F. SNOW.

DRIVING AND REVERSING MECHANISM.

APPLICATION FILED DEC. 21, 1905.

912,043.

Patented Feb. 9, 1909.

4 SHEETS--SHEET 1.

Fig. I.

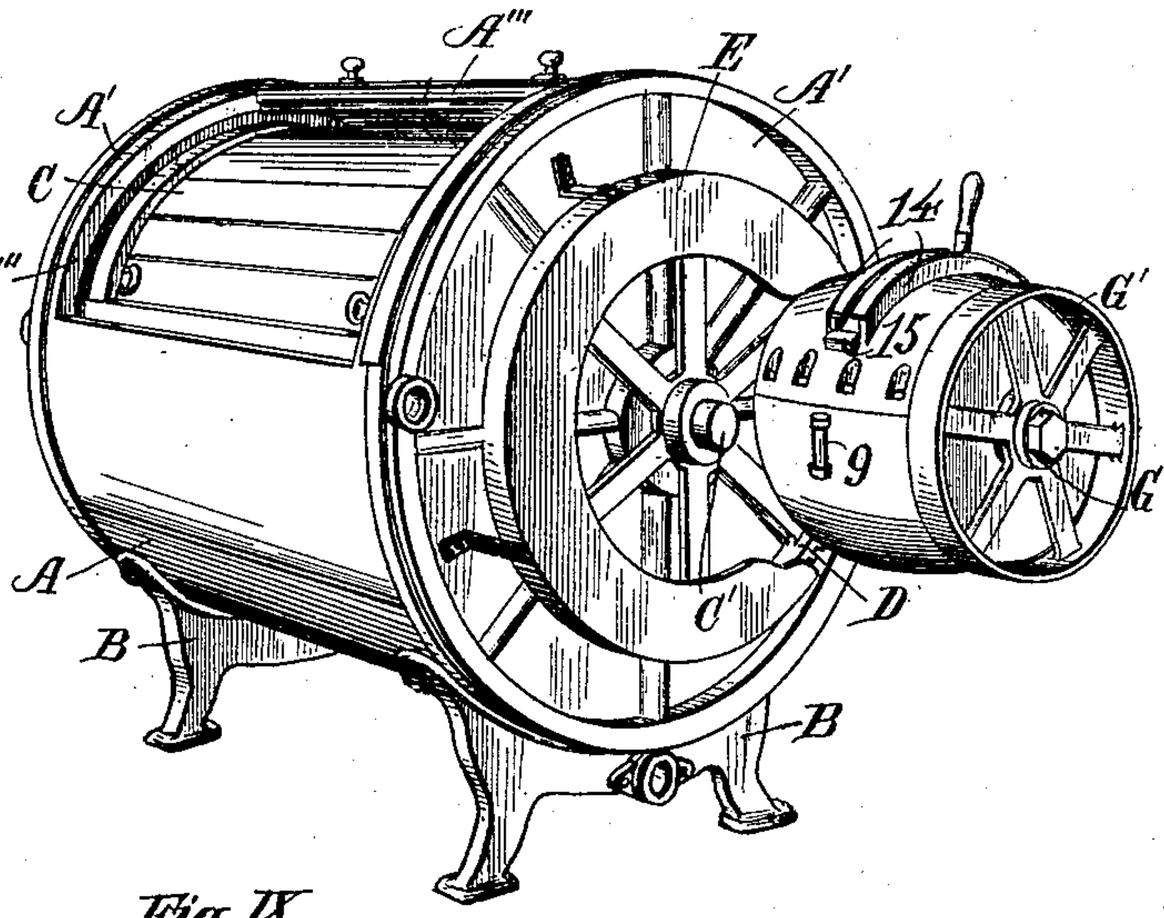



Fig. IX.

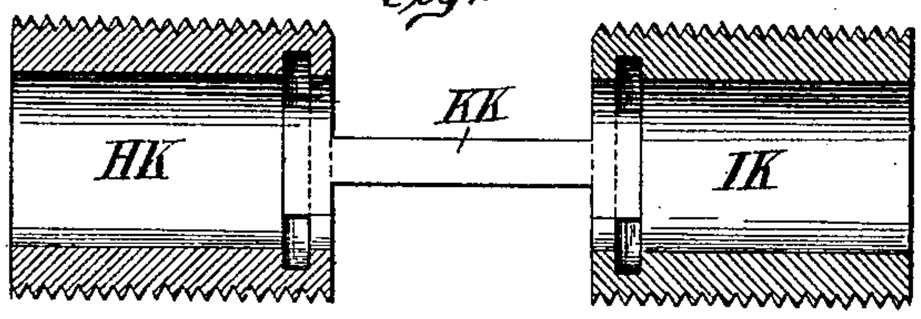



Fig. X.

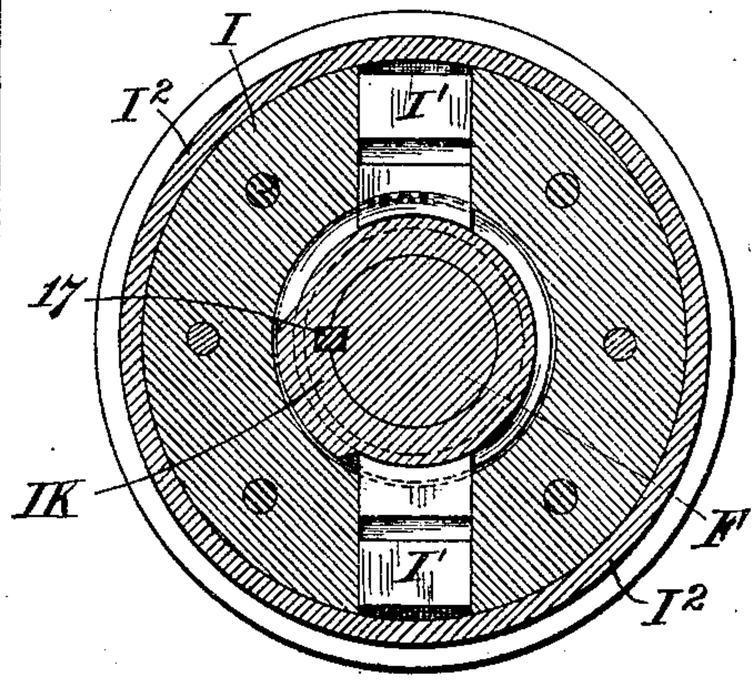



Fig. XI.

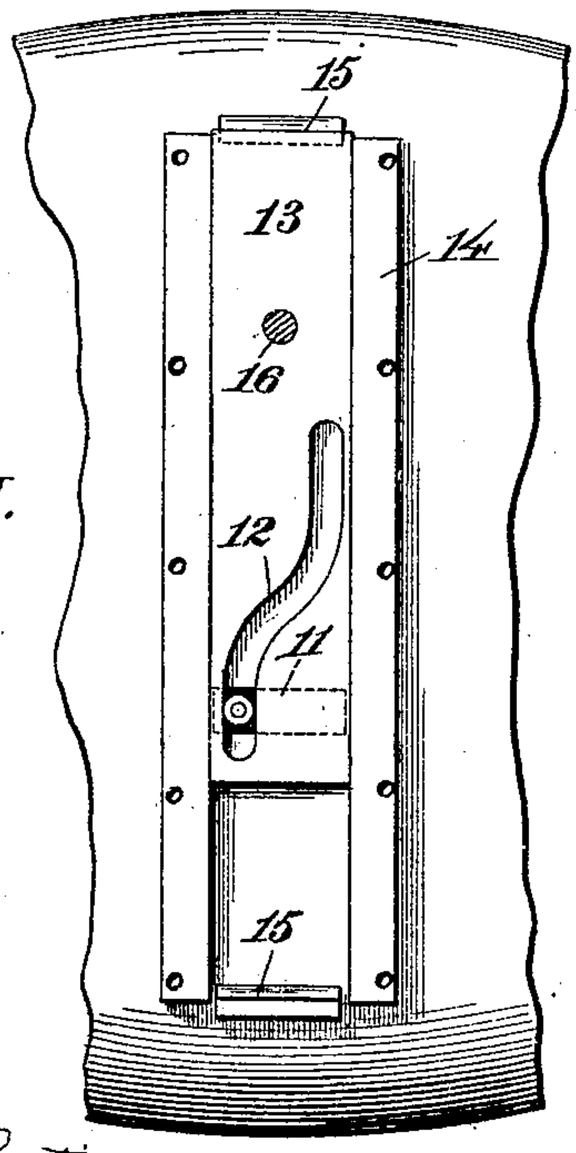
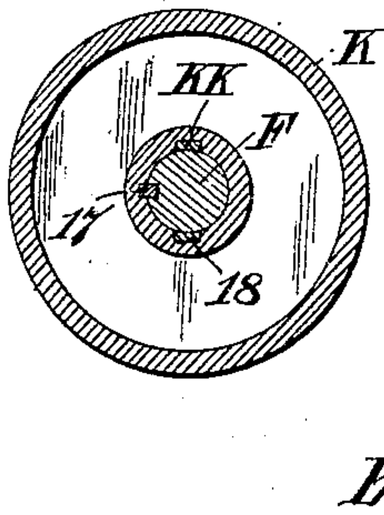



Fig. XII.




Witnesses;

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4 SHEETS—SHEET 2.

Fig. II.

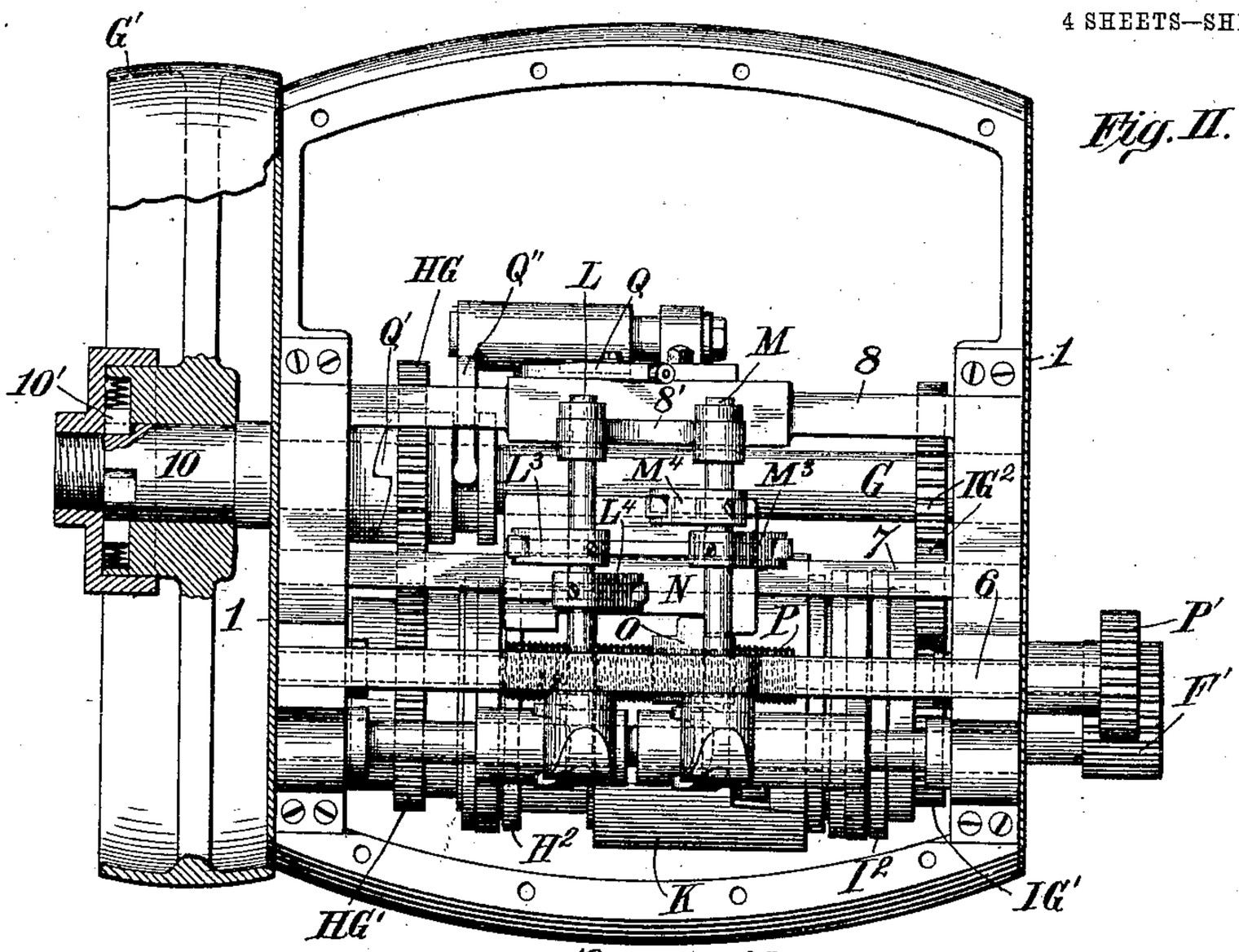
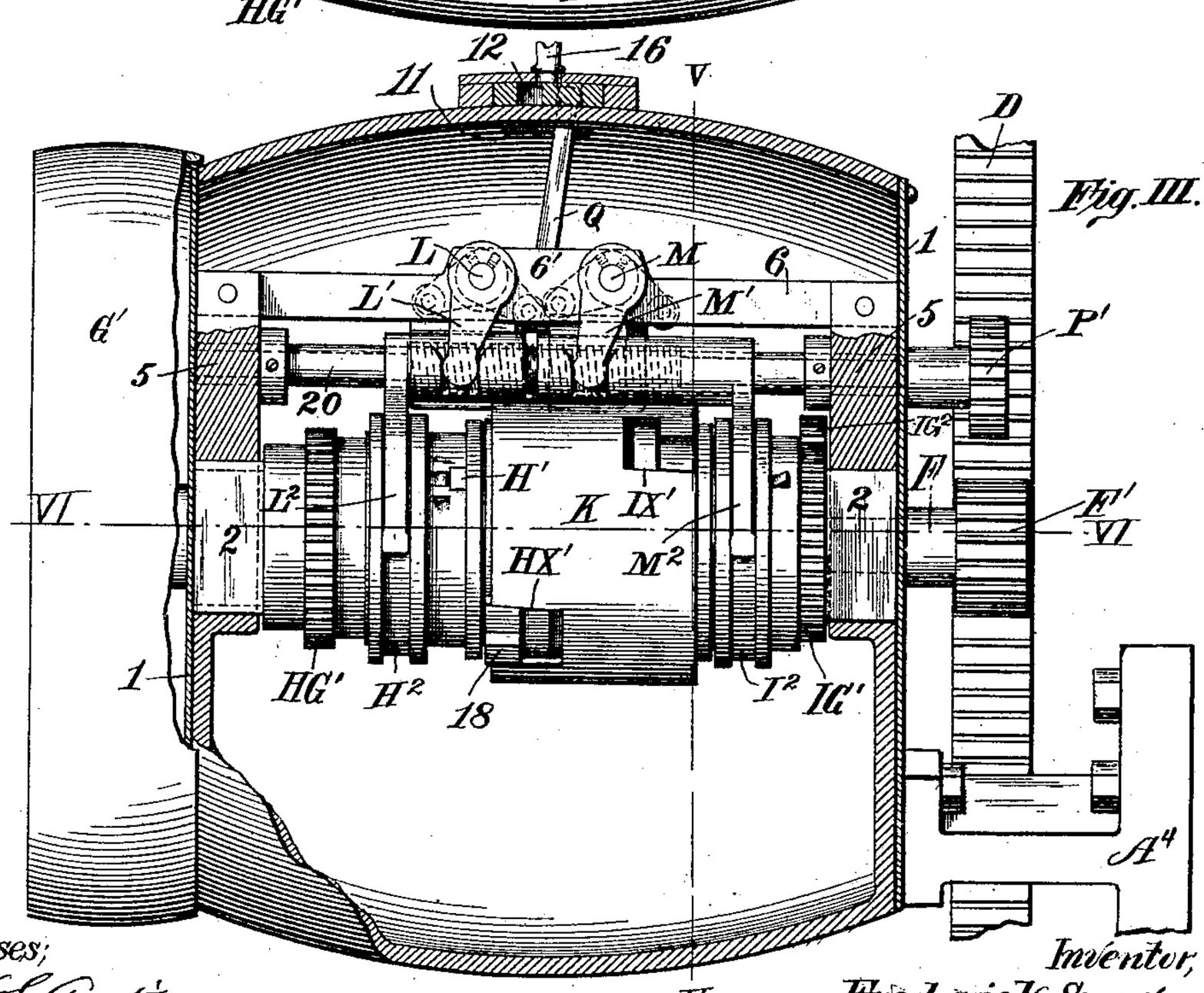



Fig. III.

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4 SHEETS—SHEET 3.

Fig. IV.

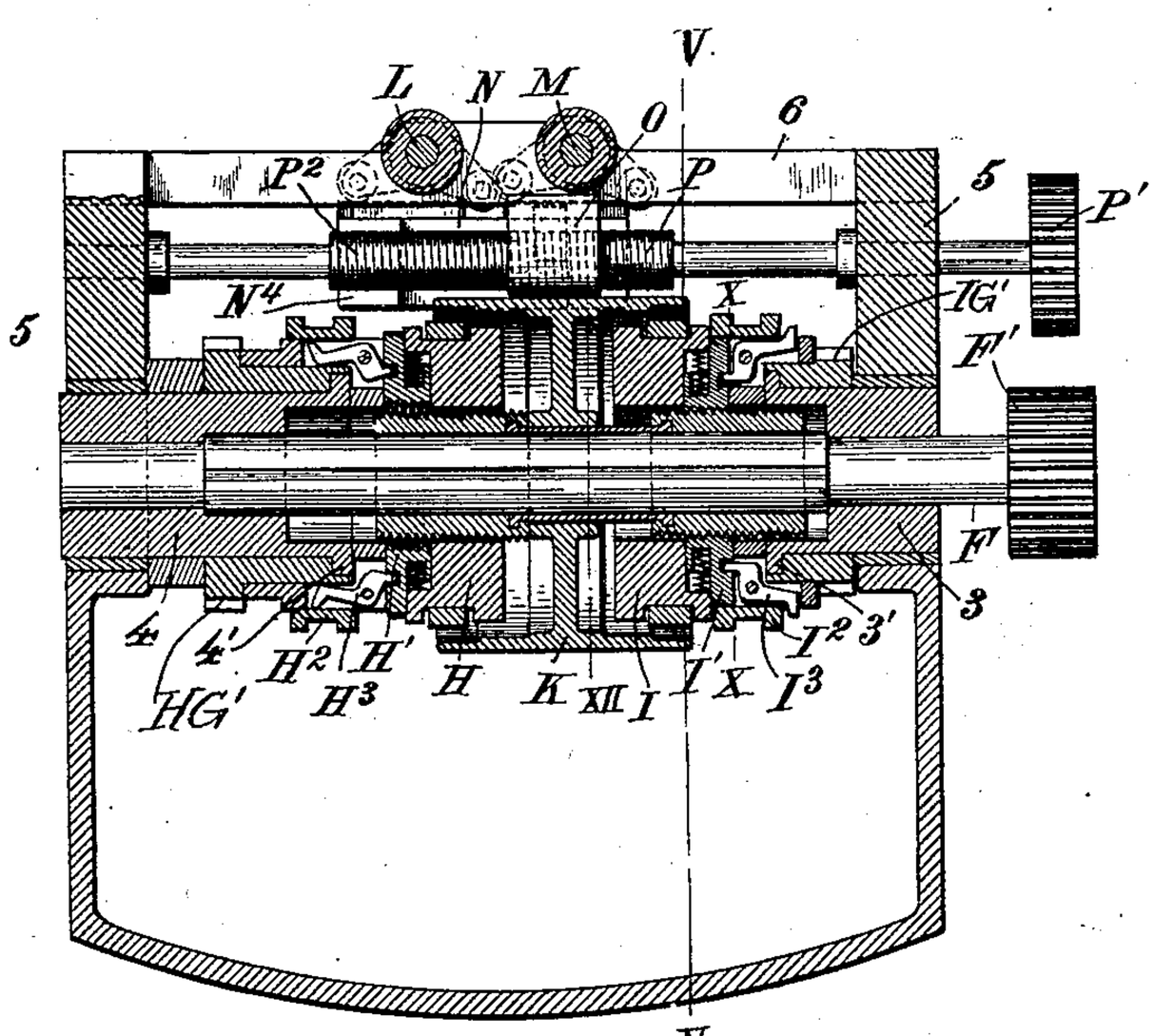
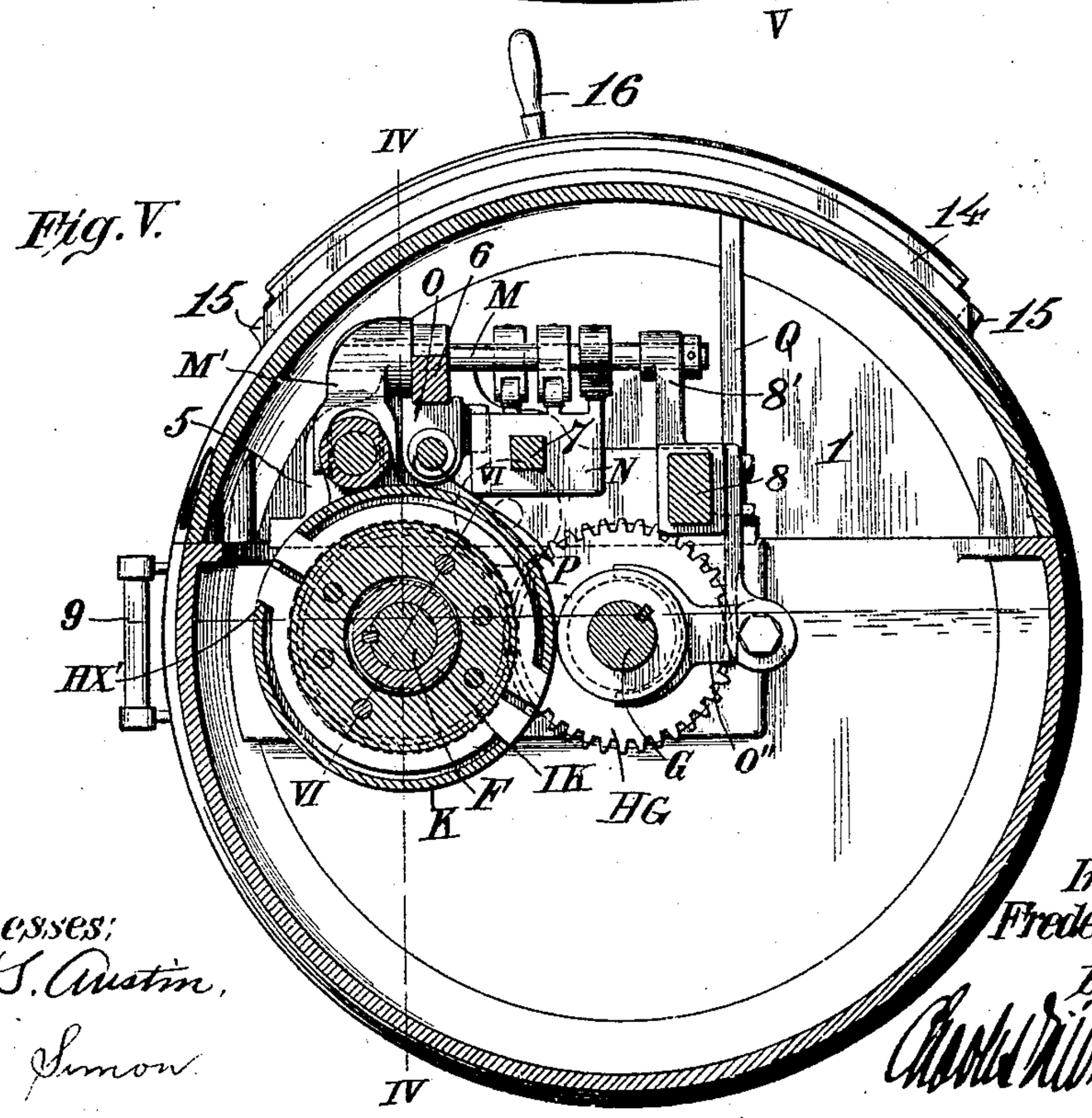



Fig. V.

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4 SHEETS—SHEET 4.

*Fig. VI.*

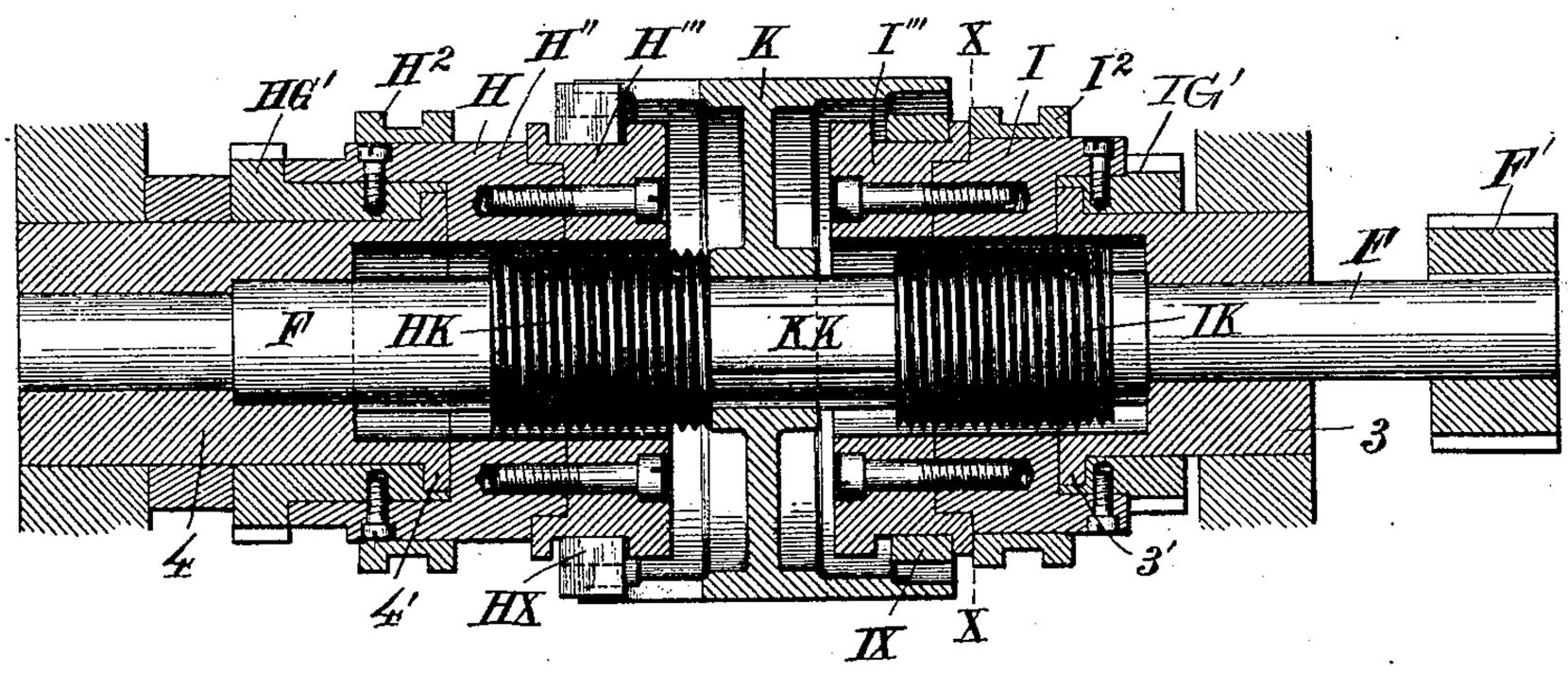



*Fig. VII.*

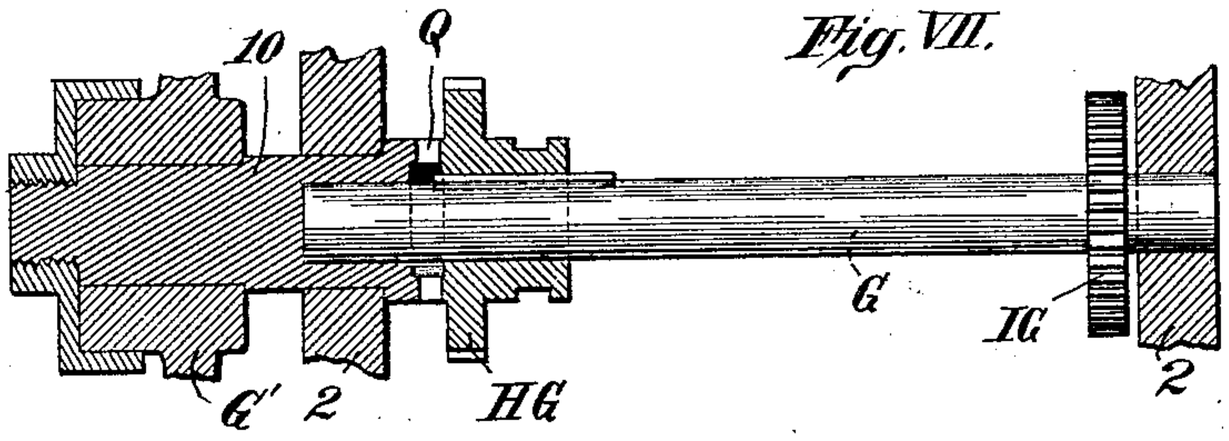
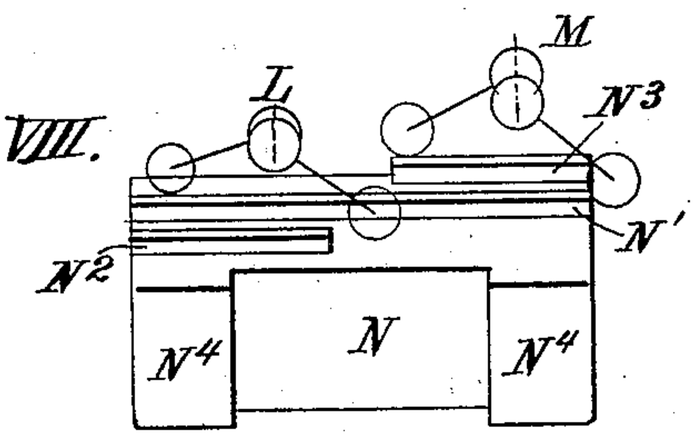



*Fig. VIII.*

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# UNITED STATES PATENT OFFICE.

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

## DRIVING AND REVERSING MECHANISM.

No. 912,043. Specification of Letters Patent. Patented Feb. 9, 1909.

Application filed December 21, 1905. Serial No. 292,778.

*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.

As will appear hereinafter, my invention is adapted for operation under manual control, where employed upon machines requiring frequent reversal, without restriction to given times or periods of operation in one or the other direction. But my invention in its completeness is intended and adapted for use upon or in connection with machines or mechanisms of strictly reciprocal, oscillatory or alternative types; wherein it is required that the movement in one direction shall be exactly equaled by the movement in the opposite direction.

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 change of direction is 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 reroll 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 the lost motion before alluded to. The result of this massing of the clothing is that an unnecessarily protracted operation of the machine 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 machanism. The same difficulties with slightly different but no less important and annoying consequences or results, are encountered in machines other than rotary washer and which like the washer have reciprocating or oscillating movements which should be exactly equal.

The object of my invention is to provide a driving and reversing mechanism which shall be of simple and comparatively economical construction, both compact and durable, and which shall be peculiarly fitted for imparting exact movements to machines of the oscillatory or reciprocatory (straight line or rotary) types, and for causing quick, sudden, and powerful reversals of movement therein.

Other and special objects of the invention are, to provide a driving and reversing mechanism of such design and form that it may be attached to any of several different types of machines without modification in any essential particular;—to provide a mechanism of the class described, which shall be

entirely inclosed and self-lubricating, to the end that it shall require a minimum of attention and care; to provide a driving and reversing mechanism that shall be wholly automatic in its operation, and further a mechanism which shall be so constructed and protected that it cannot be injured or rendered inoperative by careless or ignorant manipulation of the controlling or starting lever.

A further and special object of the invention is to greatly simplify the form and reduce the number of the parts or elements necessary to the performance of the functions of such machine.

Still other objects of my invention will appear hereinafter.

As will be made apparent hereinafter, the gist of my invention lies in an automatic driving and reversing mechanism of the general class specified, so constructed that the moments of the reversal of the driven element are positively determined from and by the measured rotation or movement of said driven element of the mechanism, whereby the common fault of slippage or lost motion between the driving and the driven elements is avoided.

In carrying out my invention I prefer to embody it in a mechanism conforming to the above definition and which, briefly, comprises a driven member for connection with the machine or part to be actuated, in combination with suitable continuously operated mechanism for rotatively reciprocating said member, and a reversing mechanism for controlling the operation of the reciprocating mechanism, which said reversing mechanism is either directly, or in effect, positively operated by said member, whereby the movement of the latter is measured and it is made to cause its own reversal; the certainty and equality of the reciprocations being thereby insured.

More specifically defined, the invention, as hereinafter described in detail, preferably consists in the combination of a driven shaft with members continuously rotated in opposite directions, suitable clutches for connecting one or the other of said members to said shaft to cause corresponding rotation thereof, and a clutch controlling and actuating mechanism, which is driven by and is timed from said driven shaft; whereby the reversals of the driven shaft are brought about by its own movement and are thus made independent of the more or less varying actions of the oppositely rotating driving clutch members.

My invention also consists in many and various novel constructions and in combinations of parts, making up a driving and reversing mechanism of great merit; all as 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 perspective view of a rotary washing machine equipped with a driving and reversing mechanism, embodying my invention; Fig. 2 is an enlarged plan view of my driving and reversing mechanism, the upper portion of the casing being removed or broken away to disclose said mechanism; Fig. 3 is a side elevation of the mechanism the casing thereof being in section, upon the vertical plane of the driven shaft; Fig. 4 is a vertical, sectional view on the line IV—IV of Fig. 5; Fig. 5 is a vertical, transverse section of the mechanism on the line V—V of Fig. 3; Fig. 6 is an enlarged, sectional view of the driven shaft and the parts thereon, on the line VI—VI of Fig. 3; Fig. 7 is an enlarged view of the driving shaft; Fig. 8 is a diagrammatic, perspective view of the clutch shifter block; Fig. 9 is an enlarged view of the draft member or sleeves belonging to the clutch mechanism; Fig. 10 is an enlarged, transverse section on the line X—X of Fig. 6; and Fig. 11 is an enlarged plan view of a portion of the top of the casing, showing the shifting cam plate for operating the throwout clutch, and Fig. 12 is a cross section on the line XII of Fig. 4.

As before stated, my invention is capable of and is adapted for use upon and in connection with machines of many kinds and the invention is of great value in respect to each, but in designing the particular embodiment or mechanism here illustrated, I have kept in view the special and exacting requirements of the rotary washing machine. This being the case, I have chosen to illustrate my invention as applied to a rotary washer; showing, in Fig. 1, the manner of attaching my reversing mechanism to the end of a washing machine for driving the rotary cylinder thereof.

A washing machine of the kind here shown, has cylindrical shell, A, arranged horizontally and supported upon cradles, B. The ends, A′, of the washer shell are usually made of metal and the upper part of the shell contains an opening, A″, to be closed by a sliding door, A‴. The cylinder, C within the shell comprises two heads connected by a plurality of perforated staves and containing a door, corresponding to the door in the shell and which may be opened when opposite the latter, so that the cylinder may be partly filled with the garments or clothing to be washed. The ends of the cylinder are provided with gudgeons, C′, having bearings, in the ends, A′, of the shell. On one of these is a large gear wheel, D, keyed to the gudgeon shaft. E represents a cover or shield for the large gear wheel, D.

The driving and reversing mechanism is connected with the gear wheel, D, and the

mechanism considered as a whole is attached to and supported upon the end, A′, of the washer shell. The mechanism has its own rigid frame, which, in this case is in the form of a barrel-like casing having a bracket, A⁴, which is bolted to the same and to the end of the washer shell, providing a proper space between them.

A brief description of the principal members of my mechanism and their relations will facilitate an understanding of the details of construction. Referring now to the detail views of the mechanism, F, represents the driven shaft, which at its inner end is provided with a pinion, F′, that meshes with the large gear wheel, D, belonging to the washer cylinder.

G, represents the driving or power shaft, bearing a belt pulley, G′, at its outer end.

H and I, are oppositely rotated clutch members which are revoluble about the driven shaft, F. The manner in which these are supported will be explained later. The clutch parts H and I, are connected with the power shaft by spur gears of such number and arrangement that the clutch parts are driven in opposite directions, whenever the power shaft is rotated.

K, is a shiftable clutch member on shaft F, this part being adapted to communicate the rotation of either of the clutch parts, H or I, to the driven shaft, F. The part, K, is fixed against rotation on the shaft, F, but is slidable thereon and when moved in one direction, couples the shaft, F, with the clutch part, H, and when moved in an opposite direction, with the part, I. Briefly, the mechanism for imparting the longitudinal movement to the part, K,—that is, shifting it—comprises a threaded or draft screw mechanism, which derives its motion from the rotation of the clutch parts. The principal members of the draft mechanism are the threaded sleeves, HK and IK, and shiftable, segmental nuts, H′ and I′, the latter, arranged in the clutch parts, H and I. The sleeves HK—IK, are keyed upon the shaft, F. They are connected by coupling bars KK, and are adapted to slide back and forth together, in order that their inner ends may engage, first one and then the other, with the slidable clutch part, K, to force the same into engagement with the clutch members, I and H, alternately. The movement is imparted to the draft sleeves by the nuts in the clutch parts. When the nuts, I′, are allowed to close upon the draft sleeve, IK, the nuts H′, will be out of engagement with the opposite sleeve and the rotation of the member, I, about the then stationary or reversely rotating shaft, F, will draw back the draft sleeve, and, after a brief moment, draw the clutch part, K, into engagement with the member, I, thereby connecting the shaft to the member, I, and setting it into rotation or causing the reversal of its rotation. It will now be evident that the direction of rotation of the shaft, F, is directly dependent upon the positions of the nuts in the clutch parts, and that to cause the reversal of the shaft, F, it is only necessary to interchange, shift or reverse the nuts H′ and I′. The immediate shifting devices are collars, H² and I² of the parts H and I, which operate small bell cranks, (see Fig. 4,) engaged with the nuts.

As will appear hereinafter the rings not only operate to raise and lower the draft nuts but also serve to lock the same in engagement with respective draft sleeves. The associated shifting devices are rock shafts, L and M, located above the other parts and connected with the collars. I employ a reciprocating block, N, for operating these rock shafts, the arrangement being such that the previously engaged clutch nuts, H′ or I′, will always be removed from the draft device before the other set is permitted to engage the same. The operation of the reversing mechanism therefore depends upon the movement of the block, N, and for absolute certainty of operation, I provide means for moving the block from the shaft F. This means comprises a timing block, O, adapted to travel back and forth upon the threaded shaft or spindle, P, its direction of movement being determined by the direction in which P is rotated. The block, O, is arranged to engage the block, N, toward the end of the movement or stroke of block, O, in either direction, and rotation is imparted to the shaft, P, by the shaft, F, in this case operating through the medium of the large gear wheel, D, and a pinion, P′, on the shaft, P. In other words both of the pinions, F′ and P′ engage with the gear, D, hence the peripheral travel of P′ will at all times exactly equal the peripheral travel of F′, as though the pinions were in direct engagement. It will now be obvious that both the direction and the duration of the rotation of the timing shaft, P, exactly correspond to the driven shaft, F, and that the rotative direction of the shaft, F, and the moment of its reversal are positively dependent upon the shaft, P, operating through the medium of the blocks, O, and N, the rocking shafts, L, and M, and the draft mechanism, including the nuts described. Every part of the movement imparted to the shaft, F, by either of the clutch parts, H, I, is measured by the timing shaft, P, and the moments when the clutches will change or alternate are therefore positively and definitely determined and any possible slippage in the clutches, though deterring or diminishing the speed of the pinion, F′, can in no wise affect the sum of the peripheral travel thereof. It will be understood that the next preceding sentence is based upon the theoretical consideration of the mechan-

ism and that from a practical standpoint, all possible lost motion between the parts is avoided by the almost instantaneous operations which effect the equally quick exchange of clutches. It will also be well understood that the usual slippage—that is, the slippage which in all other reversing mechanisms, occurs between the driven shaft and the driving shaft or mechanism, is entirely eliminated, that is, so far as it concerns or affects the reciprocation of the driven shaft. For convenience in stopping and starting the washer cylinder, I employ a shifting lever, Q, and a clutch, Q′. These connect the driving pulley, G′, with the power shaft, G.

The operation of the mechanism is as follows: It will be understood that the belt pulley, G′, is rotated continuously. When the starting lever is thrown, to operatively connect the power shaft, G, with the belt pulley, G′, the rotation of the power shaft is communicated to the clutch parts, H and I, through the spur gears. The clutch part, H, is connected to the power shaft by a single pair of gears, and the part, I, through a train of three gears, so that said clutch parts H and I rotate in opposite directions. This action occurs and continues as long as the rotating belt pulley is connected with the power shaft. When the parts are thus set in rotation one clutch part will be in engagement with the shaft, F, which therefore will be rotated and will communicate its movement to the large gear wheel, D. The latter imparts rotation to the timing device, P, and eventually the traveling block, O, moving thereon, "picks up" and moves the block, N, thereby causing the described successive movements of the two rocking shafts. These operate to first withdraw the draft nuts of the engaged clutch and then drop the nuts of the opposite clutch part into engagement with the draft device. The last action is almost instantly followed by the shifting of the part, K, to disconnect the shaft, F, from the first clutch part and connect it with the second. As soon as this is done the rotation of the shaft, F, is reversed. This reversal of movement effects the reverse or return movement of the timing block, O, and the same will travel to the end of its opposite stroke, ultimately picking up and shifting the block, N; thereby causing another reversal of the clutches. In this manner the shaft, F, and the gear, D, or other connected part or machine, will continue in automatic oscillatory, reciprocatory or alternative motion until the lever, Q, is thrown, to disconnect the mechanism from the belt pulley.

Having briefly outlined the construction, assemblage, functions, and operations of the principal members or parts of a mechanism involved in my invention, I will now describe said parts or elements in greater detail.

*The frame.*—The frame or casing for the operating parts of my mechanism is in such form as to completely inclose said parts and contain a quantity of oil for lubricating the mechanism. It has the shape of a barrel or globe, though the preferred shape may be altered to suit various designs. The casing is concentric with the power shaft, G. This being the case the belt pulley appears as though forming an extension of the casing. The lower and upper parts of the casing are formed separately and are secured together by bolts as shown; and the arrangement is such that the upper part may be removed without disturbing the contained mechanism. I prefer to employ plates, 1—1, for finishing the ends thereof and for closing the openings in the ends of the upper part. The upper edges of the lower part of the casing are provided with recesses to contain two blocks, 2—2, which are set therein along with all of the mechanism which is supported upon the two shafts, F and G. The blocks furnish bearings for said shafts, said bearings being suitably bushed. The most important of these bushings are those indicated by numerals 3 and 4 in Figs. 4 and 6; these not only furnishing bearings for the shaft, F, but also for the clutch parts, H, and I. The operating mechanisms above the shafts F and G are supported by a bridge frame, which comprises the two blocks or standards, 5—5, together with three cross or bridge bars, 6, 7, and 8. The blocks, 5, when bolted in place serve to fasten the bearing main blocks, 2—2. The casing, particularly its lower part, is oil-tight. This I partially fill with oil. The rotating parts of the mechanism, being thus partly immersed in oil, it is evident that the oil will be distributed upon all parts and bearings of the mechanism, thoroughly lubricating every part and making it unnecessary to otherwise oil the mechanism.

9 represents a small gage glass provided on the side of the casing for showing the height of oil therein.

*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, G′ and IG 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, and Fig. 11, 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. 15—15 are stops therefor, and 16 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, the lever being locked in the straight parts of the cam (see Fig. 11). Fig. 3 shows the plate in one position and Fig. 11 in the other.

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 forward 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 location and the manner of their operation is well shown in Fig. 4, also in Fig. 10. 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. Referring to Fig. 12, 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, see Fig. 9. 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, 18, 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. 2 to 6, 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. Now, if the ring, $I^2$ is shifted to raise or expand the clutch nut, 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 members. A moment after the ring, I, is shifted, the ring, H, 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. 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 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 shaft, F. It is to be remembered, however, that the momentary slippage which occurs between the members of the clutch at the instant of the first firm or positive reversal of the shaft, F, in no wise affects the operation of the timing mechanism; inasmuch as every part of the rotative travel of the shaft, F, has its counterpart in the movement of the timing block, O, and the shifting block, N.

*The reversing mechanism, for shifting the clutches.*—The reversing mechanism, as before stated, comprises the rocking shaft and connected parts together with the block, N. The rocking shafts, L and M, are carried in bearings, 6′ and 8′, provided on the bars, 6 and 8; each has a rocker arm, L′—M′, and these engage the clutch ring shifting yokes, $L^2$ and $M^2$, respectively. The yokes embrace the clutch rings, $H^2$ and $I^2$, and they are arranged to slide upon a short shaft or supplemental bridge bar, 20, extending between the blocks, 5—5. The arms, L′ and M′ are forked to engage the yokes, as shown in Figs. 2 and 3. Generally speaking, L′ and M′, are maintained parallel and are thus held and operated by the block, N. This block, as clearly shown in Figs. 2 and 8, is provided with raised ribs or tracks, N′, $N^2$—$N^3$. $N^2$ and $N^3$ are less than half the length of the rib N′. The rocking shafts, L and M carry the short rider arms, $L^3$ and $M^3$, fixed thereto, extending in opposite directions with their free ends adapted to travel upon the track N′. Each shaft also bears a like, rider arm, $L^4$, $M^4$, extending inwardly and these engage the tracks or ribs, $N^2$ and $N^3$, respectively. The arms are fixed upon the shafts L and M and the arms on each shaft are so disposed that at a moment when the arm $L^4$ or $M^4$ is about to rise upon its respective track, the other arm, $L^3$ or $M^3$, will drop from the end of the track N′, and vice versa. These relations being established, it will be evident that the rocking shafts may be turned or rocked by shifting the block, N upon the bar, 7, which supports it. Thus the parts being in the positions illustrated in Figs. 2 and 3 the clutch rings, $I^2$ and $H^2$ will be held in respectively locked and unlocked positions, because the corresponding rider arms, $M^4$ and $L^3$ are at that moment elevated upon their tracks or ribs (see Fig. 3). If now the block N is moved to the right, the tracks thereon will move from beneath the

arms, $M^4$ and $L^3$, and will engage and elevate the arms, $L^4$ and $M^3$, thereby rocking the shafts and moving the clutch rings and yokes into opposite positions to elevate the nuts in member I and drop or release the nuts in member H. In this connection it will be observed that the tracks or ribs upon the block, N, are so proportioned and related that the rocking shaft which represents a working clutch will be turned slightly in advance of the turning of the other shaft to release that clutch before the other goes into operation. The proportions referred to are well shown in Figs. 3 and 8. It is obvious that the arbitrary reversal of the clutches and hence of the shaft F, may be brought about at any time by merely shifting the block, N, and in this respect the mechanism may be said to be capable of manual control. In conformity with this idea, I may connect a reversing lever to the block, N, and so do in cases where the mechanism is employed upon machines that are characterized by the unequal reciprocation or oscillation of their parts. But as a chief object to the invention is to provide a driving and reversing mechanism which shall operate automatically and with a degree of exactness hitherto unattained, I equip the mechanism with the timing mechanism hereinbefore briefly described and whereof the shaft, P, geared to the shaft, F, is the principal member.

*The timing mechanism for actuating the reversing mechanism.*—The shaft, P, has bearings in the blocks, 5—5 and is operated from the gear, D, through medium of pinion, P′. The middle portion of the shaft is provided with a thread, $P^2$, and the block, O, has an internal thread fitting same. The lower side of the bridge-bar, 6, serves as a guide for the block, O, and prevents its rotation with the shaft, P; hence, as the shaft P is rotated, the block, O, will be moved in one direction or the other, according to the direction in which P is turned. The shifting block, N, has two lugs, $N^4$, separated by a wide space, wherein the block, O, of less width, travels. The movement of the block, O, is measured by the number of turns imparted to the shaft, P, and the number of turns which will be made by same and the shaft, F, is measured by the length of the gap between the lugs on the block, N. The arrangement of the related parts is such that when the block, O, has substantially reached the end of its stroke in either direction, it engages the lug, $N^4$, on the block, N, the short stroke or movement necessary to the reversal of the rocking shafts, in the manner above explained. The rotative direction of the shaft, F, and hence of the gear, D, will thereupon be immediately reversed and the reverse movement being communicated to the shaft, P, and the block, O, the latter will start upon its return stroke toward the end of which it will pick up or engage the block, N, and through the medium thereof produce another reversal.

By varying the length of the gap between the lugs, $N^4$, the rotative travel of the shaft, F, may be varied or adjusted, and in some cases I arrange the said lugs, $N^4$, for adjustment from the exterior of the casing. It will be noted that the length of the thread upon the shaft, P, and the length of the block, N, when compared with the length of the casing are such that the block may run completely off the thread and maintain the mechanism in rotation in a single direction in case any part of the mechanism becomes so deranged as to interrupt the normal operation of the clutches.

Inasmuch as the timing device is in effect geared directly to and is driven by the shaft, F, it is obvious that the intermittent movement of the shifting block, N, will occur at the end of equal intervals, and that for this and other reasons hereinbefore stated, the rotative reciprocations of the shaft, F, *i. e.*, the driven element will be exactly equal, and that this equality is established without reference to and independently of the times or duration of successive reciprocations. In the practical operation of the mechanism it is only necessary to maintain a sufficient quantity of oil in the barrel or casing of the machine and to start and stop the mechanism by manipulating the starting lever; all other operations are automatic and continue as long as the belt wheel is rotated.

Numerous modifications, adaptations and alterations of the form and construction of the mechanism herein shown and described may be made without departing from the spirit of my invention, and as many such will suggest themselves to a skilled mechanic, I do not limit or confine my invention to the specific 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 power shaft, in combination with a shaft to be rotatively reciprocated, a suitable opposite direction clutch mechanism for connection with said shaft geared to said power shaft, a clutch shifting mechanism, a reciprocating member for actuating the latter, and a second reciprocating member driven by the rotatively reciprocating shaft for actuating the first reciprocating member, substantially as described.

2. In a driving and reversing mechanism, a shaft to be rotatively reciprocated in combination with clutches, shiftable means for engaging the clutches with said shaft alternately, means geared to said shaft for actuating said shiftable means, and a power shaft connected with said clutches for driv-

ing them in opposite directions, substantially as described.

3. In a driving and reversing mechanism, a shaft to be rotatively reciprocated, in combination with clutches, shiftable means for engaging the clutches with said shaft alternately, means geared to and driven by said shaft for actuating said shiftable means, a power shaft connected with said clutches for driving them in opposite directions and a single driver for said power shaft, substantially as described.

4. In a driving and reversing mechanism, a shaft to be rotatively reciprocated, in combination with clutches, shiftable means for engaging the clutches with said shaft alternately, means geared to said shaft for actuating said shiftable means, a power shaft connected with said clutches for driving them in opposite directions, a driver for said power shaft, and a single direction ratchet interposed between said power shaft and said driver, substantially as described.

5. A machine frame and a machine member to be driven, in combination with a driving shaft connected with said member, a reversing clutch provided on said shaft and having oppositely rotating members, a single direction power shaft, sets of gears joining said clutch members to the power shaft to be driven thereby, and a clutch shifting mechanism operated by the first mentioned shaft, substantially as described.

6. In a driving and reversing mechanism, a two part barrel-like frame having pairs of parallel shaft bearings, a power shaft and a driven shaft arranged in said bearings and projecting through opposite ends of said frame, a reversing mechanism arranged on said driven shaft and having oppositely rotated clutch members which are connected with said power shaft, a driving wheel mounted on the outer end of said power shaft, a shifting mechanism arranged within said barrel-like frame and adapted to control the operation of the members of the reversing mechanism, said shifting mechanism including a timing shaft, and a machine element geared to both the driven shaft and said timing shaft at one end of said frame, substantially as described.

7. In a driving and reversing mechanism, a frame, adapted to contain a body of oil, having pairs of parallel shaft bearings, a power shaft and a driven shaft arranged in said bearings and projecting through opposite ends of said frame, a reversing mechanism arranged on said driven shaft and having oppositely rotated clutch members which are connected with said power shaft, a driving wheel mounted on the outer end of said power shaft, a shifting mechanism arranged in said frame and adapted to control the operation of the members of the reversing mechanism, said shifting mechanism including a timing shaft, means extending from the top of said frame for disconnecting said driving wheel and power shaft, and a machine element geared to both the driven shaft and said timing shaft, at one end of said frame, substantially as described.

In testimony whereof, I have hereunto set my hand, this 7th day of December, 1905, in the presence of two subscribing witnesses.

FREDERICK SNOW.

Witnesses:

CHARLES GILBERT HAWLEY,

C. F. MURRAY.