No. 764,638. PATENTED JULY 12, 1904.

D. J. SHEA.

MECHANICAL MOTOR.

APPLICATION FILED NOV. 13, 1903.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 7.

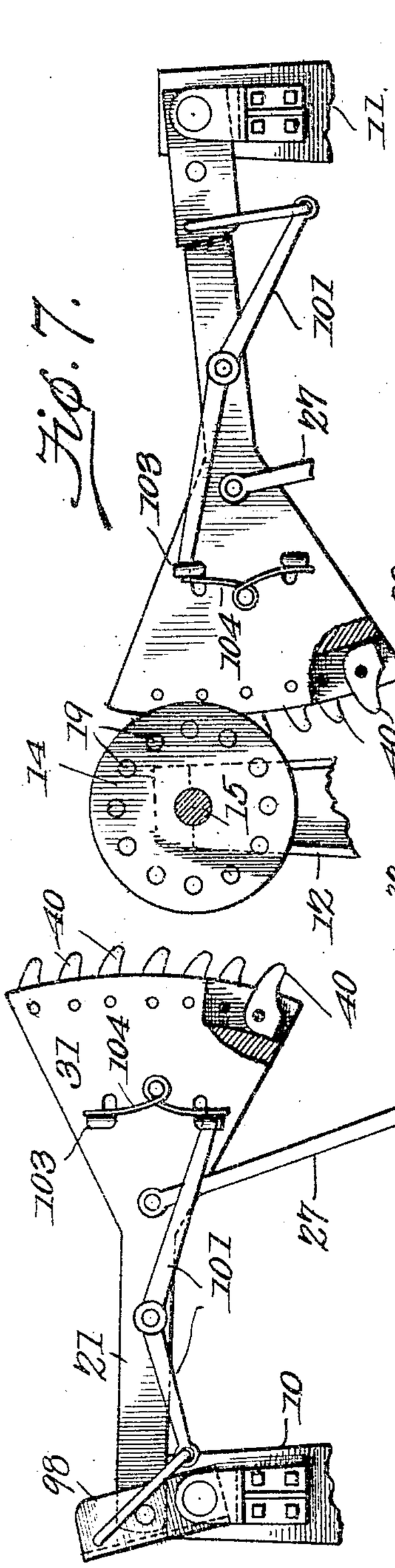
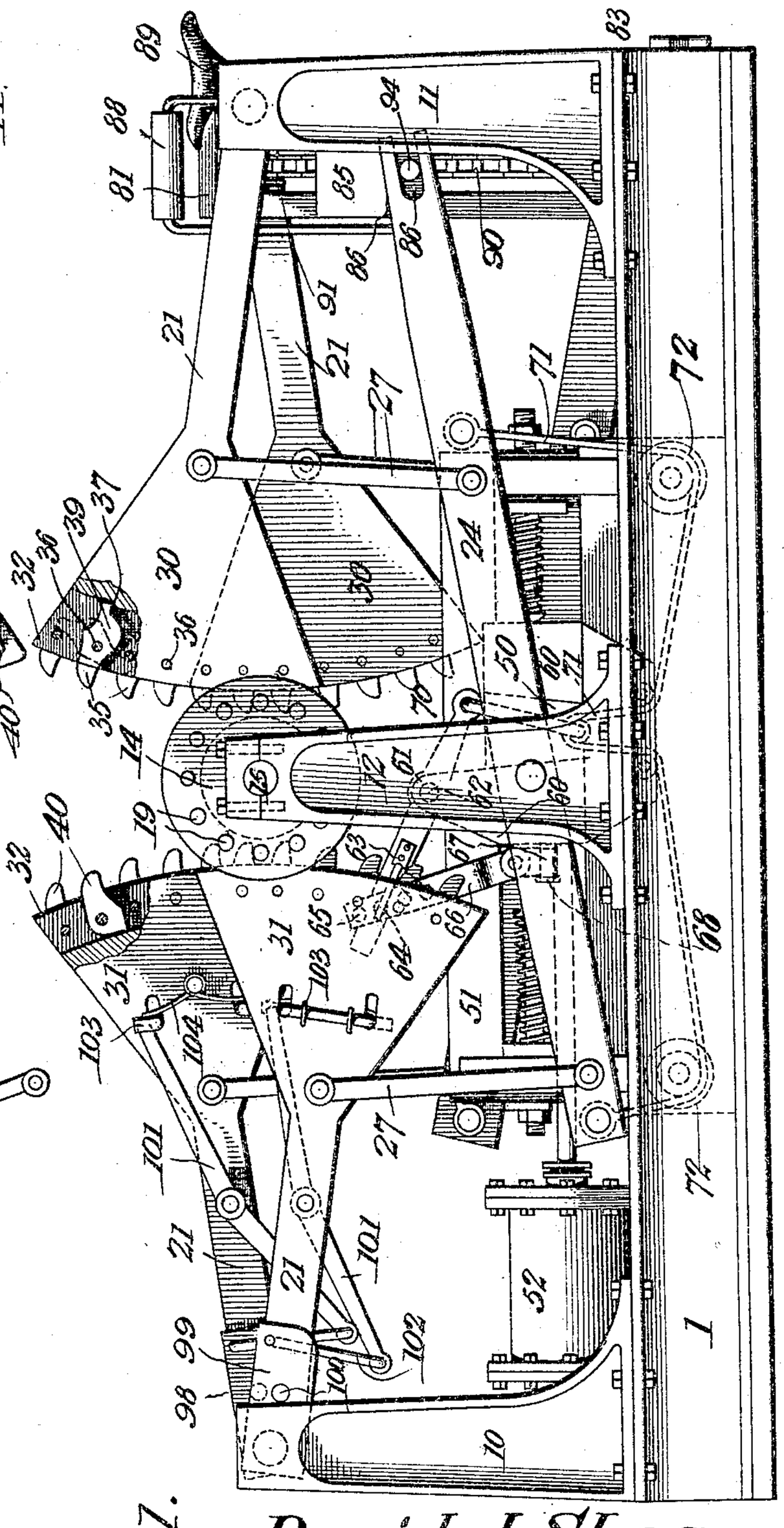


Fig. 1.



Witnesses
E. F. Stewart
Jno. C. Paton

David J. Shea,
Inventor
by Church & Co
Attorneys

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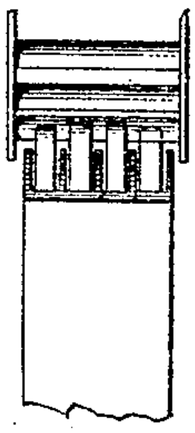
NO MODEL. 3 SHEETS—SHEET 2.

Fig. 6.



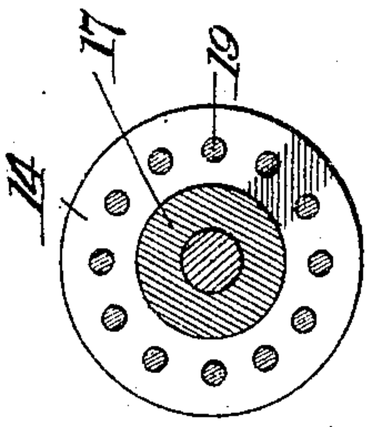
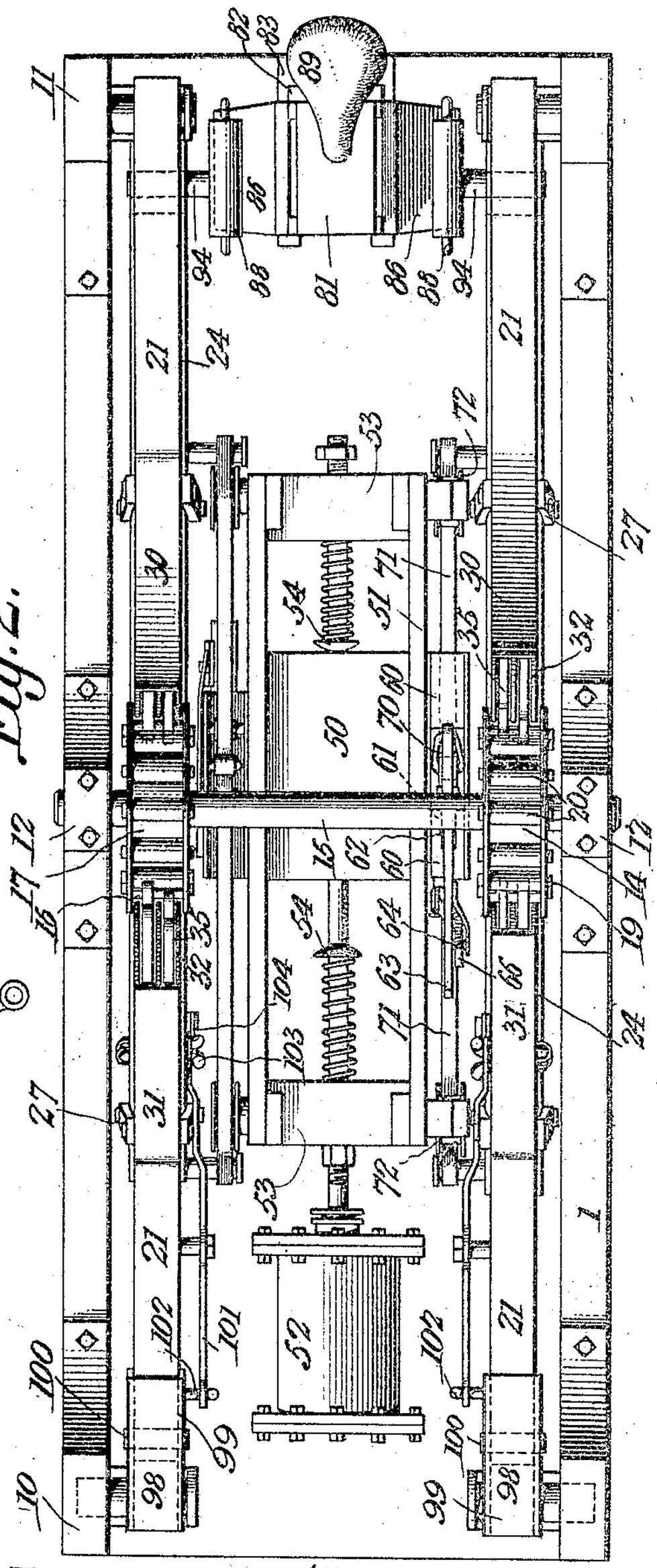


Fig. 5.

Fig. 2.



David J. Shea,

Inventor.

Witnesses
E. F. Stewart
Jno. E. Porter

by Cachow & Co

Attorneys

No. 764,638. PATENTED JULY 12, 1904.

D. J. SHEA.

MECHANICAL MOTOR.

APPLICATION FILED NOV. 13, 1903.

NO MODEL. 3 SHEETS—SHEET 3.

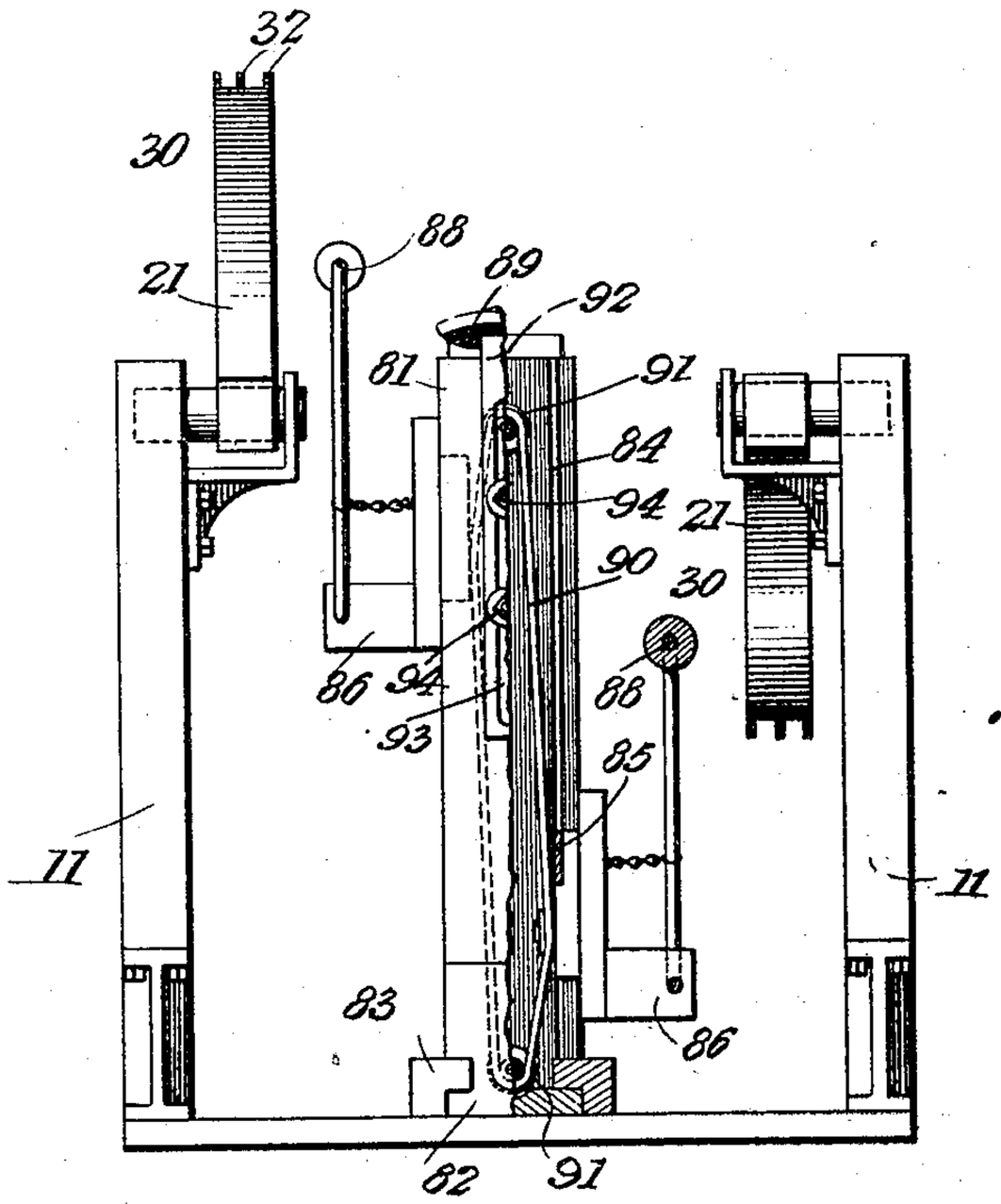
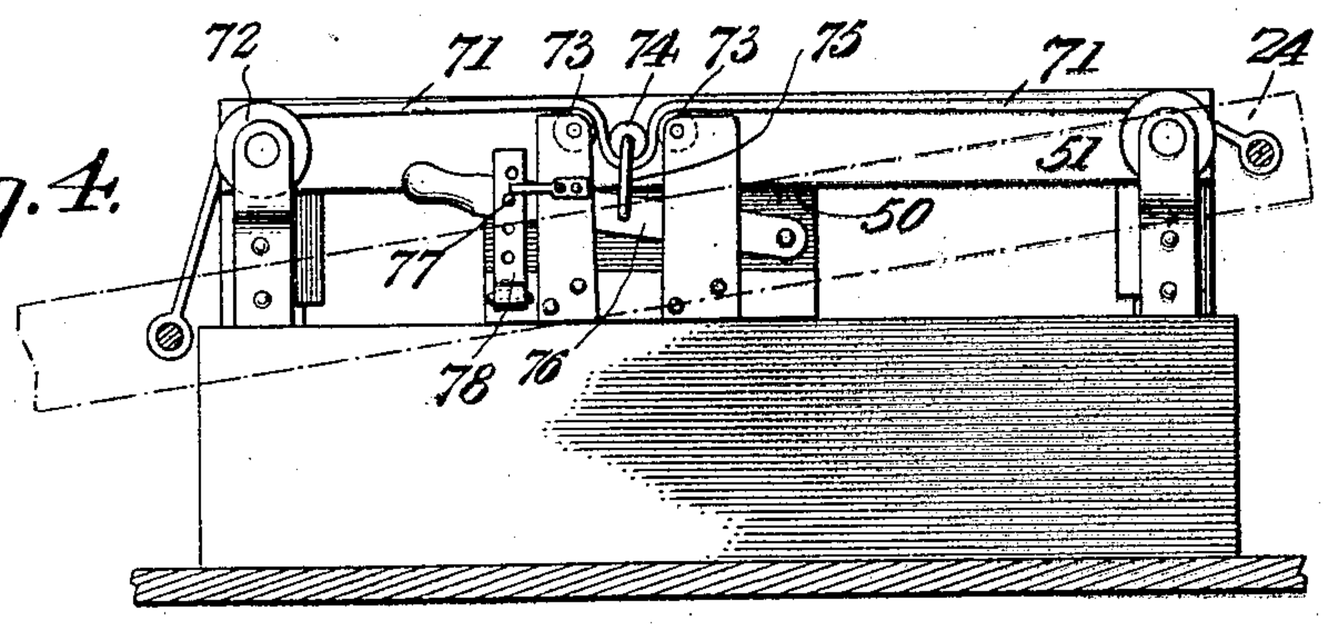


Fig. 3.

Fig. 4.



Witnesses
E. F. Stewart
Jno E. Parker

David J. Shea,
Inventor.
by Crosby & Co
Attorneys

No. 764,638. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

DAVID JOSEPH SHEA, OF MARIANNA, ARKANSAS.

MECHANICAL MOTOR.

SPECIFICATION forming part of Letters Patent No. 764,638, dated July 12, 1904.

Application filed November 13, 1903. Serial No. 181,080. (No model.)

To all whom it may concern:

Be it known that I, DAVID JOSEPH SHEA, a citizen of the United States, residing at Marianna, in the county of Lee and State of Arkansas, have invented a new and useful Mechanical Motor, of which the following is a specification.

This invention relates to certain improvements in mechanical motors, and especially to devices of that general class for transforming reciprocatory into rotary motion.

The principal object of the invention is to provide a novel form of mechanical motor in which reciprocatory movement may be transformed with minimum friction into continuous rotative movement.

A further object of the invention is to provide a novel form of gearing in which a revoluble wheel having spaced teeth or rollers is engaged by one or more segmental racks having teeth yieldable in one direction and serving in the opposite direction to engage the teeth or rollers of the wheel and impart a positive driving movement thereto.

A further object of the invention is to provide improved means for operating a number of segments in unison and so arranging the mechanism that when more than two segments are used one shall be active while a second is idle.

A still further object of the invention is to provide improved means for moving one or more of the segments to inoperative position.

A still further object of the invention is to provide a novel form of mechanism for adjusting the tension of one of the members employed in the transmission of the power.

With these and other objects in view, as will hereinafter appear more fully, the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size, and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of a mechanical motor constructed in accordance with the invention. Fig. 2 is a plan view of the same. Fig. 3 is an end elevation of the device, portions being broken away in order to more clearly illustrate the structure. Fig. 4 is an elevation of a portion of the machine looking from the side opposite to that seen in Fig. 1. Fig. 5 is a detail view of one of the segments and its adjusting devices, showing one of the gear-wheels in section. Fig. 6 is a sectional plan view illustrating a segment of modified construction. Fig. 7 is an elevation illustrating the mechanism as arranged for driving the main shaft in either direction.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

In the drawings, 1 designates a suitable base provided at its opposite ends with standards 10 and 11, and at the central portion of the base is a third pair of standards 12, the standards forming the principal supports for the movable members of the power-transmitting mechanism.

At the upper end of the standards 12 are formed bearings for the support of a transversely-disposed shaft 15, from which the power may be taken in any convenient manner and be used for the driving of machinery of any desired character. On this shaft are arranged two wheels 14, each of which comprises a pair of spaced disks 16, that are separated from each other by a spacing-block 17, and near the peripheral lines of the disks are annular series of openings for the reception of transversely-disposed pins 19, on which are mounted rollers 20, the whole forming a gear or spur wheel in which rollers take the place of fixed teeth for the purpose of reducing friction.

At the upper end of each of the standards 10 and 11 is pivotally mounted a lever 21, carrying a gear-segment adapted to engage with the antifriction-rollers of the wheels, and the parts are so arranged that two segments will engage with each of the gears, one of the segments moving on its operating stroke while the other is moving in the opposite direction on the return stroke. To accomplish this movement of the segments, they are connected in pairs to levers 24, mounted on pivot-pins

projecting from the standards 12 and connected by suitable links 27 to the segments, and said levers receive rocking movement and effect simultaneous movement of the segment of each pair, one of the segments being moved upward during the operating stroke and the other being in operative engagement with the gear on the downstroke.

The segments 30 and 31 of each pair are of practically the same construction, with the exception of minor differences in the mounting of their gear-engaging teeth. Each segment is formed of a plurality of spaced plates 32, three of such plates being shown in the present instance, and in the spaces between the plates are arranged teeth, said teeth being disposed alternately or in staggered order and each tooth being of a width approximately equal to one-half of the width of the segmental gear-wheel. The teeth 35 of the segment 30 are pivotally mounted on pins 36, carried by the segment-plates, the front ends of the teeth being extended upward beyond the edges of the plates for engagement with the gear-wheel, while the rear or inner end of each tooth is adapted to engage a stationary shoulder or pin 37 in order to limit downward movement of the rear end of the teeth, so that on the downstroke of the segment the engaging ends of the teeth will be held from upward movement and will positively engage with and turn the gear-wheel, while on the opposite or upward stroke of the segment the teeth will yield as they pass the teeth of the gear-wheel and will not impart movement thereto. After moving from engagement with the teeth of the gear-wheel on the upstroke the teeth are returned to initial position by counterweights 39, formed at the inner ends of the teeth.

The teeth of the segments 31 are designed to operate on the gear-wheel during the upstroke, and for this purpose each tooth 40 is approximately triangular in form and is pivoted near its upper rear edge in such manner that the lower body portion of the triangle will form a weight for restoring the teeth to initial position. On upward and operative movement the rear and shorter face of the triangle comes into contact with the curved face of the segment and is held positively from swinging movement independent of such segment.

It will be noted that by arranging the teeth in staggered relation they may be made much larger and stronger than if all were disposed in regular order between a single set of pivot-plates, and this arrangement of the teeth may be more fully developed by providing four or more plates and disposing the teeth therein in the manner shown in Fig. 6.

In the present construction it is preferred to employ a rocking lever 24 at each side of the frame, and said levers may be simultaneously moved in opposite directions, respectively, by mechanical, manual, or animal power.

In the drawings, 50 designates a horizontally-movable block adapted to suitable guide-bars 51 near the base of the machine, and said block receives reciprocating movement from any ordinary form of reciprocating engine, of which the cylinder is indicated at 52. At each end of the guides is a cross-bar 53, carrying a spring-pressed pin 54, with which the block 50 comes into engagement at the completion of each stroke, the spring yielding and forming a cushion for the piston and block and as the latter starts on its rear movement serving to impart initial impetus to said block. The springs will also serve to take up any jar, such as will at times occur in the changing of direction of movement of the segments.

To one side of the block 50, which projects through the guide 51, is arranged a pair of blocks or lugs 60, one of which is continued up beyond the other and is provided with a pair of spaced lugs 61, perforated to receive a pivot-pin 62, and on the latter is mounted an adjustable lever 63, near the handled end of which is a locking-pin 64, which may be introduced into any one of a series of perforations 65, formed in a pivotally-mounted locking-bar 66, and thus lock the lever in any angular position to which it may be adjusted. The locking-bar 66 is pivoted to a bracket 67, that in turn is pivotally mounted on a pin 68, projecting from one of the blocks 60 in order to permit free movement of the locking-bar. To the lower end of the lever is hung a link 70, which engages an intermediate portion of a belt or flexible connecting-strip 71. The opposite ends of the belt are guided over sheaves 72, disposed near the opposite ends of the block-guides, and the extreme end portions of such belts are connected to the rocking lever 24, so that on reciprocating movement of block 50 one end of the rocking lever will be moved down, while the opposite end thereof will receive corresponding movement in an opposite direction. The adjusting-lever serves as convenient means for taking up any slack which may occur in a belt through exposure to varying climatic conditions.

At the opposite side of the block the take-up mechanism is of slightly-different construction, as illustrated in Fig. 4. In this case an intermediate portion of the belt 71 is passed over two rollers 73 and thence under an intermediate roller 74, that is connected by a link 75 to a lever 76, held by means of a removable pin 77, adapted to any one of a series of openings formed in a bar 78, carried by the block 50.

In some cases it may be desirable to operate the power-transmitting mechanism manually, and for this purpose the ends of the levers 24 are continued to a point near one end of the base and are provided each with a slot 80 for the reception of a removable motor mechanism which may be driven by a single

operator. This mechanism comprises a frame 81, provided at its lower end with a slide 82, which may be adjusted in guides 83 on the base of the machine when the motor is to be used. In the vertical standards of the frame are formed vertically-disposed guiding-grooves 84 for the reception of suitably-shaped blocks 85, having outwardly-extending pedals 86, and to the pedals are connected grips 88, which may be grasped by an operator seated on a saddle 89, so that both his strength and weight may be utilized when at work. The two blocks are connected by an endless belt or chain 90, passing over suitable guiding-sheaves 91, carried by the frame, so that said pedals may move simultaneously in opposite directions, respectively. The saddle 89 is carried by a saddle-post 92, provided with suitable slots 93, through which extend locking-bolts 94, projecting from the frame. This permits of adjustment of the height of the saddle to seat the operator.

The pedal-blocks are provided with projecting pins 95, that extend into the slots at the end of the rocking levers 24, so that the movements imparted to the pedals by the operator will serve to rock the levers, and this movement will be transmitted to the segments and from thence to the gear-wheels and the main shaft 13.

In the operation of the device where two gear-wheels and four segments are used two of the segments will be on the upstroke while the other two are on the downstroke, one of the segments 30 positively engaging with one side of one of the gears, while the opposite segment 31 engages the opposite side of the second gear. This in a measure balances the power and prevents strain on the main shaft. Any mechanism employing four segments will not be readily actuated by a single operator, and for this purpose provision is made for disconnecting one or more of the segments, so that when the engine or other mechanical power is cut off the work may be continued manually.

The rear ends of the segments 31 are connected to the pivot-studs of the standards 11 by links 98 in the form of channel-bars 99, that are pivoted at one end to the stud of the supporting-standards and are connected at an intermediate point to the rear ends of the segments by means of a pivot-pin 100. When the three webs of the channel-bar are parallel with the shank of the segment, the parts will be locked in opposite position, the teeth of the segment being then in position to engage the gear-wheel. The parts are held in locked position by means of levers 101, pivoted at an intermediate point to the shanks of the segment and connected at one end by links 102 to the links 98. The opposite end of each lever 101 is locked in place by a pivoted catch 103 in the form of an angularly-bent rod having its opposite end portions extending through openings formed in the segment and pivoted to the outer side of said segment. The ends of the rods are bent upward and downward, respectively, to form seating-catches for the ends of the lever and serve to maintain the lever in one position or the other. The rods are preferably held from movement by small spring-arms 104, which engage against the extreme end portion of the lever and retain the same in its seat. To move one of the segments 31 to inoperative position, the lever is disengaged from the upper catch and moved downward, this resulting in the raising of the inner end of link 98 and the consequent withdrawal of the teeth of the segment from operative position. The end of the lever may be engaged with the lower catch in order to positively lock the segment in its inoperative position.

The mechanism employed for engaging and disengaging the segments from the gear is utilized to advantage in constructions where it is desired to provide for the rotation of the main shaft in either direction. A structure of this character is illustrated in Fig. 7, wherein the two segments are each provided with teeth 40, that are operable only on the upward movement of the segment. When it is desired to rotate the gear in the direction of the arrow, the left-hand segment is disconnected and operative movement is transmitted from the right-hand segment, and these conditions are reversed when it is desired to rotate the gear and main shaft in the opposite direction. It will of course be understood that the construction shown in Fig. 7 may be added to by increasing the number of the segments and gears without departing from the invention.

In a device of this class it is possible to operate drag-saws or machinery of any character without material waste in power from undue friction, and the full power of an engine may be utilized without the necessity of employing a balance or fly wheel to carry the crank past the dead-center. When used in connection with drag-saws to which reciprocating movement is imparted, the teeth of the segments may be made rigid in order to operate positively on the gear-wheels and impart oscillatory movement thereto.

Having thus described the invention, what is claimed is—

1. In mechanical motors, a frame, a shaft supported thereby, a gear-wheel carried by the shaft, a pair of oppositely-disposed segments for engaging the gear-wheel, said segments having each a plurality of rows of teeth, the teeth of the segments being disposed in staggered relation, a rocking lever having linked connection with the segments, and means for actuating said lever.

2. In a mechanical motor, a frame, a shaft carried thereby, a gear-wheel mounted on the shaft, a pair of pivotally-mounted segments

engaging the gear-wheel, said segments having pivotally-mounted teeth yieldable in one direction only, the teeth of each segment being arranged in a plurality of sets and all of the teeth of the segment being disposed in staggered relation.

3. In a mechanical motor, a frame, a shaft carried thereby, a gear-wheel mounted on the shaft and comprising a pair of spaced disks, a spacing-block for maintaining the disks in proper relation to each other each of said disks having an annular row of perforations, pins mounted in the perforations, and anti-friction-rollers mounted on the pins, substantially as specified.

4. In a mechanical motor, a frame, a shaft carrying the frame, a gear-wheel mounted on the shaft, a pair of pivotally-mounted segments for engaging the gear-wheel, means for adjusting one of the segments to operative and inoperative positions, and means for actuating said segments.

5. In a mechanical motor, a frame, a shaft carried thereby, a gear-wheel supported by the shaft, a pair of segments intermeshing with the gear-wheel, a channeled support pivotally connected to one of the segments and having a pivot-stud on the fixed frame, and means for adjusting the support thereby to move the segment in operative or inoperative position.

6. In a mechanical motor, a frame, a shaft carried thereby, a gear-wheel mounted on the shaft, a segment engaging the gear-wheel, a channeled support pivoted at one end to the fixed frame and embracing a portion of the segment, there being a pivotal connection between the segment and its support, an adjusting-lever pivotally mounted on the segment and connected to the support, and means for locking said lever in position.

7. In a mechanical motor, a frame, a shaft carried thereby, a gear-wheel mounted on the shaft, a segment intermeshing with the gear-wheel, a channeled support pivotally connected to the frame and to the segment, said support partly embracing the segment, an adjusting-lever pivoted to the segment and connected to said support, a pivotally-mounted locking-bar having its opposite ends bent to form retainers for the adjusting-lever, and means for holding said locking-bar in operative position.

8. In a mechanical motor, a frame, a shaft supported thereby, a gear-wheel mounted on the shaft, a pair of pivotally-mounted segments intermeshing with the gear, a rocking lever having linked connection with the segments, a reciprocating block, guides for said block, a flexible connecting means secured at an intermediate point to the block and at its opposite ends to the rocking lever, and means for reciprocating the block.

9. In a mechanical motor, a frame, a shaft carried thereby, a gear-wheel mounted on the shaft, a pair of segments engaging the gear-wheel, a rocking lever having linked connection with the segments, a reciprocating block, guides for the block, an adjustable lever carried by the block, a flexible connecting means having an intermediate portion connected to the lever, and its opposite ends being connected to the rocking lever, and means for reciprocating the block.

10. In a mechanical motor, a rocking lever, a reciprocating block, a flexible member having its opposite ends connected to the rocking lever, a lever pivotally mounted on the block, a link carried by the lever and connected to an intermediate portion of the flexible member, and means for locking said lever in position when adjusted to take up the slack of said flexible member.

11. In a mechanical motor, the combination with a gear, of a pivoted segment having teeth intermeshing with the gear, said segment comprising a plurality of spaced arcuate plates, pivot-pins arranged in staggered relation between said plates, the teeth of the segment being mounted on the pins and counterweighted to insure their return to initial position.

12. In a mechanical motor, a main shaft having a gear-wheel, a pair of segments for engagement with the gear-wheel and arranged to transmit operative movement in opposite directions respectively, and means for disconnecting one or other of the segments from the gear.

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

DAVID JOSEPH SHEA.

Witnesses:
W. T. DINICK,
A. S. RODGERS.