E. EINFELDT.

AUTOMATIC REVERSING MECHANISM.

APPLICATION FILED APR. 16, 1906.

944,604.

Patented Dec. 28, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

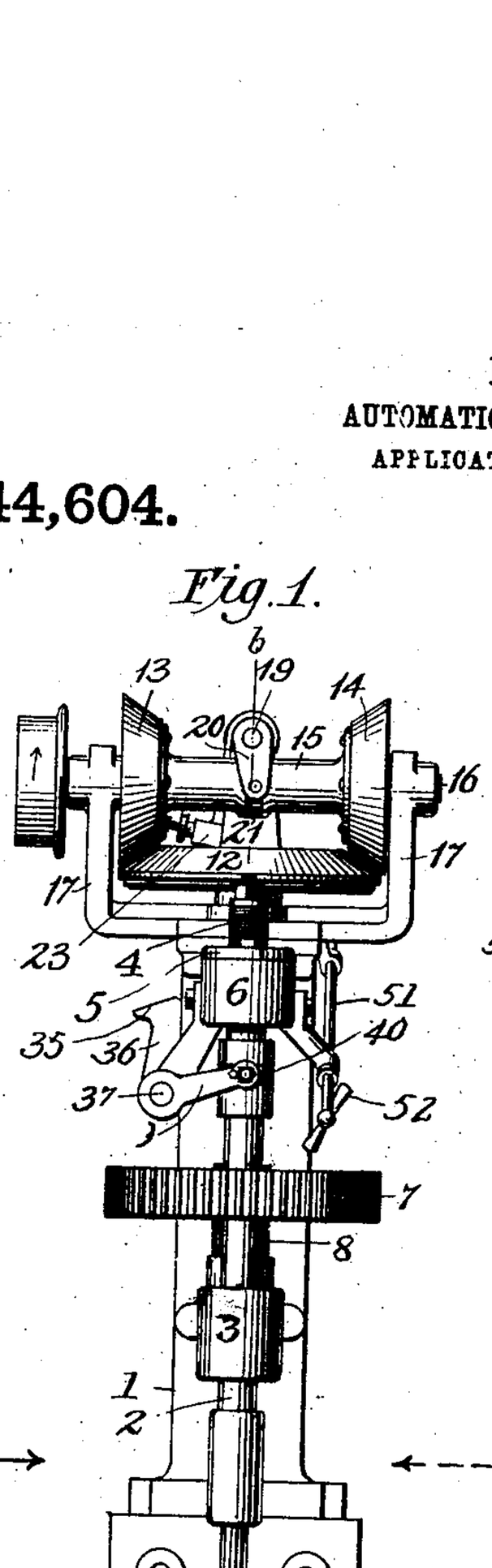
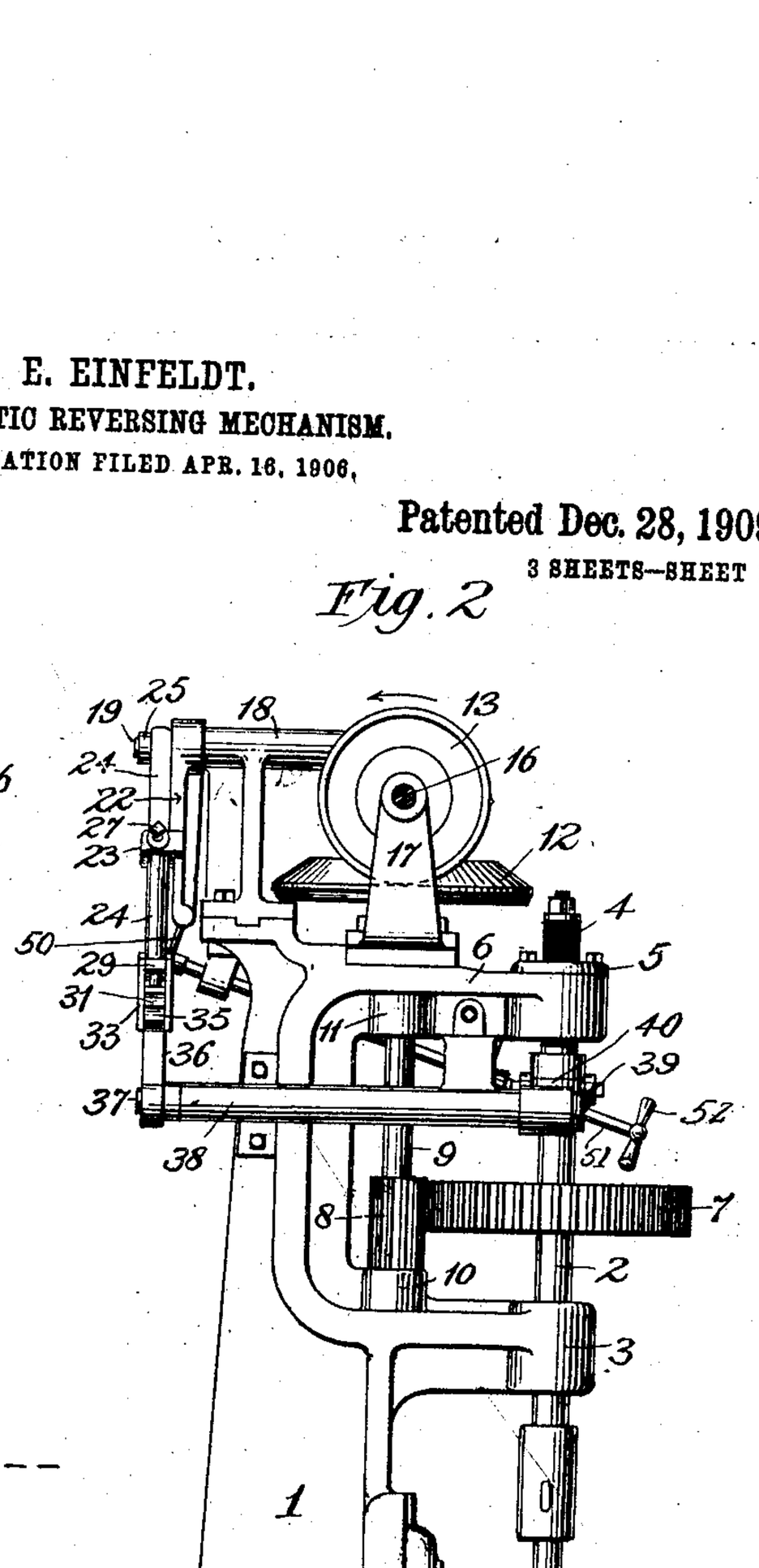


Fig. 2



Witnesses

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3 SHEETS—SHEET 2.

Fig. 3.

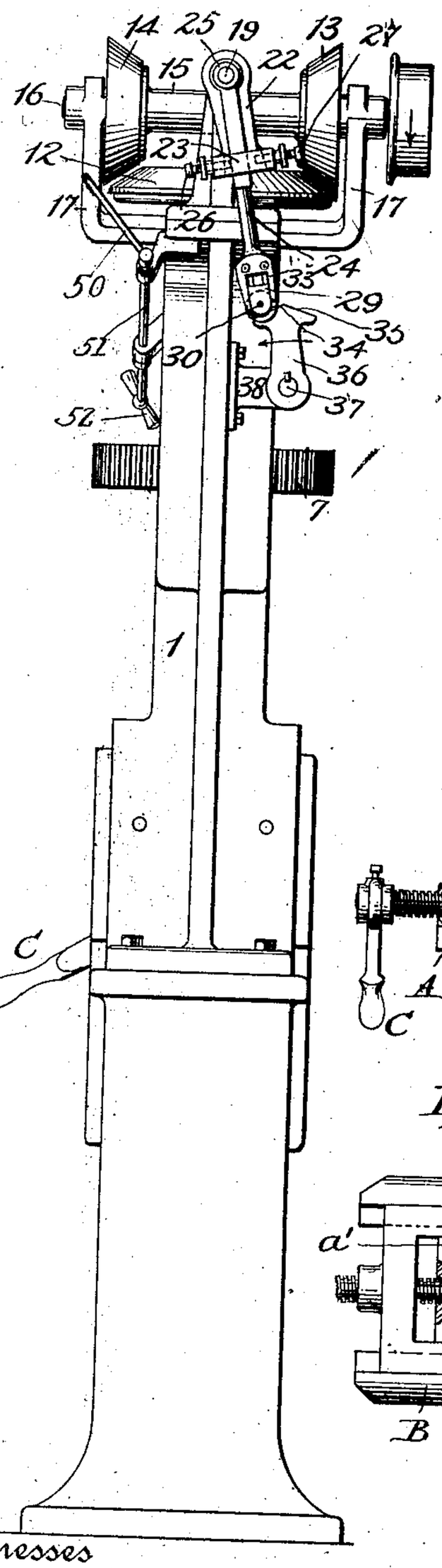

Fig. 4.

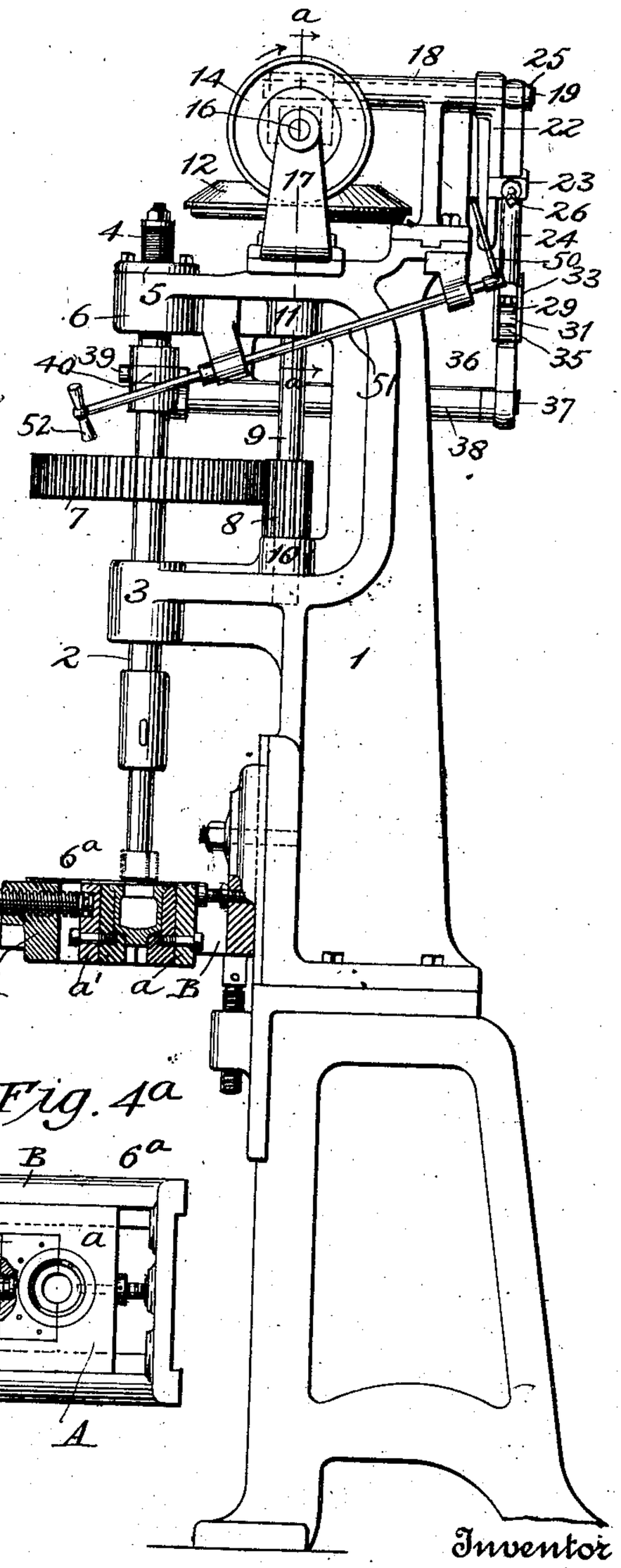

Fig. 4a

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3 SHEETS—SHEET 3.

Fig. 7.

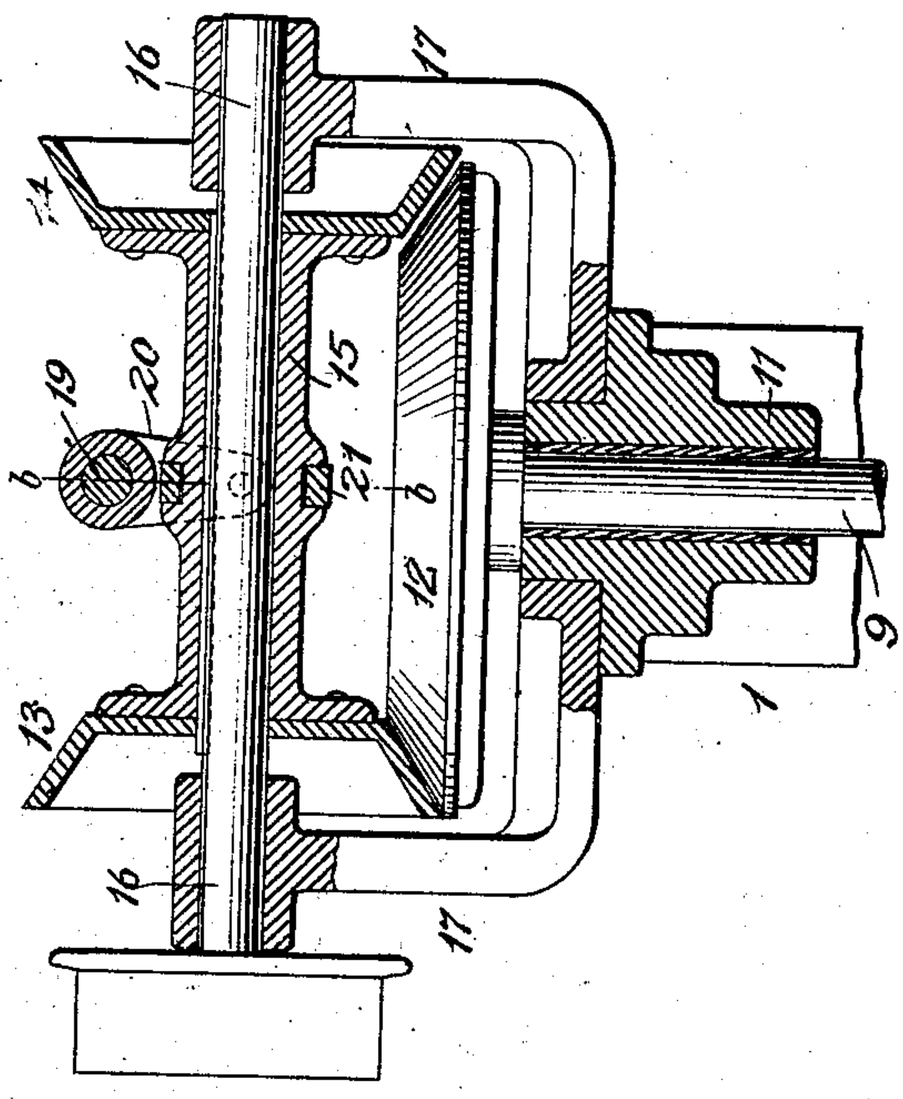


Fig. 8

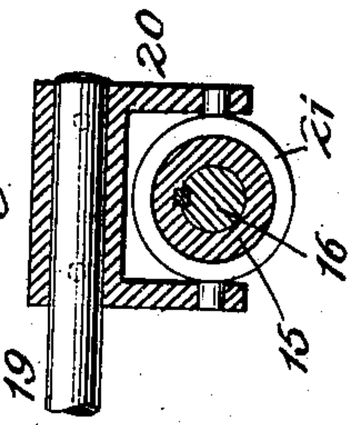


Fig. 6

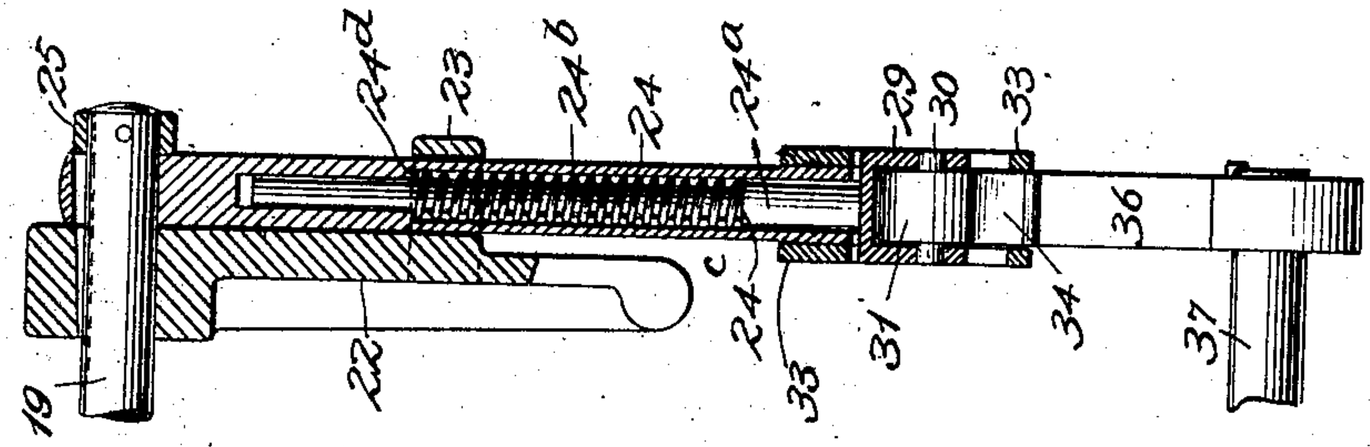
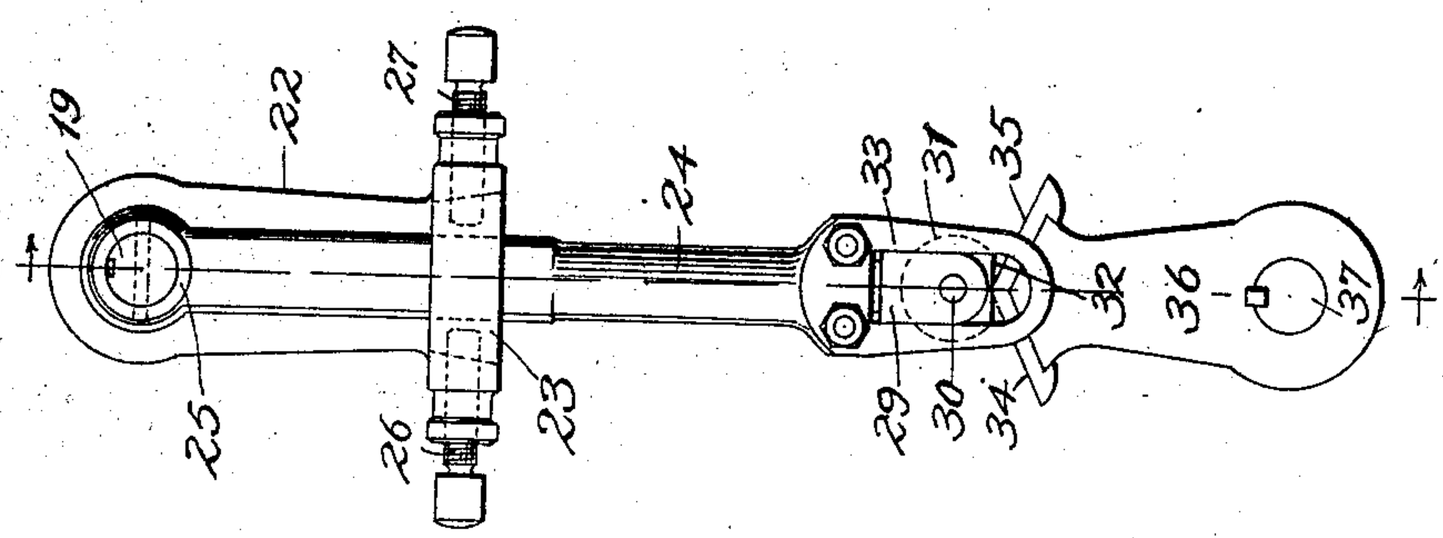


Fig. 5.



Witnesses

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UNITED STATES PATENT OFFICE.

EMIL EINFELDT, OF DAVENPORT, IOWA, ASSIGNOR, BY MESNE ASSIGNMENTS, TO G. WATSON FRENCH, NATHANIEL FRENCH, AND JOSEPH L. HECHT, ALL OF DAVENPORT, IOWA, A FIRM.

AUTOMATIC REVERSING MECHANISM.

944,604. Specification of Letters Patent. Patented Dec. 28, 1909.

Application filed April 16, 1906. Serial No. 311,865.

To all whom it may concern:

Be it known that I, EMIL EINFELDT, of Davenport, county of Scott, and State of Iowa, have invented a new and useful Improvement in Automatic Reversing Mechanism, of which the following is a specification.

This invention relates to reversing mechanism designed more particularly for use in connection with tapping machines, in which the tapping tool advances and retreats with a rotary motion, the finished nut or other article being replaced by a new blank on the retreat of the tool.

The invention consists of automatic mechanism of improved form and construction, controlled in its action by the advance and retreat of the tapping tool, which mechanism acts to automatically reverse the motion of said tool on the completion of each tapping operation, and to automatically reverse the motion of the tool after it has retreated to a predetermined position, the said reversing actions being uninterrupted and independent of any action on the part of the attendant.

In the accompanying drawings: Figure 1 is a front elevation of a tapping machine having my invention embodied therein. Fig. 2 is a side elevation of the same, looking in the direction of the full arrow in Fig. 1. Fig. 3 is a rear elevation of the machine. Fig. 4 is a side elevation as viewed in the direction of the dotted arrow in Fig. 1. Fig. 4ª is a detached view in plan of the blank positioning and holding device. Fig. 5 is an elevation on an enlarged scale of a detail of the reversing mechanism. Fig. 6 is a sectional elevation of the same as viewed in the direction of the arrow in Fig. 5. Fig. 7 is a vertical sectional elevation on the line *a*—*a* of Fig. 4. Fig. 8 is a sectional elevation on the line *b*—*b* of Figs. 1 and 7.

While in the drawings I have shown my improved mechanism embodied in a tapping machine, it is manifest that the invention is not confined in its application to this particular use, and may be employed in connection with machines for other purposes, wherever there may be occasion to automatically reverse the motion of the operating tool or part, and cause it to automatically advance and retreat with reference to the work being acted on.

Referring to the drawings: 1 represents an upright frame which may be of any appropriate form or construction to give support to the operative parts of the mechanism.

2 represents a vertical spindle or tap shaft, mounted in a bearing 3 extending forwardly from the frame, which shaft has its upper end threaded as at 4, and screwed in a fixed feeding nut 5 on the end of an arm 6 extending forwardly from the frame near its upper end, the rotary motion of the spindle causing the same to move up and down vertically, first advancing to its work, and then retreating as its motion is reversed by the mechanism presently to be described. The spindle is provided on its lower end with a suitable tap or tool adapted to act on the work held in a clamping table 6ª of a form and construction more fully described hereinafter. The spindle has fixed to it above the bearing 3, a horizontal pinion 7 driven by the small long pinion 8 on a vertical driving shaft 9, journaled at its lower end in a step-bearing 10 on the main frame, and having its upper end mounted in a bearing 11 at the upper end of the main frame, above which bearing the shaft has fixed to it a horizontal bevel friction driving wheel 12. The friction wheel 12 is adapted to be driven alternately in opposite directions by two constantly rotating vertical bevel friction wheels 13 and 14, sustained as far as their endwise movement is concerned in fixed relations, and movable into and out of engagement with the opposite sides of the horizontal friction wheel, with the result that the continued rotation of the two vertical wheels will impart to the horizontal wheel, and the parts driven thereby, a rotary motion alternately in opposite directions. The two vertical wheels are fixed to the ends of a sleeve 15 splined to a main horizontal drive shaft 16, mounted in bearings in vertical arms 17, rising from the upper end of the frame, the said main drive shaft receiving a continuous rotation from any suitable source of power, and the sleeve being so mounted that while capable of a limited endwise movement, to alternately engage and disengage the vertical wheels with the horizontal wheel on opposite sides, it will be compelled to rotate with the constantly moving drive shaft. The

endwise movement of the sleeve carrying the vertical friction wheels, is controlled and effected by the vertical movements of the rotary spindle, through the medium of the following reversing mechanism.

Mounted in a bearing 18 on the upper end of the frame, is a fore and aft rock shaft 19, provided at its forward end with a fork 20 engaging a collar 21 loosely encircling the sleeve 15 in such manner that when the shaft is rocked, the sleeve will be moved endwise, and will shift the two vertical friction wheels, engaging one with one side of the horizontal friction wheel, and disengaging the other from the opposite side of said wheel. The rock shaft has fixed to its opposite end, a depending arm 22 formed with a rearwardly extending yoke 23 having a vertical opening, through which extends a vertical lever 24, having its upper end mounted loosely on the rock shaft 19, and confined by a collar 25. The lever 24 has a limited movement within the yoke, which movement is controlled and determined by two oppositely arranged adjustable stops in the form of set screws 26 and 27 extending through the sides of the yoke, with their inner ends in position to be engaged by the lever 24, by which engagement the arm 22 will be shifted and will rock the shaft 19 and thereby shift the vertical friction wheels. The lever 24 is hollow and contains a plunger or rod 24^a, encircled by a spiral spring 24^b bearing at its lower end against a shoulder 24^c, near the lower end of the rod, and at its upper end against a shoulder 24^d on the interior of the lever, the spring thus tending to normally project the rod downward. Carried on the lower end of the rod is a frame or block 29 formed, with a transverse opening, in which is mounted, on a fore and aft axis 30, a friction wheel 31 having a flat face 32, the block being mounted so as to slide vertically in fixed guides 33 on the lower end of the lever. The flat face of the roller is adapted to coöperate with two oppositely inclined surfaces 34 and 35 on the upper end of a vertical finger 36, fixed at its lower end on a fore and aft rock shaft 37, mounted in a bearing 38 on the side of the frame, the said shaft terminating at its front end adjacent the spindle 2.

Extending inward from the end of the rock shaft, as shown in Fig. 1, is an arm 39 having its end forked and engaging a collar 40 loosely encircling the spindle between fixed shoulders, and movable up and down with it, the downward motion of the spindle acting to rock finger 36 in one direction (to the left in Fig. 3) and the upward motion of the spindle acting to rock the finger in the opposite direction, which rocking motions of the finger act, by coöperation with the lever 24, to shift the vertical friction wheels and thereby reverse the motion of the spindle.

The operation of the mechanism described, is as follows: Assuming that the main driving shaft is rotated in the direction of the arrow in Fig. 2, and that vertical friction wheel 13 is in engagement with horizontal friction wheel 12, the spindle will be rotated, and will feed downward through its feeding nut. In this position of the parts, and at a certain period in the downward feed of the spindle, the lever 24 stands at about the position shown in Fig. 3, in engagement with set screw 26, and holding the friction wheel 13 in engagement with the horizontal wheel 12, with the flat side of roller 31 resting on inclined surface 34 of finger 36. As the downward feed of the spindle continues, finger 36 moves to the left in Fig. 3 and its apex gradually approaches the flat face of the roller, at the same time forcing the block 29 and plunger rod 24^a upward in the lever 24, thereby compressing and placing spring 24^b under tension and finally (at the moment that the tapping operation is completed) as the apex of the finger passes by the center of the roller, as shown in Fig. 5, the roller will tip on its axis to the opposite position and its flat face will rest on the opposite inclined face 35 of the finger. When this action takes place the expansion of spring 24^b tends to project the plunger 24^a outward, causing the roller to slide quickly down the inclined face 35 of the finger, thereby throwing the lever 24 to the right, the engagement of the lever with set screw 27 acting to shift lever 22 to the right, thereby correspondingly shifting collar 15, with the result that friction wheel 13 will be disengaged from the horizontal friction wheel, and friction wheel 14 will be engaged therewith, so that the motion of the spindle will be reversed and it will begin to rise. As it rises, finger 36 will be moved to the right, lever 24 in the meantime holding friction wheel 14 in engagement with the horizontal wheel, and by the time the tap spindle has risen far enough to free the tap, the apex of the finger again passes beneath the center of the flat face of the roller, and the latter again tips on its axis to the opposite inclined face of the finger, thereby again reversing the motion of the parts and causing the spindle to advance for a second operation.

It will be observed that the tendency of the spring to project the plunger, which carries the roller, coöperates with the inclined face of the finger in maintaining the vertical friction wheel in contact with the horizontal friction wheel, and this pressure is only released at the time when the apex of the finger passes beneath the center of the flat face of the roller, when the reversing action takes place. It will be observed also

that in the action of the mechanism described, the arm 24 has a movement, under the influence of spring 24ᵇ, relative to and independently of the finger 36, and that this relative independent movement of the arm is under the control of the finger and serves to actuate the reversing mechanism. By the provision of the two set screws 26 and 27, by which is controlled the point on the inclined faces of the finger, at which the roller comes to rest after it passes over the center of the finger in the reversing actions, the parts may be so set that a greater or less movement of the finger will be required, relative to the roller, to carry the apex of the former beneath the roller, so that the degree of feeding movement of the spindle and its retreat, before the reversing actions take place, may be nicely controlled.

It will be observed that the reversing action is controlled by the advance and retreat of the tap spindle, and that the parts may be so adjusted that when the spindle reaches a certain predetermined point in its advance, it will immediately come to rest, and its motion will be reversed and it will retreat and permit the finished article to be removed and a new blank to be inserted. When the spindle has reached a certain point in its upward movement, it will again come to a rest, and its movement will be again reversed, whereupon it will advance to its work to act on the new blank. These operations are without interruption, the spindle moving downward and upward at a given and uniform speed, permitting the finished article to be removed as the spindle retreats, and enabling a new blank to be placed in position, to be acted on when the spindle again advances.

In order that the finished article may be quickly removed without the necessity of lifting it vertically, while beneath the tool, I provide a support or clamp of improved form, adapted to fixedly hold the blank in position while being acted on, and adapted to withdraw the blank horizontally and release it when the operation is completed.

This device comprises, as shown in Figs. 4 and 4ᵃ, a rectangular slide A, mounted to be moved back and forth in parallel forwardly extending guides B projecting from the frame of the machine. The rectangular slide is in the form of a fixed jaw *a* and a relatively movable jaw *a'*, which are formed in their adjacent ends with sockets to conjointly receive a blank and firmly clamp it between them. The sliding jaw *a'* is mounted to move in guides on the fixed jaw, and its movement to and from the fixed jaw is effected by means of a rotary rod threaded through the front of the fixed jaw, and having an interlocking swiveling engagement with the movable jaw, the rotation of the rod causing the movable jaw to approach or recede from the fixed jaw according to the direction of movement. The rod is provided with a handle C for turning it and for moving the entire slide back and forth in its parallel ways or guides. In setting the blank in place, the rectangular slide is drawn outward horizontally from beneath the tapping tool, and the rod C rotated to retract the movable jaw *a'*. The blank is then set in place and the rod turned to set the movable jaw up and clamp the blank against the fixed jaw, after which the slide is moved back on its guides with the blank vertically below the tool ready to be acted on.

From the construction described it will be observed that the blank may be removed immediately on the disengagement of the tapping tool with the same, it being but necessary to withdraw the slide horizontally and release the jaws. This facilitates and renders very quick the removal of the finished blank and its replacement by a new one, so that the degree of retraction of the tapping tool may be comparatively slight, and not as great as would be necessary if the blank were removed vertically from its socket while beneath the tool.

In the general organization described, the two vertical shifting friction wheels, in conjunction with the horizontal friction wheel, constitute a reversing gear included in the driving mechanism of the operating tool; while the coöperating rocking lever and finger, constitute an actuating device for the reversing gear, which actuating device is controlled by the advance and retreat of the operating tool.

In order that the two vertical friction wheels 13 and 14 may be set and held so that neither will engage the horizontal friction wheel 12, and this for the purpose of arresting the motion of the drive shaft 9 and the tap shaft 2, I provide a movable arm 50, shown more particularly in Figs. 2, 3 and 4, which is carried on the rear end of an obliquely arranged rock shaft 51, mounted in bearings on the frame and having at its forward end a turning handle 52, by means of which the shaft may be rocked and the arm 50 caused to engage lever 24, and through the medium of this lever, shift the arm 22 and thereby move the sleeve 15, with friction wheels 13 and 14 thereon, to a medial position where both friction wheels will be out of engagement with the horizontal friction wheel 12.

Having thus described my invention, what I claim is:—

1. In a mechanism of the type described, the combination of a driving member, a driven member, a coöperating reversing mechanism, an arm operatively connected with the reversing mechanism, an oscillating finger operatively connected with the driven member and having one end dis-

posed in juxtaposition to and having a sliding engagement with the arm, whereby said arm is adapted to have movement independently of the finger to actuate the reversing mechanism, and means controlled by the movement of the finger for effecting the independent movement of the arm.

2. In a mechanism of the type described, the combination of a driving member, a driven member, a shifting reversing mechanism, an oscillating arm operatively connected with the reversing mechanism to shift it, an oscillating finger operatively connected with the driven member, an engaging element shiftable longitudinally of and carried by the oscillating arm and having a sliding engagement with the finger, said arm being movable in its oscillations relatively to the finger, and means controlled by the oscillating movement of the finger for moving the arm to actuate the reversing mechanism.

3. In a mechanism of the type described, the combination of a driven member, an oscillating finger operatively connected therewith, a reversing mechanism, an oscillating arm operatively connected with the reversing mechanism to actuate it, and an intermediate member movable with said arm in its oscillating movement and movable also longitudinally and independently of said arm and engaging the finger.

4. In a mechanism of the type described, the combination of a driven member, an oscillating finger operatively connected therewith and provided with inclined flat engaging surfaces, a reversing mechanism, an oscillating arm operatively connected with the reversing mechanism to actuate it, and a rocking member mounted on the arm and adapted to coöperate alternately with one or the other of the inclined surfaces on the finger.

5. In a mechanism of the type described, the combination of a driven member, an oscillating finger operatively connected therewith and formed with oppositely inclined surfaces, a reversing mechanism, an oscillating arm operatively connected therewith, an intermediate member sustained by and movable longitudinally of the arm and formed with a flat face to coöperate with the inclined surfaces of the finger, and a spring acting to maintain the engagement of said intermediate member with the finger.

6. In a mechanism of the type described, the combination of a driven member, an oscillating finger operatively connected with the driven member provided with oppositely inclined surfaces, a reversing mechanism, an oscillating arm connected therewith, a slide carried by the arm and movable longitudinally thereof, a spring acting to project the slide outward, and a rocking member carried by the slide and having a surface cooperating with the inclined surfaces of the finger.

7. In a mechanism of the type described, the combination of a driven member, an oscillating finger operatively connected therewith, a reversing mechanism, an arm operatively connected with the reversing mechanism and having an endwise alinement with the finger, and endwise engagement therewith, and a movement relative to the finger, a spring sustained by the arm and adapted by the movement of the finger to be placed under tension, and means controlled by the movement of the finger for releasing the spring; whereby in its expansion it will move the arm.

8. In a mechanism of the type described, the combination of a driven member, an oscillating finger operatively connected therewith and formed with oppositely inclined surfaces, a reversing mechanism, an arm operatively connected therewith and extending toward the finger, a [illegible]ng projected slide carried by the arm [illegible]nd a rocking member mounted on the slide and adapted to coöperate with the inclined surfaces on the finger.

9. In a mechanism of the type described, the combination of a driven member, a friction drive wheel connected therewith, two constantly rotating friction wheels movable in unison in the direction of their axis so that they will alternately engage and disengage the opposite sides of the drive wheel, automatic means for moving said friction wheels to thus engage and disengage the drive wheel, a slidable member connecting with said friction wheels and a spring acting in conjunction with said slidable member to maintain alternately the engagement of said wheels respectively with the drive wheel.

In testimony whereof I hereunto set my hand this seventeenth day of February, 1906, in the presence of two attesting witnesses.

EMIL EINFELDT.

Witnesses:
M. Louise Dodge,
Andrew Neilson.