J. McDONALD.

GEARING.

APPLICATION FILED MAR. 27, 1911.

1,015,055.

Patented Jan. 16, 1912.

3 SHEETS—SHEET 1.

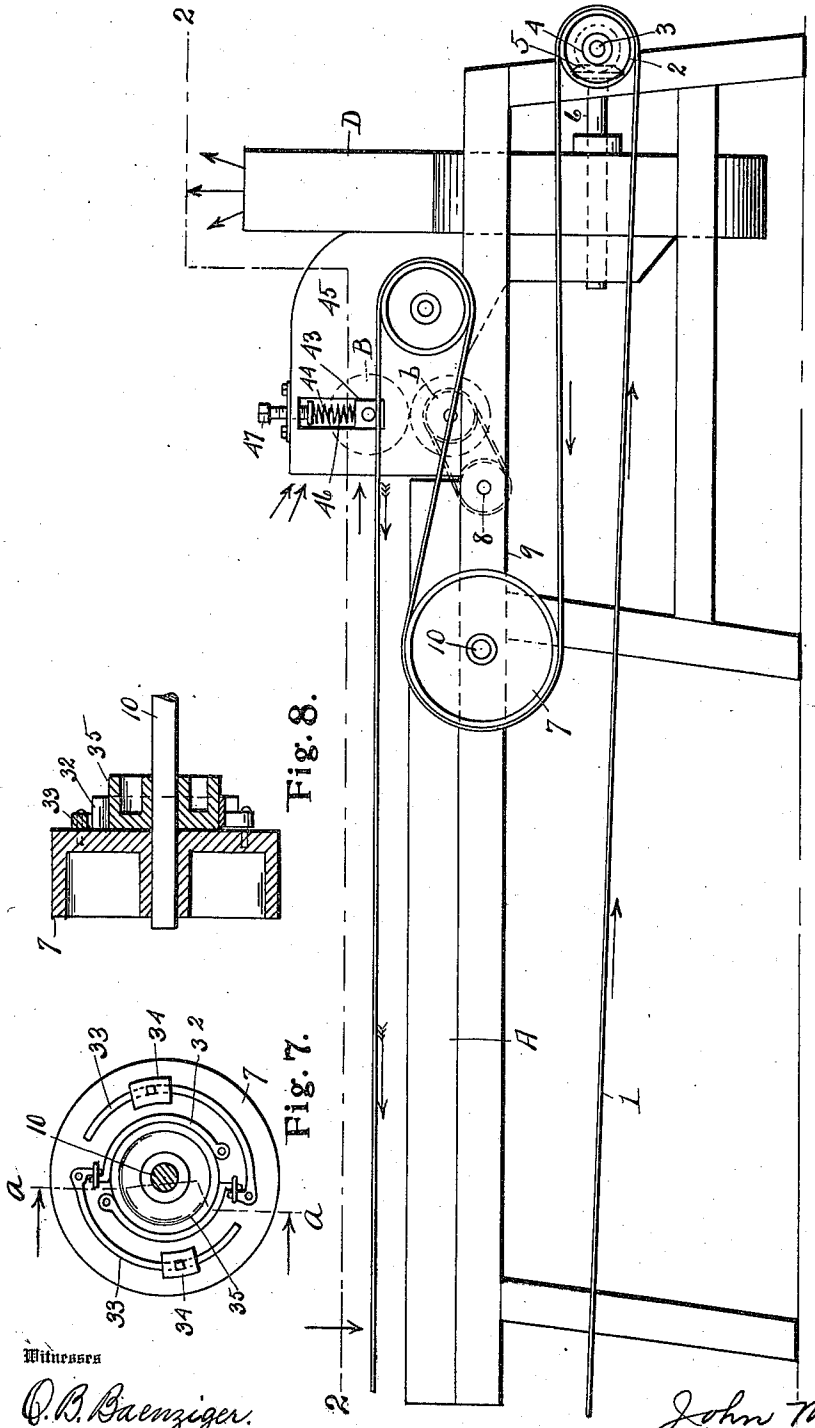

Fig. 1.

Fig. 8.

Fig. 7.

Witnesses

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3 SHEETS—SHEET 2.

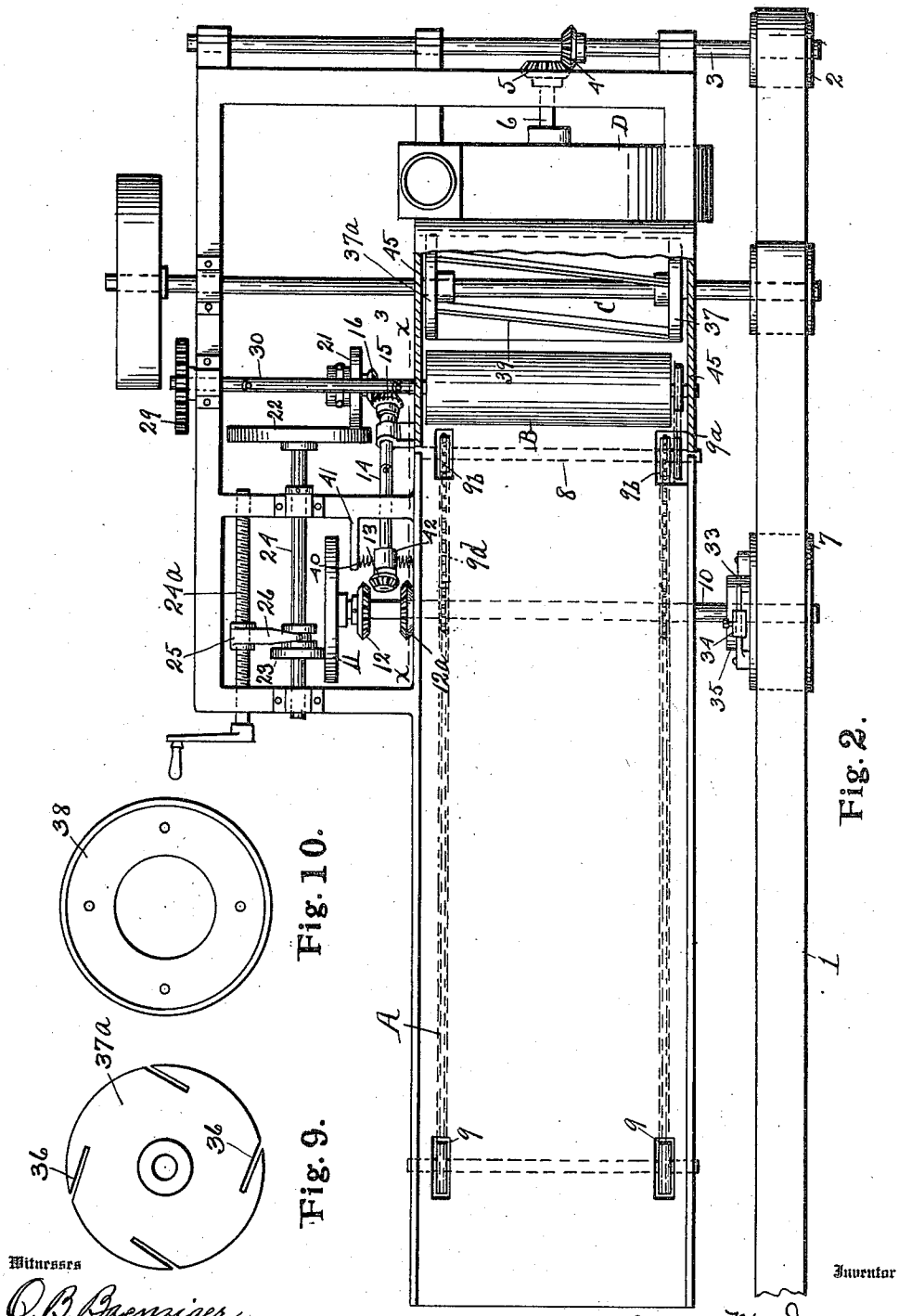

Fig. 2.

Fig. 10.

Fig. 9.

Witnesses

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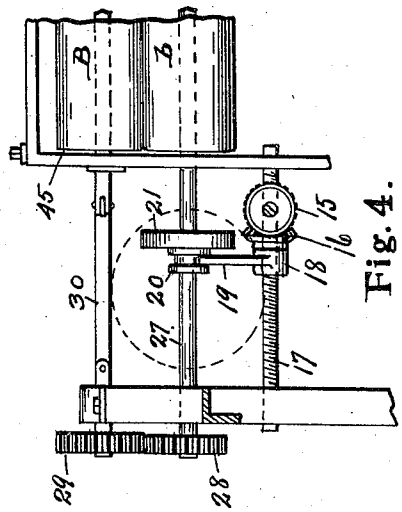

Fig. 4.

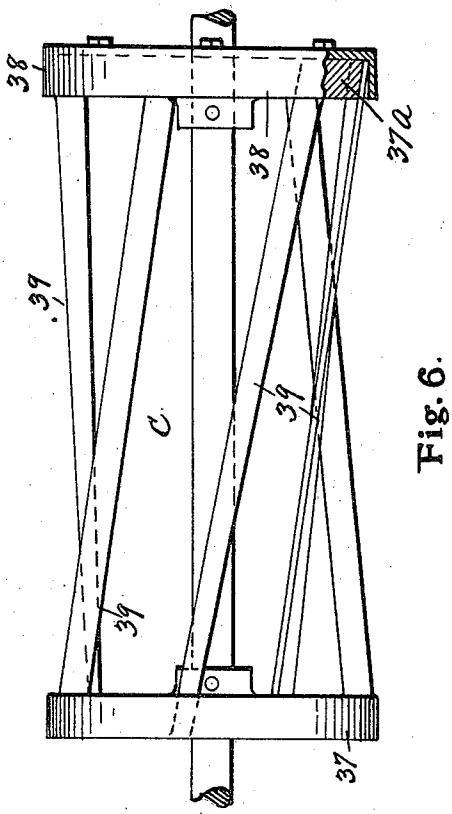

Fig. 6.

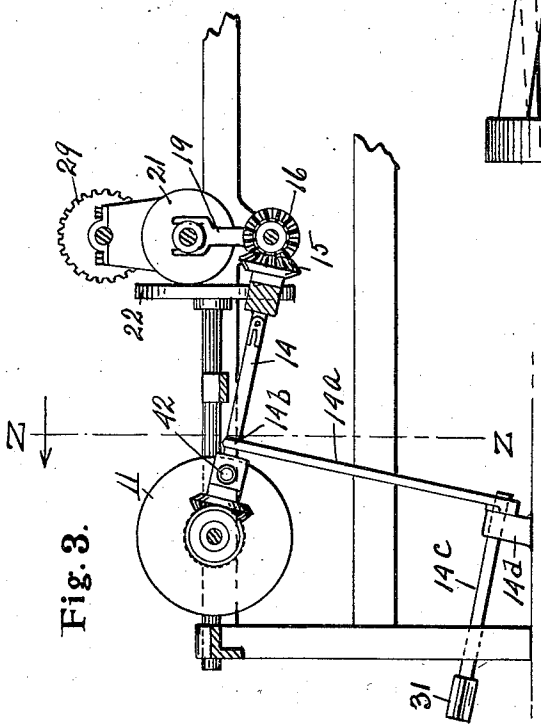

Fig. 3.

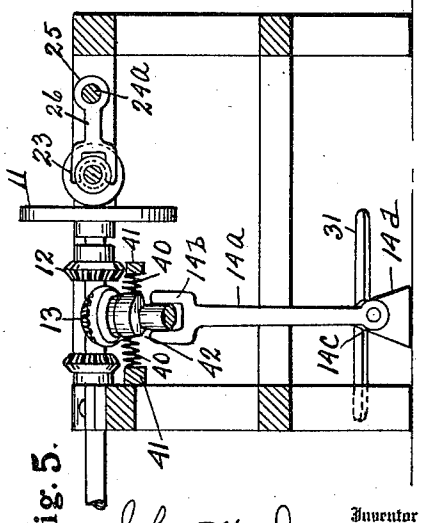

Fig. 5.

Witnesses

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UNITED STATES PATENT OFFICE.

JOHN McDONALD, OF BYRON, MICHIGAN, ASSIGNOR OF ONE-HALF TO ROBERT MUIRHEAD, OF ORCHARD LAKE, MICHIGAN.

GEARING.

1,015,055. Specification of Letters Patent. Patented Jan. 16, 1912.

Application filed March 27, 1911. Serial No. 617,019.

To all whom it may concern:

Be it known that I, JOHN McDONALD, a subject of the King of Great Britain, residing at Byron, county of Shiawassee, State of Michigan, have invented a certain new and useful Improvement in Gearing, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to ensilage cutters; it has for its object an improved cutter in which provision is made for regulating the relative speed of the feed and the cut.

The object of the invention is to provide an easily regulated feed which may be regulated while the machine is in motion and to provide means whereby the feed is not brought into operation at all until the speed of the cutters has been developed.

In the drawings:—Figure 1, is a side elevation. Fig. 2, is a plan view. Fig. 3, is a side elevation of a foot actuated stop or reverse mechanism. Fig. 4, is a front elevation of one change speed gear. Fig. 5, is a rear elevation of the foot actuated reverse gear taken at the line *z—z* of Fig. 3 and looking in the direction of the arrow. Fig. 6, is an elevation of the cutter wheel. Fig. 7, is an elevation of an automatic clutch which throws the feed in when the cutters have reached a predetermined speed. Fig. 8, is a section longitudinal of the axis of the clutch of Fig. 7 taken at the broken line *a—a* of Fig. 7. Fig. 9, is an elevation looking from the inside toward the outside of the knife fastening, and Fig. 10, is an elevation of the cap over the knife fastening.

The machine in its entirety comprises a feed table A, a feed roll B, beneath which is a second feed roll *b*, a revolving cutter C, and a fan contained in a housing D. The mechanism hereinafter described drives the apron on the feed table A, drives the feeding rolls, the cutter and the fan.

Motion is communicated to the machine by a driving belt 1 which passes around a wheel 2 on a cross shaft 3 at the rear of the machine and this by means of intervening mitered wheels 4 and 5 drives the fan shaft 6. The same belt 1 returns over a wheel 7 located in proper position to drive the feed apron, which, however is not directly driven by the shaft of the wheel 7 but by a wheel on a counter shaft 8 that receives motion from the shaft of roll *b* by means of sprocket wheels 9^b and 9^b and sprocket chain 9^a. The wheel 7 runs loose on the shaft 10 until sufficient speed has been developed to drive the fan and cutter at a predetermined rate of speed and at that predetermined rate of speed the wheel 7 comes into automatic clutch engagement with its shaft using for that purpose a governor clutch which will be described hereinafter.

The wheel 7, when the speed has been developed drives the shaft 10 which passes across the machine under the feed table and has mounted on its end a friction wheel 11 and near its end a miter pinion 12 which can be engaged by a miter pinion 13. On the same shaft 10 at the other side of the miter pinion 13 on a shaft 14 is a miter pinion 12^a, having teeth on its opposite face. Either of these pinions may be engaged by the pinion 13, when this pinion is moved either way along the shaft. This movement is accomplished by a rod 14^a, which has a forked terminal 14^b, which straddles the shaft 14. The rod 14^a is attached to the rocking rod 14^c, which is journaled in the bracket 14^d. The rocking rod extends beyond the feed table and is rocked either way by the pedal-bar 31. Spiral springs attached to the rails 41, and connected to the sleeve 42 on the shaft 14 normally hold the pinion 13 in a neutral position out of engagement with either of the pinions 12 and 12^a. The miter pinion 13 is on the flexible shaft 14 which carries at its end a pinion 15 which meshes with the pinion 16 on a worm shaft 17. The worm shaft 17 drives a nut 18 which carries a fork 19 that spans the neck in the hub 20 of friction wheel 21, and the friction wheel 21 runs across the driving friction pinion 22. If the pedal-bar 31 is depressed at one end, it throws the miter gear 13 in mesh with the pinion on the side depressed, which in turn drives the worm shaft 17 causing the nut 17 to run thereon and changing the relation of the friction wheel 21 to the friction pinion 22. This changes the gear and, if allowed to run beyond the center of friction pinion 22, reverses the rotation of the roller *b*, and if beyond the rim of the friction pinion 22, disengages the power. By depressing the

opposite end of the pedal-bar 31 the pinion 13 engages the other pinion and the shaft 17 revolves in the opposite direction causing the nut 18 to run in the opposite direction, and changing the feed, and, if allowed to run beyond the center of the friction pinion 22 reversing the roller *b*, and if allowed to run beyond the rim of the friction pinion cuts off the power.

The friction wheel 11 drives a friction pinion 23 on the shaft 24 of the wheel 22 and this friction pinion 23 is changed in position and gear by means of a hand actuated screw 24ª, and nut 25 and fork 26 which engages the neck of the hub of the friction wheel 23.

The friction wheel 21 is on shaft 27 which drives the lower feed roll *b* and gear 28 on the end of the shaft 27, meshes with the gear 29 on the end of the shaft 30 of the feed roll B. The shaft 30 is a flexible shaft to allow for variation of opening between the rolls B and *b*. The engaging friction wheels 11 and 23 of which the wheel 23 is adjustable across the face are to enable the workmen to primarily set the machine and regulate the motion of the knives with respect to the feed rolls. In normal operation, this having been once set will remain set during the period of work and the friction wheels 22 and 21 also remain in the position of adjustment primarily given to them. These, however, are an emergency set of wheels to be adjusted quickly and promptly by the workman using the pedal-bar 31, if he desires to suddenly change the speed of the rotation of the knives, or throw them to a reverse rotation.

The governor clutch shown in Figs. 7 and 8 mounted on shaft 10 and wheel 7 comprises brake levers 32 pivotally connected to the wheel 7 and actuated into their brake position or friction position by governor levers 33, each of which is provided with an adjustable weight 34, the levers 33 are pivotally connected to the wheel and under centrifugal motion which throws the weights 34 away from the center compressing the brake levers 32 against the hub 35 which is secured to the shaft 10. The pressure exerted on the brake levers is dependent on the speed of the wheel, the weight 34 and its location along the lever 33, and may be adjusted to produce the requisite clutch connection at a predetermined speed.

The knives 39 of the cutter are held in circumferential slots 36 in the holding disks 37 and 37ª. These slots are arranged so as to hold the knives obliquely from disk to disk and so that the pitch of the blade will approximate the circumference of the circle of rotation. One disk 37 may be constructed without circumference openings for the slots 36, the knives being inserted endwise, but the knives are forced in the slots from circumference openings in the other disk 37ª and the cap 38, then, bolted on holding them securely in place.

An adjusting device is mounted on the table at each side of the roller B, and is adapted to raise or lower the roller B with respect to the roller *b*. This device comprises a block 43, in which the roller B is journaled, and which is movable vertically in the guide slot 44 of the supporting bracket. This block normally rests at the bottom of the slot, but is only yieldingly held by the spring 46. Provision for more or less yield between the rollers can be readily made by the adjusting screw 47 by which the spring 46 is kept under compression.

What I claim is:—

1. A transmission device, having in combination driven mechanism, driving mechanism, means connecting said two mechanisms for changing their relative speeds, reversing their relative motions and disconnecting them while the power is on, comprising a friction pinion and a friction wheel engaging with said friction pinion and adapted to be driven across the face of said friction pinion, means for driving said friction wheel across the face of said friction pinion, the said means being provided with a pair of selected gears, one adapted to drive said friction wheel across the face of said friction pinion in one direction, and the other adapted to drive said friction wheel across the face of said friction pinion in the other direction, and means for connecting either one of said gears to the driving mechanism, substantially as described.

2. A transmission device, having in combination driven mechanism, driving mechanism, manually operated means for disconnecting the driven and the driving mechanism and for setting the ratio of relative speed thereof, and the direction of their motion, and emergency means for changing their relative speed, changing their relative motion and for disconnecting them while the machine is in operation, substantially as described.

3. A transmission device, having in combination driven mechanism, driving mechanism, manually operated means for throwing off the power, setting the ratio of speed and direction of motion of the driving mechanism, and emergency means, connecting the driven mechanism with the driving mechanism, for changing their relative speed, reversing their relative motion and disconnecting them while the power is on, and means for utilizing the power in making such changes with respect to the emergency means, substantially as described.

4. A transmission device, having in combination a drive shaft, a friction driving pinion driven thereby, a driven shaft, a

friction wheel splined on the driven shaft engaging the friction driving pinion, and slidable across the face thereof, a worm shaft adapted to drive said friction wheel across the face of the friction driving pinion, and selective gears for driving the worm shaft, and means for selecting one of said gears to rotate said worm shaft, whereby the direction of rotation of the worm shaft is controlled, substantially as described.

5. A transmission device, having in combination a drive shaft, an intermediate shaft, a friction driving pinion driven thereby, a driven shaft, a friction wheel splined on the driven shaft engaging the friction driving pinion and slidable across the face thereof, a worm shaft adapted to drive said friction wheel across the face of the friction driving pinion, and means to operatively connect the said drive shaft and worm shaft to drive the latter, substantially as described.

6. A transmission device, having in combination a drive shaft, a friction driving pinion, driving connections therebetween, a driven shaft, a friction wheel splined on the driven shaft engaging the friction driving pinion and slidable across the face thereof, a worm shaft adapted to drive said friction wheel across the face of the friction driving pinion, and means for driving the worm shaft comprising a pair of oppositely disposed miter pinions on the drive shaft, a transmission shaft adapted to drive the worm shaft, a miter pinion on the end of said transmission shaft, and means for throwing said miter pinion in engagement with either of said first-mentioned miter pinions, substantially as described.

7. A transmission device, having in combination a drive shaft, a friction driving pinion, driving connections therebetween, a driven shaft, a friction wheel splined on the driven shaft engaging the friction driving pinion and slidable across the face thereof, a worm shaft adapted to drive said friction wheel across the face of the friction pinion, and means for driving the worm shaft, comprising a pair of oppositely disposed miter pinions on the said drive shaft, a transmission shaft adapted to drive the worm shaft, a miter pinion on the end of said shaft, and mechanism for throwing said miter pinion into engagement with either of said first-mentioned miter pinions consisting of a rod yoking the transmission shaft, a rocking rod connected to and adapted to oscillate the said rod, and a pedal bar adapted to rock the rod and adapted by a depression on either end to connect the pinion on the transmission shaft with the pinion on the drive shaft on the side of the pedal bar which is depressed, substantially as described.

8. A transmission device, having in combination a drive shaft, a friction wheel attached thereto, a driven shaft, an intermediate shaft disposed transversely to said drive and driven shafts, a friction wheel splined on said intermediate shaft and adapted to be moved across the face of said first-mentioned friction wheel, a hand-actuated screw adapted to move said friction wheel across the face of the other friction wheel, a friction driving pinion attached to said intermediate shaft, a friction wheel splined on said driven shaft and running across the face of said friction driving pinion, a worm shaft adapted to drive said friction wheel across the face of the friction driving pinion, a pair of oppositely disposed miter pinions attached to said drive shaft, a pinion on said worm shaft, a transmission shaft a pinion thereon meshing with the pinion on said worm shaft, and a second pinion on said transmission shaft adapted to be thrown into mesh with either of the pinions on said drive shaft, and means for throwing said transmission shaft and said second pinion into mesh with either of said miter pinions on the first-mentioned shaft, substantially as described.

9. A transmission device, having in combination with a manually operated change speed device adapted to be set to any one of various speeds, an intermediate driving shaft operatively connected therewith, a drive shaft adapted to drive said intermediate shaft through the means of the change speed device, a friction driving pinion driven by said intermediate driving shaft, a driven shaft, a friction wheel splined on the driven shaft engaging the friction driving pinion and slidable across the face thereof, a worm shaft adapted to drive said friction wheel across the face of the friction driving pinion, and means for driving the worm shaft comprising a pair of oppositely disposed pinions on the drive shaft, a transmission shaft adapted to drive the worm shaft, a pinion on the end of said transmission shaft, and means for throwing said pinion in engagement with either of the first-mentioned pinions, substantially as described.

In testimony whereof, I sign this specification in the presence of two witnesses.

JOHN McDONALD.

Witnesses:

J. L. VAN ALSTINE,

ALMA BAHNMILLER.