A. J. FISHER.

DRIVE MECHANISM FOR WASHING MACHINES.

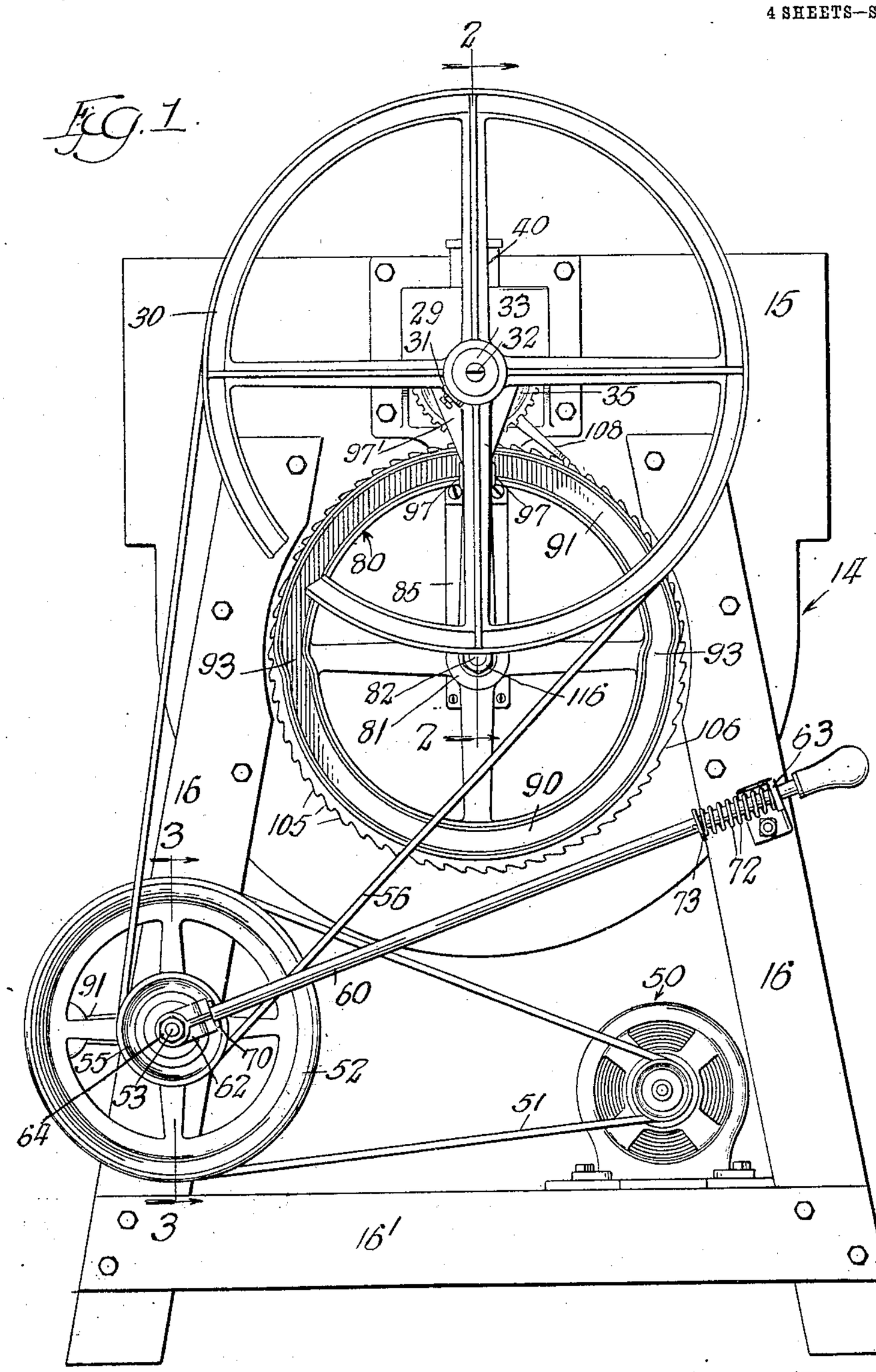
APPLICATION FILED MAY 27, 1909.

966,677.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 1.

Fig. 1.



Witnesses:
F. H. Hollands
G. R. Wilkins

Inventor:
Alva J. Fisher.
by Poole & Brown
Attys

A. J. FISHER.

DRIVE MECHANISM FOR WASHING MACHINES.

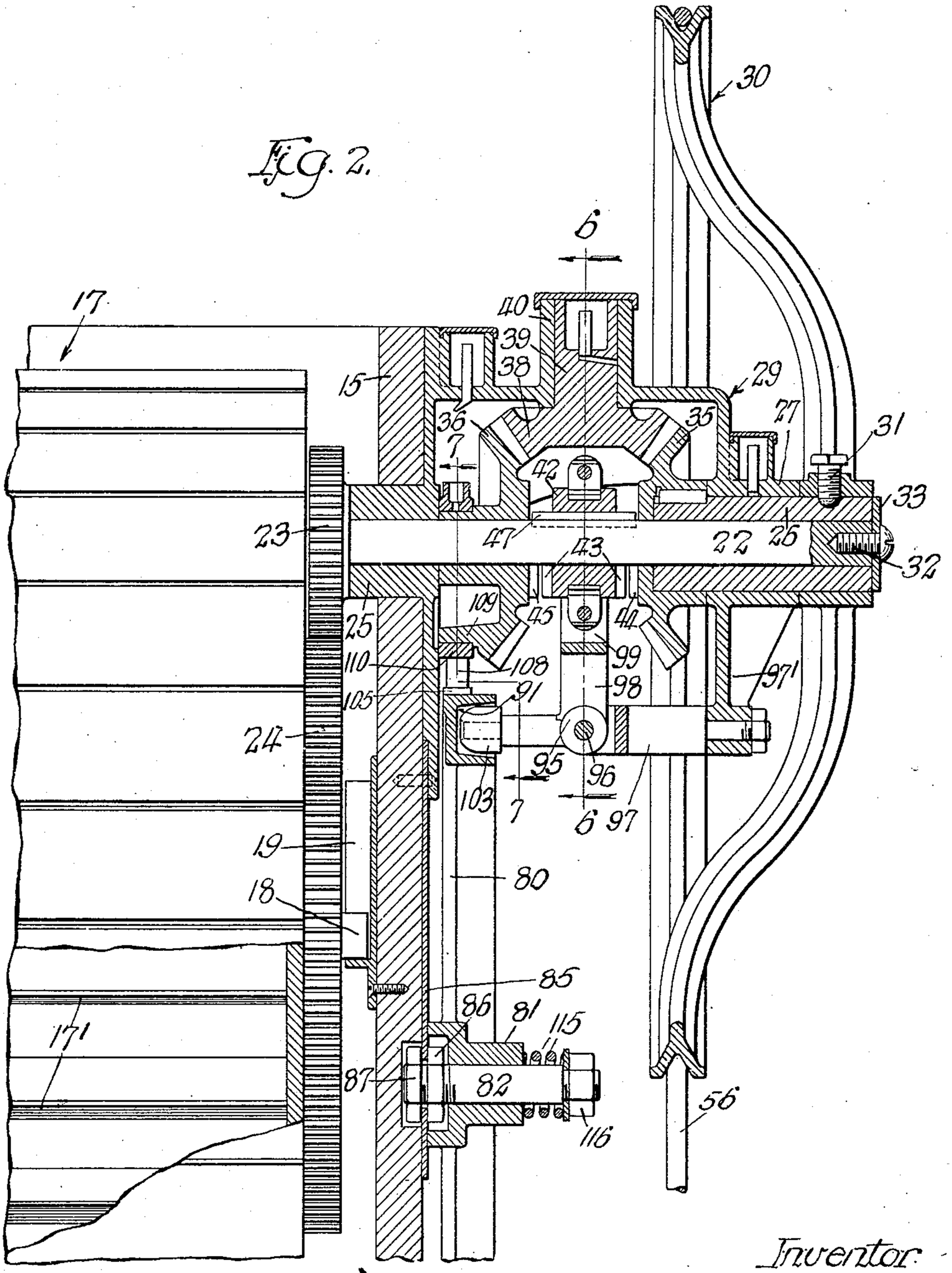
APPLICATION FILED MAY 27, 1909.

966,677.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
T. H. Hughes
G. R. Wilkins

Inventor:
Alva J. Fisher
by Poole & Brown
Attys.

A. J. FISHER.

DRIVE MECHANISM FOR WASHING MACHINES.

APPLICATION FILED MAY 27, 1909.

966,677.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 3.

Fig. 3.

Fig. 4.

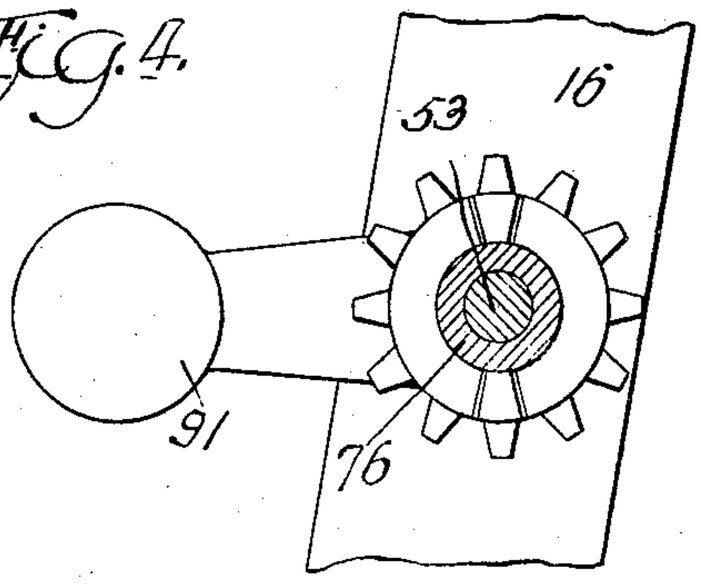
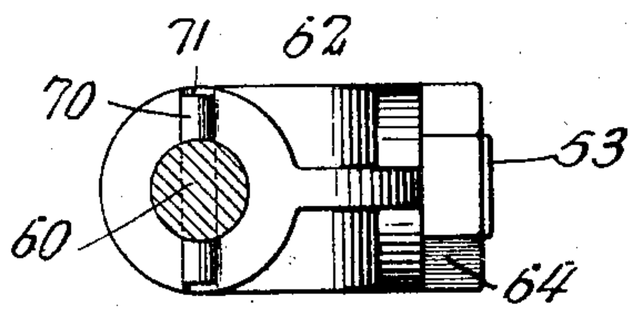


Fig. 5.



Witnesses:
F. N. Hyde
G. R. Wilkins

Inventor
Alva J. Fisher
by Poole & Brown
Attys

A. J. FISHER.

DRIVE MECHANISM FOR WASHING MACHINES.

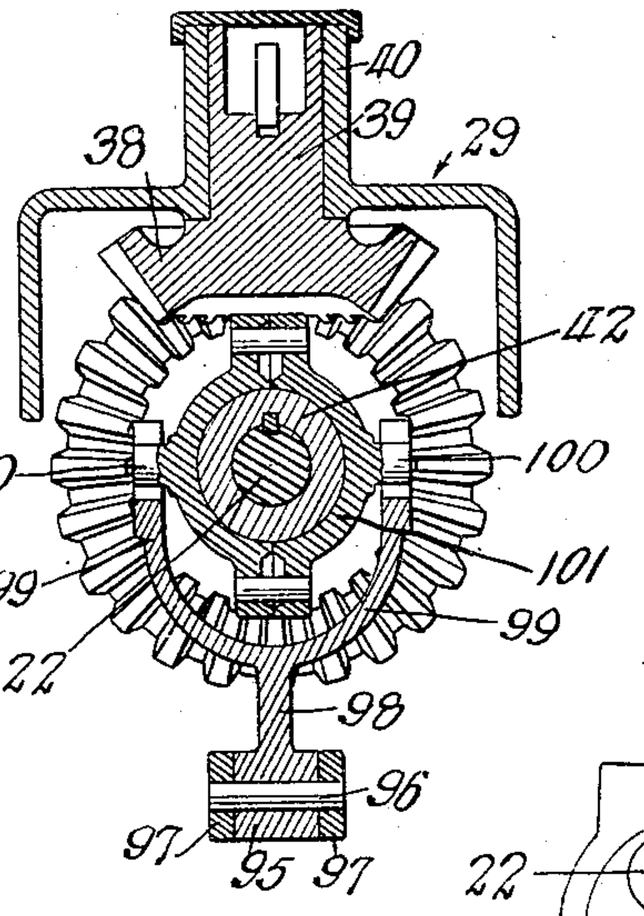
APPLICATION FILED MAY 27, 1909.

966,677.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 4.

FIG. 6.



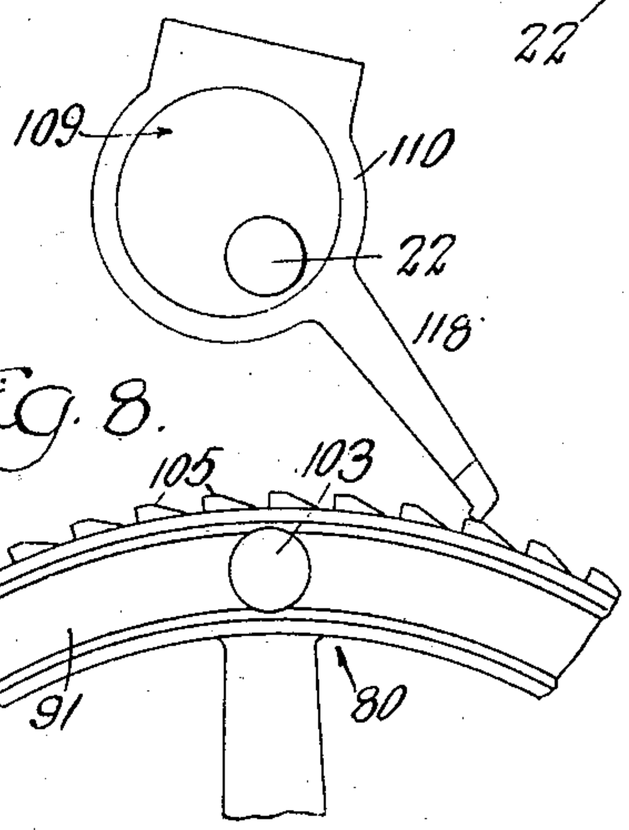


FIG. 8.

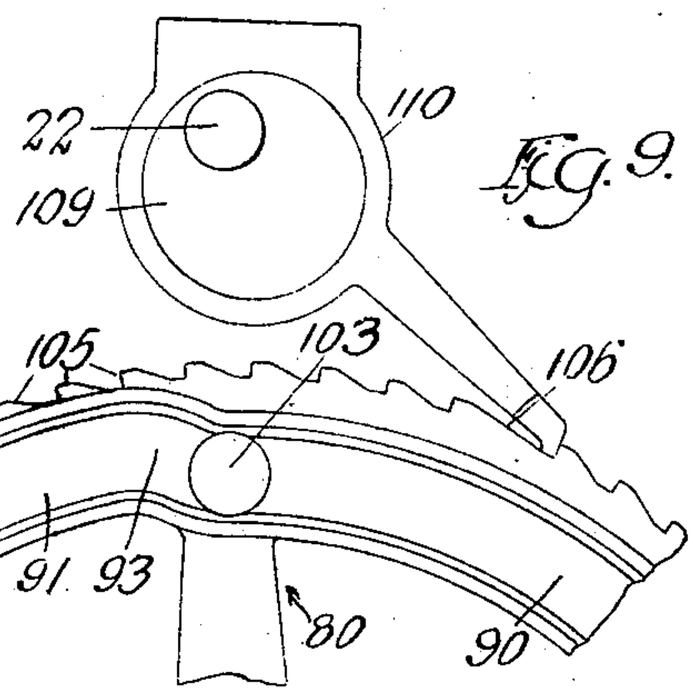


FIG. 9.

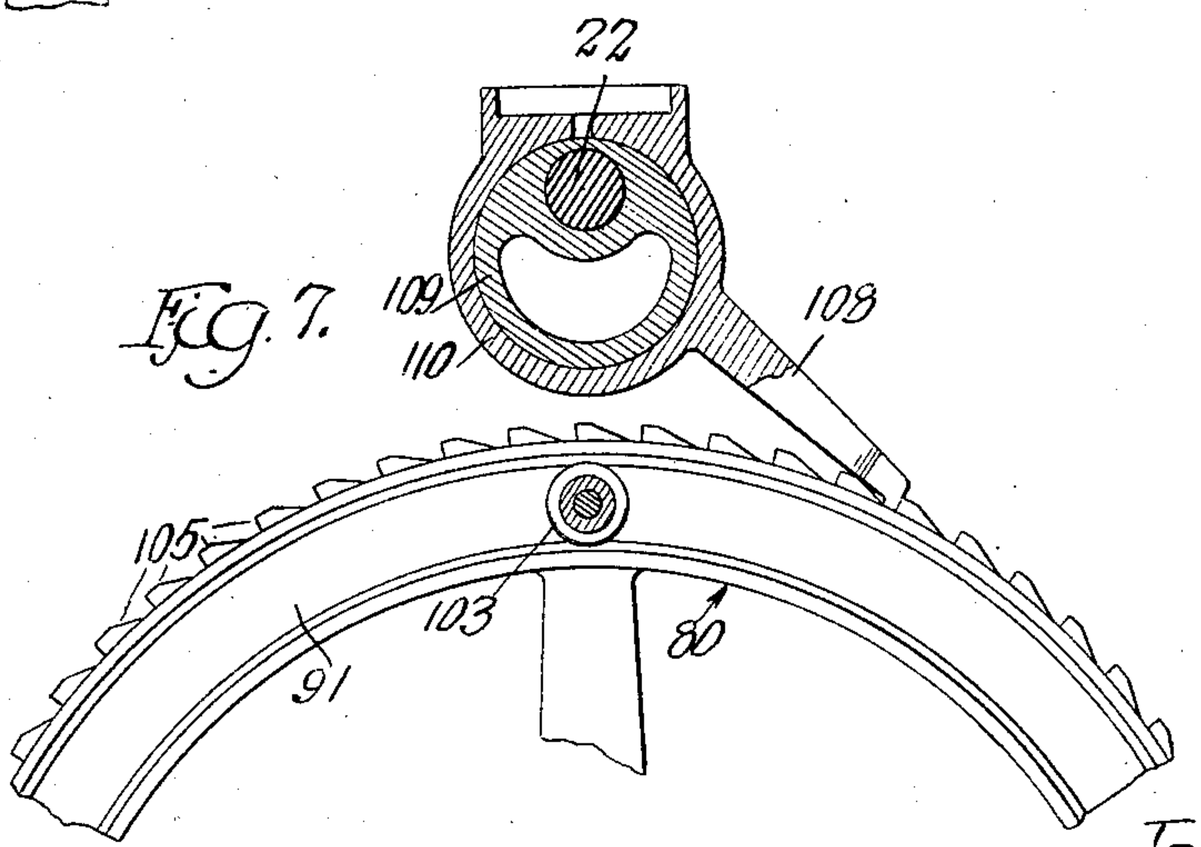


FIG. 7.

Witnesses:

T. N. Helfrich

G. R. Wilkins

Inventor:

Alva J. Fisher

by Poole & Brown

Attys

UNITED STATES PATENT OFFICE.

ALVA J. FISHER, OF CHICAGO, ILLINOIS, ASSIGNOR TO HURLEY MACHINE COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

DRIVE MECHANISM FOR WASHING-MACHINES.

966,677. Specification of Letters Patent. **Patented Aug. 9, 1910.**

Original application filed September 28, 1908, Serial No. 455,028. Divided and this application filed May 27, 1909. Serial No. 498,748.

To all whom it may concern:

Be it known that I, ALVA J. FISHER, a citizen of the United States, of the city of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Drive Mechanism for Washing-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the numerals of reference marked thereon, which form a part of this specification.

This invention relates to motor-operated drive mechanism for rotating the operating or clothes cleaning member of a washing machine or like operating part of a similar machine, provided with means for automatically reversing the rotation of the clothes cleaning or operating member so arranged that the latter will rotate through a number of complete revolutions in one direction and then through a number of complete revolutions in the reverse direction. The drive mechanism is particularly designed for use in connection with washing machines in which a perforated cylinder is rotatably mounted within a tub containing the wash water, the cylinder being arranged to receive the clothes and having a series of lifting vanes or blades which lift the clothes as the cylinder is rotated and drop them through the wash water. It is desirable to rotate the cylinder through several revolutions in one direction and then through several revolutions in the reverse direction to prevent the clothes from wadding up into a compact mass. In a hand-operated cylinder machine the reversal of the cylinder is of course readily effected by hand.

The present invention seeks to provide a simple and effective arrangement by which the cylinder may be power-driven and at the same time intermittently reversed so as to effect a number of complete revolutions of the cylinder first in one direction and then in the other.

The invention also seeks to provide reversible, power-operated drive mechanism for the washing machine which consists of few parts and which may be compactly mounted upon the machine.

The invention also seeks to provide a simple and effective drive mechanism for the operating member of the washing machine and wringer or like secondary driven member in which there is but little friction and which may be operated by a motor of small power.

With these and other objects in view the invention consists in the features of improvement hereinafter set forth, illustrated in the accompanying drawings and more particularly pointed out in the appended claims.

In the drawings: Figure 1 is an elevation of the washing machine and wringer and of the improved driving mechanism therefor. Fig. 2 is a section on the line 2—2 of Fig. 1. Fig. 3 is a detail section on the line 3—3 of Fig. 1. Fig. 4 is a view of the driving mechanism for the wringer, parts being shown in section on the line 4—4 of Fig. 3. Fig. 5 is a detail section on the line 5—5 of Fig. 3. Fig. 6 is a detail section on the line 6—6 of Fig. 2. Fig. 7 is a detail section on the line 7—7 of Fig. 2. Figs. 8 and 9 are detail views similar to Fig. 7 illustrating the operation of part of the reversing mechanism.

The washing machine to which my invention is shown as applied, comprises a tub or receptacle having a body portion 14 and opposite end-walls 15. Supporting legs 16 are secured at their upper ends to the end-walls 15 of the tub and at their lower ends are connected by intermediate brace bars 16^1. A cylinder 17 for holding the clothes is arranged within the tub. This cylinder is provided with perforated walls and with lifting blades or wings 17^1 which lift the clothes as the cylinder is rotated and drop them back into the water in which the lower portion of the cylinder is immersed. Each end of the cylinder is provided with an axial trunnion 18 which engages a bearing 19 fixed to the adjacent end-wall of the tub. A gear 24 fixed to one end-wall of the cylinder is arranged to be engaged by a pinion 23 on a drive shaft 22. This drive shaft is journaled at its inner end in a bearing 25 which extends through the end-wall 15 of the tub and, at its outer end, extends loosely through a short sleeve 26 which is journaled in a bearing 27. The bearings 25 and 27 are integral parts of a cast bracket or housing 29 which is fixed to the upper part of the end-wall 15 of the tub and which incloses the reversing gear mechanism. A wheel or pulley 30 is fixed to the outer end of the sleeve

26 by a set screw 31, and a washer 33 fixed to the end of the shaft 22 by a screw 32 engages the outer end of the sleeve 26 and holds the sleeve and wheel or pulley 30 against lateral displacement while at the same time the sleeve and pulley are free to rotate independently of the shaft. A beveled gear 35 is fixed to the inner end of the sleeve 26 adjacent the inner end of the bearing 27 and an oppositely arranged beveled gear 36 is loosely mounted on the shaft 22 adjacent the outer end of the bearing 25. An intermediate beveled gear 38 meshes with the gears 35 and 36. This gear is provided with a stem 39 which is arranged within a bearing sleeve 40 formed upon the upper portion of the bracket or housing 29.

A clutch sleeve 42 is mounted on the shaft 22 between the beveled pinions 35 and 36 and is connected to rotate with the shaft by a key 47. The clutch sleeve is longitudinally shiftable on the shaft 22 and is provided on its opposite faces with clutch lugs or teeth 43 which are arranged to alternately engage corresponding clutch lugs 44 and 45 formed upon the adjacent faces of the gears 35 and 36. The pulley 30 is arranged to be continuously driven in the same direction and serves to drive the beveled gears 35 and 36 in opposite directions. By shifting the clutch 42, either one of these gears may be connected to the shaft 22 to drive the same and the cylinder 17, which is geared to the shaft, in one or the other direction.

The pulley or wheel 30 is driven from a small electric motor 50 that is mounted upon the cross brace 16^1 at one end of the machine and adjacent one of the supporting legs 16. The shaft of the motor is connected by a belt 51 to a drive wheel or pulley 52 which is loosely mounted on a stub shaft 53 fixed to the other leg or support 16 at the same end of the machine. This stub shaft is fixed, as shown in Fig. 3, at its inner end to the support or leg 16 and projects outwardly therefrom. A small wheel or pulley 55 loosely mounted upon the outer end of the stub shaft 53 is connected by a belt 56 to the wheel or pulley 30 upon the drive shaft 22. As shown, the pulley 30 is dished so that its rim is inwardly offset over the casing 29 of the reversing gear mechanism. The spokes of the dished or offset pulley act as a guard therefor, and this offset arrangement also permits of a compact disposition of the parts on the stub shaft 53. The pulley on the shaft of the motor 50 is considerably smaller than the pulley or wheel 52 and the wheel or pulley 55 is considerably smaller than the pulley 30, so that the high speed, low power motor will operate the rotating member of the washing machine at the desired low speed.

A clutch is provided for connecting and disconnecting the pulleys 52 and 55 upon the stub shaft 53 to throw the washing machine into and out of operation. This clutch preferably comprises clutch teeth or lugs 57 and 58 formed upon the adjacent faces of the hubs of the wheels 52 and 55, and the pulley 55 is longitudinally shiftable on the shaft to bring the clutch lugs or teeth 57 and 58 into and out of engagement. A rotatable shifting rod 60 is provided for shifting the pulley or wheel 55. This rod is rotatably mounted at one end in an L-shaped bracket 62 that is fixed to the reduced outer end of the stub shaft 53 by a nut 64 and extends upwardly and inwardly over the hub of the pulley 55. An eccentric pin 65 on the end of the rod 60 carries a block 66 which engages an annular groove 68 in the hub of the wheel 55, and by rotating the rod 60 the wheel or pulley may be shifted into and out of engagement with the motor-driven wheel 52. The opposite end of the shifting rod 60, which is inclined upwardly, as shown in Fig. 1, is journaled in a bracket 63 upon the opposite leg or support 16. A cross-pin 70 extends through the shifting rod 60 adjacent its lower end and is arranged to engage a seat formed upon the face of the bracket 62. A spring 72 coiled about the rod extends between the bracket 63 and a washer 73 thereon and forces the rod longitudinally to hold the pin 70 thereon within its seat 71. The shifting rod 60 may be readily rotated through a half revolution in either direction until the pin 70 again engages its seat. Such a half revolution will throw the wheel or pulley 55 either into or out of engagement with the drive wheel 52 and the coöperating pin 70 and seat 71 will hold the wheel or pulley 55 in either one of its positions and in such a manner that no unnecessary amount of friction will be developed between the wheel or pulley 55 and the stub shaft 53 or between the pulley 55 and the drive pulley 52. Moreover, if the machine is in operation, the operator may quickly stop it by rotating the shifting rod 60 in either direction.

The hub of the wheel or pulley 52 is provided with an inwardly extending sleeve 76 which surrounds the stub shaft 53 and abuts against the hub of a weighted arm 91^a that is loosely mounted on the inner end of the stub shaft. The wheel or pulley 52 is thus held against lateral movement on the stub shaft in one direction. It is held against lateral movement in the opposite direction by a key 94 which extends through the stub shaft and engages the outer face of the wheel.

The reversing mechanism for the drive gear of the cylinder 17 is controlled by an actuator cam 80, the hub 81 of which is rotatably mounted on a short stub shaft 82. This shaft is secured to the lower end of a brace plate 85 by nuts 86 and 87. This

brace plate is arranged upon the outer face of the end wall 15 of the tub and is secured at its upper end to a depending lug integral with the bearing 25 and housing or bracket 29.

On its outer face and adjacent its periphery, the actuator cam 80 is provided with a cam groove comprising two concentric portions 90 and 91 connected by inclined portions or projections 93. A shifter for the clutch member is operated by the actuator cam 80 and this shifter is preferably in the form of a bell-crank 95 which is pivotally mounted at the angle between its arms upon a pin 96 carried by the forked inner end of a bracket 97. This bracket, as shown, is fixed at its outer end to a depending lug 97^1 formed integral with the bearing 27 and bracket or housing 29. The horizontal arm of the bell-crank 95 extends inwardly from its pivot and is provided with an anti-friction roller 103 which engages the cam groove of the actuator cam 80. The upwardly projecting arm 98 of the bell crank is provided with forked portions 99 which engage studs 100 upon a split collar 101 that fits within an annular groove upon the clutch sleeve 42. The actuator cam 80 serves to oscillate the bell-crank or shifter 95 and throw the clutch sleeve 42 back and forth to alternately connect the beveled gears 35 and 36 to drive the shaft 22 and thus rotate the cylinder 17 of the washing machine alternately in opposite directions.

It is desirable to rotate the actuator cam 80 at slow speed so that the cylinder 17 may make several complete revolutions in one direction before its direction of motion is reversed. At the same time it is desirable to operate the shifter or bell-crank 95 quickly so that the clutch teeth 43 may be properly thrown into engagement with the clutch teeth 44 and 45. For this purpose, suitable means are provided for slowly rotating the actuator cam while the concentric portions 90 and 91 of the cam groove are in engagement with the bell-crank or shifter but which will drive the actuator cam at accelerated speed when the inclined portions 93 are acting upon the reversing shifter. This variable speed driving mechanism for the actuator cam comprises an actuator pawl 108 which is arranged to engage ratchet teeth 105 and 106 formed upon the periphery of the actuator cam. The pawl 108 is provided with an integral eccentric strap 110 which fits over an eccentric 109 formed upon the inner face of the beveled gear 36. As shown, the ratchet teeth 106 are nearly twice as long as the ratchet 105 and, as indicated in Fig. 1, there are two of these long ratchet teeth 106, one at one portion of the cam and one at a diametrically opposite portion. The operating pawl 108 is shown at the opposite limits of its throw in Figs. 8 and 9. This throw of the pawl is substantially equal to or slightly greater than the length of the long ratchet teeth 106 and is nearly equal to the length of two of the short teeth 105. When the pawl is operating on the short teeth it will, after acting on one tooth, move back over the next adjacent tooth and nearly over the second succeeding tooth, as shown in Fig. 8.

During its forward stroke, the lost motion between the pawl and the next adjacent tooth will first be taken up before the tooth is acted upon by the pawl. In this way, the pawl will only operate on the tooth 105 during the last part of its forward movements and will only advance the actuator cam a short distance at each stroke, and the actuator cam will be rotated quite slowly while the concentric portions 90 and 91 of the cam are in engagement with the roller 103 of the bell-crank or shifter 95. But, as the inclined portions 93 act upon the shifter, the pawl will engage the teeth 106 and will operate the actuator cam during the entire portion of its forward stroke and thus accelerate the movement of the cam to quickly throw the shifter and clutch sleeve 42 to reverse the drive mechanism. In this way, a very simple speed reducing mechanism is provided for the actuator cam which will normally operate it at slow speed relatively to that of the cylinder, so that the cylinder is rotated through several complete revolutions in one direction before its motion is reversed as is desirable for effective operation of the cylinder in cleaning the clothes. At the same time, the speed of the actuator cam will be accelerated to quickly throw the clutch mechanism so that the clutch teeth 43 may be disengaged from the clutch teeth 44 or 45 and properly thrown into engagement therewith to reverse the drive mechanism. The momentum of the movable parts assists in throwing the clutch member.

In order that the cam 80 shall properly operate the clutch sleeve 42 without causing the teeth 43 thereon to strike upon the outer faces of the teeth 44 and 45 when the clutch sleeve is shifted, it is necessary to hold the cam in position to which it is shifted by the operating pawl 108. For this purpose, a friction brake is applied to the cam. In the form shown, this brake consists of a coiled spring 115 extending about the outer end of the stub shaft 52 and held in place by a nut 116. This spring presses upon the hub 81 of the cam 80 and the latter is held thereby into frictional engagement with the plate 85, as shown in Fig. 2. It will be noted that the operating pawl 108 acts upon the upper part of the cam 80 and the upper part of the cam acts upon the clutch shifter 95. By closely arranging these parts, the power of the driving pawl is effectively applied to the cam for operating the clutch shifter. Moreover, any

strain upon the actuator cam is in vertical direction and is taken up by the connecting plate 85.

It is obvious that numerous changes may be made in the details set forth and the application of the invention without departure from the essentials of the invention.

I claim as my invention:—

1. The combination with a rotatable operating member, of drive mechanism therefor comprising a driving element arranged to rotate continuously in one direction, reversible drive gearing connecting said driving element and said operating member, a cam controlling the reverse of said gearing, and pawl and ratchet mechanism operated by said gearing for intermittently actuating said cam.

2. The combination with a rotatable operating member, of drive mechanism comprising a driving element rotatable continuously in one direction, reversing gearing connecting the driving element and the operating member, a rotatable cam controlling the reverse of said gearing, and pawl and ratchet mechanism operated by said drive mechanism for intermittently advancing said cam.

3. The combination with a rotatable operating member, of drive mechanism therefor comprising two driving members, reversing means for separately connecting said members to said operating member, and pawl and ratchet mechanism operated by said drive mechanism and controlling the operation of said reversing means.

4. The combination with a rotatable operating member, of drive mechanism therefor comprising two driving members, reversing means for separately connecting said members to said operating member, a rotary cam for shifting said reversing means, and speed reducing means operated by said drive mechanism for intermittently actuating said cam.

5. The combination with an operating member, of drive mechanism comprising two driving members arranged to rotate in opposite directions, reversing means for separately connecting said driving members with the operating member, a rotary cam for operating said reversing means, and pawl and ratchet mechanism operated by said drive mechanism for actuating said cam.

6. The combination with an operating member, of drive mechanism comprising two driving members arranged to rotate in opposite directions, a clutch member for separately connecting the driving members with the operating member, a shifter for said clutch member, a rotary cam for actuating said shifter, and pawl and ratchet mechanism operated by said drive mechanism for actuating said cam.

7. The combination with a rotatable member, of drive mechanism therefor comprising two driving members arranged to rotate in opposite directions, a clutch member for separately connecting said members to said operating member, a shifter for said clutch member, and pawl and ratchet mechanism operated by said drive mechanism and controlling the operation of said shifter.

8. The combination with a rotatable operating member, of drive mechanism therefor comprising a shaft connected to said member, a pair of beveled driving gears loose on said shaft, a beveled idler gear connecting said driving gears, a sliding clutch member keyed to said shaft for separately connecting said driving gears thereto, a shifter for said clutch member, a rotary cam for operating said shifter, and pawl and ratchet mechanism operated by said drive mechanism for actuating said cam.

9. The combination with an operating member, of drive mechanism comprising a shaft connected with said operating member, a pair of beveled drive gears loosely mounted on said shaft, a beveled idler gear meshing with said drive gears, a drive wheel on said shaft connected to one of said drive gears, a sliding clutch member keyed to said shaft for separately connecting said drive gears thereto, a shifter for said clutch member, a rotary cam for actuating said shifter, and means operated by said drive mechanism arranged to rotate said cam, said means being adapted to rotate said cam at an accelerating speed at the points of reversal.

10. The combination with an operating member, of drive mechanism comprising a shaft connected to said operating member, a pair of beveled drive gears loosely mounted on said shaft, a beveled idler gear meshing with said drive gears, a drive wheel on said shaft connected to one of said drive gears, a sliding clutch member keyed to said shaft for separately connecting said drive gears thereto, a shifter for said clutch member, a rotary cam for actuating said shifter, said cam being provided with a series of ratchet teeth, and a pawl operated by one of said drive gears engaging said ratchet teeth for actuating said cam.

11. The combination with an operating member, of a horizontal drive shaft geared to said operating member, a pair of beveled drive gears loosely mounted on said shaft, a beveled idler gear meshing with said drive gears, a motor actuated drive wheel on said shaft connected to one of said drive gears, a sliding clutch member keyed to said shaft for separately connecting said drive gears thereto, a rotary cam journaled below said shaft and having a cam groove in its face, a pawl and ratchet mechanism operated by said drive mechanism for actuating said cam, and a bell crank shifter connected to said clutch member and engaging the groove of said cam.

12. The combination with an operating

member, of a horizontal drive shaft geared to said operating member, a pair of beveled drive gears loosely mounted on said shaft, a beveled idler gear meshing with said drive gears, a drive wheel on said shaft connected to one of said drive gears, a sliding clutch member keyed to said shaft for separately connecting said drive gears thereto, a rotary cam journaled below said shaft and having a cam groove in its face, a bell crank shifter connected to said clutch member and engaging said cam groove, said cam having a series of ratchet teeth, and one of said drive gears having an eccentric portion, and a pawl mounted on and operated by said eccentric portion and engaging said ratchet teeth.

13. The combination with a rotatable operating member, of drive mechanism therefor comprising two oppositely rotating driving members, reversing means for separately connecting said driving members to said operating member, a rotary cam controlling said reversing means, pawl and ratchet mechanism operated by said drive mechanism for actuating said cam, and a brake engaging said cam.

14. The combination with a rotatable operating member, of drive mechanism therefor comprising two oppositely rotating driving members, a clutch member for separately connecting said driving members to said operating member, a shifter for said clutch member, a rotary cam for operating said shifter, pawl and ratchet mechanism operated by said drive mechanism for actuating said cam, and a friction brake device engaging said cam.

15. Reversible driving gear mechanism embracing means for controlling the periods of reversal of said mechanism including a cam, and means operatively connected with and continuously driven by said driving gear mechanism for intermittently actuating said cam.

16. Reversible driving gear mechanism embracing means for controlling the periods of reversal of said mechanism including a rotary cam, and means for actuating said cam operatively connected with and driven by said driving gear mechanism through means producing lost motion between said parts.

17. Reversible driving gear mechanism embracing means for controlling the periods of reversal of said mechanism including a cam and pawl and ratchet mechanism operatively connected with and driven by the driving gear mechanism for intermittently advancing said cam, said pawl and ratchet mechanism being constructed to effect lost motion between the pawl and ratchet.

18. Reversible drive gear mechanism embracing means for controlling the reverse of said drive gear mechanism and variably operating, speed reducing gearing for actuating said controlling means comprising pawl and ratchet mechanism operated by said drive mechanism, said ratchet having a series of teeth shorter than the throw of said pawl, and one or more relatively longer teeth for periodically accelerating the movement of said controlling means.

19. The combination with a rotatable driven element, of drive mechanism comprising a pair of oppositely rotating driving members, reversing means for separately connecting said driving members to said driven element, shifter mechanism for said reversing means, and lost motion pawl and ratchet mechanism operated by said drive mechanism for actuating said shifter mechanism.

20. The combination with a rotatable driven element, of drive mechanism comprising a pair of oppositely rotating driving members, reversing means for separately connecting said driving members to said driven element, a cam for operating said reversing means, and variably operating pawl and ratchet mechanism operated by said drive mechanism arranged to operate said cam and to periodically accelerate the speed thereof.

21. The combination with a rotatable driven element, of drive mechanism therefor comprising a pair of oppositely rotating driving members, a clutch member for separately connecting said members to said driven element, shifter mechanism for said clutch member, a pawl operated by said drive mechanism, and a ratchet actuated by said pawl having relatively short and long teeth arranged to operate said shifter mechanism and to accelerate its speed during its clutch shifting movements.

22. The combination with a rotatable driven element, of drive mechanism therefor comprising a pair of oppositely rotating driving members, a clutch member for separately connecting said driving members to said driven element, a shifter for said clutch member, an actuator cam for said shifter, and pawl and ratchet mechanism operated by said drive mechanism for actuating said cam, said ratchet having a series of teeth shorter than the throw of said pawl for operating said cam at slow speed and relatively long teeth for accelerating its speed during its movements in throwing said shifter.

23. The combination with a rotatable driven element, of drive mechanism comprising a drive shaft geared to said driven element, a pair of beveled drive gears loosely mounted on said shaft, a beveled idler gear meshing with said drive gears, a sliding clutch member keyed to said shaft for separately connecting said gears thereto, a shifter for said clutch member, a rotary cam for

intermittently throwing said shifter, and pawl and ratchet mechanism operated by said drive mechanism for rotating said cam, said ratchet having a series of teeth shorter than the throw of said cam and relatively long teeth for accelerating the speed of said cam during its operative movements for throwing said shifter.

24. The combination with two gear wheels continuously rotative in opposite directions, and a movable clutch device arranged to separately engage with said gear wheels, of a cam operatively connected with said clutch device for actuating it, said cam being provided with ratchet teeth, and a pawl operatively connected with one of the gear wheels and engaging said ratchet teeth.

25. A reversible drive gear mechanism embracing reversing mechanism, a cam controlling said reversing mechanism, and means operatively connected with the driving gear adapted to operate said cam, said means being arranged to accelerate the speed of said cam at the periods of reversal.

26. A reversible drive gear mechanism embracing reversing mechanism, a cam for controlling said reversing mechanism, and speed reducing means operatively connected with the driving gear adapted to operate said cam, said means being arranged to accelerate the speed of said cam at the periods of reversal.

27. A reversible drive mechanism embracing reversing mechanism, a cam for controlling said reversing mechanism, and speed reducing means operatively connected with the driving gear adapted to intermittently actuate said cam, said means being arranged to move said cam through an increased distance at the periods of reversal.

28. The combination with an operating member, of drive mechanism comprising a shaft connected with said operating member, a pair of beveled gears loosely mounted on said shaft, a beveled gear meshing with said drive gears, a drive wheel on said shaft connected with one of said drive gears, a sliding clutch member keyed to said shaft for separately connecting the said drive gears thereto, a shifter for said clutch member, a cam adapted to operate said shifter, and means operatively connected with said drive mechanism adapted to actuate said cam, said means being arranged to accelerate the movement of said cam when said shifter is actuated.

In testimony, that I claim the foregoing as my invention I affix my signature in the presence of two witnesses, this 20th day of May A. D. 1909.

ALVA J. FISHER.

Witnesses:

CLARENCE E. MEHLHOPE,

GEORGE R. WILKINS.