F. SNOW.

DRIVING AND REVERSING MECHANISM.

APPLICATION FILED MAY 14, 1906.

912,045.

Patented Feb. 9, 1909.

2 SHEETS—SHEET 1.

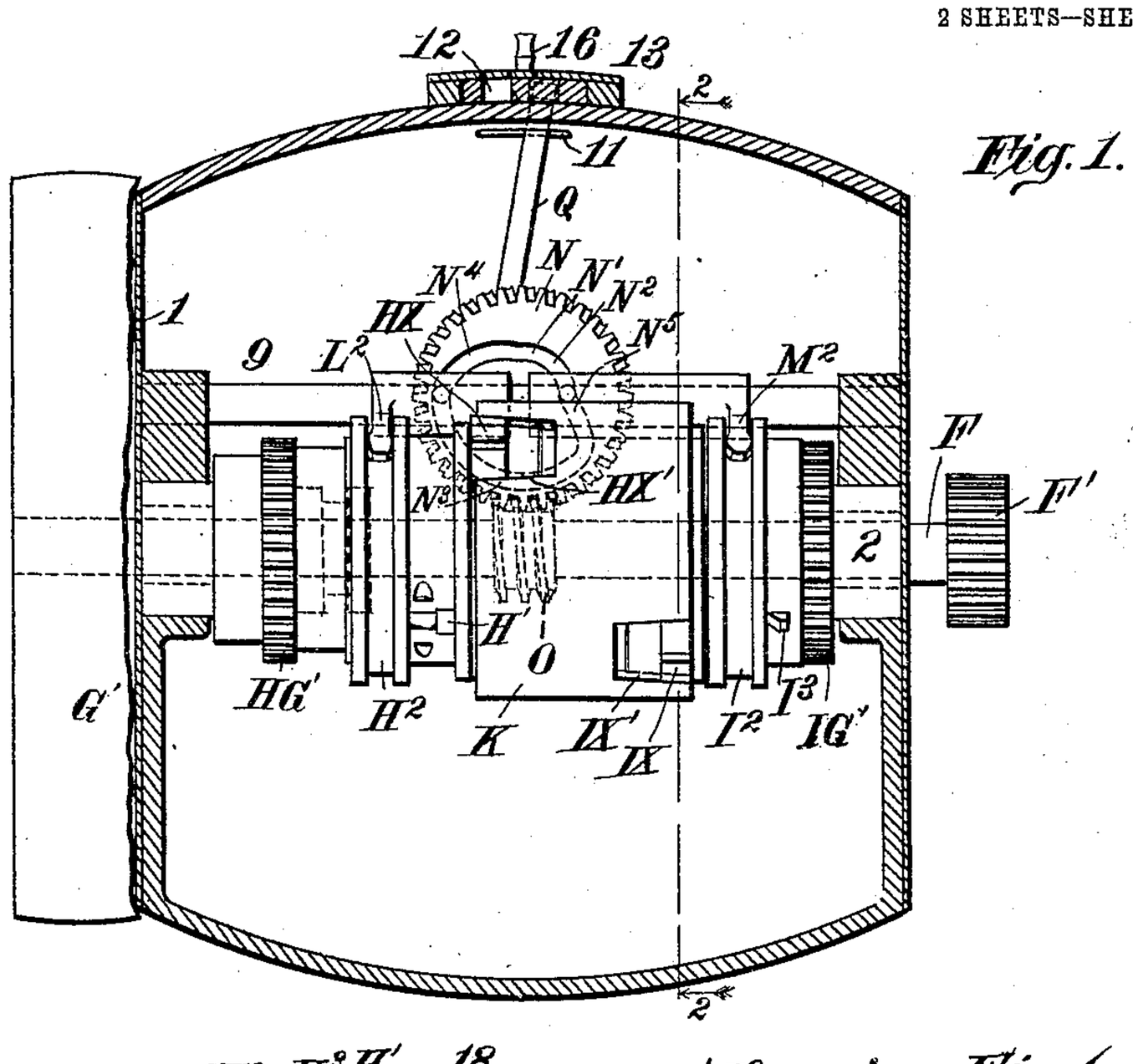

Fig. 1.

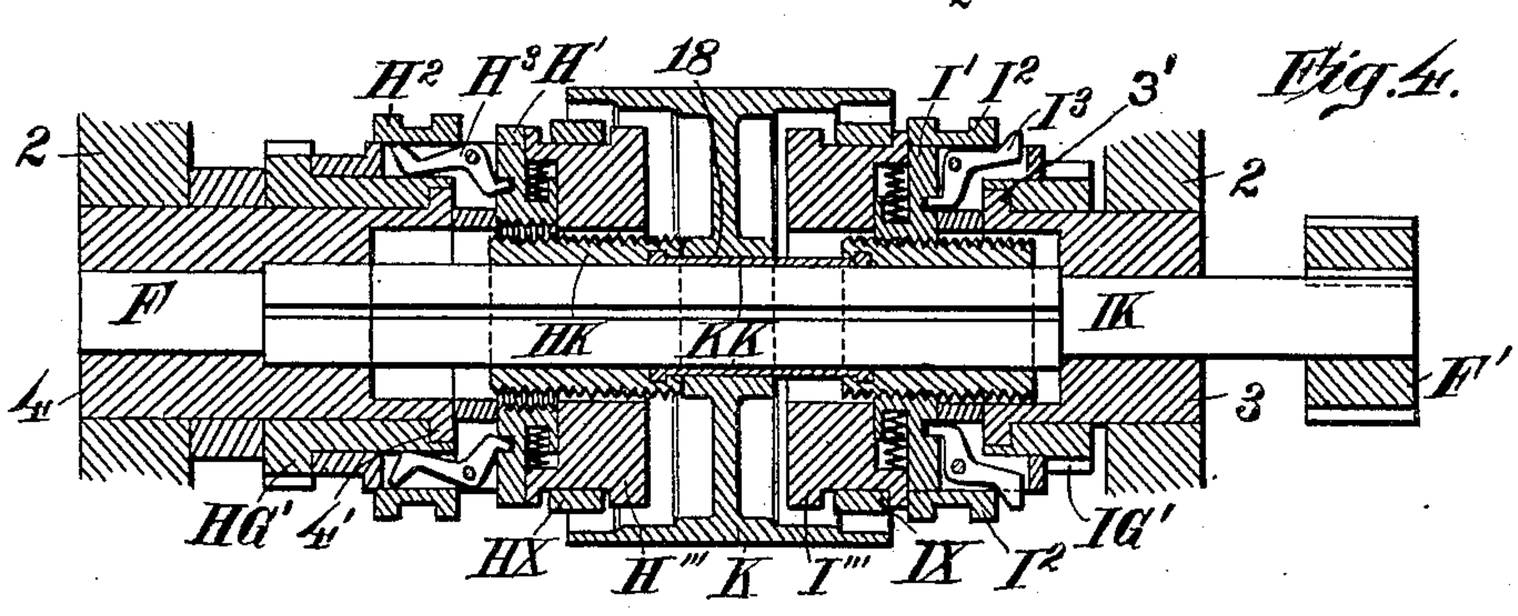

Fig. 4.

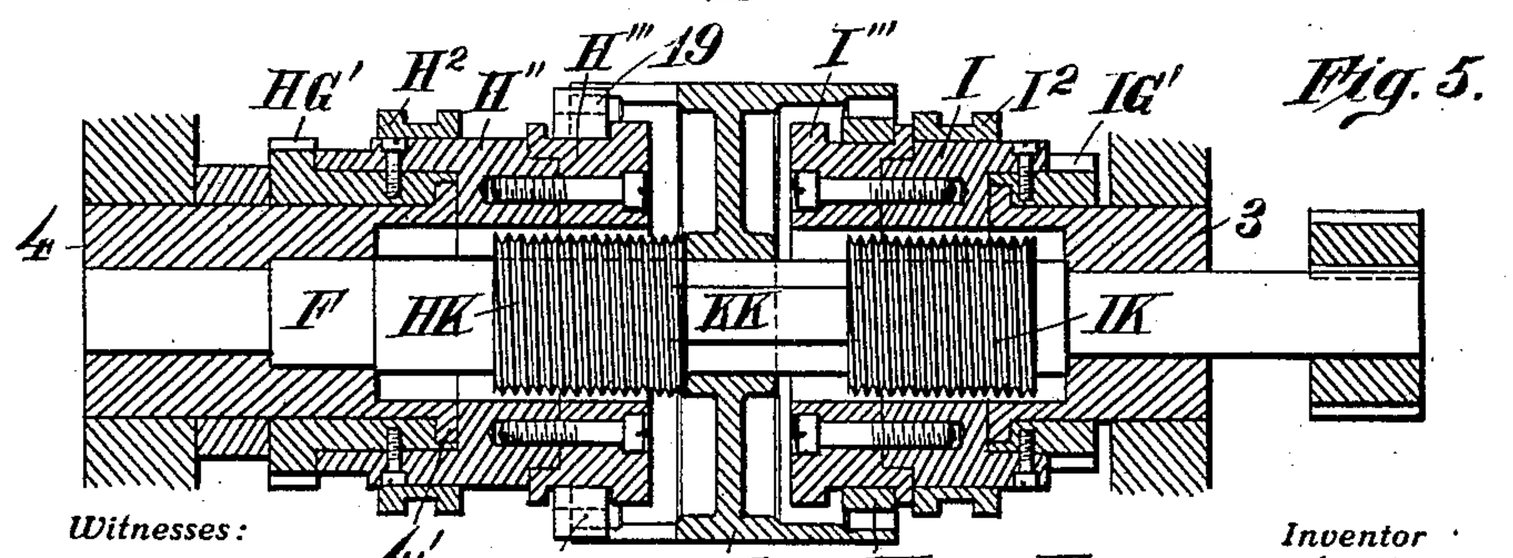

Fig. 5.

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2 SHEETS—SHEET 2.

Fig. 2.

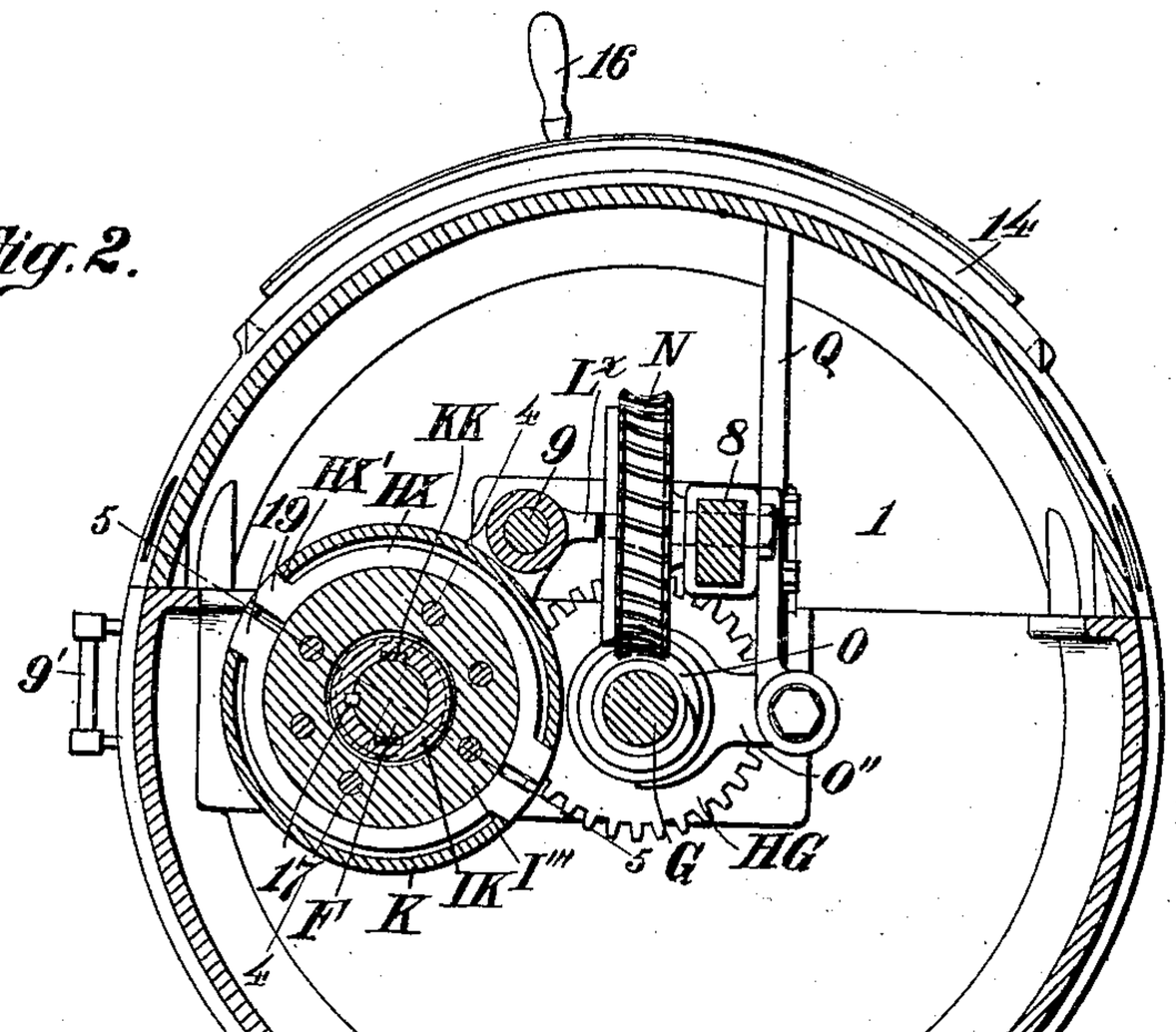

Fig. 3.

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UNITED STATES PATENT OFFICE.

FREDERICK SNOW, OF CHICAGO, ILLINOIS, ASSIGNOR TO CONKLING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

DRIVING AND REVERSING MECHANISM.

No. 912,045. Specification of Letters Patent. Patented Feb. 9, 1909.

Application filed May 14, 1906. Serial No. 316,792.

To all whom it may concern:

Be it known that I, FREDERICK SNOW, a citizen of the United States, and a resident of Chicago, Cook county, Illinois, have invented a certain new, useful, and Improved Driving and Reversing Mechanism, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in driving mechanisms for reciprocating or oscillating machines, such for example, as rotary washing machines, planers, shapers and the like, wherein movement in both directions is required.

My invention in its completeness is specially intended and adapted for use upon or in connection with machines or mechanisms of reciprocal, oscillatory or alternative types, requiring that the movement in one direction shall be exactly equaled by the movement in the opposite direction.

The object of my invention is to provide a driving and reversing machine or machines of the class described, which shall be operated by a single power connection or belt and in which the reversal of the driven element shall be accomplished practically without relative slippage between the driving and driven parts; to the end that the opposite movements of reciprocations of the driven element shall be exactly equal.

Another object of my invention is to provide a driving and reversing mechanism which shall be capable of accomplishing sudden reversals of the driven element in both directions and which, furthermore, shall be so constructed that the reversal of the driven element shall be brought about without subjecting the mechanism to objectionable or destructive shocks.

My invention consists generally in a driving and reversing mechanism of the construction and combination of parts hereinafter described and particularly pointed out in the claims.

The invention will be more readily understood by reference to the accompanying drawings forming a part of this specification, and in which;

Figure 1 is a front elevation of the mechanism embodying my invention, the front of the casing being removed; Fig. 2 is a cross section on the line 2—2 of Fig. 1; Fig. 3 is a plan view of the same, the top of the casing being removed; Fig. 4 is an enlarged, sectional view of the driven shaft and the parts thereon on the line 4—4 of Fig. 2; Fig. 5 is a section of the same on the line 5—5 of Fig. 2.

The chief difficulty encountered in the driving or reversing mechanisms hitherto invented and placed upon the market, and the factor which renders the same ineffective and objectionable, is the slippage or lost motion which occurs between the driving and driven parts. Such slippage being indefinite and unequal in opposite directions, makes it impossible to maintain the desired exact reciprocation in the machine under operation and causes it to be uncertain and ineffective in its action. Perhaps the most notable instance of the difficulty thus presented is found in the case of the common rotary washing machine. This machine comprises a stationary shell and a perforated cylinder, the latter being adapted for rotary reciprocation within the shell. The washer shell is partially filled with washing fluid and the garments to be cleansed are placed in the cylinder. The cylinder is then rotated first one way and then the other, the operation being continued for a considerable time. The efficacy of the washing operation depends in part upon the quickness or suddenness with which the rotation of the cylinder is reversed, the sudden changes of direction being depended upon to force the washing fluid into and through the clothing. The washing operation is also peculiarly dependent upon the exactness of the cylinder's reciprocation. Upon this point it will be understood that the garments normally lie at the bottom of the cylinder and that the opposite revolutions of the latter cause the garments to successively roll, unroll and re-roll, therein, this action serving and being necessary to expose all parts of the garments to the impact and passage of the washing fluid. It will be evident that if the washing cylinder rotates further in one direction than in the other the garments will be formed into a roll or ball; and this is what occurs in the washing machines that are now in use, the cause being unexact reciprocation, due to the lost motion before alluded to. Under such con-

ditions an unnecessarily protracted operation is required to cleanse the garments, and besides the loss of time, the clothing is subjected to unnecessary wear and tear. These objectionable effects and their causes have been recognized and known for a long time but have failed of a remedy by reason of the difficulties and the expense attendant upon the provision of a sufficiently powerful, quick-acting and exact reversing mechanism. The same difficulties with slightly different but no less important and annoying consequences, are encountered in machines other than rotary washers, but which like the washer have reciprocating or oscillating movements which to secure the best results should be exactly equal.

By means of my driving and reversing mechanism I am able to entirely overcome the false and objectionable features above noted. The driving and reversing mechanism hereinafter more particularly described, comprises: First: a frame or casing in which the moving members of the mechanism are contained. Second: a single direction driving shaft which is rotated by a single belt or motor. Third: a driven shaft wherefrom the reciprocating machine, whatever its kind is actuated. Fourth: two clutch members which, mounted concentrically with the driven shaft, are rotated in opposite directions from or by said driving shaft. Fifth: a shifting clutch-member arranged on and connected to said driven shaft for connecting the same with the first mentioned clutch members alternately. Sixth: a mechanism which I term a draft mechanism, associated with the shifting clutch member for moving the same into alternate engagement with the oppositely rotated clutch members. Seventh: certain shifting means for operating or causing operation of said draft mechanism, which said shifting means are actuated from or by said driving shaft whereby sudden and exact reversals of the driven shaft are brought about.

Having briefly named the constituent elementary mechanisms making up my novel driving and reversing mechanism, I shall now describe the constituent elements of the mechanism in detail.

The frame or casing for the operating parts of my mechanism is in such form as to completely inclose said parts to contain the oil for lubricating said mechanism. The casing has the shape of a barrel or globe, but this preferred shape may be altered, if desired, to suit the general design of the machine with which the mechanism is to be associated. When in use the casing occupies a horizontal position, that is, its axis is horizontal, and the lower part of the casing is filled with oil partly submerging the rotating members of the mechanism. Suitable means are employed for attaching the casing to the machine to be actuated. I prefer that the casing shall be in two parts, the upper part being removable to expose the contained mechanism.

The ends of the casing contain two blocks, 2—2. These blocks furnish bearings for the driving shaft, G, and the driven shaft F, said bearings being suitably bushed. The most important of these bushings are those indicated by numerals 3 and 4 in Figs. 4 and 5 of the drawings, these not only furnishing bearings for the shaft, F, but also for the clutch parts H and I, hereinafter described. The frame is completed by two cross bars 8 and 9 parallel with the axis of the casing and fastened in the bearing blocks 3 and 4.

The driving mechanism, including the clutch members, H and I.—The driving mechanism proper comprises a number of parts, including the following: the belt pulley, G′, the stud shaft, 10, the power shaft, G, the set of gears HG, HG′ and IG, IG′, IG² and the clutch members H and I: wherewith the starting lever, Q, is associated. The stud shaft, 10, is journaled in the bearing block, 4, and the outer end of the power shaft, G, is journaled in the inner end of shaft, 10. The inner end of the shaft, 10, forms one-half of the clutch, Q′, and the other half of said clutch is formed on the spur gear, HG; the hub of said gear has a groove to receive the yoke, Q″, at the lower end of the starting lever, Q, and the gear HG is slidable on the shaft, G, for disengagement from the shaft, 10, but is never moved out of engagement with the companion gear, HG′, on the clutch member, H. It is obvious that a simple slot could be provided in the top of the casing and that the lever, Q, could be made to be operated directly from the exterior of the casing, but it is desirable that the starting clutch, Q′, shall be operated quickly, and also that means shall be arranged for locking the same, in either of its positions. For these reasons, I provide a separate operating mechanism for the starting lever. The end of the lever, as shown in Fig. 3, is provided with a small anti-friction roll and projects through a slot, 11, in the top of the casing, and into engagement with a cam groove or slot, 12, in a plate, 13. This plate is curved and is held between guides, 14, on the top of the casing.

16 is a handle, by which the plate may be shifted.

The movement of the plate is transverse to the throw of the lever, Q, and it is obvious that the cam therein will operate the starting lever, Q, when the plate is reciprocated or shifted.

To prevent the backward turning of the power shaft, I prefer to connect the belt pulley, G′, and the shaft, 10, by means of a single-direction ratchet, 10′, adapted for for-

ward turning only. The ratchet is concealed by the cap nut which holds the pulley in place on the stud-shaft.

The spur gears, HG, HG′, are two in number, whereas on the opposite side I employ three gears, IG, IG′, and IG², one IG² thereof being an intermediate or idler gear. The clutch members, H and I, are thus positively connected with the power shaft and are rotated in opposite directions. If desired, the clutch members, H and I, may be directly mounted upon the driven shaft, F, but to avoid the effects of possible binding and of friction upon said shaft, I prefer to mount the clutch members upon the inner ends of respective bushings, 4 and 3. These bushings have shoulders, 4′ and 3′, at their inner ends, to prevent longitudinal movement of the clutch parts, and like the clutch members, are made hollow, to accommodate the threaded draft sleeves, HK and IK. It is possible to make the body member of each clutch part in a single piece, but for convenience in manufacturing them I prefer that said body parts shall comprise several connected parts, one being the spur gear and its hub, the other an intermediate part, H″, and the third, H‴. The intermediate part bears the sliding collar, and contains recesses for the clutch nuts, H′ or I′, as the case may be. The arrangement is such that the collar may slide over the recesses containing the nuts to engage with the ends of the latter when in work. Extensions of these recesses accommodate the bell-cranks, H³ and I³, underlying outer position of respective sliding rings, H² and I². The bell-cranks engage the nuts and operate to drop and lift the same when actuated by the sliding rings. The parts H‴—I‴ contain grooves for the friction rings, HX and IX, which latter rotate with the shifting clutch part, K, and are properly parts of that portion of the mechanism.

The driven shaft, including the shiftable clutch member.—The shaft, F, is held against longitudinal movement by the abutment of its shoulders against the bushings, 4 and 3. It is provided with a key or feather, 17, and the sleeves, HK and IK and the drum, K, are secured to the shaft, F, by said key or feather, 17. These parts are slidable on the shaft, such movement being necessary to the shifting of the clutches. It will be seen that the draft or coupling bars, KK, are arranged to operate in grooves, 18, provided in the hub of the member, K. Said bars have their ends held in the threaded sleeves, the latter being provided with annular grooves to receive the lugs of the bars, KK. The bars are of greater length than the hub of the member, K, allowing lost motion or freedom of movement between said member and the sleeves, HK—IK. The ends of flanges of the member, K, overhang or inclose the inner ends of the clutch members, H and I, and said flanges are provided with converging or V-shaped notches, HX′ and IX′. The rings, HX—IX, are made in halves and are provided with lugs, 19, which are accommodated in the wedge recesses of the member, K. It will now be evident that when the member, K, is shifted on the shaft, F, the clutch ring which is held in one pair of wedge recesses will be loosened, while the ring held in the opposite pair will be tightened upon its clutch member. A very slight longitudinal movement of the member, K, thus suffices to free it from one clutch member and connect it to the other by tightening its ring thereon. The necessary movement is imparted to the member, K, by the clutch nuts operating through the medium of the longitudinally shiftable draft sleeves. My purpose in allowing lost motion between the member, K, and the draft sleeves—that is for allowing the latter greater freedom of movement, is to insure the proper setting of the threaded sections or nuts, H′—I′ in the threads of the sleeve before said nuts are subjected to the strain incident to the shifting of the member, K, and to allow the shifting ring or notch to complete its movement to the position over the recesses containing the nuts. It will be observed that the nuts are freed as soon as the bell-cranks or triggers are liberated by the first movement of the ring. This being the case the nuts will sink to the full depth of their threads at about the instant that the ring reaches a position over the outer ends of the nuts. After the ring is thus located it is obvious that it serves to lock the nuts in engagement with the threaded sleeve.

As constructed both draft sleeves are freed when one set of nuts is withdrawn, and therefore respond instantly to the first slight contact of the set which is closed thereon in the opposite clutch member, and the time which elapses before the draft device engages the member, K, is sufficient to permit the incoming nuts to become firmly seated and to be locked before the draft device begins to pull upon the member, K.

The complete operation of this portion of the mechanism may be traced as follows: Assuming that the parts are in the positions shown in Figs. 1 to 4, the part, K, will be in rotation with the member, I, and as both K and the draft sleeves are keyed to the shaft, F, all of these parts will rotate together, there being at this time no relative movement between the nuts I′ and the sleeve, IK. Referring now to Figs. 4 and 5:—If the ring, I² is shifted to raise or expand the clutch nuts, I′ the draft sleeves will be liberated, but the part, K, will continue to be rigidly connected to the part, I, there having been as yet no movement between these mem-

bers. A moment after the ring, I^2, is shifted, the ring, H^2, is moved inward to release the nuts, H′ in the member, H. Thereupon the nuts, which are spring-pressed, will close upon the sleeve, HK. The part H operates in a reverse direction, and as the threads of the nuts sink into the thread of the sleeve, HK, the latter will be drawn back until the opposite sleeve, IK, ultimately engages the hub of the member, K, after which the whole draft effort will be exerted upon said member and will operate to free the clutch ring, IX, and bind the opposite ring, HX, upon the member, H, thereby completing the exchange of the clutches and causing the shaft, F, to be rotated with the member, H. The member, K, remains in connection with the clutch from which it is about to be separated until the draft device actually begins to draw upon it. The causes of its so doing are:—first, the lost motion referred to; and second, a further and distinct cause lies in the fact that the friction rings and the flanges of the drum, one or both, possess considerable elasticity and resiliency, causing the same to bind firmly upon one another and preventing the natural expulsive operation of the wedge, which latter is proportional to the inclination of the sides of the wedge recesses. The elasticity and resiliency of the parts serve a further and particularly advantageous purpose in this; that at the first moment of engagement between a rotating clutch member and a then oppositely rotating clutch ring the clutch ring and the drum, K, one or both, expand sufficiently to prevent, for the moment, the rigid coupling of the parts, which latter would result in an injuriously sudden reversal of the heavy body that is geared to the pinion F′ on the shaft, F.

The shifting or reversing mechanism employed for actuating the rings H^2 and I^2 of the clutches, comprises the two shiftable yokes, L^2 and M^2, slidable on the frame rod 9, and a rotary cam, N, which is driven by the driving shaft, G, and is engaged with the yokes by means of lugs, LX, thereon. The cam wheel, N, is preferably a worm gear wheel and engages and is operated by a worm, O, on the shaft, G. As the shaft, G, rotates continuously in one direction, it is obvious that the cam wheel, N, likewise rotates in only one direction. The cam, N, is supported on a stud provided therefor on the frame or cross rod, 8, as shown in Figs. 2 and 3, occupying a position directly above the shaft, G. As stated the cam engages both yokes, L^2 and M^2 through the medium of the lugs, LX—LX, and imparts intermittent motion thereto, the arrangement being such that the yoke whose ring is in operating position will be released or thrown back before the opposite yoke is moved to disengage its ring from the clutch nut operating levers or bell cranks. The cam groove, N′ in the wheel N has two portions, N^2 and N^3, which follow arcs of minor and major circles. These are joined by a portion, N^4, which is the throwing in portion of the cam. The opposite parts of the groove are joined by irregular groove portion or section, N^5, forming an abrupt angle and constituting the throw-out portion of the cam. The cam rotates in the direction of the arrow of Fig. 1, and it will be observed that the throw-out section always acts in advance of the throw-in section of the cam. As pictured in Fig. 1 the yoke, M^2, is about to be thrown out, that is, moved in such direction as to cause the ring, I^2 to engage and lift the underlying levers, I^3, thereby freeing the sectional nuts I′ from the draft device. Further referring to Fig. 1, it will be seen that the lug on the yoke, L^2, is about to be actuated by the throw-in or inwardly moving portion of, N^4, of the cam. As the yokes are definitely related through the medium of the cam; as the movement of the yokes controls the operation of the clutches; and, as the rotation of the cam is dependent upon the driving shaft, G, it is obvious that the clutches will be alternated at certain fixed intervals or period during the rotation of the driving shaft. Slippage between the parts is in effect wholly avoided by the employment of the clutch mechanism shown, and as the operation of these reliable parts is directly and positively controlled from a continuously driven power shaft, it is obvious that slippage or lost motion between the power shaft and the driven shaft is practically done away with.

As various modifications of my invention will readily suggest themselves to one skilled in the art, I do not confine the same to the specific form and constructions herein shown and described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. In a driving and reversing mechanism, a machine shaft and element to be alternatively driven, in combination with a single direction driving shaft, a driven shaft geared to said element, opposite direction clutch parts concentric with said driven shaft and driven by said driving shaft, a shiftable clutch member and shifting means operatively connected with said shiftable clutch member and continuously actuated by said driving shaft, substantially as described.

2. In a driving and reversing mechanism, a machine shaft and element to be alternatively driven, in combination with a driving shaft, clutch members connected with said driving shaft and thereby driven in opposite directions, a driven shaft for imparting movement to said element and adapted to be rotated by alternate connection with said clutch members, a shifting clutch member,

and a single direction reversing member constantly rotated by said driving shaft and arranged to cause periodical movement of said shifting clutch member, substantially as described.

3. In an automatic driving and reversing mechanism, a machine element to be alternatively rotated, in combination with a single direction, constantly rotated driving shaft, a driven shaft geared to said element, opposite direction driving clutch members rotated by said driving shaft, for rotating the driven shaft alternately, in opposite directions, and means geared to said driving shaft for positively controlling and timing the operation of said driven shaft by said opposite direction members, substantially as described.

4. In a driving and reversing mechanism, a machine element to be alternatively rotated, in combination with a shaft, geared to said element, oppositely rotated clutch members means for connecting either thereof with said shaft, an intermitting member for operating the clutches, a continuously driven single direction member periodically operating said intermitting member, and a power or driving shaft for rotating said clutch members and said intermitting member, substantially as described.

5. In a driving and reversing mechanism, a machine element to be alternatively driven, in combination with a single direction continuously driven shaft, two clutch members continuously driven in opposite directions by said shaft, a shaft to be driven by said clutch members and arranged to drive said element, a clutch mechanism for engaging said members with the last mentioned shaft alternately and a cam continuously driven by the first mentioned shaft and actuating and controlling said clutch mechanism, substantially as described.

6. A driving and reversing mechanism, comprising a driven shaft, in combination with continuously rotated opposite direction drivers, a shifting clutch mechanism, shifting yokes, and a continuously rotated cam engaged with said yokes and adapted to operate one in advance of the other, as and for the purpose specified.

7. In a driving and reversing mechanism, a single direction power shaft, in combination with a driven shaft to be rotatively reciprocated, a machine element geared to said driven shaft, a suitable opposite direction clutch mechanism driven by said power shaft, for connection with said driven shaft, a shiftable clutch member, a reciprocating draft mechanism for actuating the latter, and a cam rotated by said power shaft and controlling the operation of said draft mechanism, substantially as described.

8. In a driving and reversing mechanism, a driving shaft, in combination with a driven shaft, to be rotatively reciprocated, clutch members rotated by said driving shaft, shiftable means for engaging the clutches with said driven shaft alternately, a worm on said driving shaft, a worm gear and a cam rotated with said gear for actuating said shiftable means, substantially as described.

In testimony whereof, I have hereunto set my hand, this 4th day of May, 1906, in the presence of two subscribing witnesses.

FREDERICK SNOW.

Witnesses:

CHARLES GILBERT HAWLEY,

JOHN R. LEFEVRE.