No. 790,039. PATENTED MAY 16, 1905.

J. EDGAR.

TABLE ACTUATING MECHANISM FOR MILLING MACHINES.

APPLICATION FILED OCT. 29, 1902.

3 SHEETS—SHEET 1.

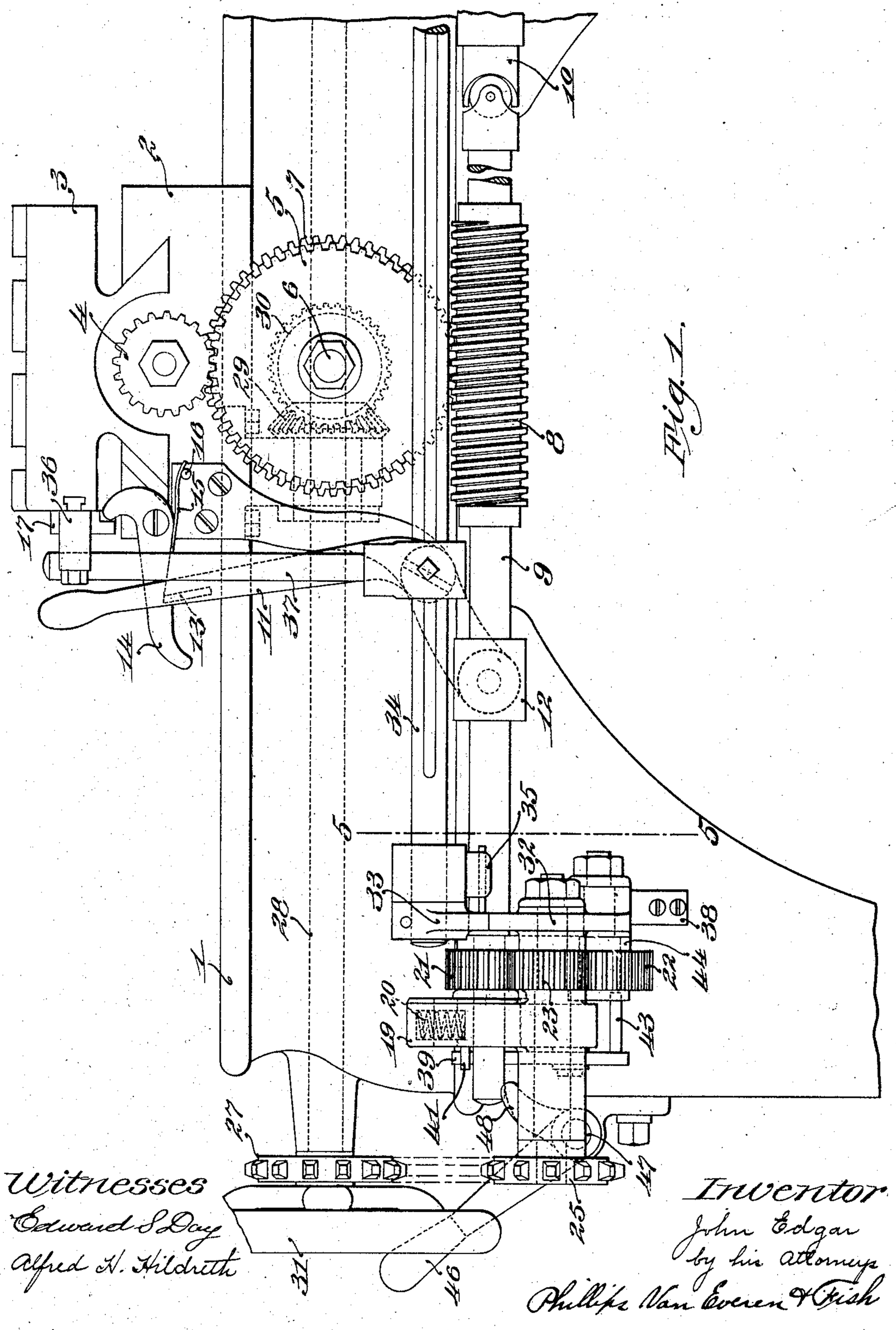

Fig. 1.

Witnesses
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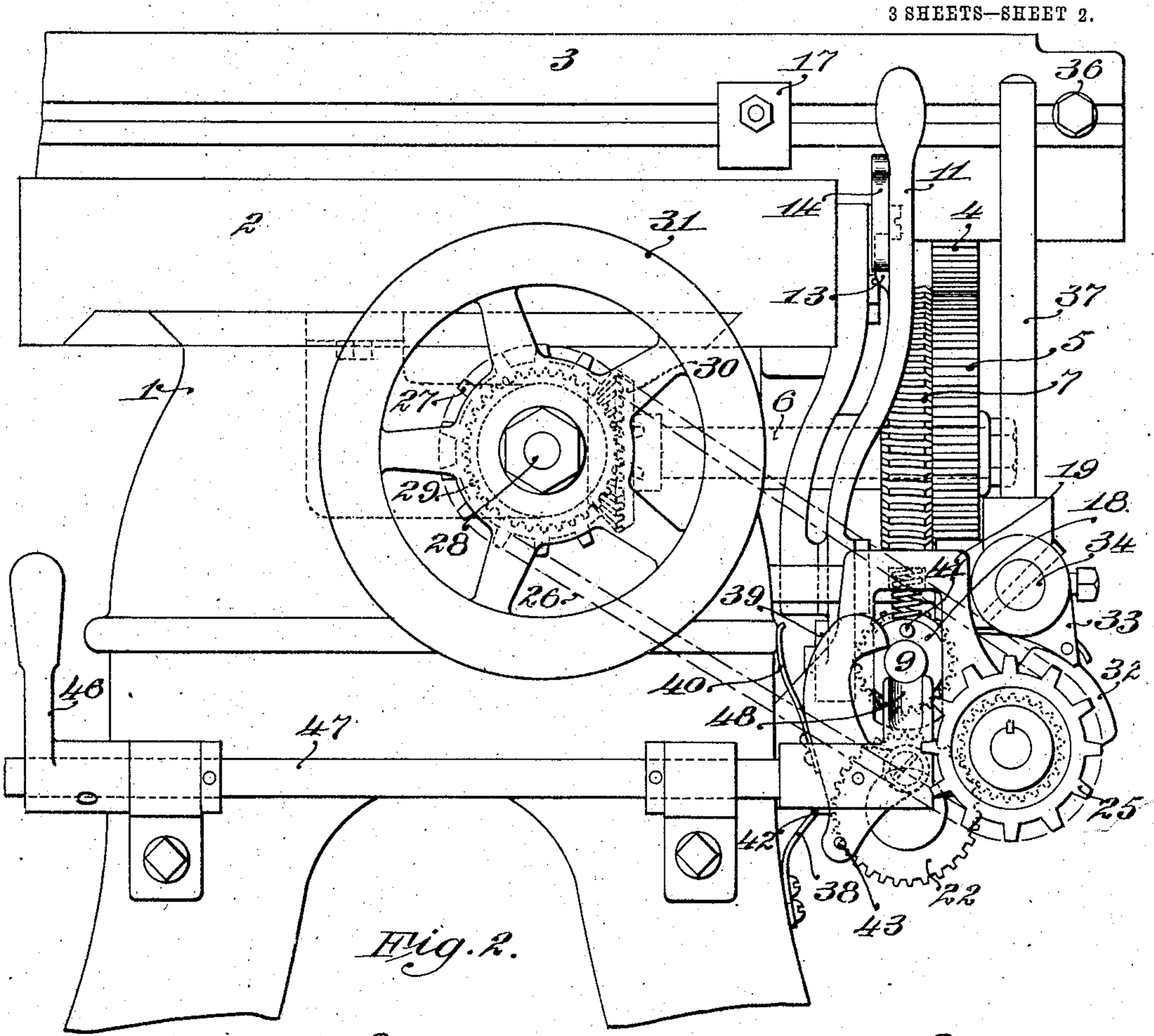

Fig. 2.

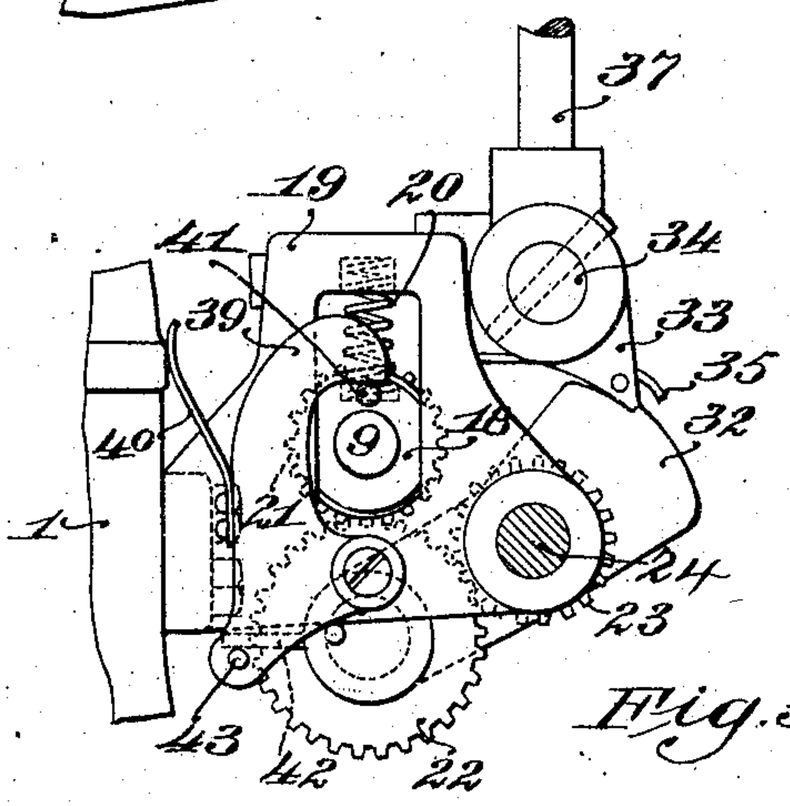

Fig. 3.

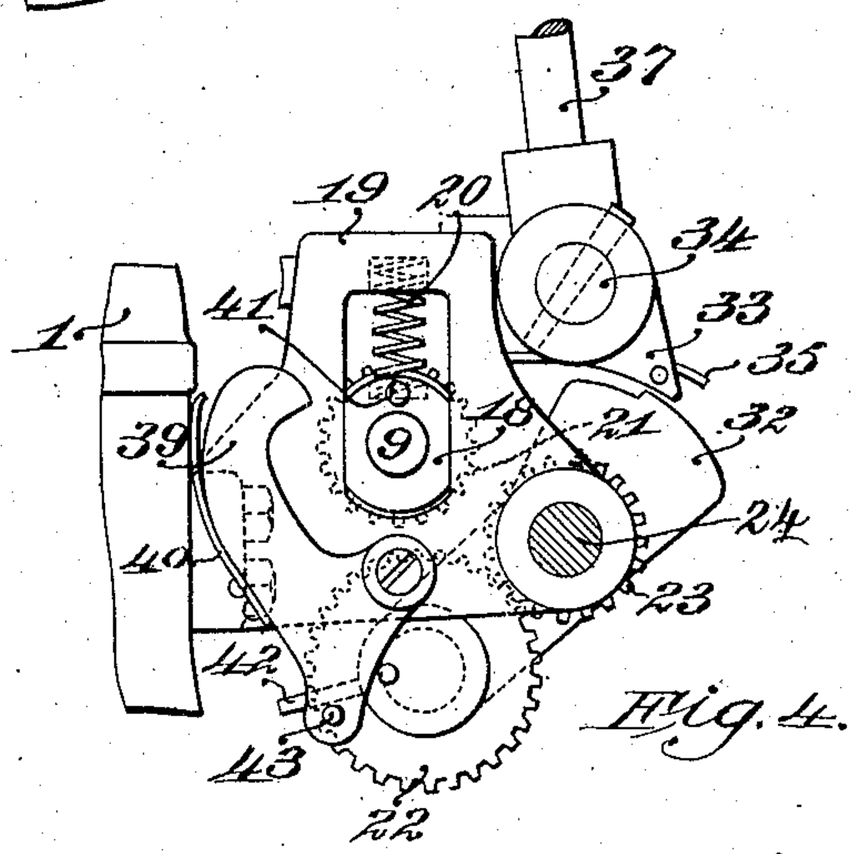

Fig. 4.

Witnesses
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3 SHEETS—SHEET 3.

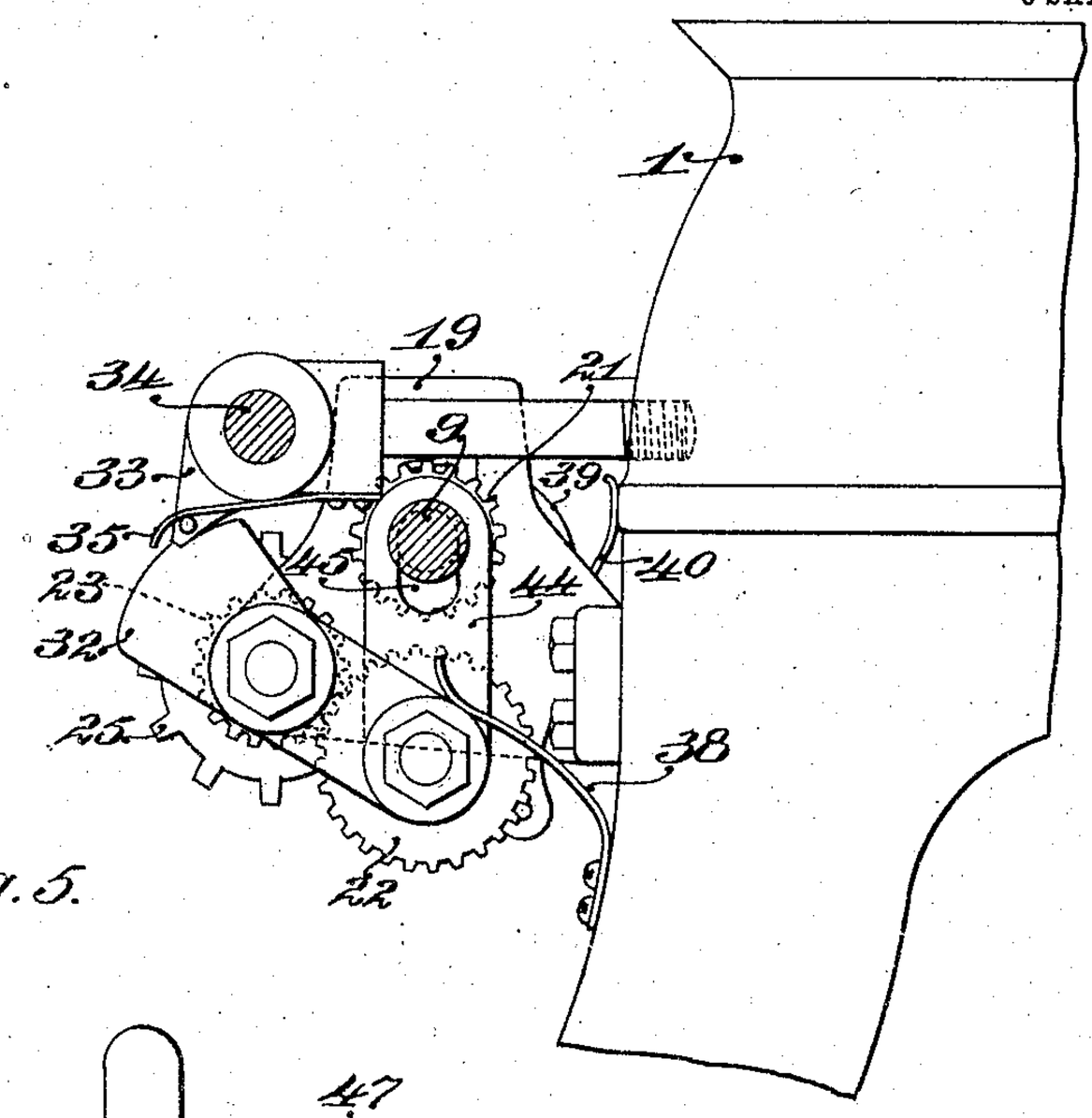

Fig. 5.

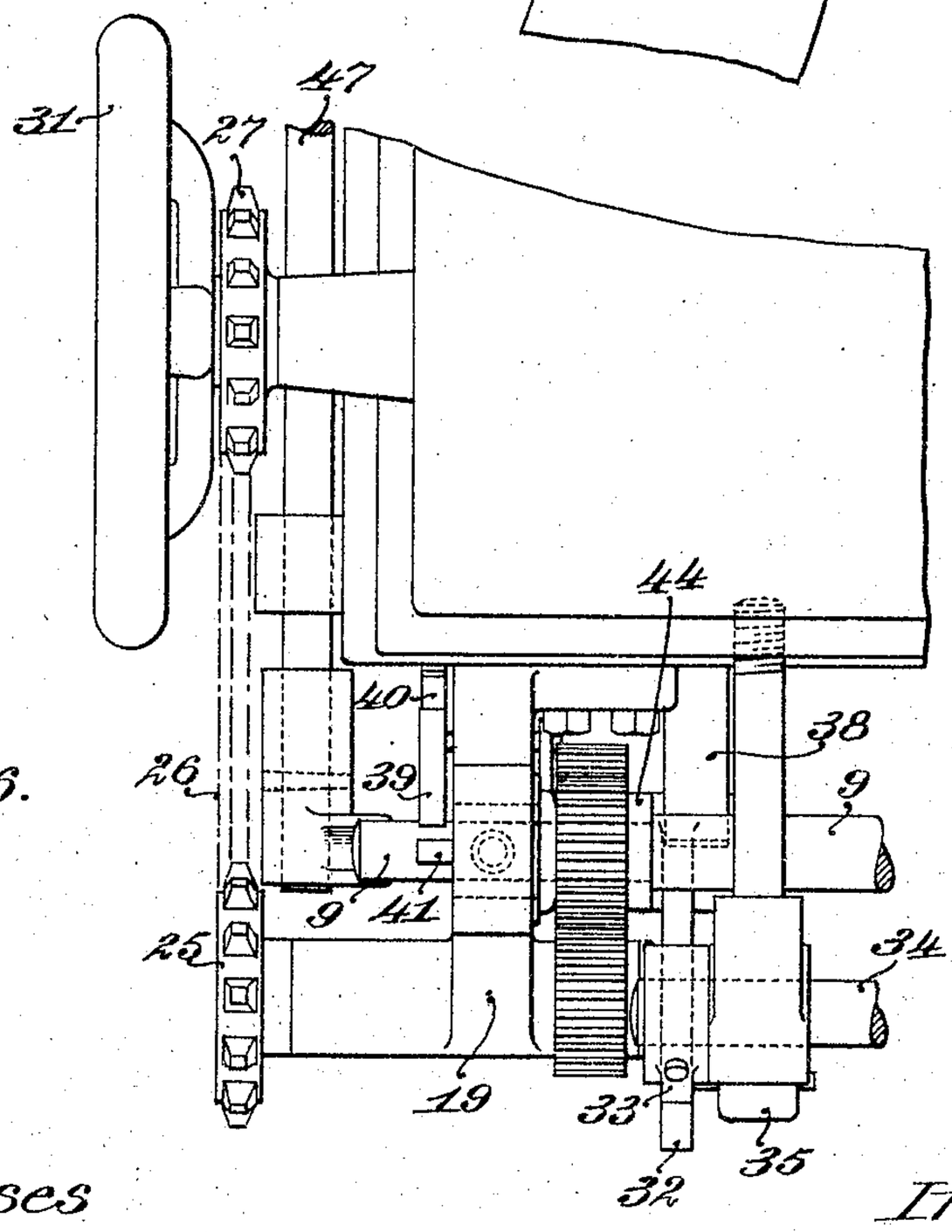

Fig. 6.

Witnesses
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No. 790,039. Patented May 16, 1905.

UNITED STATES PATENT OFFICE.

JOHN EDGAR, OF HYDEPARK, MASSACHUSETTS, ASSIGNOR TO BECKER-BRAINARD MILLING MACHINE COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

TABLE-ACTUATING MECHANISM FOR MILLING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 790,039, dated May 16, 1905.

Application filed October 29, 1902. Serial No. 129,240.

To all whom it may concern:

Be it known that I, JOHN EDGAR, a subject of the King of Great Britain and Ireland, residing at Hydepark, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Table-Actuating Mechanism for Milling-Machines; 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.

The present invention relates to an improved table-actuating mechanism for milling-machines or other machine-tools in which a movable work-supporting table is employed.

The object of the invention is to provide an improved mechanism automatic in its action for quickly returning the table to its initial position after it has completed its work-feeding movement.

With this object in view my invention consists in the constructions, combinations, and arrangements of parts hereinafter described and claimed, which possess certain advantages as to simplicity of construction and arrangement and certainty of operation, as will be obvious to those skilled in the art from the following description.

A milling-machine or other machine-tool embodying my invention comprises a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement and a return movement, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the mechanism for imparting a return movement to the table into operation when the table reaches the end of its feeding movement, and means for throwing the mechanism for imparting a return movement to the table out of operation when the table reaches the end of its return movement. Table-actuating mechanisms having these general features of construction and operation have heretofore been devised. In order to render such mechanisms more certain and reliable in operation, a feature of my invention contemplates providing means for locking the driving-shaft in the position to which it is moved to throw the mechanism for imparting a return movement to the feed-table into operation.

It also contemplates providing means for releasing the driving-shaft when the mechanism for imparting a return movement to the table is thrown out of operation in order to allow the shaft to be moved when it is desired to again throw the mechanism for imparting a feed movement to the table into operation. As to these features of my invention, broadly considered, the mechanism connecting the driving-shaft and table may be of any suitable construction.

Other features of my invention contemplate providing a mechanism for imparting a return movement to the feed-table of improved construction, arrangement, and mode of operation. As to these features the construction and arrangement of the mechanism for imparting a feed movement to the table are immaterial, as any suitable mechanism may be used. The mechanism which I prefer to employ for this purpose comprises a worm on the driving-shaft, a worm-gear with which the worm on the driving-shaft engages during the feeding movement of the table, and connections between the worm-gear and the table.

Those features of my invention which relate to the construction and arrangement of the mechanism for imparting a return movement to the table are embodied in a construction comprising a gear on the driving-shaft, a gear with which the gear on the driving-shaft is arranged to be brought into engagement when the driving-shaft is moved to throw the worm thereon out of mesh with the worm-gear, and connections between the gear with which the gear on the driving-shaft is brought into engagement and the table. In accordance with my invention this gear is movably mounted, and means are provided whereby this movable gear is moved to throw it out of mesh with the gear on the driving-shaft when the table reaches the limit of its return movement. Other novel features of this mechanism con-

sist of means whereby the movement of the movable gear releases the driving-shaft to allow it to be moved to throw the worm thereon into mesh with the worm-gear, of means for locking the movable gear in position to be engaged by the gear on the driving-shaft, and of a connection between the movable gear and the driving-shaft for returning the gear to locking position when the driving-shaft is moved to throw the worm thereon into mesh with the worm-gear. In the illustrated embodiment of these features of my invention hereinafter specifically described the connections between the movable gear and the table for imparting a return movement to the table comprise a gear secured to a shaft mounted in fixed bearings. The movable gear is mounted upon a carrier pivotally supported upon said shaft and is thereby maintained in mesh with the gear thereon at all times. The movable gear is locked in position to be engaged by the gear on the driving-shaft by means of a locking device, which engages the carrier and which is arranged to be actuated to release the carrier when the table reaches the end of its return movement. The driving-shaft is locked in the position to which it is moved to throw the gear thereon into mesh with the movable gear by means of a locking device, which is arranged to be actuated to release the driving-shaft by the carrier for the movable gear during its movement in throwing the movable gear out of mesh with the gear on the driving-shaft. A connection between the driving-shaft and the carrier returns the carrier into a position to be engaged by its locking device when the driving-shaft is moved to throw the mechanism for imparting a feed movement to the table into operation.

The specific construction of the mechanism above referred to will be clearly understood from an inspection of the drawings accompanying this application, in which—

Figure 1 is a view in side elevation of a portion of a milling-machine with a preferred form of my invention applied thereto. Fig. 2 is a view in end elevation thereof. Fig. 3 is a detail view of a portion of the mechanism for imparting a return movement to the table, the parts being shown in the position which they assume during the return movement of the table. Fig. 4 is a view similar to Fig. 3, showing the position which the parts assume at the end of the return movement of the table. Fig. 5 is a detail sectional view on the line 5 5 of Fig. 1, illustrating the position of certain parts of the mechanism for imparting a return movement to the table during the feeding movement of the table; and Fig. 6 is a plan view of the mechanism at the left-hand end of the machine as viewed in Fig. 1.

1 indicates the frame of the machine, which is provided with guideways upon which the saddle 2 is mounted.

3 indicates the feed-table, which is mounted to reciprocate in guideways in the saddle 2. In the saddle 2 a feed-shaft is journaled by which the table 3 is engaged and actuated, as is common in this class of machines. To the end of the feed-shaft a gear 4 is secured, with which a gear-wheel 5 meshes, secured to a shaft 6, mounted in bearings in the saddle 2 below and parallel with the feed-shaft. Also secured to the shaft 6 or to the gear-wheel 5 so as to rotate therewith is a worm-gear 7, and with this worm-gear a worm 8 upon a driving-shaft 9 is arranged to engage, the construction being such that when the worm 8 is in mesh with the worm-gear 7 the feed-shaft is rotated in a direction to impart a feeding movement to the table 3. The driving-shaft 9 is driven from a shaft 10 and is connected thereto by means of a universal joint which allows the shaft to be moved to throw the worm 8 into and out of mesh with the worm-gear 7. The shaft 9 is held in the position in which the worm 8 is in mesh with the worm-wheel 7 by means of a lever 11, which is pivoted upon a bracket secured to the saddle 2. At its lower end the lever 11 carries a block 12, pivotally mounted thereon, through which the shaft 9 passes, and near its upper end it is provided with a lug 13, which is arranged to be engaged by a latch-lever 14, pivotally mounted upon the saddle 2. To the latch-lever 14 a leaf-spring 15 is secured, the free end of which engages a pin 16 upon the saddle 2 or the bracket secured thereto. The end of the latch-lever 14 opposite to that which is arranged to engage the projection 13 of the lever 11 extends into a position to be engaged by the cam-surface of a block 17, adjustably secured to the table 3. The spring 15 tends to hold the latch-lever in a position in which one arm is in engagement with the lug 13 of the lever 11 and the other arm extends into the path of movement of the block 17. By the engagement of the latch-lever 14 with the lug 13 of the lever 11 the driving-shaft 9 is held in its raised position, as indicated in Fig. 1, with the arm 8 in mesh with the worm-gear 7, until the table reaches the limit of its feeding movement, at which time the latch 14 is actuated by the engagement therewith of the cam-surface of the block 17, the lever 11 is released, and the shaft 9 is allowed to drop and throw the worm 8 out of mesh with the worm-gear 7.

The driving-shaft 9 is supported at one end by means of the universal joint which connects it with the shaft 10 and at the other end by a bearing-block 18, mounted to slide in a vertical slot in a bracket 19, secured to the frame of the machine. A coiled spring 20 is interposed between the bearing-block 18 and the upper wall of the slot in the bracket 19 and serves as a means for moving the shaft 9 to throw the worm 8 out of mesh with the worm-gear 7 at the end of the feeding movement of the table in case the shaft fails to be so moved by gravity. A gear 21 is secured

to the shaft in proximity to the bracket 19 and is arranged to be thrown into mesh with a gear 22 when the driving-shaft 9 is moved to disengage the worm 8 from the worm-gear 7. The gear 22 meshes with a gear 23, secured to a shaft 24, mounted in bearings in the bracket 19. Also secured to the shaft 24 is a sprocket-wheel 25, over which a sprocket-chain 26 (indicated in dotted lines in the drawings) passes. The sprocket-chain 26 also passes over a sprocket-wheel 27, secured upon a shaft 28, mounted in bearings in the frame of the machine at right angles to the shaft 6. The shaft 28 has a splined connection with a beveled gear 29, mounted in bearings in a bracket depending from the saddle 2, which gear meshes with a beveled gear 30 upon the shaft 6. The above-described construction is such that when the worm 8 is thrown out of mesh with the worm-gear 7 and the gear 21 is thrown into mesh with the gear 22 the shaft 6 is driven in the opposite direction to which it was driven by the worm 8 and at an increased speed, and thereby through the gears 5 and 4 the feed-shaft is rotated at an increased speed in a direction to return the table to its initial position.

A hand-wheel 31 is secured to the outer end of the shaft 28, by means of which the shaft can be rotated by hand to move the table in either direction when the mechanism for actuating the table automatically is out of operation.

When the table reaches the end of its return movement, the gear 22 is moved to throw it out of mesh with the gear 21. To allow it to be so moved, the gear 22 is mounted upon a carrier 32, pivotally supported upon the shaft 24. The gear 22 is mounted on the inner end of the carrier 32, and the outer end of the carrier is provided with a locking shoulder or recess, which is arranged to be engaged by a locking-pawl 33. The arrangement of the shoulder or recess on the carrier and the locking-pawl is such that the carrier is locked in position by the pawl to allow the gear 21 to be thrown into mesh with the gear 22 when the driving-shaft 9 is moved to disengage the worm 8 from the worm-gear 7. The locking-pawl 33 is secured to a rock-shaft 34, journaled in bearings on the side of the machine-frame. A leaf-spring 35, secured to one of the bearings for the shaft 34 and engaging a pin on the locking-pawl, tends to move the pawl in a direction to engage the carrier 32. At the end of the return movement of the table the pawl 33 is actuated to release the carrier by means of a block or stud 36, adjustably secured to the table, which engages the upper end of a rod 37, secured to the rock-shaft 34. As soon as the carrier 32 is released by the pawl 33 it is moved by gravity or by means of a leaf-spring 38, secured to the frame of the machine and bearing against the inner end of the carrier, in a direction to throw the gear 22 out of mesh with the gear 21. The driving-shaft 9 is held in the position to which it is moved to throw the gear 21 into mesh with the gear 22 during the return movement of the feed-table by means of a locking-pawl 39, pivotally mounted upon the bracket 19. A leaf-spring 40 is secured to the pawl 39 and bears against the frame of the machine, and this spring as soon as the shaft 9 is moved to throw the gear 21 into mesh with the gear 22 moves the pawl 39 into the position illustrated in Fig. 3, in which position the pawl engages a pin 41, projecting from the block 18, in which the end of the shaft 9 is journaled, and locks the shaft in position. Before the shaft 9 can be raised to throw the worm 8 into engagement with the worm-gear 7 in order to impart another feeding movement to the table after it has been returned to its initial position the pawl 39 must be actuated to release the driving-shaft. To so actuate the pawl, a projection 42 is provided at the inner end of the carrier 32, which during the movement of the carrier in a direction to throw the gear 22 out of mesh with the gear 21 engages a pin 43, projecting from the pawl 39, and thereby swings the pawl against the tension of the spring 40 into the position illustrated in Fig. 4.

When the shaft 9 is raised to throw the worm 8 into mesh with the worm-gear 7, it is necessary that the carrier 32 be returned to the position in which it is engaged by the locking-pawl 33 in order that the gear 21 may be thrown into mesh with the gear 22 when the driving-shaft is moved to disengage the worm 8 from the worm-gear 7 at the end of the feeding movement of the table. To return the carrier to its locking position, the link 44 is provided, the lower end of which is pivotally connected with the carrier and the upper end of which is provided with a slot 45, through which the driving-shaft 9 passes. The carrier is thus returned by the link 44 during the upward movement of the shaft 9 into a position to be engaged by its locking-pawl, and the slot 45 of the link allows the shaft 9 to drop to throw the gear 21 into mesh with the gear 22 at the end of the feeding movement of the table. The driving-shaft 9 may be raised to bring the worm 8 into mesh with the worm-gear 7 by means of the lever 11 or by means of a hand-lever 46, secured to a rock-shaft 47, to which is also secured an arm 48, extending beneath the end of the shaft 9.

Briefly stated, the operation of the mechanism above described is as follows: Starting with the parts in the positions indicated in Figs. 1, 2, 5, and 6, which are the positions which the parts assume during the feeding movement of the table, the table is moved until the block 17 actuates the latch 14 to release the lever 11. The driving-shaft 9 then drops to throw the worm 8 out of mesh with the worm-gear 7 and the gear 21 into mesh with the gear 22. The shaft is locked in this position by the engagement of the pawl 39 with

the pin 41 on the bearing-block 18, the position of the parts at this point in the operation being illustrated in Fig. 3. The table 3 is now returned at an increased speed to its initial position. As it reaches the end of its return movement the block 36 contacts with the rod 37, and the locking-pawl 33 is actuated to release the carrier 32. The carrier then moves in a direction to throw the gear 22 out of mesh with the gear 21 and at the same time actuates the locking-pawl 39 to release the driving-shaft. The position which the parts assume at this point in the operation is indicated in Fig. 4. As soon as the gear 22 is thrown out of mesh with the gear 21 the table comes to rest and remains disconnected from the driving-shaft until the driving-shaft is raised to bring the worm 8 into mesh with the worm-gear 7. When it is desired to again throw the mechanism for actuating the table into operation, the shaft 9 is raised either by means of the lever 11 or of the lever 46, and the parts assume the positions indicated in Figs. 1, 2, 5, and 6.

The mechanism which I have illustrated in the drawings and specifically described embodies my invention in the best form at present known to me. It is to be understood, however, that except as defined in the claims my invention is not limited thereto nor to any particular construction or arrangement of parts.

Having thus indicated the nature and scope of my invention and having specifically described a preferred form thereof, I claim as new and desire to secure by Letters Patent of the United States—

1. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement and a return movement, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the mechanism for imparting a return movement to the table into operation when the table reaches the end of its feeding movement, and means acting automatically to lock the driving-shaft in such position, substantially as described.

2. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement and a return movement, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the mechanism for imparting a return movement to the table into operation when the table reaches the end of its feeding movement, means acting automatically to lock the driving-shaft in such position, and automatically-acting means for unlocking the driving-shaft and for throwing the mechanism for imparting a return movement to the table out of operation when the table reaches the end of its return movement, substantially as described.

3. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement, a gear on the driving-shaft, a movable gear and intermediate connections for imparting to the table a return movement, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the gear on the driving-shaft into mesh with the movable gear when the table reaches the end of its feeding movement, and means for moving the movable gear to throw it out of mesh with the gear on the driving-shaft when the table reaches the end of its return movement, substantially as described.

4. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement, a gear on the driving-shaft, a movable gear and intermediate connections for imparting to the table a return movement, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the gear on the driving-shaft into mesh with the movable gear when the table reaches the end of its feeding movement, means for locking the movable gear in position to be engaged by the gear on the driving-shaft, and means for releasing the movable gear and for moving it out of mesh with the gear on the driving-shaft when the table reaches the end of its return movement, substantially as described.

5. A milling-machine, having, in combination, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement, a gear on the driving-shaft, a movable gear and intermediate connections for imparting to the table a return movement, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the gear on the driving-shaft into mesh with the movable gear when the table reaches the end of its feeding movement, means for locking the movable gear in position to be engaged by the gear on the driving-shaft, means for releasing the movable gear and for moving it out of mesh with the gear on the driving-shaft when the table reaches the end of its return movement, and connections between the driving-shaft and the movable gear for returning the movable gear to locking position when the driving-shaft is moved to throw the mechanism for imparting to the table a feeding movement into operation, substantially as described.

6. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement, a gear on the driving-shaft, a movable gear and intermediate connections for

imparting to the table a return movement, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the gear on the driving-shaft into mesh with the movable gear when the table reaches the end of its feeding movement, means for locking the driving-shaft in such position, means for locking the movable gear in position to be engaged by the gear on the driving-shaft, means for releasing the movable gear and for moving it out of mesh with the gear on the driving-shaft when the table reaches the end of its return movement, and means actuated by the movement of the movable gear for releasing the driving-shaft, substantially as described.

7. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement, a gear on the driving-shaft, a movable gear and intermediate connections for imparting to the table a return movement, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the gear on the driving-shaft into mesh with the movable gear when the table reaches the end of its feeding movement, means for locking the driving-shaft in such position, means for locking the movable gear in position to be engaged by the gear on the driving-shaft, means for releasing the movable gear and for moving it out of mesh with the gear on the driving-shaft when the table reaches the end of its return movement, means actuated by the movement of the movable gear for releasing the driving-shaft, and a connection between the driving-shaft and the movable gear for returning the movable gear to locking position when the driving-shaft is moved to throw the mechanism for imparting to the table a feeding movement into operation, substantially as described.

8. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement, a gear on the driving-shaft, a gear and intermediate connections for imparting to the table a return movement, an intermediate gear meshing with said gear, a carrier therefor pivotally mounted concentrically with said gear, a locking device for said carrier, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the gear on the driving-shaft into mesh with the intermediate gear when the table reaches the end of its feeding movement, and means for actuating the locking device of the carrier to release the carrier and allow it to move to throw the intermediate gear out of mesh with the gear on the driving-shaft when the table reaches the end of its return movement, substantially as described.

9. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement, a gear on the driving-shaft, a gear and intermediate connections for imparting to the table a return movement, an intermediate gear meshing with said gear, a carrier therefor pivotally mounted concentrically with said gear, a locking device for said carrier, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the gear on the driving-shaft into mesh with the intermediate gear when the table reaches the end of its feeding movement, means for actuating the locking device of the carrier to release the carrier and allow it to move to throw the intermediate gear out of mesh with the gear on the driving-shaft when the table reaches the end of its return movement, and a connection between the driving-shaft and the carrier for returning the carrier into a position to be engaged by its locking device when the driving-shaft is moved to throw the mechanism for imparting a feeding movement to the table into operation, substantially as described.

10. A milling-machine, having, in combination, a table, a driving-shaft, mechanism actuated thereby to impart to the table a feeding movement, a gear on the driving-shaft, a gear and intermediate connections for imparting to the table a return movement, an intermediate gear meshing with said gear, a carrier therefor pivotally mounted concentrically with said gear, a locking device for said carrier, means for moving the driving-shaft to throw the mechanism for imparting a feeding movement to the table out of operation and to throw the gear on the driving-shaft into mesh with the intermediate gear when the table reaches the end of its feeding movement, a locking device for locking the driving-shaft in such position, means for actuating the locking device of the carrier to release the carrier and allow it to move to throw the intermediate gear out of mesh with the gear on the driving-shaft when the table reaches the end of its return movement, connections between the carrier and the locking device for the driving-shaft for actuating the locking device to release the driving-shaft, and a connection between the driving-shaft and the carrier for returning the carrier into a position to be engaged by its locking device when the driving-shaft is moved to throw the mechanism for imparting a feeding movement to the table into operation, substantially as described.

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

JOHN EDGAR.

Witnesses:
HENRIETTA C. RAYNER,
ALFRED H. HILDRETH.