No. 757,063. PATENTED APR. 12, 1904.

E. G. SMITH.

REVERSING GEAR.

APPLICATION FILED OCT. 28, 1903.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

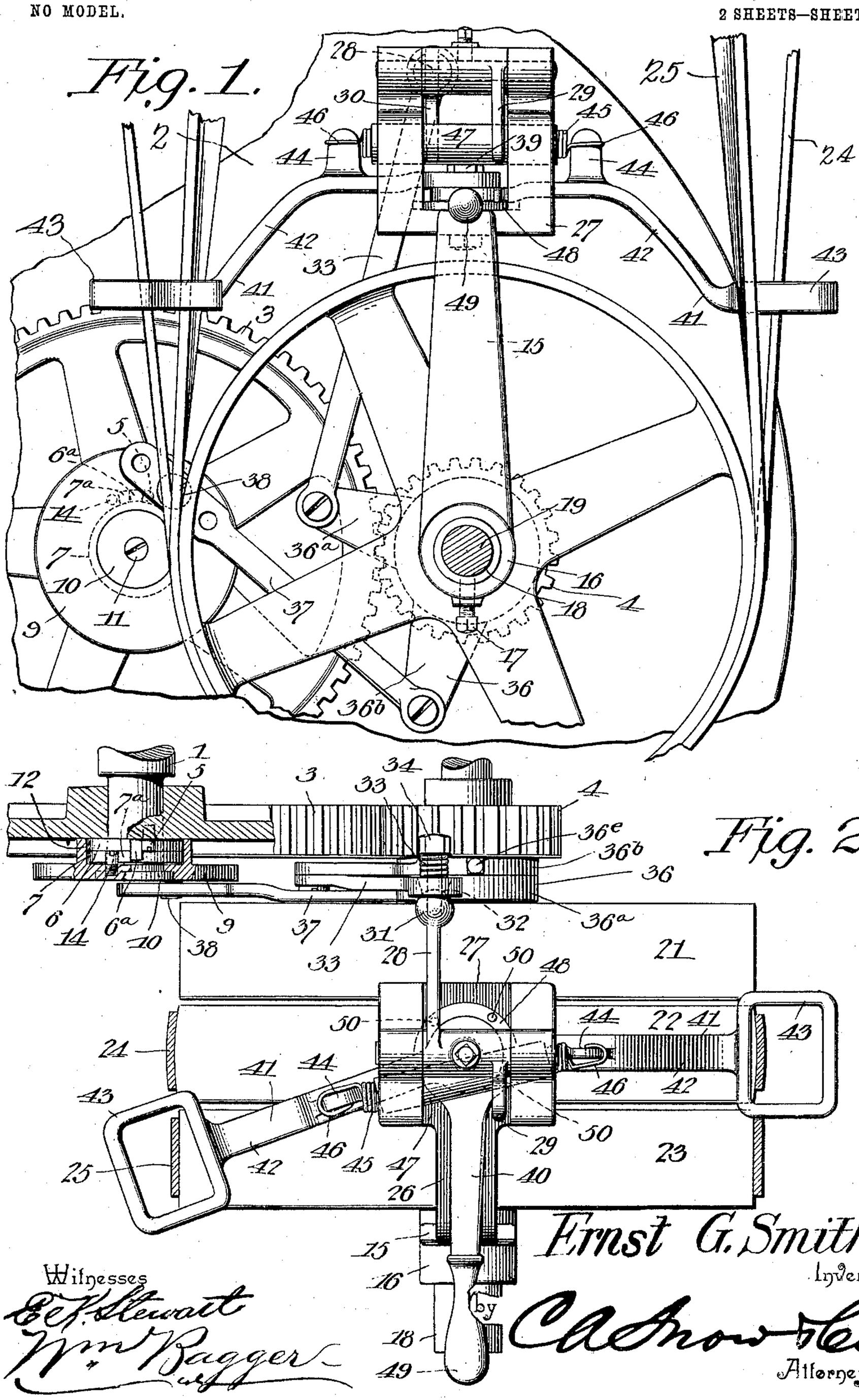


Fig. 2.

Witnesses
E. F. Stewart
Wm. Bagger

Ernst G. Smith,
Inventor.
by Church & Geo.
Attorneys

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 3.

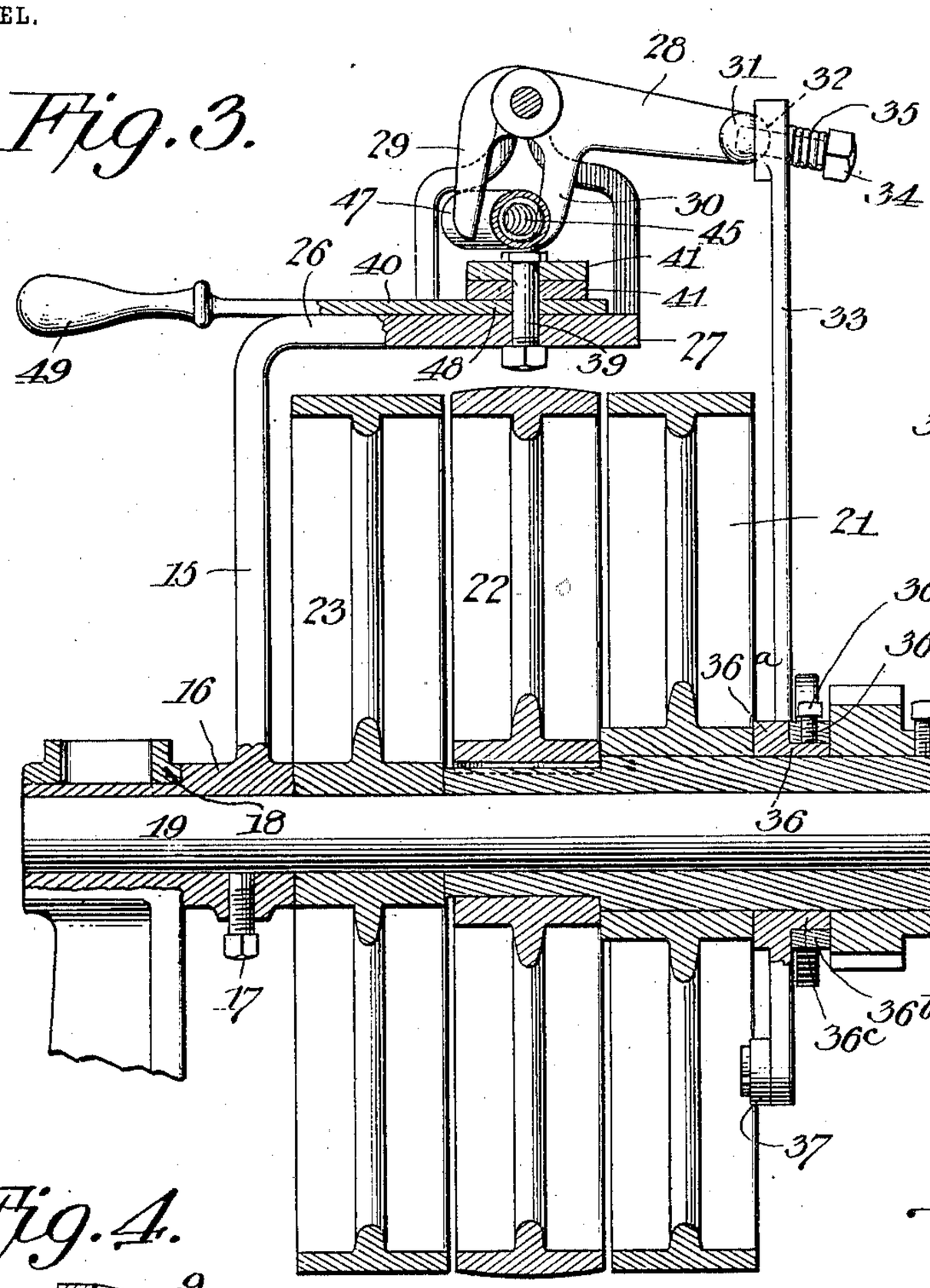



Fig. 6.

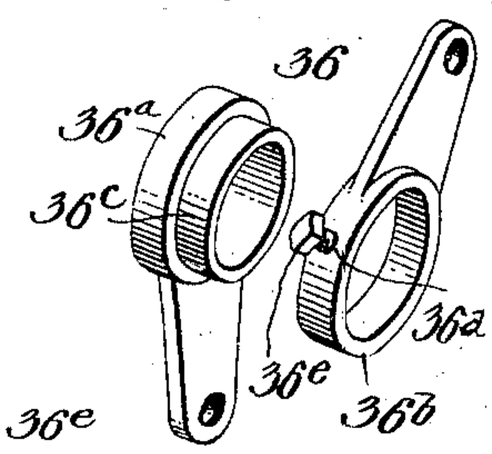



Fig. 4.

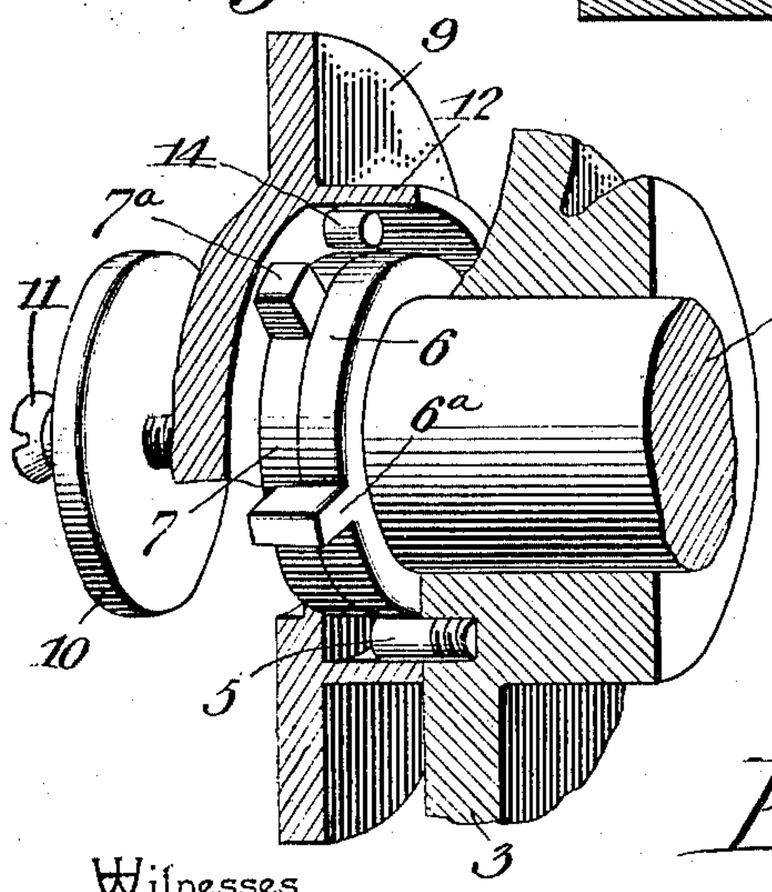
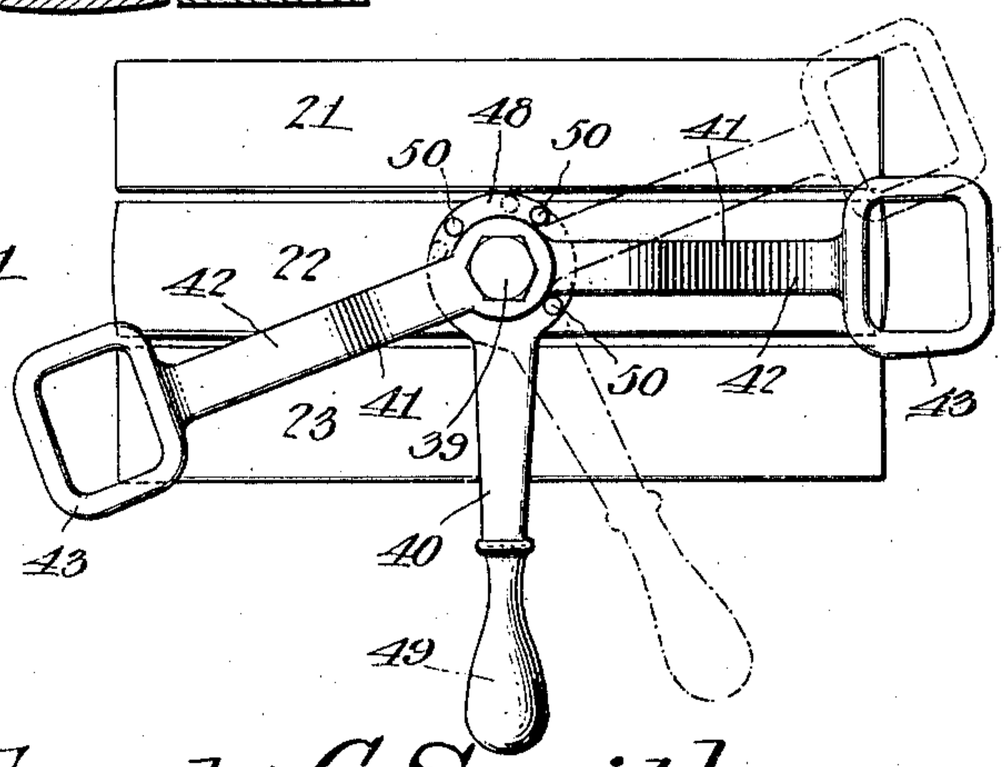



Fig. 5.




Witnesses
E. F. Stewart
Wm. Bagger

Ernst G. Smith, Inventor.
by Cachow & Co.
Attorneys

No. 757,063. Patented April 12, 1904.

# UNITED STATES PATENT OFFICE.

ERNST G. SMITH, OF COLUMBIA, PENNSYLVANIA.

## REVERSING-GEAR.

SPECIFICATION forming part of Letters Patent No. 757,063, dated April 12, 1904.

Application filed October 28, 1903. Serial No. 178,886. (No model.)

*To all whom it may concern:*

Be it known that I, ERNST G. SMITH, a citizen of the United States, residing at Columbia, in the county of Lancaster and State of Pennsylvania, have invented a new and useful Reversing-Gear, of which the following is a specification.

This invention relates to reversing-gear; and it has for its object to provide an automatically-operating device of this kind by means of which the machinery controlled thereby shall be reversed with perfect regularity at the end of a certain predetermined number of revolutions, this operation continuing as long as the machinery is in motion.

My invention consists in the improved construction, arrangement, and combination of parts, which will be hereinafter fully described, and particularly pointed out in the claims.

In practice my invention may be applied to many different kinds of machinery which require to be intermittently reversed, and especially to such classes of machinery where it is necessary or at least desirable that the reversing motion shall take place unfailingly after the accomplishment of a certain number of rotations of some one of the working parts to which the invention is specially applied. In the accompanying drawings a portion of a washing-machine has been shown to which my invention has been applied, this being one of the special purposes for which the said invention has been devised.

In said drawings, Figure 1 is an end view showing my improved reversing-gear applied in position for operation. Fig. 2 is a top plan view of the same. Fig. 3 is a vertical sectional view taken axially through the shaft supporting the reversing-pulleys. Fig. 4 is a perspective detail view showing the reversing mechanism connected with the main driven shaft. Fig. 5 is a top plan view, on a reduced scale, of the reversing-pulleys as shown in Fig. 3. Fig. 6 is a perspective detail view of the adjustable bell-crank lever.

Corresponding parts in the several figures are indicated by similar numerals of reference.

1 designates a shaft which extends through a casing 2 and which in practice carries or is connected with the washing-cylinder. Upon the projecting end of the shaft 1 is secured a spur-gear 3, meshing with a pinion 4, from which it derives motion. Suitably connected with the spur-gear 3 a short distance from its axis is a pin 5, which projects slightly from the face of said spur-gear. Loosely mounted upon the shaft 1 adjacent to the spur-gear are collars, (designated 6 7,) of which any desired number may be used, said collars being constructed with peripheral or overhanging lugs, as indicated at $6^a$ $7^a$, which are adapted for mutual engagement with each other. The shaft 1 also carries a disk 9, which is secured to said shaft by means of a washer 10 and an axial screw 11. Said disk upon its inner side is provided with a concentric flange, forming a cup or receptacle 12, within which the collars 7 6 are accommodated.

It will be seen from the foregoing that the disk 9, having flange 12, as well as the collars 6 and 7, are mounted loosely upon the shaft 1, although neither of these parts is capable of revolving completely independently of the remaining parts, owing to the obstructions formed by the pin 5 and the lugs or projections $6^a$ $7^a$ and to an additional obstruction formed by a pin 14, which extends inwardly from the disk 9 and which when the shaft 1 is in rotation will eventually come into the path of the lug $7^a$ of the collar 7.

From the foregoing description it will be understood, assuming that the shaft 1 is rotated in a certain direction, that the pin 5 after the first rotation will engage the lug $6^a$ of the collar 6. After the second rotation the lug $6^a$ will engage the lug $7^a$ of the collar 7. After the third rotation the lug $7^a$ of the collar 7 will engage the pin 14 and start the rotation of the disk 9. It is from the latter that the reversing-gear, which I shall now proceed more fully to describe, is started in operation.

15 designates a suitable supporting-bracket which is provided with a sleeve 16, having a set-screw 17, whereby it is adjustable upon a supporting-shaft 19, the outer end of which is mounted securely in a bearing 18, and the shaft 19 carries a revoluble sleeve 20, upon

which the inner end of the pinion 4 is secured. Upon the sleeve 20 is also mounted a loose pulley 21. A fast pulley 22 is mounted upon the sleeve adjacent to the pulley 21, and an additional loose pulley 23 is mounted directly upon the shaft adjacent to the pulley 22. These three pulleys, the central one fixed and the two outer ones loose, may be of equal width and are spaced apart merely sufficiently to prevent frictional contact. Two driving-belts 24 and 25 are provided, one of said belts, 24, being straight and the other one, 25, being twisted and both connecting the reversing mechanism with the source of power. The bracket 15 is provided at its upper end with an inward extension 26, which supports a frame 27, affording at its upper end a bearing for a rocking lever 28, having two separate arms 29 and 30 depending at opposite sides of the fulcrum thereof. The free end of the lever 28 is rounded, or it may terminate in a ball 31, engaging a socket 32 in a connecting-link or pitman 33, which is connected with the lever-arm by means of a bolt 34, under the head of which is interposed a spring 35, which, while the parts are securely connected, gives sufficient flexibility of movement to cause the parts to perform their requisite function without danger of breakage or binding. The pitman 33 is connected at its opposite end with one arm of a bell-crank 36, which is fulcrumed concentrically with the shaft 19, and the other arm of which is connected by a pitman 37 with an eccentric-pin 38 upon the disk 9, connected with the shaft 1. The bell-crank 36, of which a detail view has been given in Fig. 6 of the drawings, is composed of two separate arms $36^a$ and $36^b$, the former of which has a sleeve $36^c$, whereby it is adjustable upon its bearing, while the latter has a perforation $36^d$ engaging the sleeve $36^c$, upon which may be securely mounted a set-screw $36^e$, so as to adjustably connect the arms of the bell-crank lever.

It may here be stated that the object in mounting the bracket 15 pivotally is simply to enable the mechanism to be operated from various angles, thus enabling the machine to be set in different positions with relation to the source of power. When the angle of the movement is changed, it becomes necessary to provide for the adjustment of the throw of the pitman or link 37, and it is in order to provide for such an emergency that the construction above set forth has been adopted.

The arm 26 of the bracket 15 is provided with a vertical bearing-pin 39, upon which is mounted a reversing-lever 40 and two belt-forks 41 41, which latter consists, besides the supporting-rings at their inner ends, of outwardly-extending arms 42, terminating in the belt-frames 43. Each of the arms 42 is provided with a lug 44, and the lugs of the two arms are connected by means of a stout helical spring 45, the ends of which are shaped to form hooks 46, engaging the respective lugs. The spring is incased in a tubular sheath 47, which lies between the depending arms 29 and 30 of the lever 28, which said arms in addition to depending from opposite sides of the fulcrum of the lever are disposed at opposite sides of the axis of the bolt 39, so as to bear against opposite sides of the spring-incasing sheath at opposite sides of the central portion of the latter.

The reversing-lever 40 has at its inner end an eye-ring 48, engaging its bearing, and is provided at its outer end with a handle 49, by means of which it may be manipulated. The central eye-ring extends beyond the rings at the inner ends of the belt-forks and is provided with suitably-disposed lugs 50 to bear against the arms of the latter.

When the machinery operated from the source of power is at rest, it is obvious that both of the belts 24 and 25 must engage the loose pulleys. In order to start the machinery, the reversing-lever is manipulated so as to swing one of the belt-arms into a position where the belt carried thereby will engage the fixed pulley. Motion will thus be communicated to the shaft carrying the pinion 4, engaging the spur-gear 3, which latter will make a number of revolutions predetermined by the number of collars or tumblers, as $6^a$ and $7^a$, that have been placed upon the shaft. When the stated number of revolutions have been accomplished, the disk 9, through the intermediate mechanism, will operate the rock-lever 28, the depending arms of which will engage opposite sides of the spring-incasing sheath 47, the position of which is thus reversed, causing the belt engaging the loose pulley to be transferred to the fixed pulley, while the belt previously engaging the latter is transferred to the opposite loose pulley. This reversing movement will be continued automatically as long as the machinery is in motion. When it shall be desired to stop the machinery, the lever 40 is reversed and one of the studs 50 will then push the belt-fork of the belt which engages the central fixed pulley onto the loose pulley, thus stopping the movement of the driven machinery.

It will be seen that the spring 45 not only serves to assist in retaining the belt-forks in adjusted position, but that it also serves an important object in assisting the shifting of the belt-forks to their respective positions and of preventing rattling of the parts when in motion by taking up lost motion caused by wear. To this end the spring 37, connecting the link 33 with the lever 28, also assists.

It is obvious that my improved reversing mechanism is applicable to what is known as "double-geared" washers—that is, washers driven from both ends—by simply transmitting motion by means of a line-shaft from one end of the machine to the other.

The operation and advantages of my inven-

tion will be readily understood from the foregoing description, taken in connection with the drawings hereto annexed.

The general construction of my improved reversing-gear is simple, and it may be easily manipulated to effect the starting or stoppage of the driven machinery, while the reversing movement will take place intermittently, with absolute certainty as to the number of revolutions of the driven machinery.

I have in the foregoing described what I consider a simple and preferred construction of my invention; but I desire it to be understood that I do not limit myself to the precise structural details, but reserve the right to any changes, alterations, and modifications which may be resorted to within the scope of my invention and without departing from the spirit or sacrificing the efficiency of the same.

Having thus described my invention, I claim—

1. In a reversing-gear, the combination with a driven shaft, of collars mounted loosely thereon, means connected with the shaft for engaging the first collar, means upon each collar for engaging the next succeeding one, a disk loose upon the shaft and adapted to receive motion from the last collar of the series, and reversing mechanism connected with said disk and actuated by the latter.

2. In a reversing-gear, a driven shaft having a projection, a collar mounted loosely upon said shaft and having a lug to be engaged by the projection of the shaft, a disk mounted loosely upon the shaft and having an eccentric-pin, means for transmitting motion between the collar upon the shaft and the pin upon the disk, belt-shifting mechanism, and means connecting the disk upon the driven shaft with said belt-shifting mechanism to start the latter into operation when the said disk is set in motion.

3. In a reversing-gear, a driven shaft having a projection, collars upon said shaft having means whereby they are caused to be successively rotated with the latter, a disk mounted loosely upon the outer end of the shaft and having engaging means adapted to be engaged by the outermost collar, belt-shifting mechanism, and connecting means between the latter and the disk upon the driven shaft whereby said belt-shifting mechanism shall be set in motion when the said disk is set in motion with the shaft.

4. In a reversing-gear, a driven shaft, eccentric engaging means upon the latter, collars mounted upon said shaft and adapted to be successively rotated with the latter, a disk connected axially and revolubly with the shaft and having a housing for the tumblers, and means, adapted to be engaged by the outermost tumbler, whereby said disk shall be partially rotated with the shaft.

5. In a reversing-gear, a driven shaft, a disk upon the latter, means for setting said disk in motion at the end of a predetermined number of revolutions, a movable bracket, belt-shifting mechanism supported thereon, said mechanism including a rock-lever, and adjustable connecting means between said rock-lever and the said disk whereby movement of the latter in either direction shall cause the rock-levers to be operated.

6. In a reversing-gear, a driven shaft, a spur-gear upon said shaft, a pinion meshing with said spur-gear, a fixed shaft, a sleeve revoluble upon the latter and carrying said pinion, a bracket mounted pivotally upon said shaft, a frame supported upon said bracket, a rock-lever connected pivotally with said frame, belt-forks actuated by said lever, a disk connected with the driven shaft and adapted to be set in motion by the latter at the end of a predetermined number of revolutions in one direction, and connecting means between said disk and the rock-lever, said connecting means including a socketed lever engaging a ball upon the rock-lever, a connecting-bolt and a spring mounted upon said bolt.

7. In a reversing-gear, a stationary shaft, a sleeve mounted for rotation on said shaft, a pulley fixed upon said sleeve, loose pulleys adjacent to opposite sides of the fixed pulley, two belts, one straight and one twisted, connecting two of said pulleys with the source of power, pivotally-mounted belt-hooks engaging said belts, a spring connecting said belt-hooks at opposite sides of their fulcrum, and means for reversing the positions of said belt-hooks.

8. In a device of the class described, a stationary shaft, a pair of loose pulleys upon said shaft, a fast pulley disposed between said loose pulleys, two belts, one straight and one twisted, connecting the pulleys with the source of power, belt-hooks supported pivotally above the pulleys, a spring connecting said belt-hooks, a sheath incasing said spring, a rock-lever, arms depending from the latter and engaging the sheath at opposite sides of the latter and at opposite sides of the fulcrum of the belt-hooks, and means for actuating said rock-lever at predetermined intervals.

9. In a device of the class described, a pair of pivotally-mounted belt-hooks, a spring connecting said belt-hooks, the ends of said spring being connected with said hooks at opposite sides of the fulcrum, a driving-pulley, two loose pulleys adjacent to the sides of said driving-pulley, belts connecting said pulleys with the source of power, said belts being engaged by the belt-hooks, and means for automatically reversing the latter so as to transfer one belt from the driving-pulley to a loose pulley and another belt from a loose pulley to a driving-pulley.

10. In a device of the class described, a pair of belt-hooks mounted pivotally upon the same axis, a spring connecting said belt-hooks, the ends of said spring being connected with said

hooks at opposite sides of the axis, a sheath incasing said spring, and operating means adapted to engage said sheath.

11. In a device of the class described, a stationary shaft, a fixed pulley upon said shaft, a pair of loose pulleys upon said shaft adjacent to opposite sides of the fixed pulley, belts connecting said pulleys to the source of power, a bracket extending over said pulleys, a reversing-lever and a pair of belt-hooks supported pivotally and concentrically upon the said bracket, a spring connecting said belt-hooks, a sheath incasing said spring, a rock-lever supported above, and having depending arms engaging said sheath on opposite sides of the same and at opposite sides of the pivotal point of the belt-hooks, lugs upon the eye-ring of the reversing-lever adapted to engage the belt-hooks, means for transmitting motion from the pulley-supporting shaft to a driven shaft, and means connected with the latter for tripping the rock-lever at the end of a predetermined number of revolutions in either direction of said driven shaft.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

ERNST G. SMITH.

Witnesses:
C. E. LENIG,
JOS. W. YOCUM.