June 18, 1929. F. J. COUCH 1,718,191

AUTOMATIC DOOR SPOTTING DEVICE FOR WASHING MACHINES

Filed Nov. 2, 1925 4 Sheets-Sheet 1

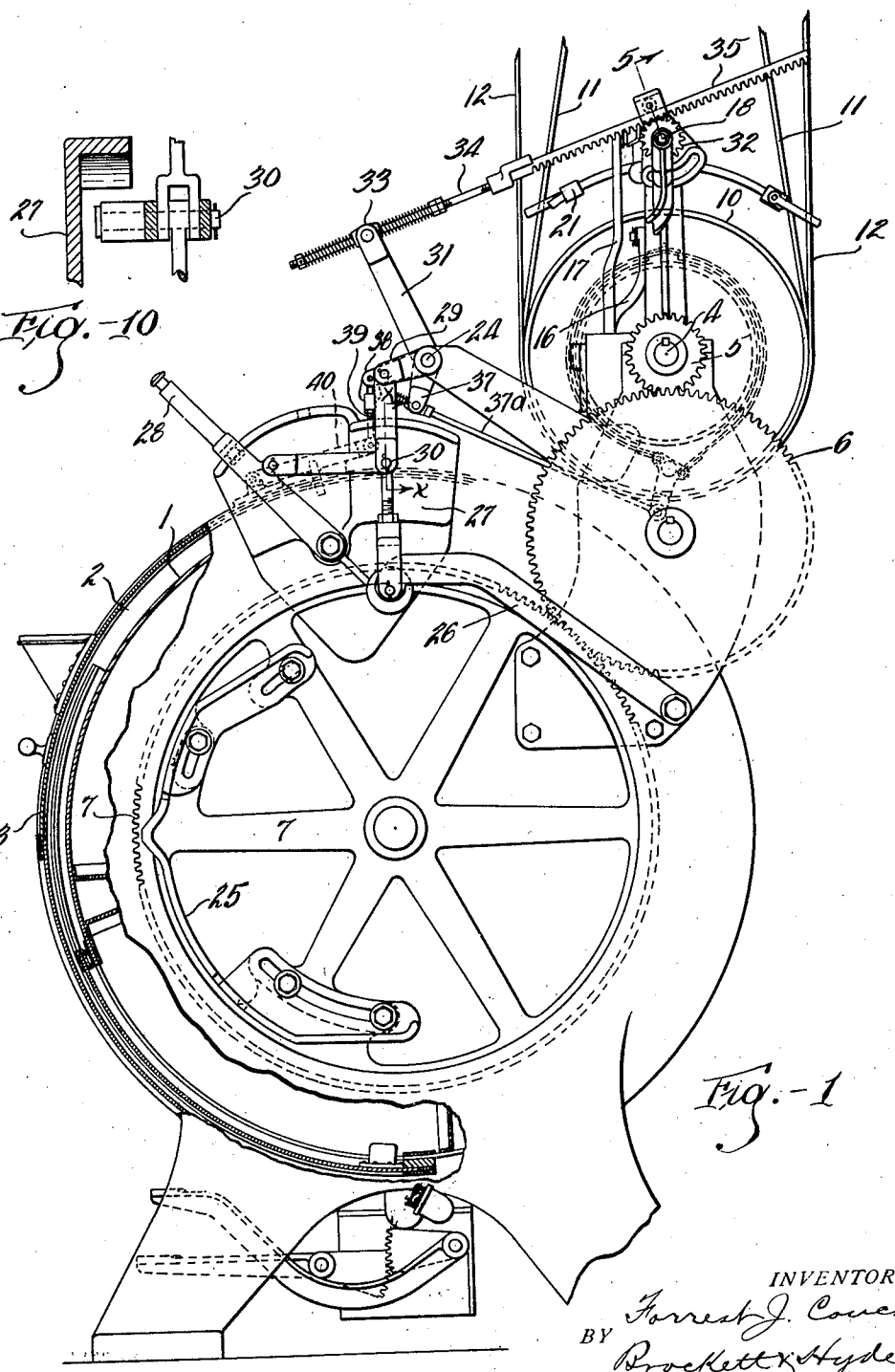



Fig. -10

Fig. -1

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AUTOMATIC DOOR SPOTTING DEVICE FOR WASHING MACHINES

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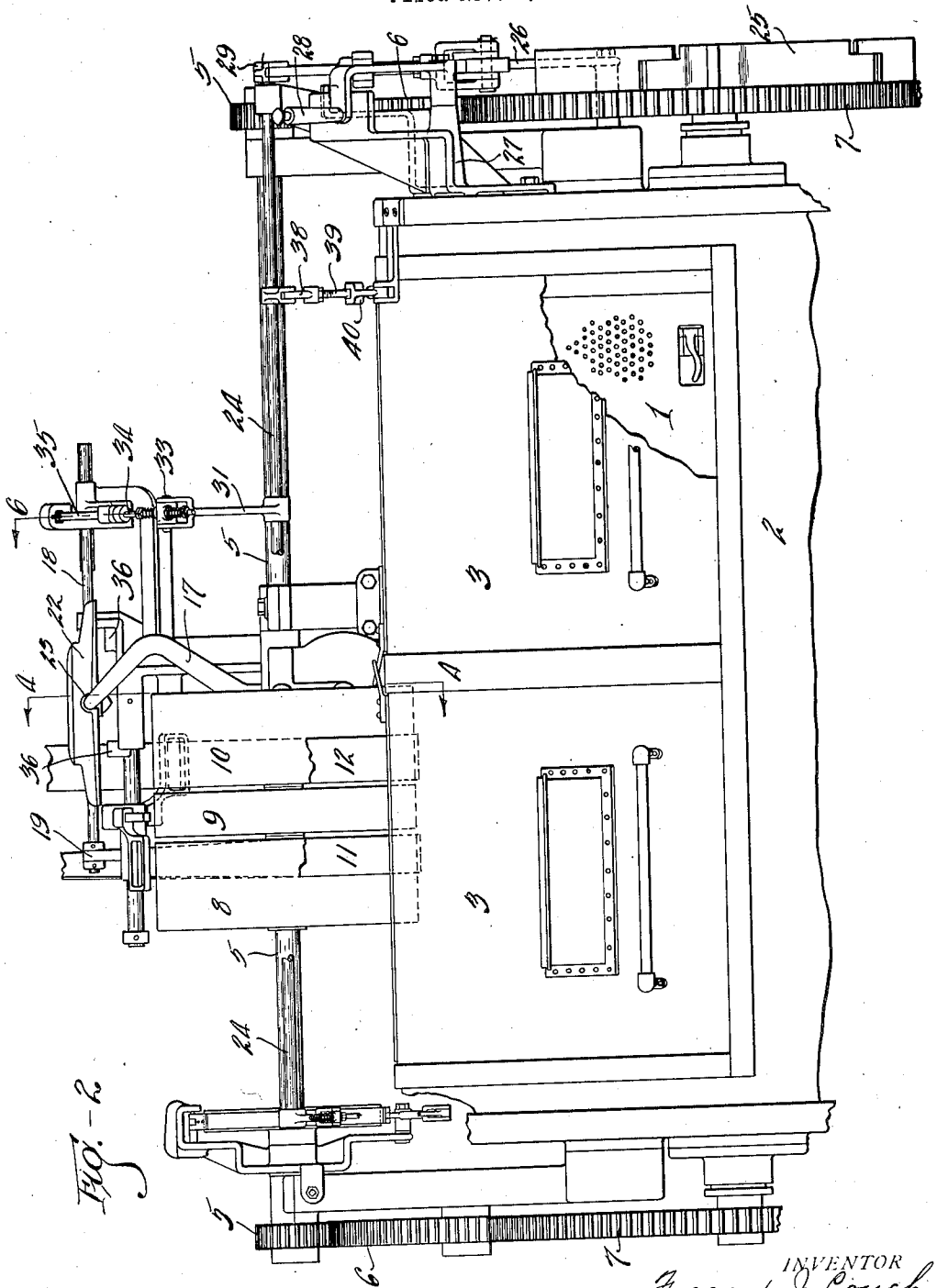


Fig. 2

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AUTOMATIC DOOR SPOTTING DEVICE FOR WASHING MACHINES

Filed Nov. 2, 1925 4 Sheets-Sheet 3

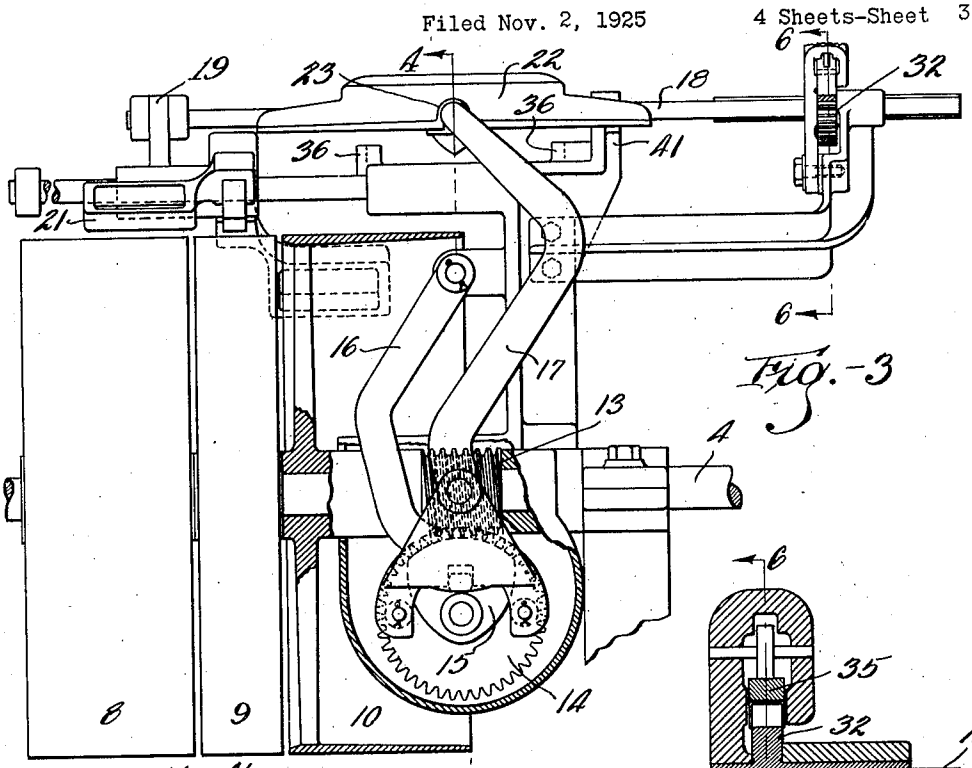



Fig.-3

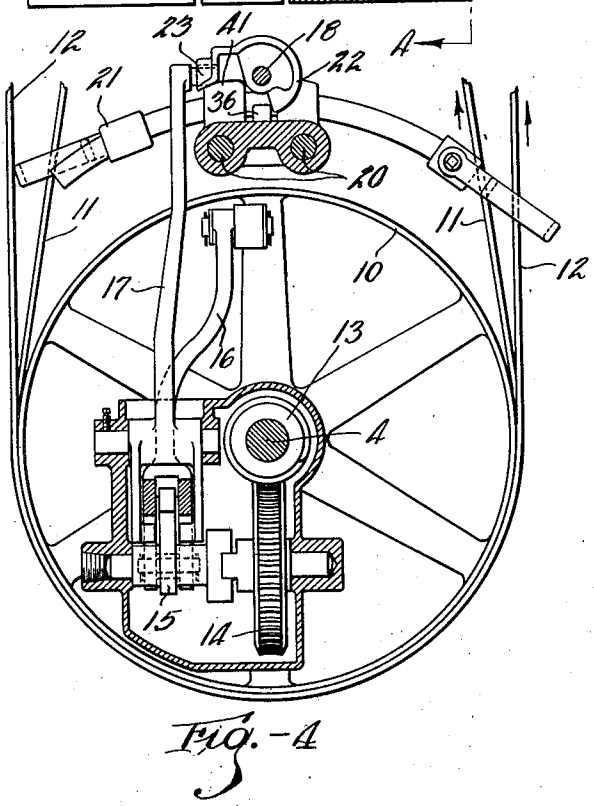



Fig.-4

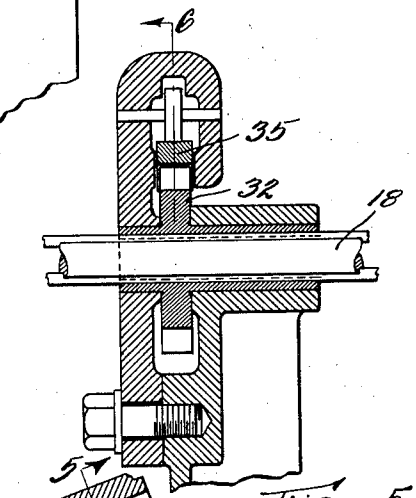



Fig.-5

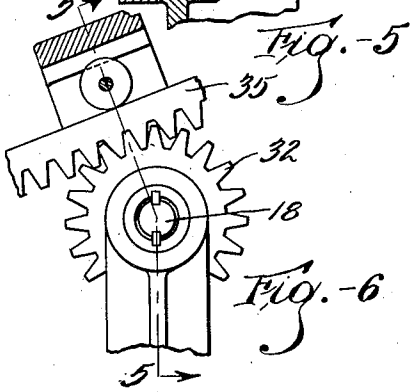



Fig.-6

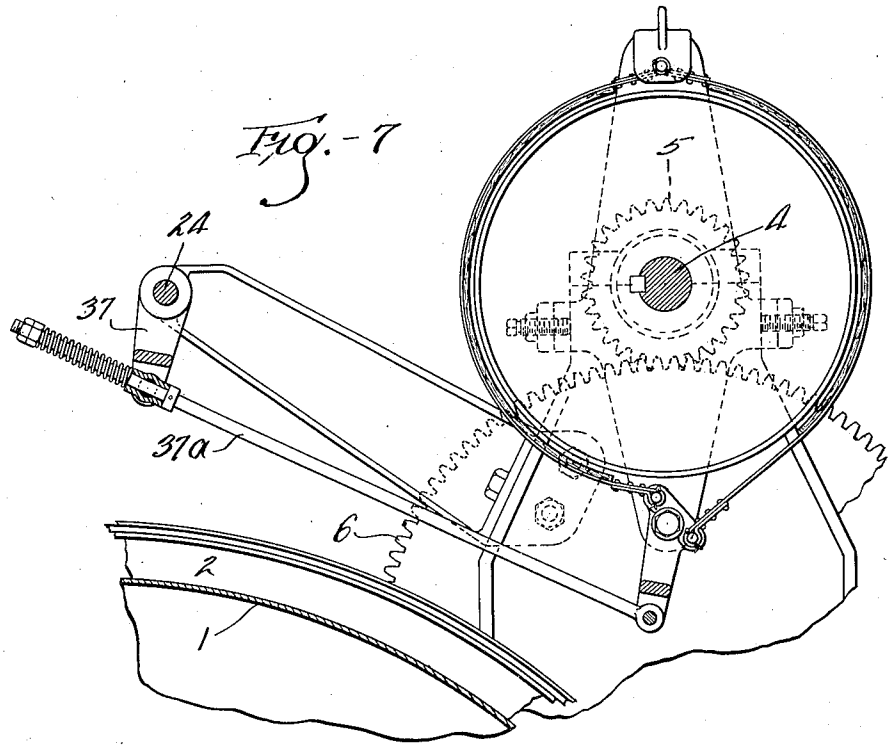
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AUTOMATIC DOOR SPOTTING DEVICE FOR WASHING MACHINES

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Fig. - 7



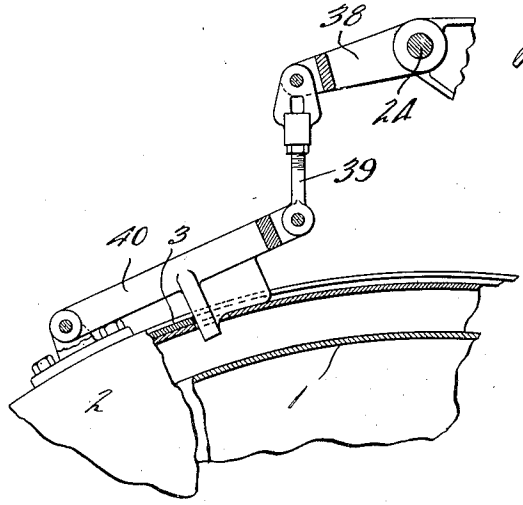




Fig. - 8

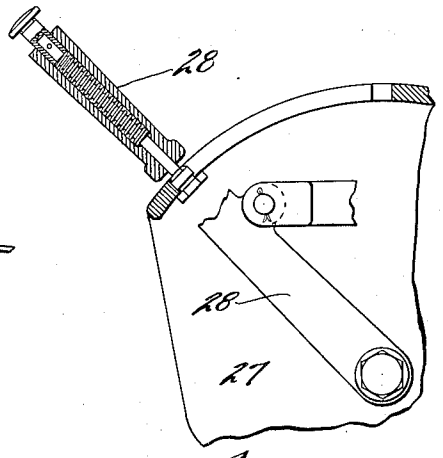



Fig. - 9

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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC DOOR-SPOTTING DEVICE FOR WASHING MACHINES.

Application filed November 2, 1925. Serial No. 66,286.

This invention relates to that class of commercial washing machines wherein articles to be washed are placed within a foraminated containing cylinder which is rotated within a close fitting casing partly filled with detergent fluid, the direction of rotation being automatically periodically reversed. More particularly, this invention relates to means for controlling such a machine and especially in stopping the machine to means for "spotting" the cylinder, that is for bringing the cylinder door into alignment with the corresponding casing door whereby the two doors may be opened and a charge of articles may be loaded into or removed from the cylinder.

Since commercial machines of the type described are of such a size and weight as to require considerable power to operate them, it is customary in the art to make some provision for slow hand controlled rotation of the cylinder for the purpose of bringing the cylinder door into alignment with the casing door when desired. For example, so-called "inching devices" being manually or power operated means whereby a leverage may be exerted upon the cylinder to revolve it a short distance; brakes for stopping the cylinder in the proper position after disconnecting the power; electric regeneration devices where the machine is electrically operated; and various combinations of the same.

The cylinders of machines operated by belt power are customarily reversed periodically by belt shifting, and automatic means for the purpose are customarily provided. Furthermore in such power machines as described interlocking safety devices preventing opening of the casing door while the cylinder is moving, and preventing the application of power when the doors are open, are highly desirable. And because of the necessary complications arising in the incorporation of such devices and their continued operation, a certain amount of adjustability must be provided for in their design.

My invention embraces all of the features described, and has for its object in summary, the provision in such a belt driven machine of inexpensive, reliable, adjustable, automatic, mechanical means for accomplishing all of the objects described.

In the drawings, I have illustrated a typical belt driven washing machine with my invention applied thereto, and in which Fig. 1 is an end elevation of the machine with the casing broken away to show interior construction of the cylinder; Fig. 2 is a front elevation of the upper portion of the machine having one of the casing doors broken away to show the corresponding cylinder door; Fig. 3 is a detail of the belt shifting mechanism for reversing the direction of rotation of the cylinder, parts being broken away to more clearly show the construction; Fig. 4 is a similar detail in the plane of line IV—IV of Figs. 2 and 3; Fig. 5 is a sectional detail taken along the plane of line V—V of Figs. 1 and 6; Fig. 6 is a detail of the parts shown in Fig. 5 along the plane of line VI—VI of Figs. 2, 3 and 5; Fig. 7 is a detail of the braking mechanism; Fig. 8 is a detail partly in section, of the casing door latching mechanism; Fig. 9 is a sectional detail of the control handle mechanism; and Fig. 10 is a detail of the shifting mechanism taken in the plane of line X of Fig. 1.

In the washing machine shown in the drawings, 1 represents a foraminated cylinder or tub closely fitting within the casing 2 which is provided with doors 3, corresponding doors being provided in the cylinder. Across and above the casing, and mounted in suitable bearings in brackets fixed at the ends and center of the frame of the machine extends the drive shaft 4 which is connected by means of pinions 5 and intermediate idle gears 6 to the gears 7, mounted upon the cylinder axis on either end of the casing 2, whereby the cylinder is rotated.

Referring particularly to Figs. 3 and 4, upon the shaft 4 are mounted the idle pulley 8, the fixed pulley 9 and the idle pulley 10. Around these pulleys pass driving belts 11 and 12 running in opposite directions, the width and spacing of both the belts and pulley faces being such that only one of the belts at a time can contact with the pulley 9 and that at all times by reason of its width the belt 12 overlies and thus rotates the pulley 10.

The hub of the loose pulley 10 is extended to embrace a worm 13 which meshes with a worm gear 14 which is coupled to the cam 15, which rotates coaxially with it and is an arcuate triangle in contour. Above the cam

15 extends the lever 16 pivotally mounted at its upper end, its lower end forming a split yoke extending on each side of the cam and carrying rollers in the plane of and spaced to be alternately engaged by the same, the arrangement being that of a positive motion cam. Pivotally mounted above the cam 15 is a lever 17 split below its pivot to form wings provided with interiorly extending lugs which are engaged by corresponding notches in the lever 16.

Above the shaft 4 extends a short shaft 18 mounted at one end to turn in a bracket secured to the frame, its other end carried by a saddle 19 longitudinally fixed upon the shaft but in which it may rotate. The saddle 19 is slidably mounted upon parallel rods 20 and carries belt shifting yokes 21 through which the belts 11 and 12 respectively pass. Fixedly mounted upon the shaft 18 is a double helical cam 22 provided at its side with a notch 23 adapted to be normally engaged by a corresponding lug at the upper end of the lever 17, the side of the cam being extended to engage regardless of longitudinal position a fixed stop 41 which limits rotary motion of the cam 22 to engage with, without support by, the lever 17.

It will be seen that the mechanism just described constitutes an automatic means for periodically reversing the direction of rotation of the cylinder 1, operating as follows: Continuous rotation of the pulley 10 with its integral wormed hub engaging the gear 14 and thus revolving the cam 15, causes the lever 16 to slowly oscillate about its axis, with prolonged dwells at each end of its swing; and through the mechanical connection of the lever 17 between the lever 16 and the notch 23, the cam 22 and the shaft 18, are caused to follow with a similar but longitudinal motion. The belt shifting yokes are given the motion of the shaft 18 by means of the saddle 19, and maintaining the relative position of the belts shift them alternately upon the drive pulley 9, reversing its direction and with it that of the cylinder; the belt 12 however when rotating the pulley 9, overlapping onto and thus rotating also the pulley 10.

Extending across the length of the machine parallel to the drive shaft 4 is a control shaft 24 maintained in suitable bearing brackets fixed to the frame of the machine. Upon the driving gear 7 at one end of the machine is adjustably mounted a cam 25 formed throughout most of its length in a circular arc concentric with the driving gear, but provided at each end with a ramp and intermediately with a short high point. Pivotally mounted at one of its ends upon the frame of the machine is a lever 26 carrying at its other end a roller and forming a cam follower for actuation by the cam 25. Secured to the frame above the cam is a bracket 27 upon which is mounted the control lever 28, and containing a slot in which the lever 28 moves. The slot is provided with enlargements at each end for engagement with a spring pressed thumb releasable stud in the offset handle of the lever, as shown in Fig. 9, whereby the control lever is positively maintained in the position set by the operator and secured from accidental movement.

Secured upon the shaft 24 in the plane of the levers 26 and 28 is an arm 29. Pivotally connected at the free end of the arm 29, the end of lever 26 and midway upon the control lever 28 respectively, are three links, their opposite ends joined at a common axis 30. It will be seen that the arrangement is that of a toggle joint, controlled by the lever 28, whereby when the lever 28 is in the position shown in Fig. 1, rotary motion may be imparted to the shaft 24 by the cam 25.

Referring now again to the belt shifting mechanism hereinbefore described; mounted upon the shaft 18 and secured by keys so as to turn with it is a pinion 32 secured from axial movement by brackets fixed to the frame of the machine, as shown in Fig. 5. Secured upon the shaft 24 in the plane of the pinion 32 is a lever 31. Secured to the free end of the lever 31 is a swivel block 33 through which passes a rod 34, the opposite end of which is secured to a rack 35, maintained in engagement with the pinion 32 by a backing roller as shown. The rod 34 while passing through the swivel block 33 is resiliently connected therewith longitudinally by means of springs as shown in Fig. 1.

It will be seen that when the control lever 28 is set in the position shown, regardless of the momentary direction of the rotation of the cylinder 1 one of the ramps upon the cam 25 will engage the roller upon the lever 26 and raise it until it rides upon the concentric portion of the cam. Motion of the lever 26 as already shown will be transmitted through the toggle 30, to the shaft 24 and cause it to move in a clockwise direction (Fig. 1). The lever 31 being fixed upon the shaft will move clockwise also, and through the spring will gently slide the rack and rotate the pinion 32 in the same direction. This will cause the shaft 18 and with it the cam 22 to rotate also.

From the mounting bracket of the belt shifting mechanism extend two lugs 36 properly spaced from each other and located for engagement with the cam 22 so that regardless of the momentary longitudinal position of the cam 22, a clockwise rotation of the same (Fig. 4) will cause it to shift longitudinally to a position midway between the lugs; and imparting this motion through the saddle 19 and the belt shifters disengage from the drive pulley 9 whichever belt was upon it. The initial rotary motion of the cam disengages it from the lever 17, and precedes its engagement with the lugs 36. Hence upon setting the control lever in the off position the

nrst result, as just described in detail, is to throw off the power which is rotating the cylinder.

Although disconnected from the power the momentum of the cylinder is such that it continues to revolve until the shaft 24 is further rotated to effect engagement of the high point in the cam 25 with its roller follower on the lever 26. At the opposite end of the drive shaft 4 is mounted a brake drum, cooperating brake band and operating mechanism as shown in detail in Fig. 7 whereby the brake is applied by a clockwise rotation of the shaft 24 (Fig. 1) acting through the arm 37 and its resilient connection with the rod 37ª. Thus the power being already disconnected the cylinder will be brought gently to a stop and held in that position when the high spot upon the cam 25 is brought to register with its follower; and by means of the adjusting slots whereby the cam 25 is mounted upon the driving gear 7 this position of the cam is made to correspond with that in which the cylinder and casing doors are in alignment.

Upon the shaft 24 is fixed the arm 38 connecting through the link 39 with the latch lever 40, which as shown in Fig. 8 is mounted upon the casing frame in such manner that a projecting portion thereof normally extends through a corresponding aperture in the casing, and abutting the sliding door 3 therein prevents its opening while the shaft 24 is in the position shown, which is that of Fig. 1. During the operation of stopping, however, as hereinbefore described, the shaft 24 is caused to turn in a clockwise direction (Figs. 1 and 8) and the latch linkage just described is so proportioned that with proper adjustment, after the brake is applied to the drive shaft 4 the latch 40 is withdrawn from its position abutting the door, leaving the door free to be opened by the operator.

In summary, the process of stopping the washing machine is as follows: The operator simply sets the control lever 28 to the stop position shown in Fig. 1. Regardless of the casual direction of rotation of the cylinder 1, control shaft 24 is caused to make a partial revolution clockwise (Fig. 1) by means of the cam 25 acting through the straightened toggle joint 30. This acting through the arm 31 and connecting mechanism first shifts to one of the idler pulleys whichever belt happens to be driving the cylinder at the time, and acting through the arm 37 gently applies the brake. Inertia, however, continues the rotation of the cylinder until its door comes into alignment with the casing door, at which time the high spot on the cam 25 causes a further rotation of the shaft 24, tightly clamping the brake and bringing the cylinder to a stop in this position; the same motion of the shaft 24 acting through the arm 38 withdrawing the latch 40 clear of its locking position abutting the casing door. The door may then be opened without danger of accidental starting, as until it is again closed, any return motion of the shaft 24 is prevented by the casing door being in the path of the latch 40. The relative positions of the arms 31 and 27 and proportional strength of the springs through which they operate their respective mechanisms, are such that during the final maximum swing of the shaft 24 as the brake is tightly clamped, the arm 31 is allowed its required further movement by its resilient connection with the rod 34.

Integral with the bracket 27 is an arcuate flange forming a cam cooperative with a roller which is coaxial with the toggle joint 30 and shown in Fig. 10. When the control lever 28 (Fig. 1) is disengaged from the position shown in Fig. 1 of the drawings and is moved back to the opposite end of its slot, this breaks the toggle joint 30 and engages the roller with the inner surface of this cam, which, acting through the arm 29, causes the shaft 24 to make a counter clockwise motion. This motion is assisted by the described spring connections but is impossible unless the casing door 3 has previously been closed. Such a motion of the control shaft 24, however, acting through the arm 37 positively releases the brake and acting through the arm 31 gently causes the rack 35 to rotate the shaft 18, release the cam 22 from its position against the projections 36 until the lower edge of the cam (Fig. 1) rests upon the stud on the lever 17. The lever 17 continuing its oscillatory motion, (the pulley 10 being in continuous rotation) as soon as its stud comes into registry with the notch upon the cam 22 the cam is engaged by the lever and is caused through the mechanism already described to shift one of the belts onto the drive pulley 9 and thus set the cylinder 1 into motion.

The operator to start the machine, therefore, needs simply see that the casing door is closed, and move the control lever 28 back to the starting position.

In a mechanism of the complex type described, in order to make provision for unavoidable inaccuracies in manufacture, and ultimate wear, some adjustments must be made; and I would particularly draw attention here to the small number of such adjustments required in the application of my invention, and to the simple means by which I have accomplished those necessary.

The cam 25 as shown in Figs. 1 and 2 is made in three sections, adjacent sections being partially coextensive circumferentially with each other and each section being independently adjustable circumferentially; the near adjusting slots of adjacent sections being arranged to overlie each other so that they may be secured upon the gear 7 with a common bolt.

Between spring connections with the arms 31 and 27 and their respectively operated

mechanisms I have made the brake and power throw-off mechanisms very gently operated, thus greatly reducing wear and tear thereon, making fine adjustment of the arms unnecessary and automatically providing a take up for any wear thereon.

By making adjustable the length of that member of the toggle joint 30 extending between the joint itself and the roller cam follower upon the lever 26, the throw of the shaft 24 is easily adjusted.

By a similar arrangement of the link 39 of the door locking mechanism the door lock may be accurately set.

By providing a slot in its supporting bracket as shown in Fig. 1, the position of the backing roller upon the rack 35, and hence that of the rack upon the gear 32 may be easily adjusted.

While I have illustrated and described an example of my invention intended to disclose its principal parts and details essential thereto, I do not wish to be limited to the specific mechanical construction shown, but rather only by the real scope and spirit thereof.

What I claim is:

1. In a washing machine, power control means, power control locking means, braking means, door locking means, a member in operative connection with all of said means and forming an interlock therebetween, and a cam for actuation of said member connectible therewith by a hand controlled toggle joint.

2. In a machine of the class described, a casing, a cylinder mounted for rotational movement therein, doors in said casing and cylinder, the doors of said cylinder being registerable with those of said casing, belt drive means for rotating said cylinder and including belt shifting means, automatic control means associated with said belt shifting means for periodically reversing the direction of rotation of said cylinder, braking means effective upon said cylinder, and automatic means for bringing said cylinder to a stop in door registering position, and comprising means for disassociating said automatic control means from said belt shifting means, means for actuating said belt shifting means to disconnect the drive, means for applying said brake dependent upon the position of said cylinder and operator operated means for presetting said automatic means to register and stop said cylinder as described.

3. In a machine of the class described, a casing, a cylinder mounted for rotational movement therein, doors in said casing and cylinder, the doors of said cylinder being registerable with those of said casing, belt drive means for rotating said cylinder and including belt shifting means, automatic control means associated with said belt shifting means for periodically reversing the direction of rotation of said cylinder, braking means effective upon said cylinder, and automatic means for bringing said cylinder to a stop in door registering position, said automatic stopping means comprising means for disassociating said automatic control means from said belt shifting means, means for actuating said belt shifting means to disconnect the drive, means for applying said brake, a member interconnecting said last three named means for actuation thereof, timing means responsive to cylinder position, and operator controlled connection between said timing means and said interconnecting member whereby said stopping means may be preset to stop said cylinder in door registering position.

4. In a machine of the class described, a casing, a cylinder mounted for rotational movement therein, doors in said casing and cylinder, the doors of said cylinder being registerable with those of said casing, belt drive means for rotating said cylinder and including belt shifting means, automatic control means associated with said belt shifting means for periodically reversing the direction of rotation of said cylinder, and braking means effective upon said cylinder, means for bringing said cylinder to a stop in door registering position, said stopping means comprising means for disassociating said automatic control means from said belt shifting means, means for actuating said belt shifting means to disconnect said drive, means for applying said brake, and means for presetting said stopping means to stop said cylinder, said presetting means including means for returning all of said other means to their relative positions to restore automatic reversing operation of said cylinder.

5. In a washing machine having a tub and a cylinder rotatable therein, said tub and cylinder having doors, means for controlling rotation of said cylinder and including braking means, means for locking said tub door closed, a member in operative connection with all of said means and forming an interlock therebetween whereby said tub door is locked closed during rotation of said cylinder and rotation of said cylinder is prevented when said door is open, timing means responsive to said cylinder, and means associated with said member and with said timing means and presettable for rendering said member subject to said timing means to stop said cylinder in door registering position.

6. In a washing machine having a tub and a cylinder rotatable therein, said tub and cylinder having doors, means for controlling rotation of said cylinder including braking means, means for locking said tub door closed, a member in operative connection with all of said means and forming an interlock therebetween whereby said tub door is locked closed during rotation of said cylinder and rotation of said

cylinder is prevented when said door is open, timing means movable with said cylinder, and means associated with said member and with said timing means and pre-settable for rendering said member subject to said timing means to stop said cylinder during registering position, said associated means comprising a toggle adapted when straightened to transmit motion from said timing means to said member.

In testimony whereof I hereby affix my signature.

FORREST J. COUCH.