

No. 680,474.

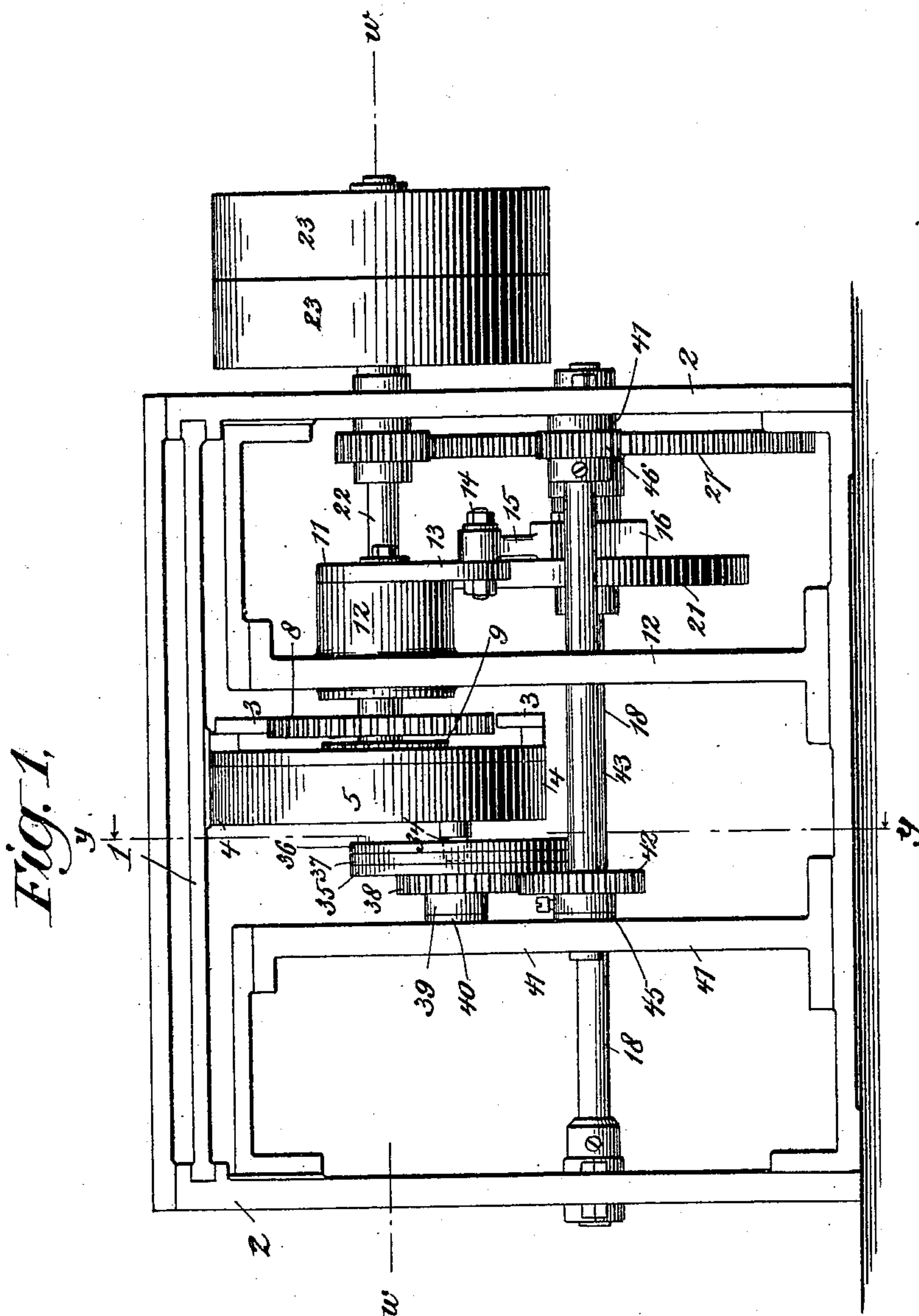
Patented Aug. 13, 1901.

C. P. COTTRELL.
MECHANICAL MOVEMENT.

(Application filed Apr. 22, 1899.)

(No Model.)

5 Sheets—Sheet 1.



WITNESSES:

O. H. Hayworth
E. M. Wells

INVENTOR

Charles P. Cottrell

BY

Jacob Selbel

ATTORNEY

No. 680,474.

Patented Aug. 13, 1901.

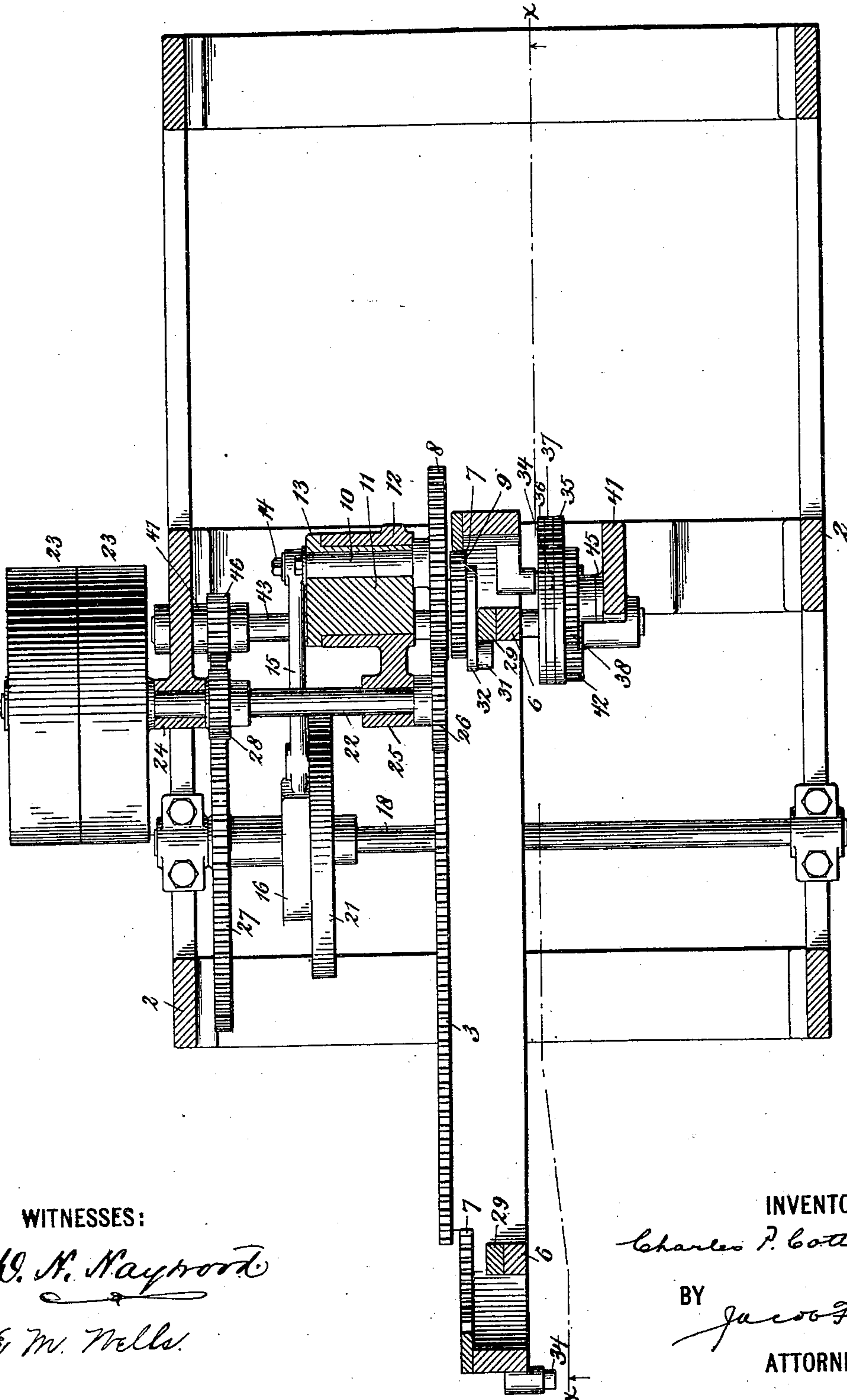
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5 Sheets—Sheet 2.

Fig. 2.



WITNESSES:

H. H. Hayworth
E. M. Wells

INVENTOR

Charles P. Cottrell

BY

Jacob Felbel

ATTORNEY

No. 680,474.

Patented Aug. 13, 1901.

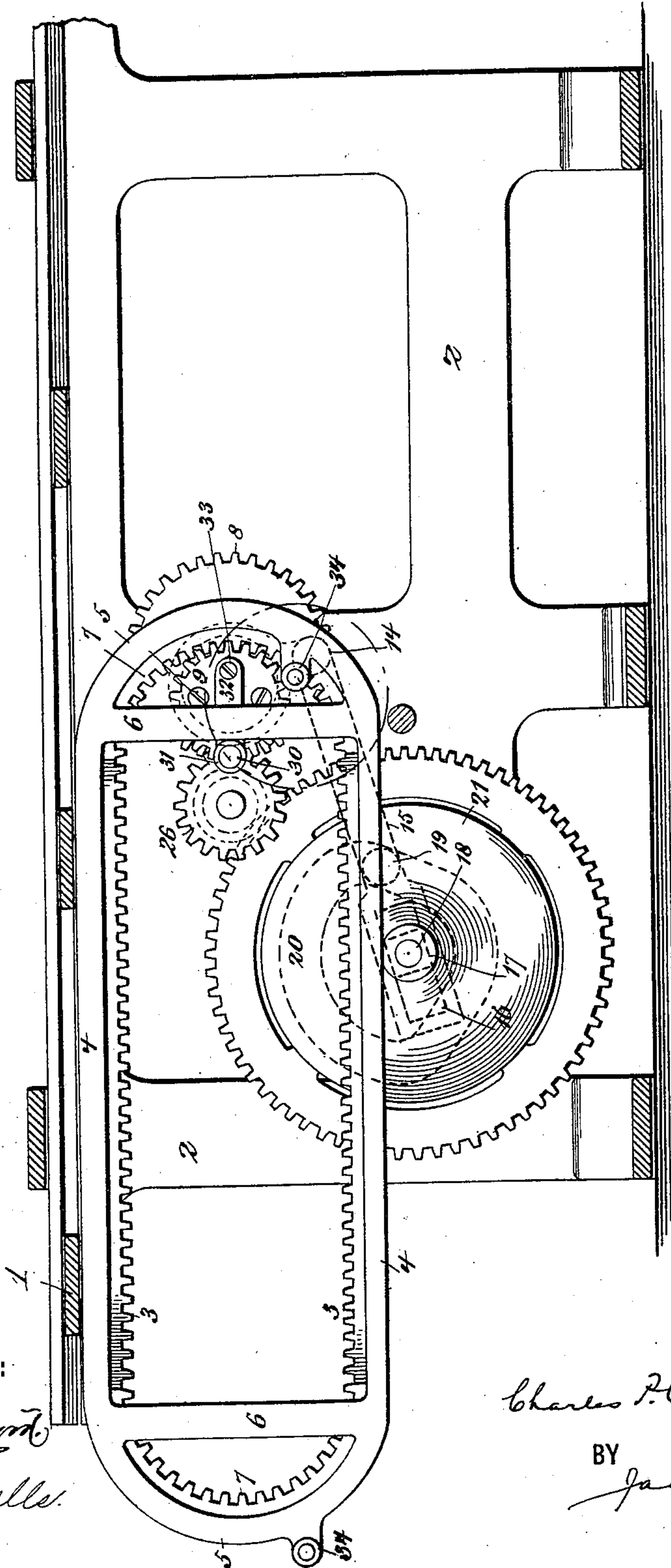
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5 Sheets—Sheet 3.

(No Model.)

Fig. 3.



WITNESSES:

N. H. Hayward
E. M. Wells

INVENTOR

Charles P. Cottrell

BY

Jacob Felbel

ATTORNEY

No. 680,474.

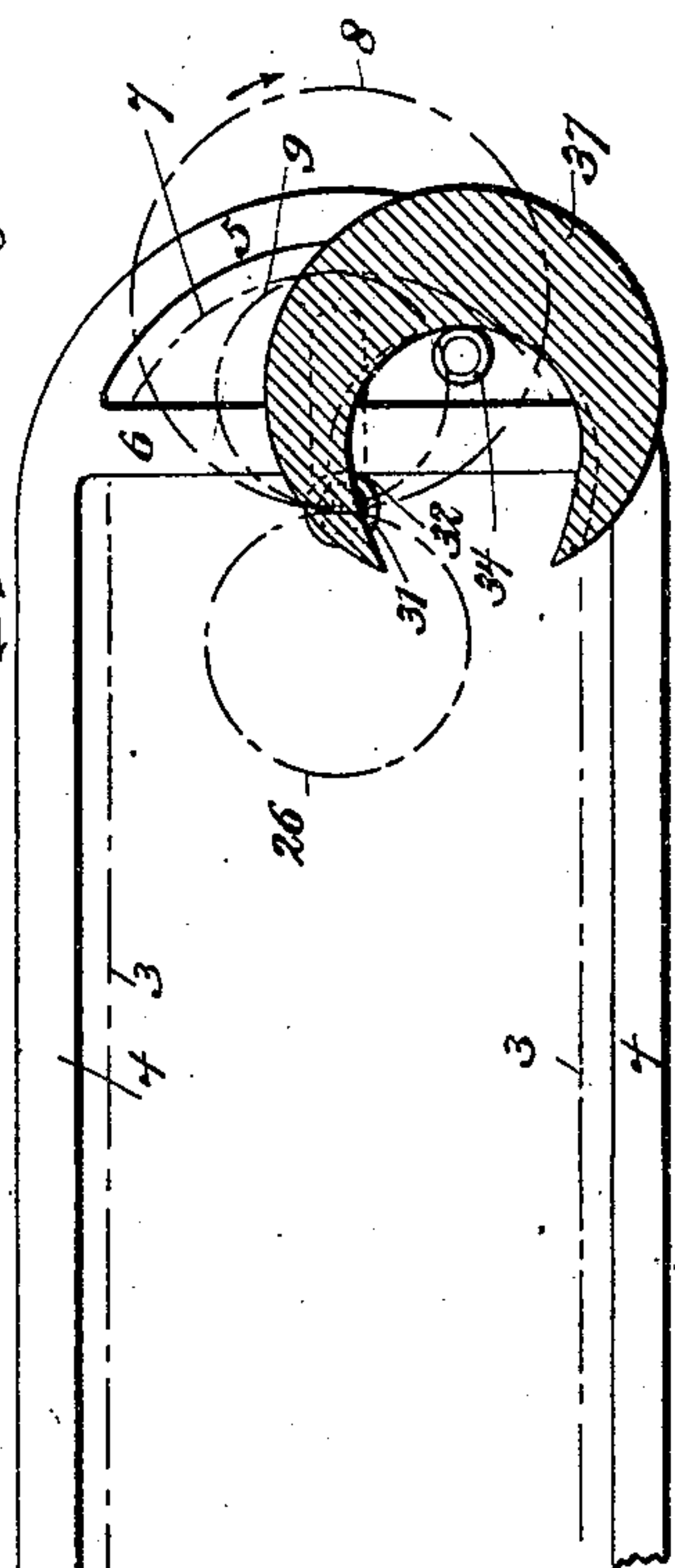
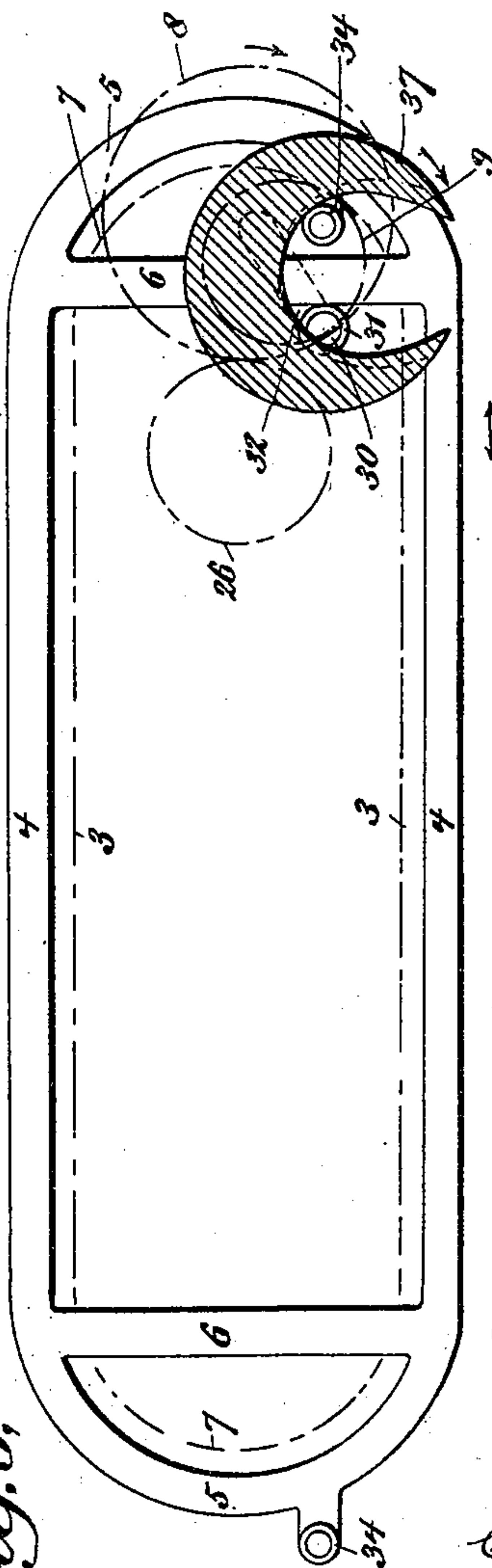
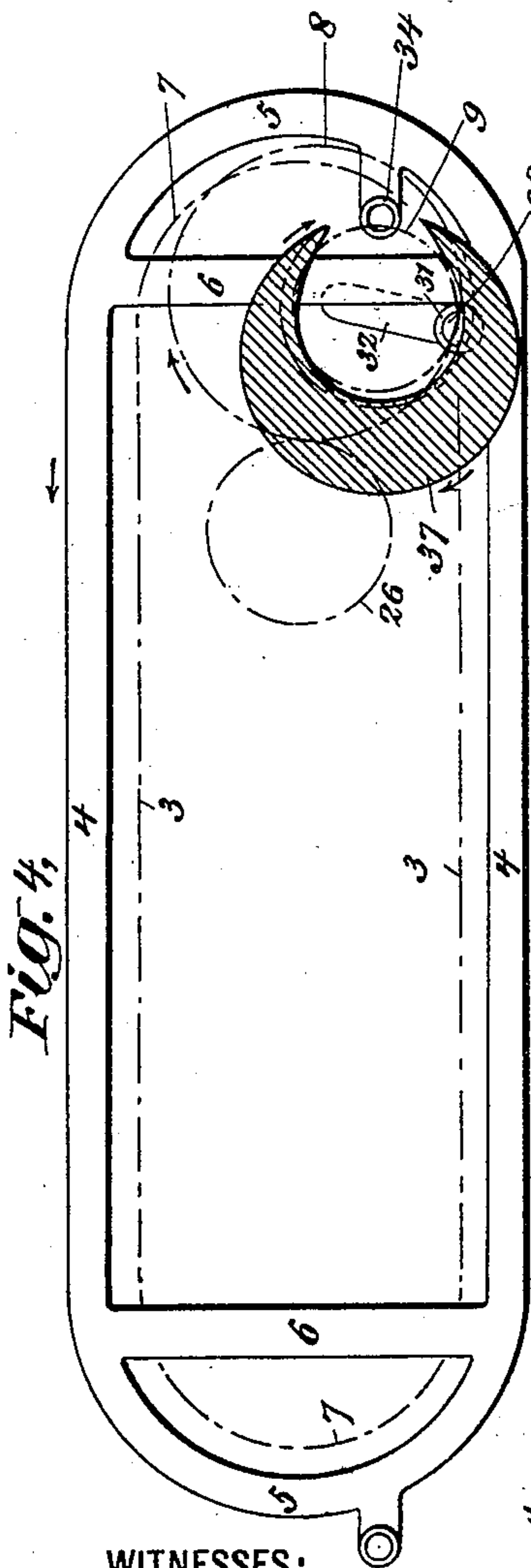
Patented Aug. 13, 1901.

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(Application filed Apr. 22, 1899.)

(No Model.)

5 Sheets—Sheet 4.



WITNESSES:

W. H. Kaybrook
E. M. Wells

INVENTOR

Charles P. Cottrell

BY

Jacob Felbel
ATTORNEY

No. 680,474.

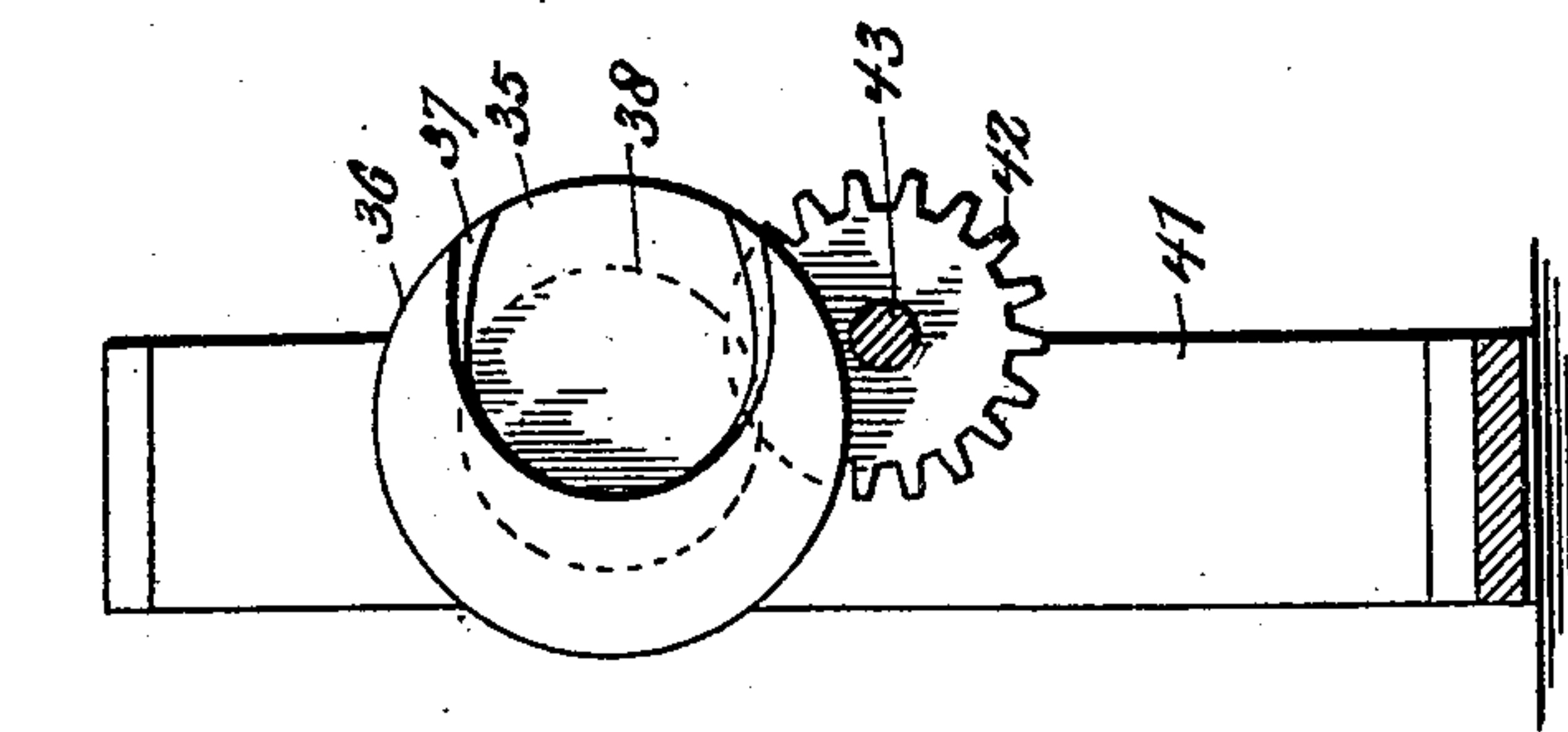
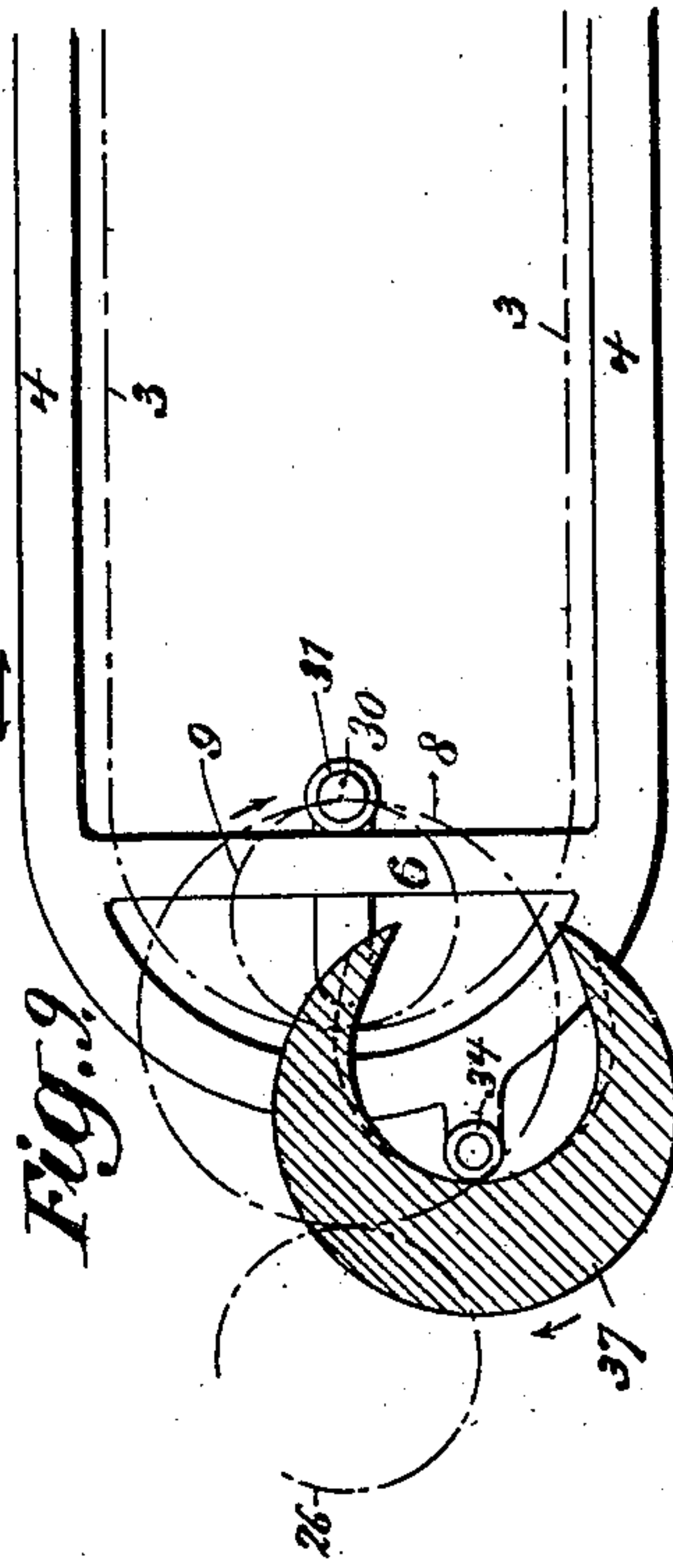
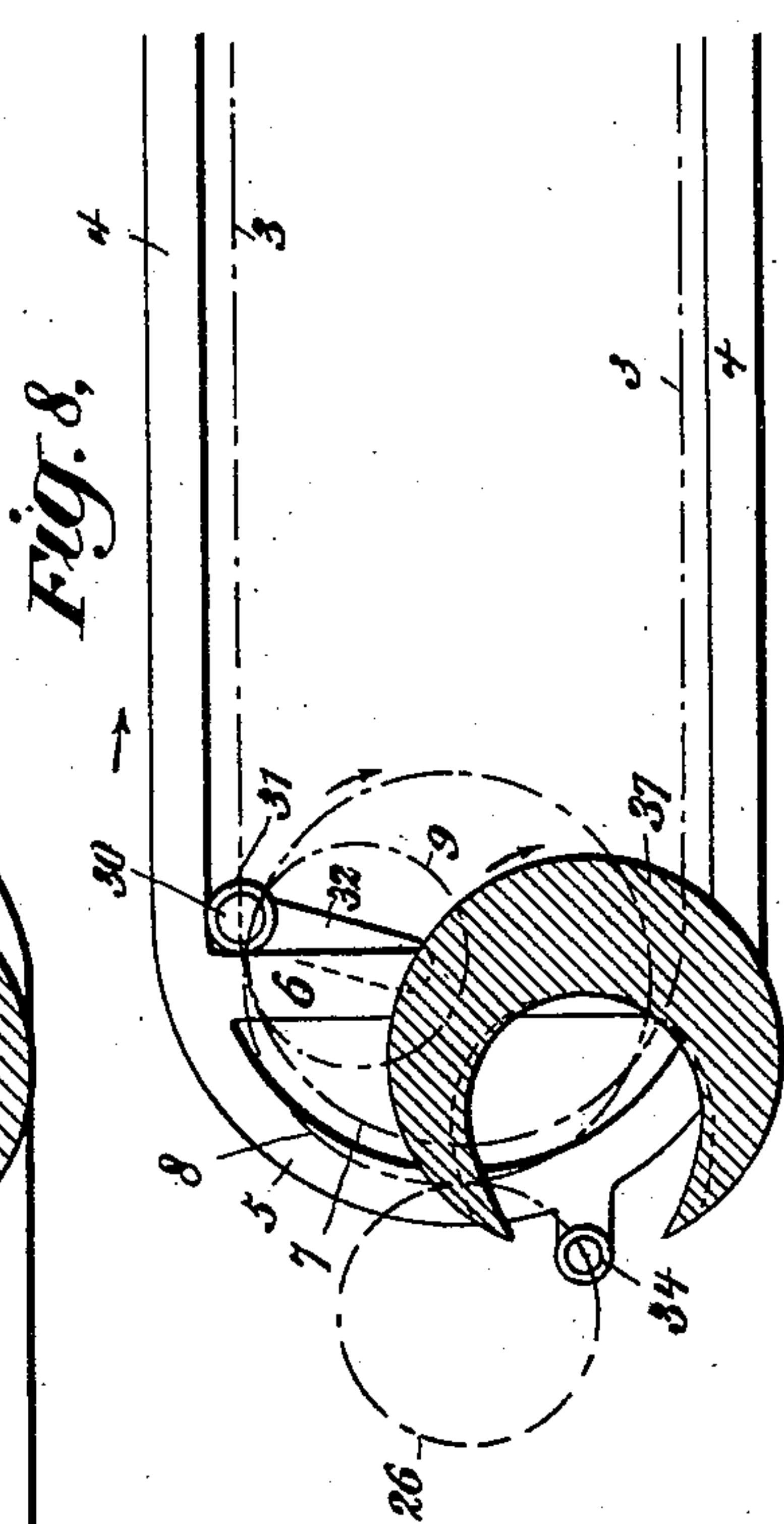
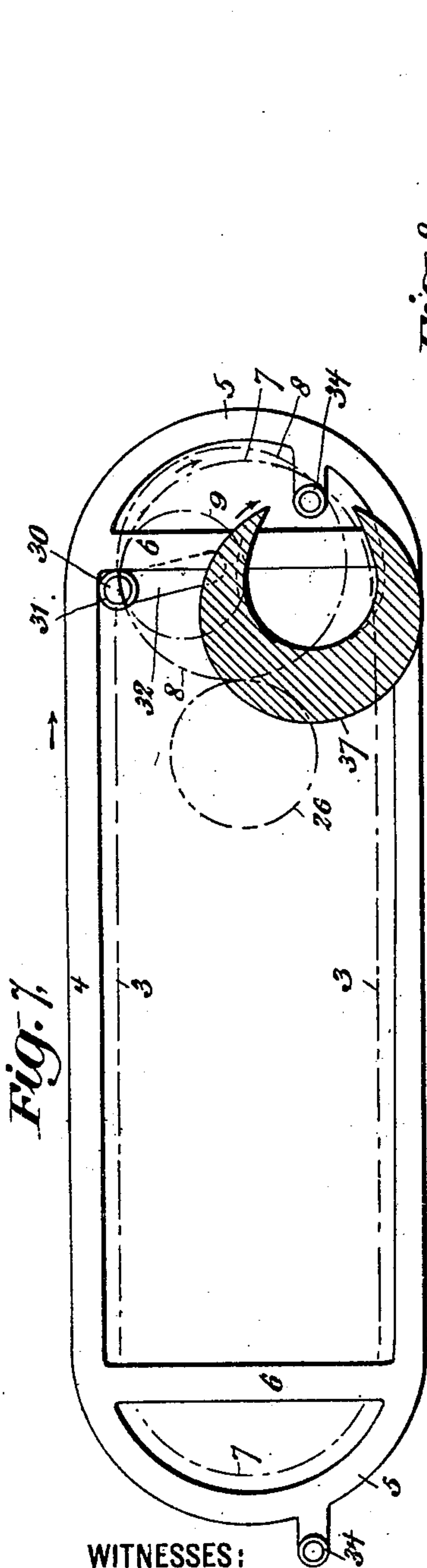
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(Application filed Apr. 22, 1899.)

(No Model.)

5 Sheets—Sheet 5.



WITNESSES:

N. H. Haywood

E. M. Wells

INVENTOR

Charles P. Cottrell

BY

James F. Felt

ATTORNEY

UNITED STATES PATENT OFFICE.

CHARLES P. COTTRELL, OF WESTERLY, RHODE ISLAND, ASSIGNOR TO C. B. COTTRELL & SONS CO., OF JERSEY CITY, NEW JERSEY; STONINGTON, CONNECTICUT, AND NEW YORK, N. Y.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 680,474, dated August 13, 1901.

Application filed April 22, 1899. Serial No. 714,015. (No model.)

To all whom it may concern:

Be it known that I, CHARLES P. COTTRELL, a citizen of the United States, and a resident of Westerly, in the county of Washington and State of Rhode Island, have invented certain new and useful Improvements in Mechanical Movements, of which the following is a specification.

My invention relates to that class of mechanical movements set forth in the United States Letters Patent No. 471,786, granted March 29, 1892, to Calvert B. Cottrell, and also set forth in certain other pending applications filed by me January 11, 1899, Serial Nos. 701,812 and 701,813, and has for its main object to further simplify, perfect, and improve the cam mechanism made the subjects-matter of the aforesaid applications.

To this end my invention consists in the various features of construction, arrangement of parts, and combinations of devices hereinafter more fully described, and particularly pointed out in the appended claims.

In the accompanying drawings, Figure 1 is an end elevation of a mechanical movement embodying my improvements. Fig. 2 is a horizontal section of the same on the line *ww* of Fig. 1. Fig. 3 is a longitudinal vertical section of the whole machine, taken at the line *xx* of Fig. 2. Figs. 4, 5, 6, 7, 8, and 9 are detail sectional views to illustrate the operation of the various parts at different times or in different positions of the rack-frame or moving bed, and which will be hereinafter more specifically referred to. Fig. 10 is a vertical section taken at the line *yy* of Fig. 1, but omitting the stud 34 for the purpose of showing more particularly the form and arrangement of the cams in said view.

In the various views the same part will be found designated by the same numeral of reference.

My invention has been designed more particularly for use in connection with the reciprocating beds of printing-presses; but it may be advantageously employed in various other kinds of machines.

The bed or other body to be reciprocated is moved longitudinally back and forth, as heretofore, by means of two longitudinally-ar-

ranged toothed racks, connected to the bed or reciprocating part, and a constantly-revolving toothed pinion which alternately engages with said racks. Means are provided for properly guiding the pinion into and out of engagement with said racks at the ends of the strokes of the bed or reciprocating member. Means are also provided for starting the bed in each direction with a slow movement and gradually accelerating its speed until the revolving pinion engages with one or the other of said racks and moves the bed at full speed and for also gradually retarding the bed during the completion of its stroke in each direction and just prior to its stoppage and restarting it in the opposite direction.

For the purpose of this case, I may represent the reciprocating bed of a printing-press, and this may be mounted for its movement in any suitable way in the framing of the machine. To the under side of the bed are rigidly connected two vertically-arranged straight racks 3, disposed longitudinally of the bed and in this instance in the same vertical plane, or one directly above the other, and with the teeth of one rack facing those of the other. These racks are preferably attached by screws to an open frame or casting, which is rigidly attached to the bed and in the form shown consists of two longitudinal bars 4, one over the other, united at their ends by integral curved bars or members 5 and vertical bars 6. At each end of the rack-frame and attached to the curved member is a semicircular or curved rack 7.

8 designates the driving gear or pinion, which alternately engages the straight racks 3, and 9 designates a smaller gear or pinion, mounted rigidly and eccentrically of the axis of rotation of the gear 8, but arranged to turn therewith and mesh with the curved end rack 7 when the gear 8 is leaving one straight rack and while it starts to reengage the other straight rack and during the time the gear 8 is wholly out of mesh with both straight racks.

The driving-gear 8 has a slight rising-and-falling motion to disengage from one rack and to engage the other, and hence the di-

ameter of this gear is less than the distance
 apart of the oppositely-disposed racks. In
 order to afford the gearing the necessary
 up and down movements, its rotating shaft
 5 10 is mounted eccentrically in a bushing 11,
 fitted in an eye or bearing at the upper end
 of a standard or bracket 12, secured to the
 base of the frame. To the outer end of said
 bushing is connected a crank-arm 13, to which
 10 is jointed at 14 one end of a link or pitman
 15, whose opposite end is slotted or provided
 with an open frame 16, that embraces and
 slides upon a square block 17, mounted loosely
 on a shaft 18, extending transversely of the
 15 machine and mounted in suitable bearings.
 Between the ends of the pitman or link is
 attached a roller 19, that works in a grooved
 cam 20, formed in the face of a disk or wheel
 21, fast on the shaft 18. This cam is so shaped
 20 and proportioned as that at the proper times
 it moves the pitman longitudinally and causes
 it, through the crank-arm, to turn the bushing,
 and thereby elevate or lower the shaft 10 and
 25 the driving-gear 8, attached thereto, so as to
 cause said gear while it is rotating to move
 bodily from one straight rack toward the
 other, and which movement takes place when
 one of said straight racks has run out of mesh
 with said gear at near the end of its stroke
 30 and while the reversing of the bed is occurring
 under the action and control of the mechan-
 ism to be hereinafter described. Just before
 the driven rack and the gear 8 part company
 the guiding gear or pinion 9 strikes into mesh
 35 with one of the curved racks and continues
 its engagement therewith until the main gear
 8 has been moved up or down to come prop-
 erly into mesh with the other straight rack,
 which it then proceeds to drive at full speed.
 40 The power may be applied at the shaft 22,
 which, as shown, is provided with the usual
 pulleys 23, and on the inner end of said shaft,
 which is mounted in a bearing 24 in the side
 frame and in a bearing 25, extending laterally
 45 from the bracket 12, is provided a toothed
 gear-wheel 26, that constantly meshes with
 and drives the gear 8, which turns always in
 the same direction during the operation of
 the machine. The cam-shaft 18 is provided
 50 with a large spur-gear 27, which is driven by
 a pinion 28 on the power-shaft 22.

The mechanism thus far described com-
 prises the means for giving the bed its main
 movements back and forth and means for
 55 guiding the driving-gear into and out of en-
 gagement with the straight racks with an
 easy and certain action, thus avoiding any
 shocks or thumping action which might
 otherwise occur when the driving-gear strikes
 60 into fresh engagement with either of the
 straight racks immediately following the ac-
 tual reversing operation, to be presently de-
 scribed.

While I have shown the straight racks as
 65 located in the same vertical plane and ar-
 ranged to have the driving-gear swing up
 and down alternately to engage said racks,

this of course is not essential so far as the
 main features of my improvement are con-
 cerned, and in lieu of such a construction and 70
 mode of operation the straight racks may be
 offset and the driving-pinion may engage
 them alternately by a lateral sliding move-
 ment, as shown and described in the Cot-
 trell patent aforesaid, and although I have 75
 shown the curved end racks as semicircular
 and continuous and as coöperating with a
 continuous pinion or guiding wheel, it will
 also be understood that as far as my inven-
 tion is concerned these end racks, forming 80
 continuations of the main racks, may be made
 in the form of sections or segments not con-
 tinuous, and the guiding-gear which coacts
 therewith may be only a partial pinion or
 segments of gears, as also shown and de- 85
 scribed in the said Cottrell patent.

I shall now describe the reversing mechan-
 ism proper, by which the bed is gradually re-
 tardated at near the end of its stroke in either
 direction and gradually accelerated after the 90
 end of the stroke has been reached and until
 the main driving-gear again takes hold of one
 of the main racks and drives the bed for the
 major part of its stroke under the full speed
 of said gear. 95

Each of the bars 6 on the rack-frame car-
 ries or is provided with a vertical bearer or
 cross-head 29, with which coöperates a crank
 pin or stud 30, provided with an antifriction-
 roller 31, that traverses the face of said bearer 100
 and operates on one half thereof gradually to
 check the speed of the bed and on the other
 half gradually to accelerate the speed of the
 same. This crank-pin is fixed at the outer
 end of a crank-arm 32, that is secured by 105
 screws 33 on the face of the fixed guiding pin-
 ion or gear 9 and radially of the axis thereof.
 The center of said crank-pin is coincident
 with the pitch-circle of the said pinion, which
 pinion is one-half the diameter of the driv- 110
 ing-gear 8 and is so attached thereto as that
 its pitch-circle passes through the plane of
 the axis of the gear 8 and through the pitch-
 line of the teeth of said gear. The pitch-cir-
 cle of the guiding-gear 9 and the center of 115
 the crank-roll pass through the centers, from
 which the curved racks 7 are formed or, in
 other words, as is shown in Fig. 3, the
 pitch-lines of the gears 8 and 9 and the cen-
 ters of the crank-roll and curved rack all co- 120
 incide.

As far as the main features of my inven-
 tion are concerned, the bearers 29 may be
 curved and concentric with the curved racks,
 with their treads or faces arranged to coincide 125
 with the pitch-lines of the teeth of said racks,
 and the crank-roller, in order to coöperate
 therewith, may be fixed axially of the guid-
 ing-gear 9, as shown and described in prior
 patents in this art; but I prefer to use the 130
 straight vertical bearers and the crank-roll,
 arranged as shown, to work in conjunction
 therewith.

At each end of the rack-frame is a hori-

zontally-projecting stud 34, provided, preferably, with an antifriction-roller, which during the time of reversal of the bed is to coact with a cam-like device, which may be attached to
 5 or formed of a piece with a plate or disk 35, which is preferably vertically arranged. There are two cams 36 and 37, one arranged alongside of the other and in parallel vertical planes, the inner cam 36 coacting with
 10 the stud 34, on the left of the frame, and the outer cam 37, coacting with the stud 34, on the right thereof, the stud on the right being slightly longer than the one on the left, so as to reach the outer cam. The cams are curved
 15 or crescent-shaped and mounted on the inner side of said disk.

The cams 36 and 37 are screwed or otherwise attached on the inner side of the disk 35, and to the outer side of said disk is screwed
 20 or otherwise attached a gear-wheel 38, whose hub 39 is mounted to turn freely on a stud 40, projecting horizontally inward from a standard 41. Meshing with the gear-wheel 38 is a similar wheel 42, whose hub is fixed
 25 by a set-screw upon a cross-shaft 43, which at its outer end is mounted in a bearing 44 in the side frame 2 and at its inner end in a bearing 45 on the standard 41. At the outer
 30 end of the shaft 43 is secured a pinion 46, that meshes with the spur-gear 27 on the shaft 18. Thus the shaft 43 is constantly driven, and through the gears 42 and 38 the cams 36 and 37 are likewise constantly driven and
 35 always in the same direction. The shaft 43 is arranged below the under side of the reciprocating rack-frame and beneath the pitman, while the vertically-disposed cams are arranged above the shaft 43 and preferably
 40 both on one side of the reciprocating rack-frame and in close proximity thereto.

It will be understood that in this class of printing-presses the bed is provided with air-springs or the like which operate to reduce the momentum of the bed during the slowing-
 45 down movements and which subsequently react to start the bed in the reverse direction. It sometimes happens that there is too much resistance in the springs, and hence the momentum is all taken out of the bed before it
 50 has completed its full stroke, and it is to provide for this contingency, more especially, that the cam is caused to come around behind the stud-roll 34 on the bed-frame, and by the continued rotation of said cam force or push
 55 the bed along to the full end of its stroke. If the bed be nicely balanced as to momentum and spring resistance, the cam will act then simply to hold the vertical bearer up against the crank-roll 31 during the slowing down
 60 of the bed and during the restarting of the bed in the opposite direction. In other words, when the cam is acting on the horizontally-extending bed-roll 34 the crank-roll 31 is acting on the vertical bearer, so that the bed
 65 practically is held firmly between the cam and the crank-roll during the entire reversing operation, the cam working on the "outer"

side of the bed, so to speak, and the crank-roller on the inner side, so that there is a sort of grasping action upon the bed by the
 70 aforesaid devices, which prevents any lost motion or excessive motion to the bed.

I shall now describe the operation of the reversing devices.

Figs. 2, 3, and 6 show the mechanism in corresponding positions, at which time the bed
 75 has completed its full travel toward the left and has been stopped and is about to be started in the reverse direction. As will be seen at Fig. 3, the main driving-gear 8 is entirely
 80 out of mesh with both the longitudinal racks 3, the guiding-pinion 9 is in a position centrally of the curved rack 7, which it is traversing, and the crank-roll 31 is on the dead-point, or centrally of the vertical bearer 29.
 85 The bed has reached the limit of its movement toward the left and is about to be started toward the right by the crank-roll, which at this time is rotating upwardly and about the axis 10 of the main driving-gear 8. Immediately the crank-roll starts above the horizontal
 90 position shown at Fig. 3 its pressure upon the vertical bearer causes the bed to begin its movement toward the right, and this movement is gradually increased as the crank
 95 approaches a vertical position. At about the time the crank has arrived in an upright position the main driving-gear 8, which had been gradually lifting bodily, strikes into
 100 gear with the upper main rack 3 and takes the bed at full speed, whereupon the crank-roll leaves the vertical bearer and the guiding-pinion leaves the curved guiding-rack. The said crank and pinion then make one revolution with the main driving-gear, and just
 105 before the main driving-gear runs out of mesh with the upper rack at the left-hand end the guiding-pinion runs into mesh with the left-hand curved rack, and the vertical bearer is simultaneously brought up against the crank-
 110 roll, which at this time is near a vertical line passing through the axis of the driving-gear, and the further movement of the bed toward the right is limited to the speed of the crank-roller, which soon passes the vertical line and
 115 then descends along the vertical bearer as the latter advances by the momentum of the bed until the dead-point or horizontal center of the axis of rotation of the crank is reached, the crank-roll thus operating at this time
 120 gradually to slow down the speed of the bed and finally wholly to arrest its movement at such dead-point. The travel of the crank-roll (beyond the dead-point) on the face of the bearer operates to start the bed again in
 125 the opposite direction—toward the left—and gradually to increase its speed. Just before the descending crank-roller reaches the aforesaid vertical line the main driving-gear comes into mesh with the lower straight rack 3, the
 130 guiding-pinion running in mesh with the left-hand curved rack, operating properly to guide the main gear into mesh with the straight rack, as before explained. Thereafter the gear

drives the bed toward the left. At Fig. 6 the crank is represented as in its horizontal position and as about to move the bed toward the right, or to the position shown at Fig. 7, where the crank has now arrived at nearly a vertical position and at which time the main driving-gear is engaged with the upper straight rack. At Fig. 8 the movement of the bed to the right by the gear 8 and rack 3 has ceased and the bearer has come up against the crank-roll, which has just moved past a vertical position and now controls the speed of the bed for the remainder of its movement to the right. At Fig. 9 the movement of the bed to the right is shown as having been completed and the bed is about to be started toward the left by the descending crank-roll acting on the lower half of the vertical bearer, and, as before explained, just before or at about the time the crank-roll leaves the bearer the main gear 8 runs into mesh with the lower rack 3 and the bed is continued at full speed toward the left. During the time the crank-roll is operating gradually to reverse the movement of the bed the vertical bearer, and hence the bed, is held up against the crank-roll or prevented from getting away from the same by one or the other of the rotating cams 36 37 and one of the bed-rolls 34.

Referring to Fig. 6, it will be observed that at the time the crank-roll 31 is about to ascend and move the bed toward the right the right-hand bed-roll 34 is at about the center or dead-point of the cam 36. During the ascent of the crank-roller to the vertical position (shown at Fig. 7) the cam 36, revolving in the direction of the arrow, makes about a half-revolution, or arrives at the position shown at Fig. 7, and during practically the entire time the cam is moving from the position shown at Fig. 6 to that shown at Fig. 7 the bed-roll 34 travels along in contact with the inner face or edge of the cam and is controlled thereby, the cam being properly shaped and properly timed relatively to the movements of the crank so that while the crank-roll is acting on the vertical bearer the cam is acting on the bed-roller, thus confining the bed between the crank-roller and the cam until the gear 8 and rack 3 intermesh and take the bed.

Figs. 4, 5, and 6 show the slowing-down movement of the bed in its travel toward the left. At Fig. 4 the main driving-gear 8 has just parted company with the lower straight rack 3 and the vertical bearer has come up against the crank-roll. Almost instantly thereafter the point of the cam embraces the bed-roll, and during the movement of the crank-roll from the position shown at Fig. 4 to that shown at Fig. 5 the cam travels around in contact with the bed-roll, as illustrated at Fig. 5. At Fig. 6 the bed is shown as having finished its movement toward the left and as having been arrested by the crank-roll and the bed-roll is shown as having arrived at the dead or neutral point of the cam. As the

crank-roll now travels upwardly it starts the bed toward the right, during which time the upper half of the cam (shown at Fig. 6) travels in contact with the bed-roll and controls the movement of the bed. At Fig. 7 the cam is shown as having just parted company with the bed-roll, which stands between the ends or points of the cam and free therefrom, so as to permit the bed to be driven swiftly toward the right under the full speed of the gear 8, which at this time has now engaged the upper straight rack 3, the crank 32 having practically finished its action. At Fig. 8 the bed is shown as traveling toward the right, the main driving-gear as having just run out of mesh with the upper straight rack, and the vertical bearer as having come up against the crank-roll. In this view the cam 37 is in a position to permit the left-hand bed-roll to enter between its ends, and instantly the lower portion of the cam runs into contact with and embraces said roll and travels therewith (in the manner illustrated at Figs. 5 and 6) until the center or dead point is reached, as at Fig. 9, where the crank is shown in a horizontal position and the bed as having moved to the full extent toward the right. During the descent of the crank-roll on the vertical bearer the bed is started toward the left again, and at this time the lower portion of the cam runs in contact with the bed-roll and controls the bed in its movement until the crank has ceased to act and the main gear has run into mesh with the lower straight rack 3 and taken the bed at full speed, at which time the bed-roll passes out between the points of the cam. Depending upon the momentum of the bed in its slowing down, the cams will have a variable action—that is to say, if there be too much momentum or too little spring resistance the cam will simply run around in contact with the bed-roll; but if there be too little momentum or too much spring resistance the cam will then perform the duty of forcing the bed along to the final portion of its intended stroke; but in the restarting of the bed in the opposite direction the cam will always control the movement of the bed or confine it to the action of the crank whether there be too much spring resistance or too little.

Owing to the fact that the main driving-gear 8 has an up-and-down swinging motion to and from the main driving-racks 3, arranged in the same vertical plane, it is found in practice that two cams, as 36 and 37, produce a better result than one cam only, adapted alternately to engage the studs at the opposite ends of the bed; but if the main driving-gear be arranged to slide endwise to engage offset-racks, as in the Cottrell patent aforesaid, a satisfactory result could be obtained with only one cam, as either 36 or 37. However, I do not wish to be limited wholly to the use of two cams in the following claims, excepting where the two cams are specifically set forth. In my aforesaid prior applications a

rotatory cam is shown. In one case the cam has a movement of translation and revolves about a movable axis. In the other case the cam has rotatory, oscillatory, and reciprocatory motions. Owing to the peculiar movements of the cams in the other cases, specially-devised driving mechanisms therefor were required, and which compared with the present mechanism will be found considerably more complex and costly. In this case the cam simply rotates constantly in one direction and on a fixed axis as distinguished from one that has a movement of translation, and because of this fact I am enabled greatly to simplify and cheapen the construction, and thus produce a more desirable cam mechanism for coöperating with the crank and bearer. The arrangement of the cam to rotate in a vertical plane instead of a horizontal one, as in my other cases, also enables me to simplify the gearing employed to rotate said cam.

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

1. The combination of a bed or member, means for reciprocating the same, means for reversing its direction of travel, and additional mechanism disconnected from said reversing means for insuring proper coöperation between said bed and said reversing means, said additional mechanism comprising a cam having a fixed axis of rotation and a device at each end of the bed or member for coöperating with said cam during the time of operation of the said reversing means.

2. The combination of a bed or member, means for reciprocating the same, means for reversing its direction of travel, additional mechanism for insuring proper coöperation between said bed and said reversing means, said additional mechanism comprising a pair of cams revolving on a fixed axis and projections of different lengths arranged at the ends of the bed or member for coöperating with said cams during the times of operation of the said reversing means.

3. The combination of a bed or member, means for reciprocating the same, a revolving crank, a bearer at each end of the bed or member adapted to coöperate with said crank, a cam mounted on a fixed axis and to revolve in a vertical plane, and a horizontal projection at each end of the bed or member for coöperating with said cam during the action of the crank and bearer.

4. The combination of a reciprocating bed or member, means for reversing the same and arranged to act on one side thereof, and additional mechanism adopted to coöperate with said reversing means and arranged to act on the opposite side of said bed or member and comprising a pair of cams mounted upon a fixed horizontal axis, and horizontal projections at the ends of the bed or member adapted to coöperate with said cams during the times of action of the reversing means.

5. The combination of a reciprocating bed or member, a revolving crank, a bearer, a pair of cams mounted on a fixed horizontal axis, and horizontal projections of unequal length at the ends of the bed or member adapted to coöperate with said cams while the crank is coacting with the bearer to effect the reversal of the bed or member.

6. The combination of a reciprocating bed or member, means for reversing the same, horizontal projections of different lengths at the ends of said bed, a pair of vertically-disposed cams arranged side by side and attached to a similarly-disposed disk, gears for rotating said disk and cams about a fixed axis of motion, the shaft, and means for turning said shaft.

Signed at the town of Stonington, in the county of New London and State of Connecticut, this 17th day of April, A. D. 1899.

CHARLES P. COTTRELL.

Witnesses:

A. R. STILLMAN,
B. F. LAKE.