No. 758,939. PATENTED MAY 3, 1904.

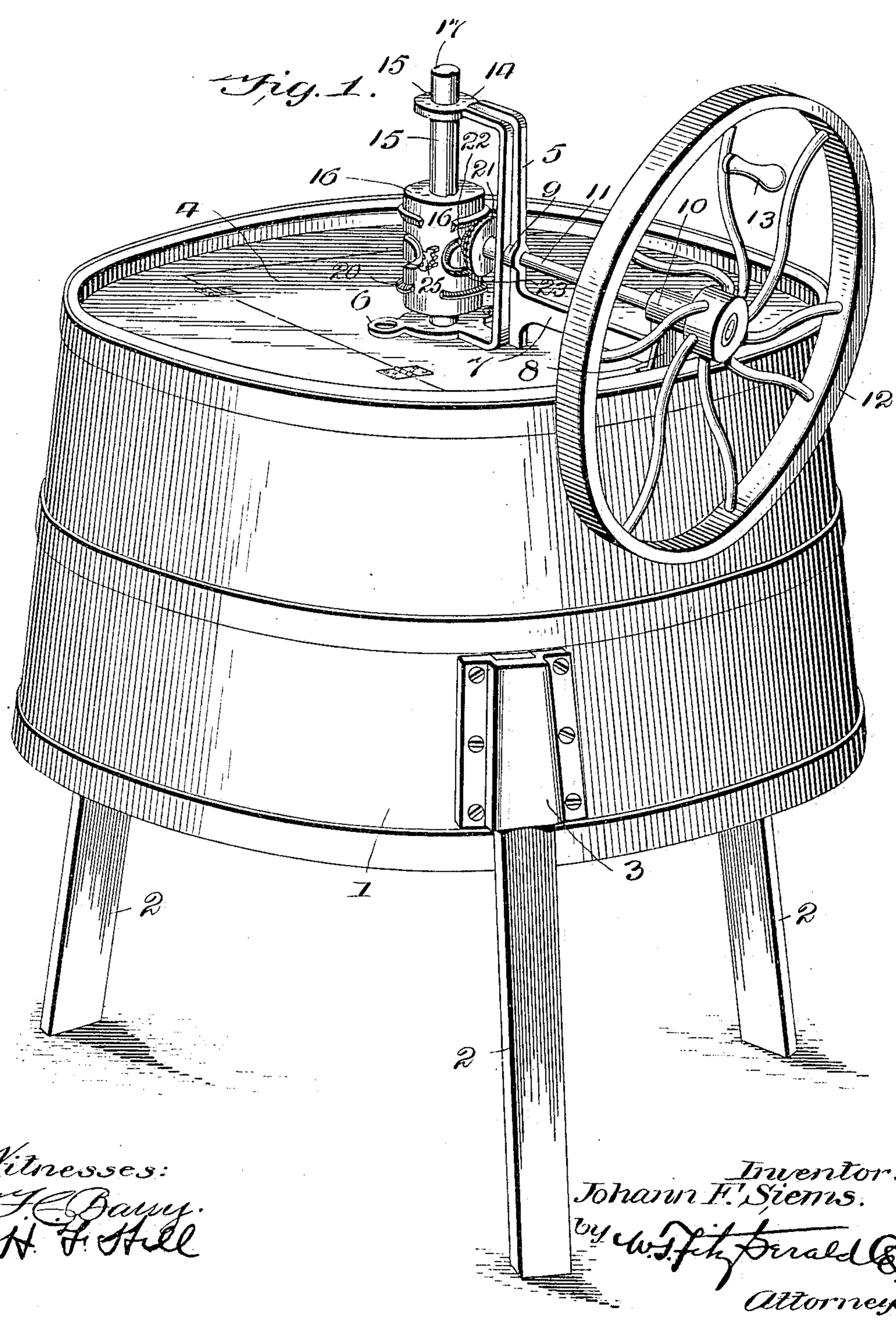
J. F. SIEMS.

MECHANICAL MOVEMENT.

APPLICATION FILED OCT. 8, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.



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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 2.

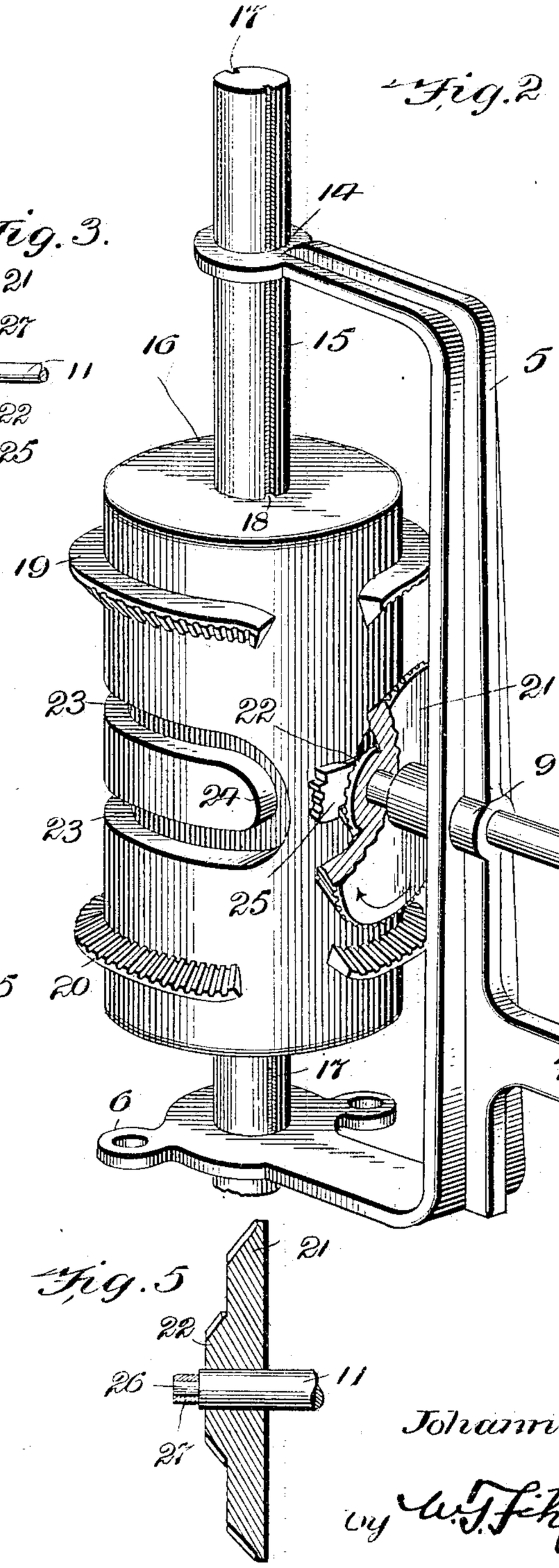

Fig. 3.

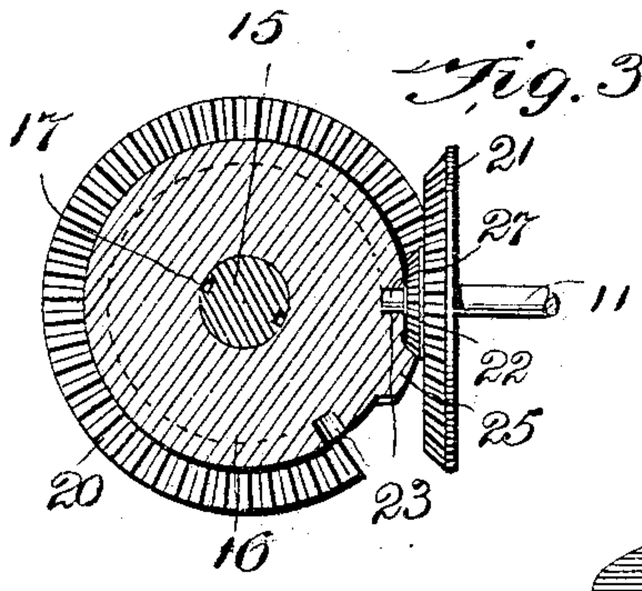

Fig. 4.

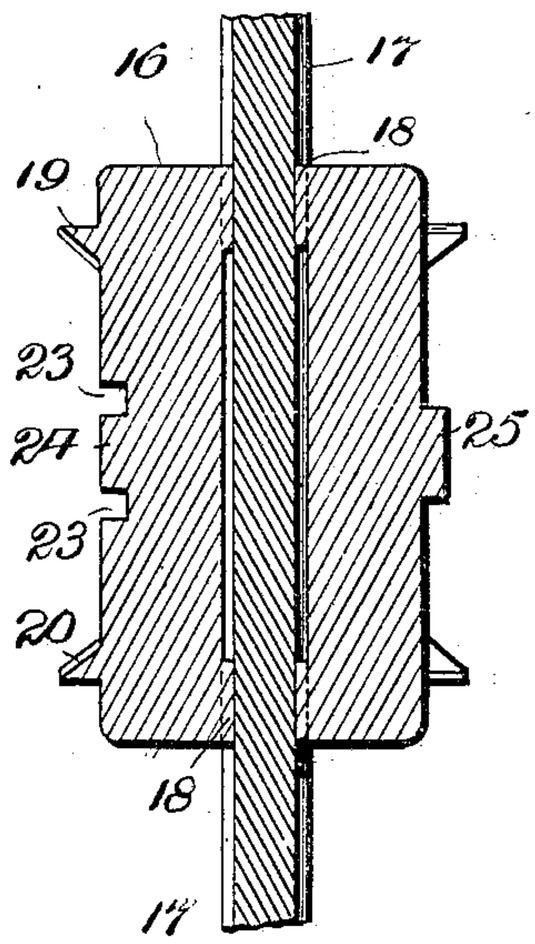

Fig. 5

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No. 758,939. Patented May 3, 1904.

UNITED STATES PATENT OFFICE.

JOHANN F. SIEMS, OF COLUMBUS, NEBRASKA.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 758,939, dated May 3, 1904.

Application filed October 8, 1903. Serial No. 176,270. (No model.)

To all whom it may concern:

Be it known that I, JOHANN F. SIEMS, a citizen of the United States, residing at Columbus, in the county of Platte and State of Nebraska, have invented certain new and useful Improvements in Mechanical Movements; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention, as will be hereinafter fully described and claimed, relates to differentiating or reversing mechanism which, while useful for a great variety of purposes, will be found to be especially desirable and efficient for use upon washing-machines and other similar machinery wherein it is important to provide simple, cheap, and thoroughly reliable reversing and power differentiating mechanism.

The prime object of my invention, among others, is to provide mechanism of the character specified which will permit the driving-shaft to be driven continuously in the same direction and at the same time intermittently and reversely drive the shaft of the washing-machine, to which is secured a plurality of agitating-blades disposed within the washing-machine body or clothes-receptacle.

A further object of my invention is to provide driving and reversing mechanism for the agitating-shaft of the washing-machine which will properly apply the power thereto in such a manner that the force imparted to the shaft will induce an almost complete rotation thereof and will also raise and lower the shaft to the smallest possible extent to enable the reversing movement of the shaft to be commenced.

A further object is to so apply the power direct to the agitating-shaft that all strain, friction, and pounding will be limited to the greatest possible extent.

Other objects and advantages will be hereinafter clearly presented, reference being had to the accompanying drawings, which are to be considered a part of this application, and in which—

Figure 1 shows a perspective view of my invention complete as applied to a washing-machine. Fig. 2 is a perspective detail view of my power-applying mechanism. Fig. 3 is a transverse section of Fig. 2 on a horizontal median line thereof. Fig. 4 is a longitudinal central section of the shaft of the washing-machine and part of my power-communicating devices. Fig. 5 is a sectional view of the power-communicating wheel employed by me.

The various details and coöperating accessories of my invention will for convenience be referred to by numerals, the same numeral being applied to a corresponding part in the several views.

The following specification discloses my power-communicating reversing mechanism as applied to a machine for washing clothing, such a machine as will be especially desirable for general household use, though it will be understood, as hereinbefore mentioned, that my reversing mechanism will be found thoroughly efficient for other purposes, as in driving the agitating-dasher of a churn, &c.

Referring to the numerals on the drawings, 1 indicates the body portion or receptacle of a washing-machine of the usual or any preferred construction or character, while 2 designates the supporting-legs, the upper ends of which are preferably removably seated in proper socket-plates 3, attached to the churn-body, whereby said legs may be readily removed for convenience in shipping or storing the machine. A suitable lid or closure-section 4 is provided, and upon said closure I secure the bracket 5, having the base-section or feet 6, whereby the bracket may be reliably secured to the closure, said bracket also having a lateral extension 7 and an anchoring terminal 8, designed to be secured, preferably, to the rim of the body or receptacle, as clearly shown in Fig. 1. The bracket thus or otherwise constructed is also provided with the bearing-seats 9 and 10, designed to accommodate the driving-shaft 11, upon the outer end of which is secured the power-communicating wheel 12, having a suitable handle 13 or the equivalent. Said bracket 5 is also provided in its base-section with a suitable aperture or bearing, while the upper end thereof is bent at right angles to form the branch or arm 14, said arm having an aperture located in registration with the aperture in the base-section,

said openings being designed to receive the shaft 15, to the lower end of which is attached a plurality of agitating-blades, designed to act upon the clothing within the washing-machine body and thoroughly agitate the same in the manner hereinafter set forth.

Upon the shaft 15 intermediate the base-section and the arm 14 I locate the power-communicating hub or member 16, which is so mounted upon the shaft 15 that it will freely move longitudinally thereon, but has no other relative movement, and this I am enabled to accomplish by forming in the shaft 15 a groove or a pair of grooves 17, while upon a contiguous part of the hub 16 I form inwardly-directed ribs 18, adapted to fit within said groove. It is therefore obvious that when the hub member 16 is rotated the shaft 15 must turn with it, while at the same time said member may move longitudinally upon said shaft, this being an important and valuable desideratum necessary to the operation of my invention, inasmuch as I apply power to the hub member 16 substantially in the following manner: Upon the hub member 16, near each end thereof, I form, preferably integral with the hub, the horizontally-disposed rack-bars 19 and 20, having inwardly-directed teeth or cogs, and designed to coöperate or mesh with said cogs or teeth is the driving-gear 21, secured near the inner end of the shaft 11, the extreme inner end of the shaft being left to protrude through the driving-wheel and also through the auxiliary driving-gear 22, whereby it will extend into the controlling-groove or continuous recess 23, formed in the periphery of the hub member 16, whereby the horizontal parts thereof will be disposed parallel with the cog-bars, pins, or teeth 19 and 20. The groove 23, as will be observed by reference to Fig. 2, does not extend entirely around the hub or power-communicating member 16, but leaves an open space between the curved ends, said curved ends being indicated by the numeral 24, and within the space between the curved terminals 24 I locate the cog or rack bar 25, each side of which is provided with a plurality of teeth of any preferred number and size, said teeth being of proper character to mesh with the teeth upon the auxiliary driving-gear 22, as will be hereinafter more fully explained. The protruding end of the shaft 11, which is designed to enter the groove 23, may be properly shaped to directly enter said groove, or, if preferred, a suitable spindle 26 may be formed thereon to receive the rotating ferrule or antifriction-roller 27, whereby friction incident to the movement of the thimble within the groove 23 will be reduced to a minimum.

By reference to Fig. 5 it will be observed that the driving and auxiliary gears 21 and 22, respectively, are integrally formed and secured upon the shaft 11, leaving the thimble 27 to protrude sufficiently to fit within the groove 23 and at the same time leave the auxiliary gear 22 to move freely along the outer edge of the groove and at the same time dispose the driving-gear 21 in such position that it will engage one of the rack-bars 19 or 20, according to whether the upper or lower groove is occupied by the antifriction-roller 27, the object of this arrangement being to insure that when the antifriction-roller is occupying the horizontal portion of one of the grooves 23 the driving-gear 21 will be in mesh with one of the rack-bars 19 or 20; but when the antifriction-roller 27 shall have reached the curved end 24 of the groove 23 the auxiliary driving-gear 22 will be disposed in mesh with one side of the teeth-carrying member or lip 25, as will be clearly obvious by reference to Fig. 2 of the drawings.

It is thought from the foregoing description that the operation of my invention will be clearly apparent, though it may be stated that when all of the parts have been properly assembled each in its respective operative position and power applied to the power-communicating wheel 12 the shaft 11 will be turned, incidentally rotating the driving-gear 21 and the auxiliary driver 22, and if the antifriction-roller 27 occupies any portion of the horizontal section of the groove 23 the driving-gear 21 will be in mesh with the rack-bars 19 or 20. We will therefore assume that the antifriction-roller 27 is occupying a horizontal portion of the upper part of the groove 23 and that the driving-gear 21 is turning in the direction indicated by the arrow in Fig. 2 and is therefore in mesh with the rack bar or teeth 19. The result will therefore be that the power-communicating member or hub 16 is turned to the right and will so continue to rotate, carrying with it the shaft 15 until the driving-gear 21 shall have reached the end of the rack-bar 19, at which time the antifriction-roller 27 will follow the curved extension 24, thereby bringing the auxiliary gear into engagement with the first tooth upon the member 25 at the instant the driving-gear 21 leaves the last tooth upon the rack 19. The auxiliary gear 22 will cause member 16 to ride loosely upward on the shaft 15 as it engages with the teeth upon the member 25 as the antifriction-roller follows in the curved section 24, the said antifriction-roller finding its way along said groove until the lower portion of the groove 23 is entered, at which point the auxiliary gear 22 will leave the last cog upon the member 25 and the driving-gear 21 will enter into engagement with the first tooth upon the rack-bar 20, the result being that the antifriction-roller 27 will be forced to travel the entire length of the lower groove 23 around to the other curved terminal thereof, and when the driving-gear 21 shall have thus reached and left the last tooth upon the lower rack-bar the auxiliary gear 23 will have been brought into position to engage the first or lowest tooth upon the

member 25, thereby insuring that the anti-friction-roller 27 will be caused to travel in the curved portion 24 of the groove, insuring that the gear 23 will mesh with all of the teeth upon the member 25 and that when the last tooth thereof shall have been past by said auxiliary gear the driving-gear 21 will be in position to engage the first tooth upon the upper rack-bar. It will be understood, however that the hub or power-communicating member 16 will by the operation herein described be caused to have a reciprocatory motion upon the shaft 15 and at the same time impart to said shaft a vibratory motion, insuring that said shaft will be completely rotated in one direction and immediately reversely turned or moved in the opposite direction.

When my power communicating and reversing mechanism is applied to use upon a washing-machine it will be obvious that the plurality of blades (not shown) carried by the shaft 15 will be moved to engage the clothing within the receptacle of the washing-machine and that when the shaft 15 shall have thus been almost completely rotated in one direction the severest strain or greatest amount of load upon the blades will be encountered. When therefore the blades have thus been driven to the fullest extent in one direction, the driving-gear 21 will have reached the end of the rack-bar with which it is engaging, and when the driving-gear 21 leaves the last tooth upon its cooperating rack-bar at that instant the auxiliary gear 22 will be brought into mesh with the teeth upon the rib or member 25, thus, in effect, instantly changing from a rotary to a longitudinal movement for the hub member 16, the office of the gear 21 being to rotate the hub member 16, as will be obvious, while the office subserved by the auxiliary gear 22 is to intermittently elevate and lower said hub member or impart a longitudinal movement thereto. It is therefore obvious that the main or driving shaft 11 may be continuously driven in the same direction and that the shaft 15, carrying the agitating-blades, will be positively and reversely rotated. The power-communicating hub or member 16 will thus be continuously reciprocated and at the same time positively and reversely rotated; but the shaft 15 will have no longitudinal movement whatever.

By providing the auxiliary driving-gear 22 in coöperation with the driving-gear 21 I am enabled not only to apply a greater force upon the power-communicating hub or member 16 at a time when such increase of force is most desirable, but I also secure another very desirable result—namely, that of reciprocating the hub member 16 at a much slower speed than would be possible if I depended upon a continuous rack-bar to coöperate with the driving-gear 21.

It will be observed by reference to the drawings that the horizontal sections of the groove 23 are very close together, and I consider this a very important feature of my invention, inasmuch as the path of reciprocation or the upward and downward movement of the member 16 will be limited to the shortest possible extent, and thereby, as a consequence, reduce the friction and the amount of power required to a minimum.

Obviously when the washing-machine body is filled with clothing to be cleansed the agitating-blades (not shown) will engage such clothing when the shaft 15 is rotated, the result being that when the end of the stroke of said blades is reached the clothing will be more compactly massed together, and the force therefore required to move the blades will be greatest at the end of the stroke. At the instant the end of the stroke is reached the gear 21 is leaving the last tooth upon one of the rack-bars 19 or 20, as the case may be, and at this instant the relatively smaller gear 22 engages with the teeth upon the rib member 25, thereby, in effect, changing from a long to a short lever, enabling the hub member to be more easily elevated or lowered, as the case may be, by means of the relatively smaller wheel 22 than would be possible if dependence was had upon the relatively larger gear 21, all of which it is thought will be clearly apparent.

By the use of relatively large and small gears I am enabled to place the horizontal sections of the groove 23 much closer together than would be possible if but one single relatively large gear was employed for the double purpose of rotating the hub member and elevating it or lowering it at the end of each partial revolution. If, for instance, the horizontal section of the groove 23 were widely separated, it follows that the hub member 16 will be forced to travel a much greater distance to compensate for the change from one section of the groove 23 to the other, and the impact or impetus and consequent friction would be multiplied in proportion to the increase of such separation. It will thus be seen that I have accomplished the result of turning the hub member and incidentally the shaft 15 one substantially complete revolution and then immediately reversing such movement thereof and that I do so with a limited amount of power and at the same time reduce the friction and pounding motion to the smallest possible degree. It will thus be seen that I have made it possible to reduce the upward and downward movement of the member 16 to the greatest possible extent by the use of the small auxiliary gear 22, combined with the relatively larger gear 21, the former coöperating with the rack-bars 19 and 20, while the auxiliary gear acts upon the toothed rib 25.

It is thought that best results will follow when the first tooth upon the right side of the rib 25 is slightly higher than the first tooth

upon the opposite side of said rib, inasmuch as said first tooth will be in a position to instantly engage with the auxiliary gear 22 when the gear 21 leaves its rack-bar and that when said gears shall have traveled around to the opposite end of the groove-sections 23 the lower rack-bar will be found of shorter extent than the end of the rack-bar immediately above upon the opposite side of the toothed rib 25, thereby delivering the larger gear 21 in such position that the auxiliary gear 22 will be disposed in mesh with the first tooth on said rib, when a further rotation will cause said small gear to travel the full extent of the rib-section and place the gear 21 in engagement with the first tooth of the rack 19. I desire, however, to reserve the right to shorten or lengthen the rack-bars 19 and 20 and the extent or number of teeth upon the rib-section 25 as I may find most desirable.

While I have described the preferred combination and construction of parts deemed necessary in materializing my invention, I desire to comprehend all possible substitutes and equivalents that may be considered as falling fairly within the scope of my invention, inasmuch as many modifications and changes may be made in the construction presented without departing from the spirit thereof.

What I claim as new, and desire to secure by Letters Patent, is—

1. The herein-described power reversing mechanism comprising the driving-shaft 11 and suitable bearings therefor; driving-gears 21 and 22 of relatively different size carried by said driving-shaft; a power-communicating shaft 15; a hub longitudinally movable upon said shaft, said hub having a continuous groove 23 arranged in parallel horizontal sections and curved terminals 24; an extension provided with an antifriction-roller upon the end of the shaft 11 designed to fit in said groove; a pair of rack-bars 19 and 20 arranged parallel with the horizontal sections of the groove 23 and terminating near the curved terminals 24; one or more teeth or pins 25 located between said curved terminals 24, said gear 21 being designed to successively mesh with the rack-bars 19 and 20 while the gear 22 is adapted to mesh with the pins or teeth 25 whereby a continuous rotation of the driving-shaft 11 will cause a positive and reverse rotation of the shaft 15 all combined substantially as specified and for the purpose set forth.

2. In a power reversing mechanism, the combination with the driving-shaft, of a pair of gear-wheels 21 and 22 of relatively different size, combined with a hub 16 having a continuous way or groove 23 and a pair of parallel horizontally-disposed rack-bars 20 and a toothed rib 25 said rack-bars being adapted to mesh with the larger wheel while said toothed rib will mesh with the smaller wheel whereby the larger gear will be changed from meshing with one rack-bar into mesh with the other rack-bar and the rotation of the hub reversed at each end of the groove, substantially as specified and for the purpose set forth.

3. In a power reversing mechanism, a shaft 15 and a hub longitudinally movable thereon, said hub having parallel rack-bars upon its upper and lower ends and an intermediate groove divided into horizontal parallel sections and curved terminals, said hub also having a plurality of teeth or pins located between said curved terminals, combined with a driving-shaft 11 and a suitable bearing support therefor said driving-shaft having its end extended to fit said groove and also having a pair of gears 21 and 22, the former being adapted to successively mesh with said rack-bars while the latter is brought into mesh with said rib-section at each end of the groove, substantially as specified and for the purpose set forth.

4. In a power reversing mechanism, a power-communicating shaft 15 having longitudinal grooves and a hub fitting said shaft and having extensions fitting said grooves, said hub also having parallel cog-bars 19 and 20 and an intermediate groove 23, a toothed rib located between the curved terminals of said groove and of less outward extent than said cog-bars whereby a pair of driving-gears of relatively different size may be employed, the larger wheel being adapted to mesh with said rack-bars, while the smaller wheel will mesh with said toothed rib and insure that the incident reciprocatory motion of the hub will be slower substantially as specified and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHANN F. SIEMS.

Witnesses:
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