks takes place as there would be if the heads 66 are nearly coincident with each other.

My invention is particularly applicable to washing machines of that character wherein the drum or mechanism connected with the drum is revolved in one direction for a certain length of time and then revolved in the opposite direction. It will be seen that my arrangement of elements when attached to the shaft of a washing machine provides for a reverse motion of the shaft at predetermined intervals and that this reverse motion takes place with an easy start and stop which is so necessary in the actuation of washing machine drums or like mechanism.

Having described my invention, what I claim is:

1. In mechanism of the class described, driving elements rotatable in reverse directions, a driven shaft, shiftable clutch mechanism connected with the shaft and adapted to be engaged with either of the driving elements to reverse the motion of the shaft, a shifting rod for actuating the clutch mechanism, and means actuated by the rotation of the shaft to shift the rod longitudinally after a predetermined number of revolutions in one direction, and then after another predetermined number of revolutions reverse the motion of such rod.

2. In mechanism of the class described, driving elements rotatable in reverse directions, a driven shaft, clutch mechanism connected to the shaft and adapted to be engaged with either of the driving elements to reverse the motion of the shaft, a shifting rod connected to the clutch mechanism, a revolving cam with which said rod is engaged to shift the latter alternately in opposite directions, and means acting after each shifting of the rod by the cam in one direction to disconnect said rod from the cam and hold it disconnected therefrom during a predetermined time.

3. In mechanism of the class described, driving elements rotatable in reverse directions, a driven shaft, clutch mechanism connected with the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected to the clutch mechanism to shift the same, a revolving cam with which the rod is engaged to shift the latter, and means actuated by the rotation of the shaft and actuated after each shifting of the rod by the cam in one direction, for disconnecting said rod from the cam and holding it disconnected therefrom during a predetermined time.

4. In mechanism of the class described, driving elements rotatable in either direction, a driven shaft, clutch mechanism connected to the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected with the clutch mechanism, a revolving cam with which the shifting rod is connected and by which it is shifted, a rotatable disk, mechanism for rotating said disk by the rotation of the shaft and adjustable means carried on said disk and brought into operation by the rotation of the disk to a predetermined point for disconnecting said rod from the cam mechanism and after a certain period of time again connecting the rod with the cam mechanism.

5. In mechanism of the class described driving elements rotatable in reverse directions, a driven shaft, clutch mechanism connected to the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected to the clutch mechanism, a revolving cam by which said rod is adapted to be shifted, a rotatable disk, means for rotating said disk from the shaft at a slower speed than the shaft, and means carried by the disk for connecting said shifting rod to the cam when the disk has reached a certain predetermined point in its movement to permit the cam to shift the rod and then permit the disconnection of the cam rod for another predetermined period of rotation of said disk.

6. In mechanism of the class described, driving elements rotatable in reverse directions, a driven shaft, clutch mechanism connected with the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected to the clutch mechanism, a revolving cam, a rotatable disk, means for transmitting the continuous rotative movement of the shaft into an intermittent rotative movement of the disk, and means carried by the disk and adjustable to a certain point on the face thereof for connecting the said rod with the cam, which means after passing the said point permits the rod to be disconnected from the cam.

7. In mechanism of the class described, driving elements rotatable in reverse directions, a driven shaft, a shiftable clutch mechanism connected to the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected to the clutch mechanism, a collar on the rod, non-rotatable therewith and shiftable with the rod, an arm pivoted to the collar and carrying a roller, a cam continuously rotatable with which said roller may be engaged when the arm is in one position, said cam acting to shift the roller and the rod longitudinally in one direction or the other, and means actuated by the shaft after each shifting of the rod by the cam in one direction to permit said arm to move away from said

cam and thereby disconnect the roller therefrom, and after a predetermined period to again lift said cam and roller into engagement with the cam to shift the cam and rod.

8. In mechanism of the class described, driving elements rotatable in reverse direction, a driven shaft, clutch mechanism connected to the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected to the clutch mechanism, a collar surrounding the shifting rod and longitudinally movable but not rotatable therewith, an arm pivoted to the collar and carrying a roller at one end, a cam with which said roller may be engaged whereby the shifting rod may be moved from one position to another, a rotatable disk, means on the shaft for giving to the disk an intermittent step-by-step rotation, said disk being provided upon its face with two series of perforations, headed pins adjustable in the perforations of the disk to positions nearer to or farther from each other around the disk, the inclined faces of said pins engaging with said arm to raise it and bring the roller into engagement with the cam, and the space between the headed pins permitting said arm to fall and be disengaged from the cam.

9. In mechanism of the class described, driving elements rotatable in reverse directions, a driven shaft, clutch mechanism connected to the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected to the clutch mechanism, a collar on the extremity of the shifting rod longitudinally shiftable but non-rotatable therewith, an arm pivoted on the collar and carrying a roller at one end, a cam carried by the shaft with which said roller may be engaged to shift the arm, the collar and the shifting rod in one or another direction, and means actuated by the rotation of the shaft and acting after each shifting of the rod by the cam in one direction to disconnect said roller from the cam, hold it disconnected therefrom during a predetermined number of revolutions of the shaft and then again engage the roller with said cam to reversely shift said rod.

10. In mechanism of the class described, driving elements rotatable in reverse directions, a driven shaft, clutch mechanism connected to the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected to the clutch mechanism, a cam track arranged on the end of the shaft, a collar on the extremity of the shaft connected to the shifting rod to shift the same, an arm pivoted in the collar and carrying on one end a roller engageable with the cam track on the end of the shaft, a rotatable disk mounted upon the shaft and having a double series of perforations in its upper face, opposed pins having heads triangular in cross section adapted to be adjustably inserted in any one of said perforations, a tappet arm projecting from the shaft, pins projecting from the circumference of the disk and adapted to be engaged successively by the tappet arm as the shaft is rotated, to rotate the disk with a step-by-step movement, a spring acting to force the arm on the collar away from the cam track, and a headed pin projecting from the said arm into the path of movement of the headed pins on the disk and adapted to be engaged and raised by the same in a registering position to carry the roller on the end of said arm into engagement with the cam track.

11. In mechanism of the character described, driving elements rotatable in reverse directions, a driven shaft, a clutch mechanism connected to the shaft and adapted to be engaged with either of the driving elements, a shifting rod connected to the clutch mechanism, a spiral cam track extending around half of the face of the shaft, a collar on the end of the shifting rod longitudinally movable therewith but not rotatable, means for holding the collar from rotation, an arm pivoted in said collar extending rearward therefrom and having a roller engageable with the cam track, and means rotatable by the shaft and with the same adapted to move said roller into engagement with the cam track at one point in the revolution of said means, and then allow the said roller to be carried out of engagement with the cam track during the remainder of said revolution.

12. In mechanism of the class described, driving elements rotatable in reverse directions, a driven shaft, clutch mechanism connected to the shaft and adapted to engage with either of the driving elements, a shifting rod connected to the clutch mechanism, means carried by the shifting rod engageable in one position with a cam track on the extremity of the shaft whereby the shifting rod shall move, said means being movable away from the cam track and a disk rotatably mounted adjacent to said means, the face of said disk being provided with a double series of holes arranged concentrically to the axis of the disk, means for rotating the disk by the rotation of a shaft, and headed pins adapted to be inserted in any hole of the double series of holes and engageable during the rotation of the disk to engage said shifting rod operating means with the cam track for movement in one or the other direction by said track.

13. In mechanism of the class described, a driven shaft, a driving pulley loose on said shaft, a friction disk opposed to said driving pulley and loose on the shaft, pinions arranged between the pulley and the friction disk and communicating motion from one to the other, opposed friction disks mounted on the shaft and longitudinally movable along

the shaft to be forced into frictional engagement with either the pulley or the first named friction disk, a shifting rod extending through the shaft, mechanism actuated by one end of the shifting rod for forcing said friction disks both in the same direction, to or from one or the other of the driving elements, and mechanism actuated by the shaft for alternately moving the shifting rod in reverse directions.

14. In mechanism of the class described, a driven shaft, driving elements loose on said shaft, both of said elements having the form of disks and one being formed as a driving pulley, pinions mounted to engage the inner faces of both of these driving elements to rotate one reversely to the other, longitudinally shiftable friction disks mounted on the shaft and longitudinally movable thereon into or out of engagement with one or the other of the driving elements, opposed pairs of toggle levers mounted between the friction disks and so arranged that when one toggle lever of a pair is flexed the other shall be straight, slide plates on either side of said shaft and longitudinally movable with relation thereto, rollers carried by the slide plates and engaging with the toggle levers to flex one or the other thereof, a shifting rod connected at its end to said slide plates, the said rod extending through said shaft, and extending beyond the same, a collar mounted on the end of the rod but not rotatable therewith, an arm on the collar, a cam track on the extremity of the shaft with which said arm engages to oscillate the shifting rod, and means actuated by the shaft for engaging said arm with the cam track or permitting it to be released from said engagement.

In testimony whereof I affix my signature in presence of two witnesses.

OTTO G. PFEIFFER. [L. S.]

Witnesses:
THEO. BOSSARD,
EFFIE HILL.