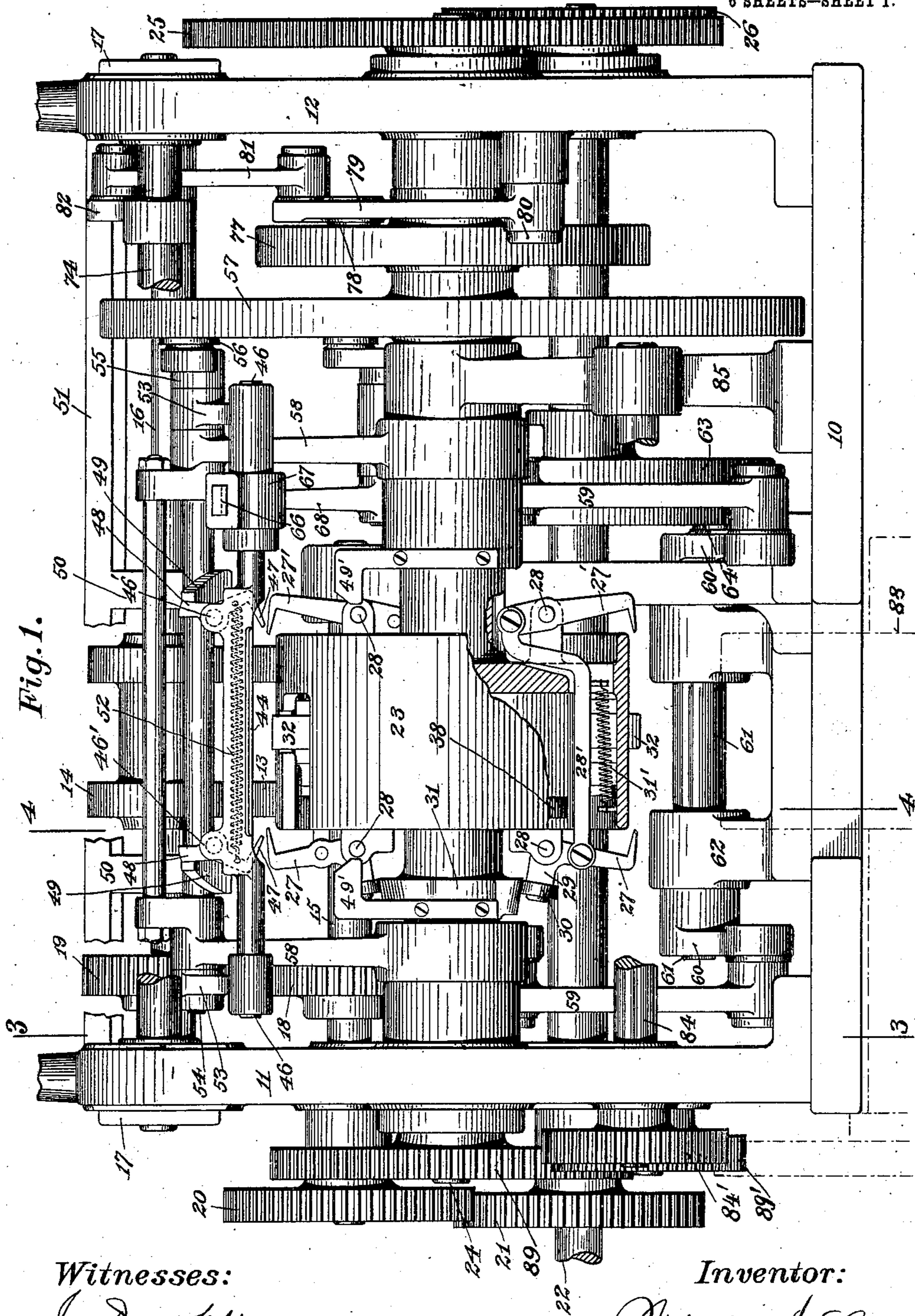


No. 847,195.

PATENTED MAR. 12, 1907.

W. A. LORENZ.
PAPER BAG MACHINE.
APPLICATION FILED DEC. 3, 1900.

6 SHEETS—SHEET 1.



Witnesses:
Jas. Dangerfield
Chas. R. Shively

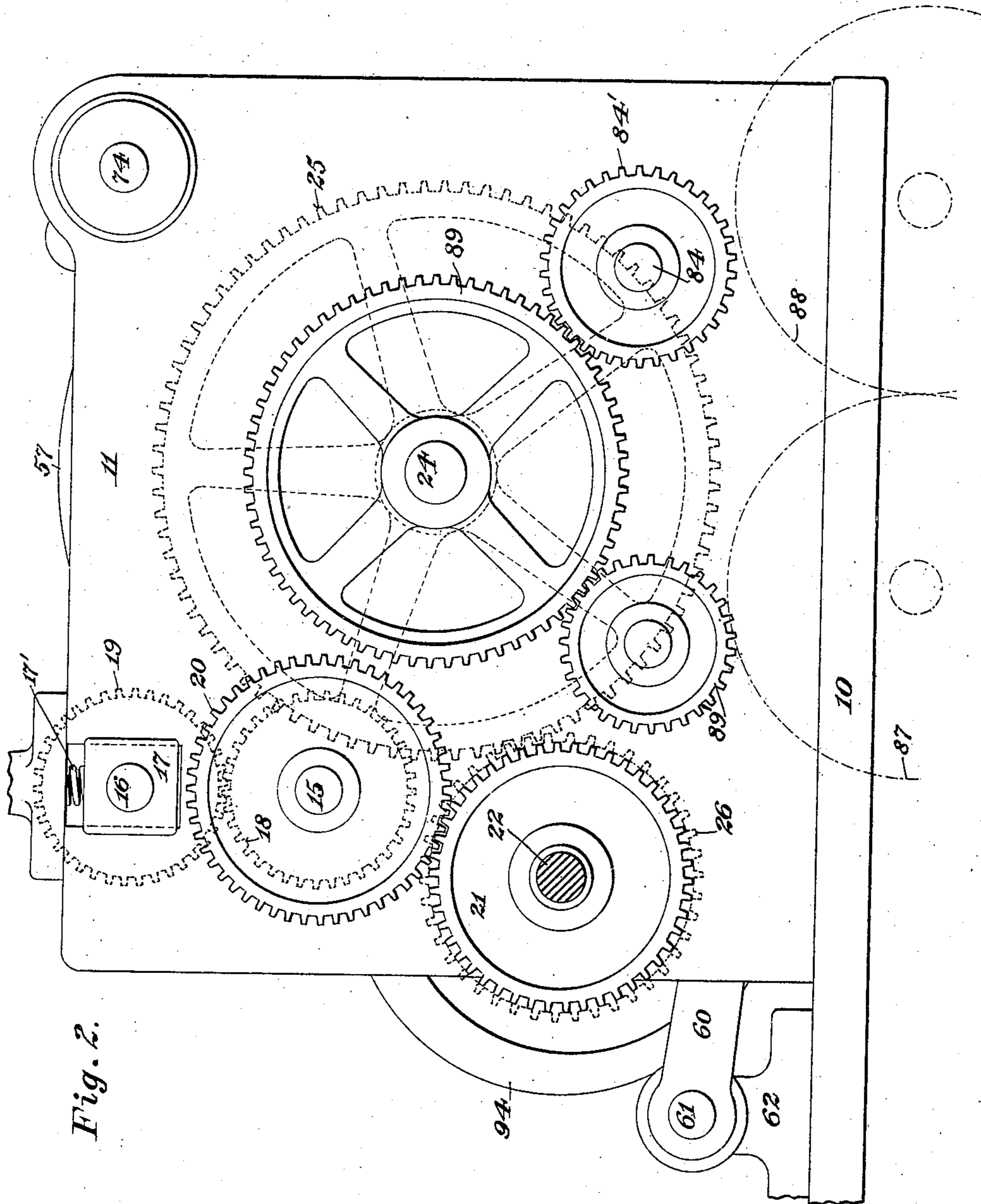
Inventor:
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6 SHEETS—SHEET 2.



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6 SHEETS—SHEET 3.

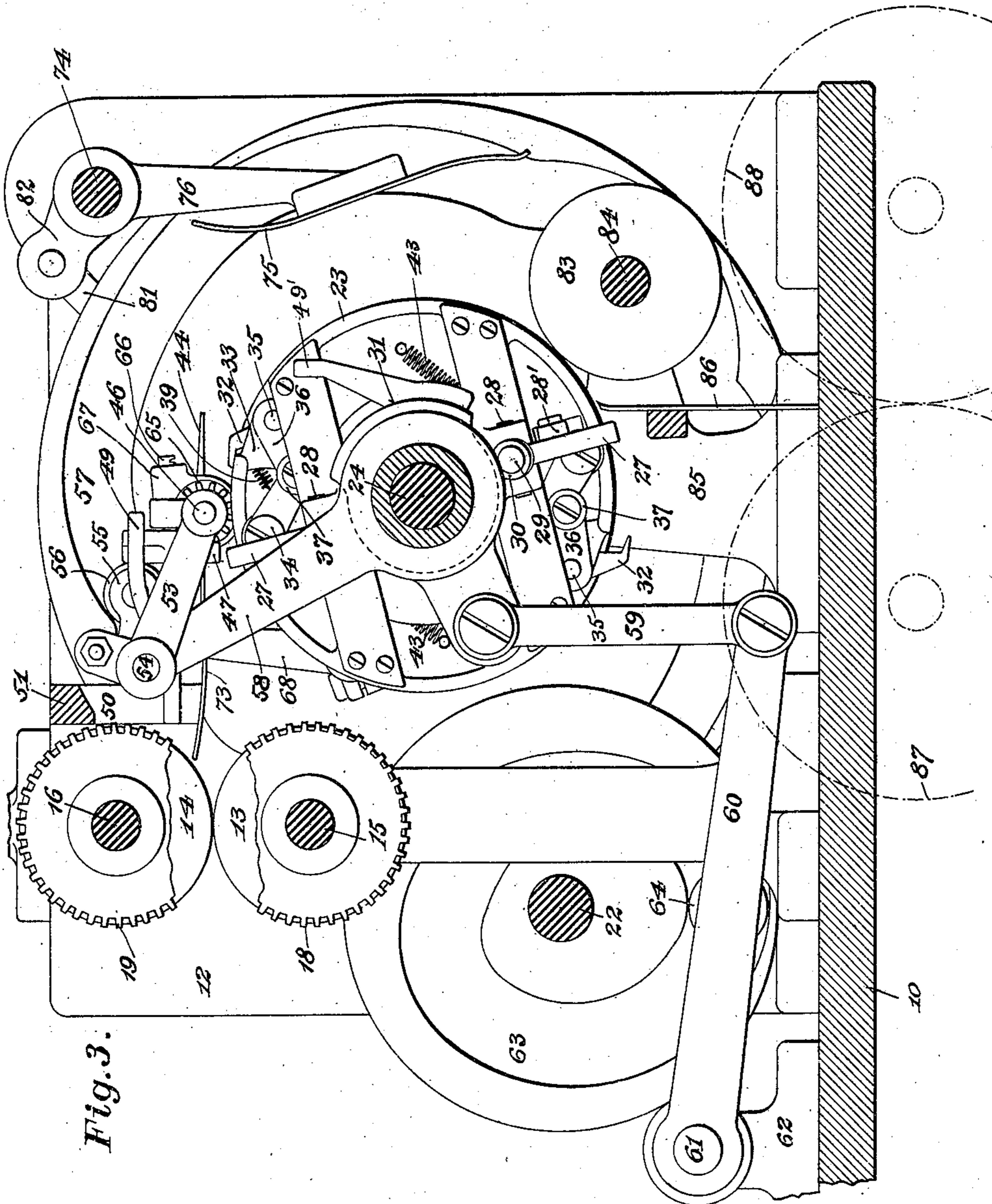


Fig. 3.

Witnesses:
Jas. Dangerfield.
Chas. P. Schuchert.

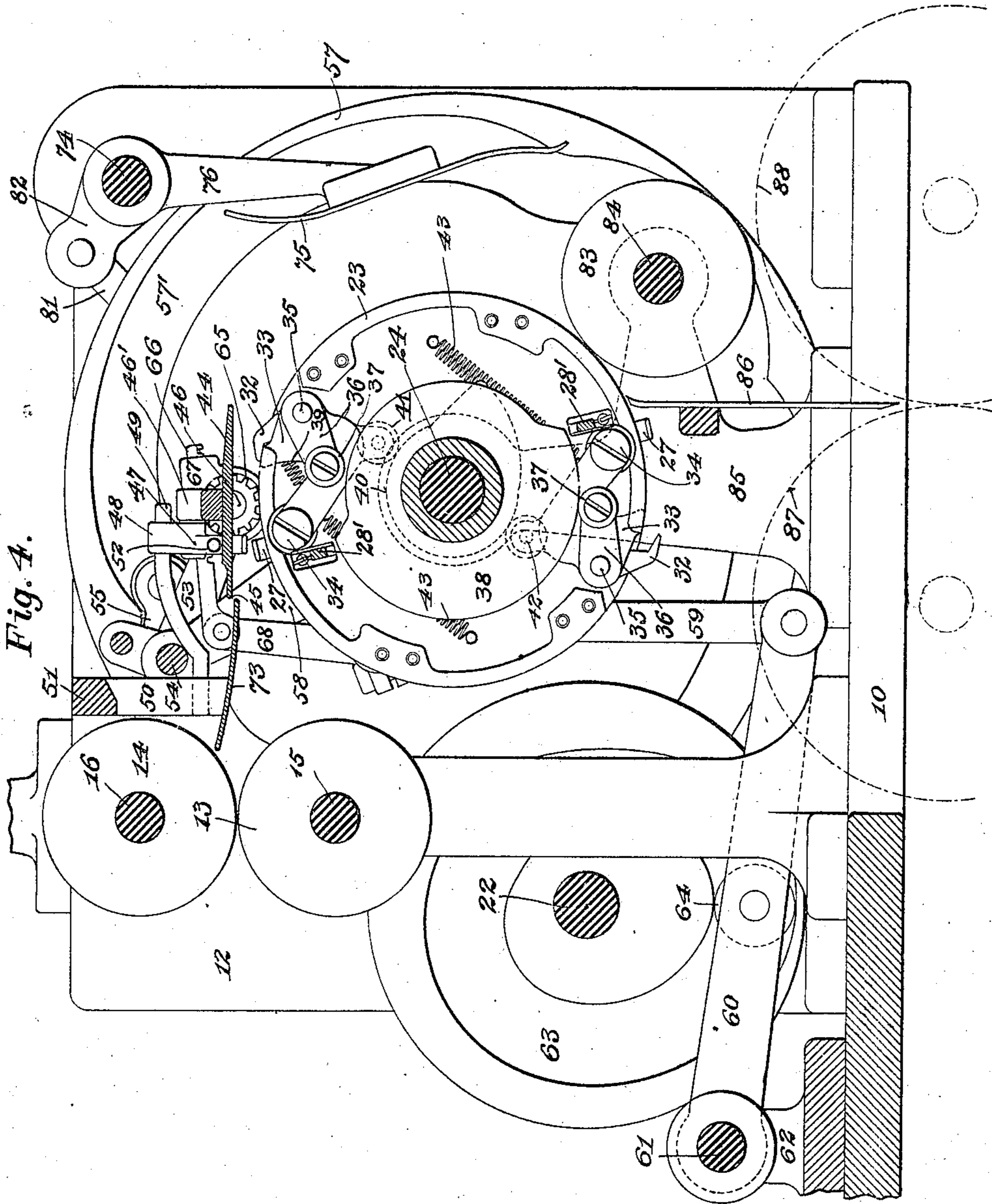
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6 SHEETS—SHEET 4.



Witnesses:
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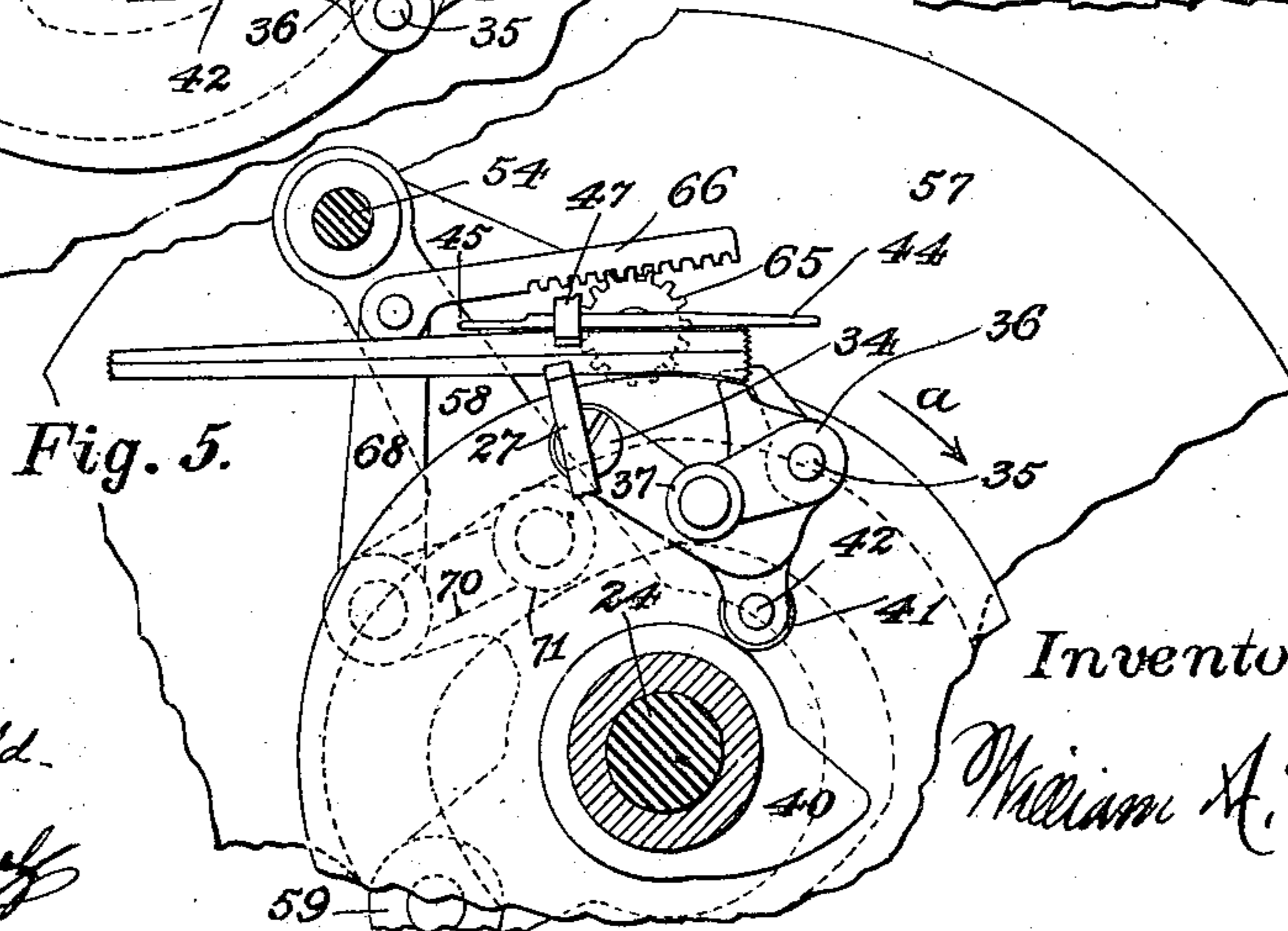
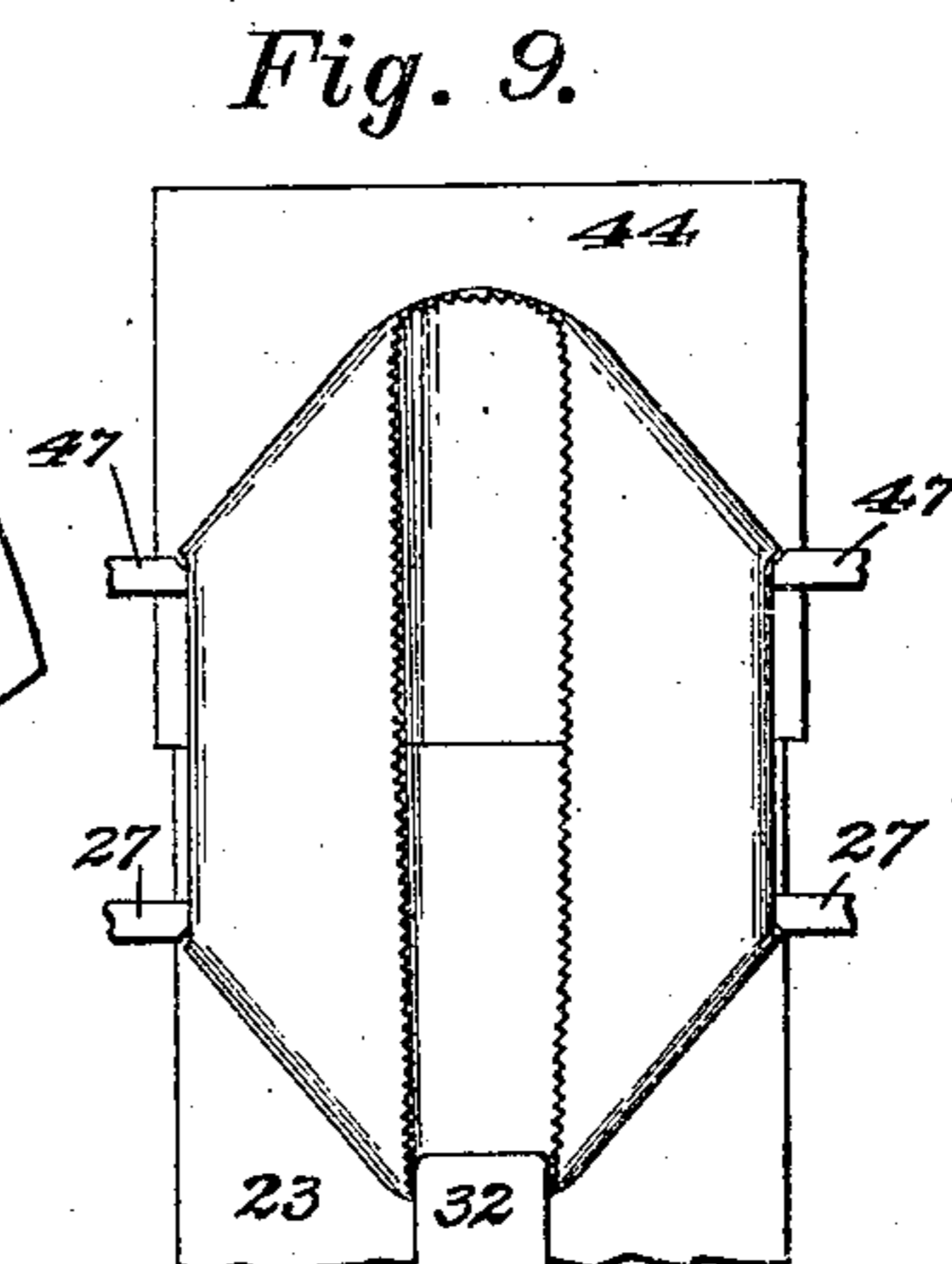
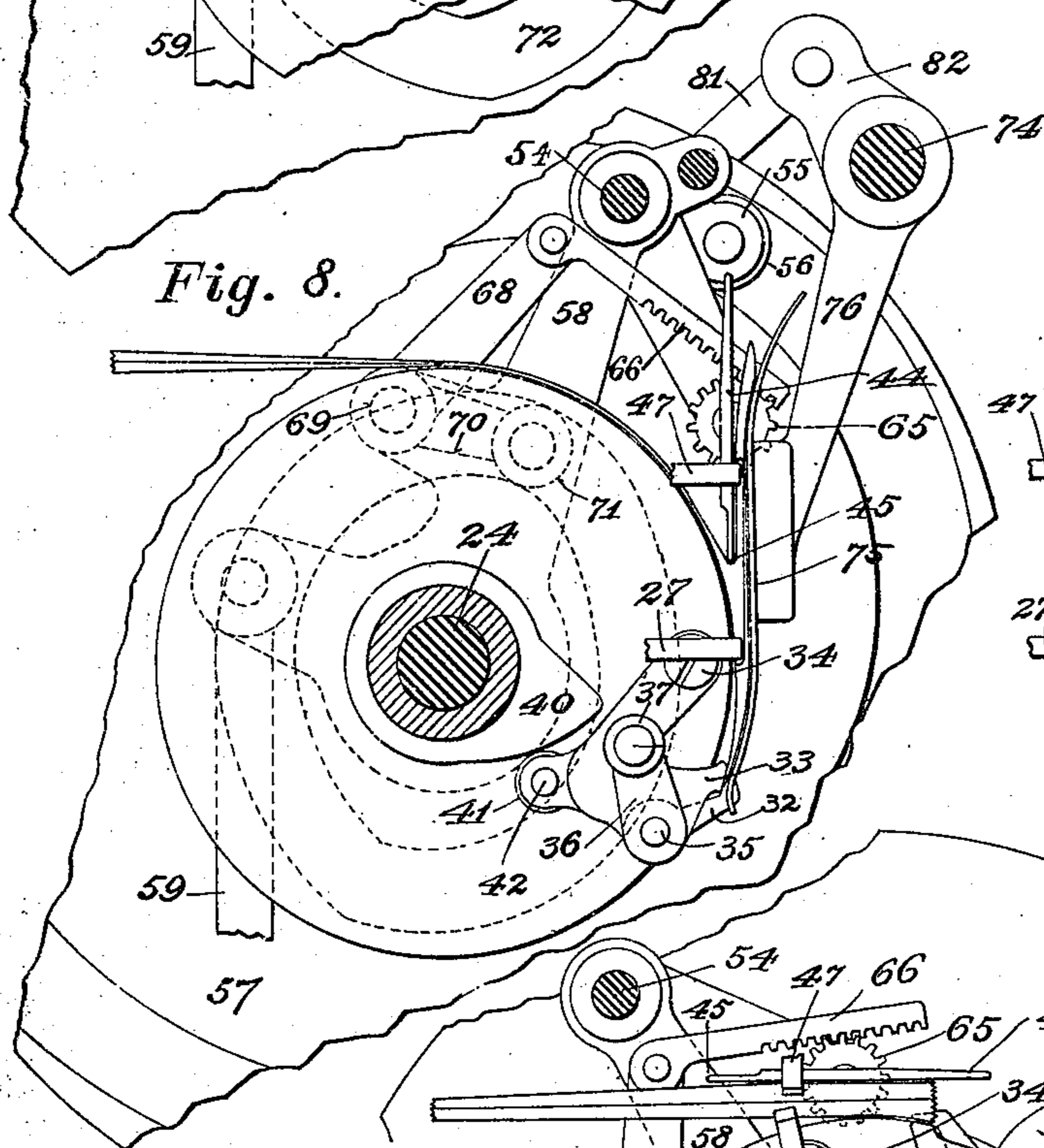
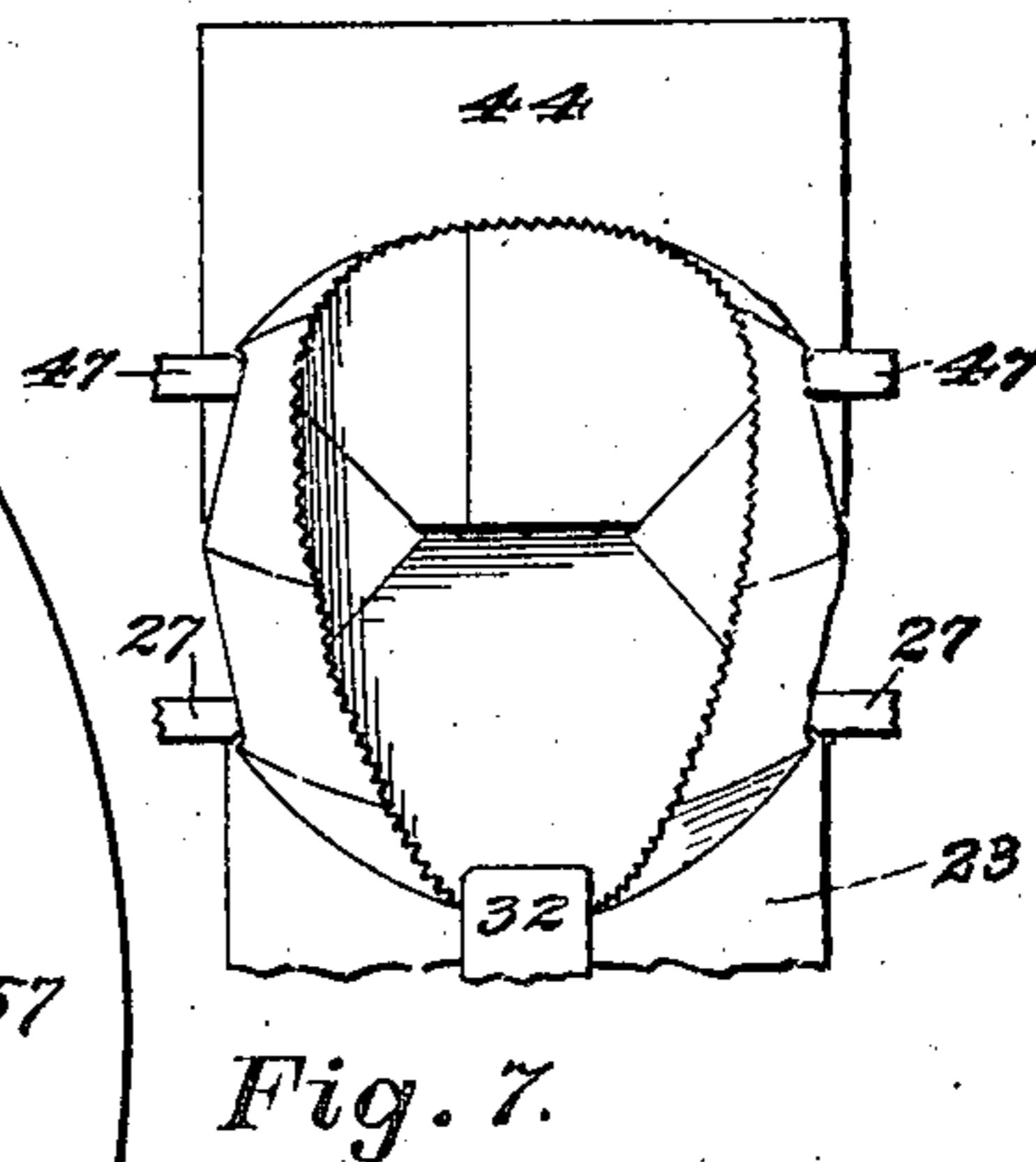
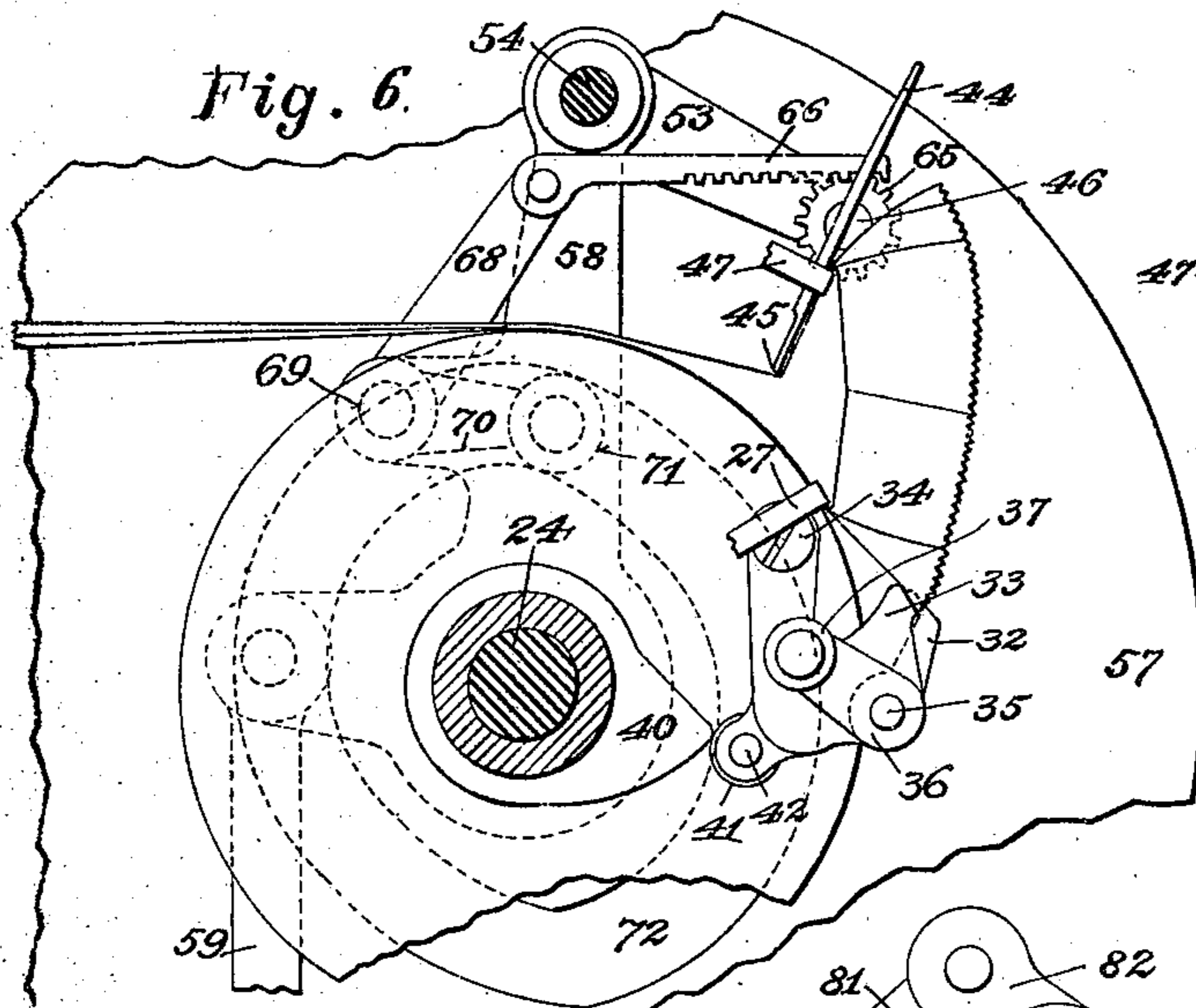
Inventor:
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APPLICATION FILED DEC. 3, 1900.

6 SHEETS—SHEET 5.



Witnesses:
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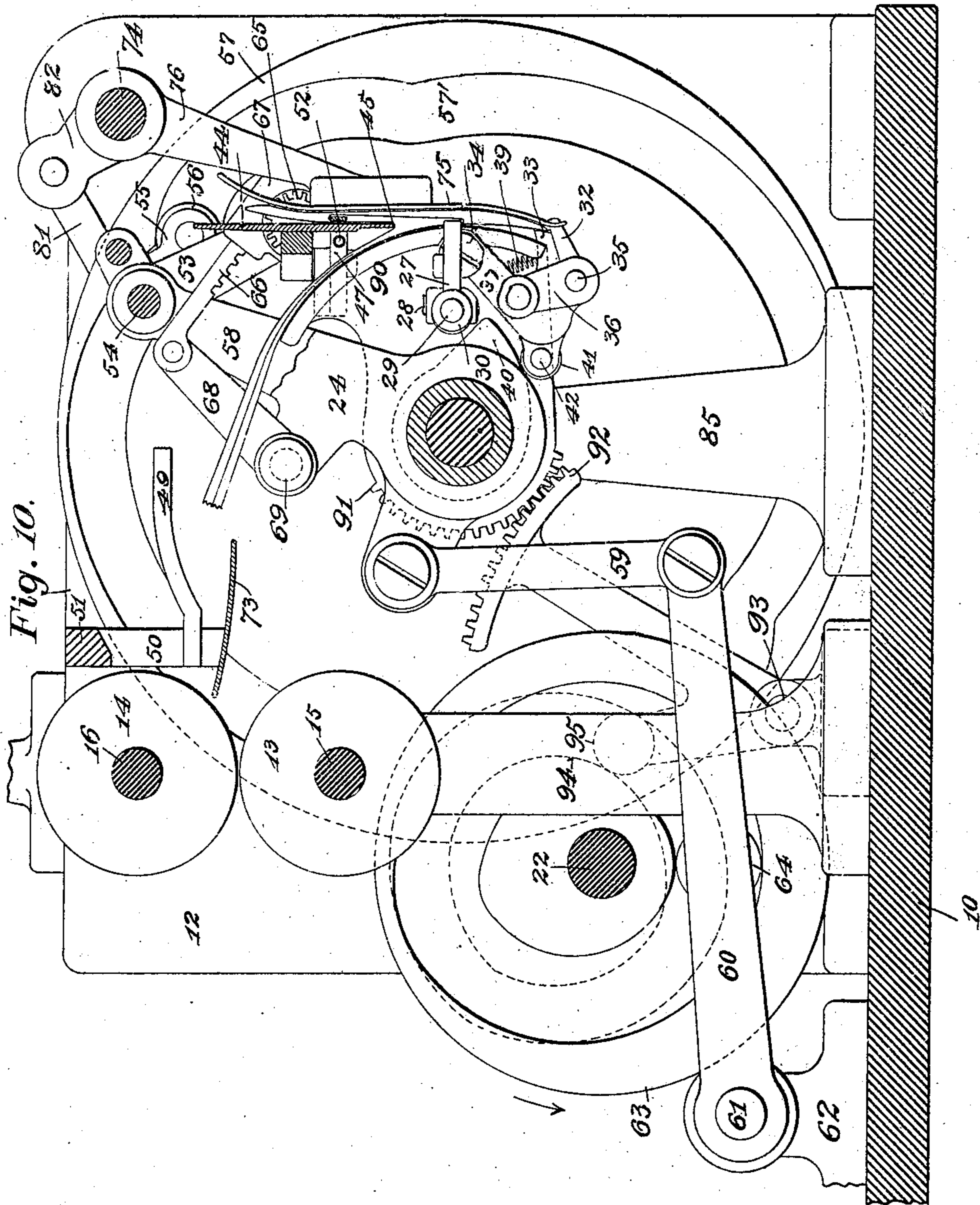
Inventor:
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6 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

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PAPER-BAG MACHINE.

No. 847,195.

Specification of Letters Patent.

Patented March 12, 1907.

Application filed December 3, 1900. Serial No. 38,396.

To all whom it may concern:

Be it known that I, WILLIAM A. LORENZ, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Paper-Bag Machines, of which the following is a full, clear, and exact specification.

This invention relates to paper-bag machines of the class employed for the manufacture of square-bottom paper bags from tucked or bellows-sided tubing, and particularly relates to that section of the said class of machines known as the "diamond-folding" section, in which one end of the bellows-sided blank is converted into a diamond-folded blank. This intermediate operation in the manufacture of this class of bags is the most important and critical, involving the formation of intricate folds at a rate of speed which for commercial success must be quite rapid.

The object of the invention is to provide an improved machine capable of producing these intricate folds perfectly and at a high rate of speed by means and combination of means which support and operate upon the blank in a manner which effects the desired transformation of the fold in the easiest and most natural manner.

My invention includes as one of its features a blank-folding member having a bottom-defining edge coöperative with a suitable blank carrier or support and adapted to open the blank or tube to the required extent, the blank-folding member being supported in a yoke or similar device mounted for swinging movement relative to the blank-supporting surface of the carrier, both blank folding member and carrier being maintained in proper relationship to each other, so as to form the diamond fold in an easy and rapid manner, the organization of the blank-folding member and its operating mechanism relative to the blank-carrier being such that while the diamond is being formed the upper and lower sides of the blank are maintained in a separated condition, the amount of such separation decreasing as the diamond approaches its completion.

Another object of my invention may be found in the organization of the blank-folding member with its operating mechanism,

the former being pivotally supported at a point remote from the defining edge and in a yoke or similar device carried on an advanceable carrier, so that while the defining edge moves in an orbit partly around its axis of support the axis itself advances also, while at the same time said axis is carried by the yoke toward and from the surface of the blank-carrier, or in a direction transverse to the general direction of travel of the blank-carrier.

A further object of my invention is the provision of a device whereby the front diamond flap of the blank is held in such a manner that the undue strain which may be brought to bear upon the blank during the formation of the diamond may be relieved.

My invention therefore comprises a front diamond-holder which is movable transversely of the surface of the blank-carrier, and, furthermore, means whereby said holder may be properly positioned or projected beyond the carrier-surface during the diamond-forming operation.

In the drawings accompanying this specification, and in which similar characters denote similar parts, Figure 1 is a front view of a paper-bag machine embodying my improvements. Fig. 2 is a side view thereof looking from the left of Fig. 1. Fig. 3 is a transverse vertical section taken on line 3 3, Fig. 1. Fig. 4 is a similar section taken on line 4 4, Fig. 1. Fig. 5 is a fractional side view of the blank-carrier and the blank-folding member, both parts being shown in their initial or blank-receiving position. Fig. 6 is a similar view showing the parts in the position which they assume when the open end of the blank has been sufficiently opened out into the "box form." Fig. 7 is a front view of the blank shown in Fig. 6. Fig. 8 illustrates the carrier and the blank-folding member in a position when the diamond has been substantially completed and flattened. Fig. 9 is a front view of the blank shown in Fig. 8, and Fig. 10 illustrates a modification of my improved machine.

In the drawings, 10 designates a bed-plate, to which are secured two upright side frames 11 and 12, in which the several coöperating shafts for driving the various devices are supported. Suitable means are provided for feeding blanks or bellows-sided tubing into

the machine, such means consisting in the present instance of suitable feed-rollers 13 and 14, mounted on shafts 15 and 16, respectively, the latter of which is journaled in boxes 17, movably held in the side frames and acted upon by suitable springs, such as 17'. (See Fig. 2.) The feed-rollers are caused to move together by means of gears 18 and 19, mounted on the shafts 15 16, respectively, and are driven by a gear 20, mounted on the lower roll-shaft and obtaining motion from a similar gear 21, carried on a shaft 22, which constitutes the main driving-shaft of the machine and to which power may be applied from any ordinary source. From the feed-rollers the blank or tube is conducted to a suitable carrier, upon which each blank is retained during the bottom or diamond forming operation. Connected for cooperation with the carrier is a blank-folding member adapted for engaging the upper ply of the tube or blank, while suitable means are provided for holding the lower ply of the blank in place on the carrier, both carrier and blank-folding member coacting to open out the open end of the blank and form the diamond, as will hereinafter appear.

The carrier is preferably of the rotary type, and consists, substantially, of a cylinder, such as 23, mounted upon a shaft 24, which receives rotary movement through a gear 25, secured thereto and engaged by a smaller gear 26, mounted upon the shaft 22 above mentioned. The means for holding the lower ply of the tube on the carrier consist, preferably, of a pair of tuck-holders 27 and 27', journaled at 28 on the carrier, and one of which, 27, has a roll-receiving portion 29, on which a cam-roller 30 is journaled. This cam-roller travels around the periphery of a suitable cam 31, which causes the tuck-holders to grip the blank on both sides simultaneously and at the proper time, both tuck-holders 27 and 27' being connected to operate in unison—as, for instance, by a link 28', which may be moved to open the tuck-holders by a spring 31'. The carrier 23 is also provided with a device for holding the front edge of the lower ply of the tube or blank, this device forming a feature of my present invention and shown herein as a front diamond-holder 32, constituting the holding member of the device and adapted for cooperation with a supporting member 33, which latter is pivoted, as at 34, to the carrier 23 and pivotally supports the holder 32, as is, for instance, shown at 35. The pivot-spindle 35 carries an arm 36, having at its free end a cam-roller 37, adapted for engagement with a cam 38, whereby said holder 32 is opened and swung away from its companion member 33 against the action of a spring 39.

From the foregoing it will be seen that the front flap-holding device may in some instances perform the function of a clamp

which may be moved in its entirety around its pivot 34—as, for instance, by a cam 40, engaging a cam-roller 41, journaled at 42 on the member 33. This cam 40 is preferably stationary and adapted in its present organization to project the holding device beyond the blank-supporting surface of the carrier, and more particularly at the time when the "box" is being formed, as is shown in Fig. 6, while a spring 43 may be employed for retracting the entire device and for returning the same to its normal position, the spring 43 being, however, of greater strength than the spring 39 above mentioned, so that the holder 32 may be opened without in any way disturbing or altering the position of the holding device as a whole.

The blank-folding member, which, as has above been stated, is connected for cooperation with the carrier is herein illustrated as a plate, one edge of which serves as a bottom-defining edge and which is in its preferred form mounted for oscillation and reciprocation relative to and with the carrier. Furthermore, as has also above been stated, I deem it of importance that the defining edge of the blank-folding member be in some instances maintained at a distance from the blank-carrier, so that as the carrier and blank-folding member coact in opening out the open end of the bag-blank the so-called "inside triangular folds" may be easily developed by stretching out the sides of the tucked tube or blank. In other words, the defining edge of the blank-folding member is during the working stroke thereof maintained in a separated position relative to the blank-supporting surface of the carrier, so that as said folding member is turned over the tucked tube sides may be properly stretched out between the tuck-holders and the box-holders carried by said folding member. In the present instance both the blank-carrier and the supporting-axis of the folding member are capable of advancement, so that the defining edge may be caused to travel in unison with the blank-carrier during a portion of its working stroke. The blank-folding member herein shown consists of a plate 44, having a defining edge 45 and provided at its sides with trunnions 46, whereby said plate is pivotally supported at a point remote from the defining edge. Each of the trunnions has a lug 46', adapted to receive suitable means for engaging the upper ply of the blank and for holding the same against the plate 44. These means consist in the present instance of box-holders 47, pivoted in the lugs 46', and having tail-pieces 48 to be engaged for opening the same at the blank-receiving end of the stroke by abutments 49, secured to arms 50, depending from a cross-bar 51, secured to the side frames of the machine in any desired manner. The box-holders may be operated to close

against the plate 44 by a suitable spring, such as 52, connected with both holders. (See Fig. 1.) At the blank-discharging end of the stroke the box-holders may be again
 5 opened by abutments 49', which may be stationary and disposed in the path of the box-holders, as shown in Fig. 1.

As has been stated, the blank-folding member is pivotally supported in a yoke or similar device, which is mounted for swinging movement transversely toward and from the blank-supporting surface of the carrier. This device may be composed of a pair of arms 53, adapted to receive the trunnions 46
 10 above referred to, and secured to a shaft 54, upon which is also mounted an arm 55, carrying at its free end a cam-roller 56 in engagement with a cam-groove 57', provided in a cam 57, which is secured upon the carrier-shaft 24, and whereby the arms 53 are positioned so as to maintain a proper separation of the tube sides during the diamond-forming operation. The arms 53 constitute substantially a yoke, mounted for rise-and-fall movement relative to the blank-carrier,
 25 and in a yoke-carrier comprising a pair of angle levers or arms 58, journaled concentrically with the blank-carrier and obtaining oscillatory movement by means of links 59, the lower ends of which are connected to levers 60, which are secured to a shaft 61, journaled in a bearing-bracket 62. Both levers 60 are operated in unison by a cam 63 in engagement with a roll 64, journaled on one of the
 30 levers 60 and in such a manner that the rocking movement of said levers will result in a properly-timed advance movement of the yoke-carrier with the blank-carrier during the diamond-forming operation.

Means are provided whereby oscillatory movement is imparted to the blank-folding member in its yoke or support, such means consisting in the present instance of a pinion 65, secured to one of the trunnions and engaged by a rack 66, one end of which is guided and retained in proper engagement with said pinion by a guide 67, loosely mounted on said trunnion, while its other end is pivotally attached to an arm 68, secured to
 45 a spindle 69, journaled in the angle-lever 58, above referred to, and carrying at its other end an arm 70, supporting a cam-roller 71. This cam-roller 71 is in engagement with a suitable cam-groove 72, also provided in the cam 57. It will therefore be seen that on account of the organization just described, and inasmuch as the angular movement of the yoke-carrier 58 is slower than that of the blank-carrier, the arm 70 will serve to move
 50 the rack 66, and thus impart the proper oscillatory movement to the blank-folding member or plate 44.

Interposed between the feed-rolls 13 14 and the carrier 23 is a guide-plate 73, secured
 65 to the under side of the downwardly-pro-

jecting arms 50, above mentioned, and whereby the blank as it is fed forward by the feed-rolls will be guided with its front end between the folding member and the blank-carrier.

Journaled in the side frames 11 and 12 is a shaft 74, to which may be secured a drop-plate adapted to cooperate with the carrier to flatten and complete the diamond after the tuck-holders and box-holders have stretched out the side of the tucked tube.
 75 This drop-plate may consist of a plate 75, secured to an arm 76, which is mounted on the shaft 74, above mentioned, said shaft being operated in any suitable manner—as, for instance, by a cam 77, (see Fig. 1,) engaging a roller 78, which is journaled on a lever 79, fulcrumed on a stud 80, secured to the side frame 12 of the machine. The free end of the lever 79 may be connected by a link 81
 80 with an arm 82, secured to the shaft 74, above mentioned. After the diamond has been flattened by the drop-plate the blank may be carried into contact with a presser-roll 83, mounted upon a shaft 84, which is journaled
 85 in the side frame 11 and also in a standard 85, secured to the bed-plate 10 of the machine, after which a delivery-plate 86 may deflect the blank from the carrier and conduct the same to other devices which may
 90 include a paster-roll and flap-folding devices, such as indicated by dotted lines 87 and 88, there to be folded into the completed bag. The shaft 84 may be driven through the pinion 84', secured thereto and in mesh with a
 100 gear 89, mounted on a shaft 24 and in engagement with an intermediate 89' for driving the flap-folding devices above mentioned.

The operation of my improved machine is as follows: Bellows-sided or tucked tubing is introduced into the machine by the feed-rolls 13 14 and guided by the guide-plate 73 into position between the blank-folding member 44 and the carrier 23 in such a manner that the tuck-holders 27 and the front diamond-holder 32 will engage the lower ply of the blank, as seen in Fig. 5, and will thus be carried along by the blank-carrier in the direction of arrow *a*. While the blank is delivered to the tuck-holders the box-holders
 110 47 of the blank-folding member 44 are open, and the forward movement of the latter is so timed that the front edges of the tuck-holders and the box-holders will first come into alinement with each other and then engage the blank, while at the same time the front diamond-holder 32 is brought into engagement with the front flap end, as shown in Fig. 5. The carrier and the defining edge of the blank-folding member will now travel
 115 substantially in unison during the formation of the diamond. During this travel the yoke-arms 53 will gradually raise the blank-folding member to maintain the defining edge at a distance from the blank-carrier and until
 120 125 130

the box fold has been substantially formed, as seen in Figs. 6 and 7, at which time the front diamond-holder will be in its raised or projected position, and thus relieve the strain to which the material is being subjected in forming the inside triangular folds. The holder is now gradually retracted by the spring 43, while at the same time the yoke 53 is lowered, such movement in connection with the oscillatory movement of the folding member itself in the yoke resulting in the defining edge gradually approaching the carrier until the position shown in Fig. 8 has been reached, at which time the diamond is substantially completed and the drop-plate 75 is in its operative position. At this time the box-holders are released from the blank and the latter is engaged by the presser-roll 83, after which the diamond-holder and the tuck-holders are opened to release the blank which may now be stripped or deflected from the blank-carrier by the plate 86, whereby it is guided to the flap-folding devices.

It is evident that many changes may be made in the particular construction and organization of some of the elements of my improved machine without altering the spirit of the invention, and while I have shown and described the blank-folding member in cooperative connection with a rotary blank-carrier it should be understood that any other form of carrier may be substituted therefor—as is, for instance, illustrated in Fig. 10, which in this instance includes an oscillatory carrier instead of a rotary device, as described. Here the carrier 90 is provided with gear-teeth 91 in engagement with a sector 92, which may be pivoted at 93 and receive proper oscillatory movement from a cam 94, engaging a cam-roller 95, journaled on said sector.

Many of the terms herein employed to designate relative position or direction of movement are used in their relative and not their absolute sense, since the various parts may be transposed or inverted or modified in structure or in position, direction, or rate of movement. For example, the statement that the yoke advances with the blank-carrier during the diamond-folding operation obviously does not indicate that the rate or extent of travel of the yoke are coincident or coextensive with the rate and extent of travel of the blank-support. In many ways which will occur to those skilled in this art the invention herein shown may be modified without departing from the spirit of the invention.

In my copending applications Serial No. 27,864, filed August 23, 1900; Serial No. 32,123, filed October 5, 1900; Serial No. 35,086, filed November 1, 1900, I have claimed certain novel improvements in bag-machines which I have shown and described

but not claimed in this application. This application, therefore, is to be understood as being subordinate to my prior applications enumerated above in so far as they show and describe in common the novel features claimed in said prior applications.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a bag-machine, mechanism for forming diamond-folded blanks from bellows-folded tubes including in combination a blank-carrier having tuck-holders, a blank-folding member having a defining edge and box-holders, a yoke pivotally supporting said blank-folding member, movable arms pivotally supporting said yoke, means for advancing said arms with the blank-carrier during the blank-folding operation, and means for swinging said yoke on said arms during such advancing movement to govern the path of the defining edge relative to the blank-carrier.

2. In a bag-machine, mechanism for forming diamond folds on bellows-sided blanks including in combination a rotary blank-support, means for securing a blank thereto, an oscillating carrier-arm moving on a center of oscillation situated within the rotary path of the bed, a yoke pivoted upon said arm, a blank-folding member pivotally connected to said yoke, means for oscillating the blank-folding member upon the yoke, means for turning the yoke relatively to the arm, and means for oscillating the arms about their center of oscillation.

3. In a bag-machine, mechanism for forming diamond folds on bellows-sided blanks, having in combination a rotary folding-bed, means for securing bag-blanks thereto, oscillating arms moving on a center of oscillation situated within the rotary path of the bed, a yoke mounted to turn upon said arms, a blank-folding member mounted for oscillation upon the said yoke, means for oscillating the blank-folding member relative to the yoke, means for turning the yoke to carry the blank-folding member toward and from the surface of the blank-support, and means for oscillating the arms to move the yoke and the blank-folding member forward and back in the general direction of travel of the blank-support.

4. In a bag-machine, the combination with the folding-bed, of means for forming the diamond fold, and means for lifting the forward end of the lower ply of the bag-blank from the folding-bed during the formation of the diamond fold, substantially as described.

5. In a bag-machine, the combination with the folding-bed, and means for folding the bag-blank thereon, of a front gripper adapted to grip both sides of the forward end of the lower ply of the bag-blank, and means for

elevating said gripper relatively to the folding-bed, substantially as described.

6. In a bag-machine, the combination with the folding-bed, of a front gripper consisting of upper and lower jaws, means for elevating said gripper relatively to the folding-bed, and means for opening and shutting the gripper, substantially as described.

7. In a bag-machine, the combination of a front gripper, a gripper-block to which the same is pivotally connected, the front gripper being adapted to open and close by movement about such pivotal connection, and the gripper-block being mounted for lifting or raising movement, and means for elevating and lowering the gripper-block, substantially as described.

8. In a bag-machine, the combination with the folding-bed, of a gripper-block pivotally connected to the same, a front gripper-support pivotally connected with the gripper-block and provided with a gripping-plate adapted to cooperate with the gripper-block so as to open and close relatively to the same, and means for swinging the gripper-block about its pivotal connection so as to elevate and lower it with respect to the folding-bed, substantially as described.

9. In a bag-machine, the combination of a front gripper, a swinging gripper-block to which said front gripper is pivotally connected, said gripper-block being mounted so as to permit it to swing to raise and lower the gripper, means for swinging the gripper-block, and means for swinging the gripper-support relatively to the gripper-block so as to open and close the gripper, substantially as described.

10. In a bag-machine, the combination with the folding-bed, of a front gripper comprising upper and lower gripping-jaws, said gripper being carried by the folding-bed and having a swinging movement relatively to the same to permit it to be raised and lowered relatively to the bed, means for forming the diamond fold while the bag-blank is engaged by the front gripper, and means for elevating the gripper during the formation of the diamond fold, substantially as described.

11. In a bag-machine, the combination with the folding-bed, of a front gripper comprising upper and lower gripping-jaws, said gripper being carried by the same and having a swinging motion relatively to the bed so as to permit it to be raised or lowered, means for forming the diamond fold while the bag-blank is engaged by the front gripper, and means for elevating the front gripper during the formation of the diamond fold and lowering the same before the completion of the fold, substantially as described.

12. In a bag-machine, the combination with the folding-bed and means for forming the diamond fold thereon, of a front gripper consisting of upper and lower gripping-jaws,

means for elevating said gripper during the formation of the diamond fold, and means for closing and opening said gripper as required to engage and release the forward end of the lower ply of the bag-blank, substantially as described.

13. In a bag-machine, the combination with a folding-bed, and side gripping devices, of means for folding the bag-blank, a front gripper comprising upper and lower gripping-jaws adapted to clasp the forward end of the lower ply of the bag-blank, and means for raising and lowering said gripper during the folding operation.

14. The combination, with a blank-carrier having tuck-holders; and with a blank-folding member having box-holders cooperative therewith; of a movable device for holding the front diamond flap of the blank; and means for projecting said device beyond the surface of the blank-carrier during the blank-folding operation.

15. The combination, with a blank-carrier having tuck-holders; and with a blank-folding member having box-holders cooperative therewith; of a movable device for holding the front diamond flap of the blank; and a cam for projecting said device beyond the surface of the blank-carrier during the blank-folding operation.

16. In a bag-machine, mechanism for forming diamond-folded blanks from bel-lows-folded tubes, having in combination a rotating folding-bed provided with devices for holding the blank and assisting in the formation of the diamond, including a front gripper adapted to hold the front lower ply of the blank at an elevation above the bed during the distention of the diamond, oscillating arms pivoted within the path of the rotating bed, folding mechanism carried by said arms and moving therewith at times in the direction of movement of the bed and at times in the opposite direction, means for causing the oscillating folding mechanism to move also toward and away from the path of the bed and means for oscillating the said folding mechanism on an axis carried by the arms.

17. In a bag-machine, mechanism for forming diamond-folded blanks from bel-lows-folded tubes, having in combination a rotating folding-bed provided with devices for holding the blank and assisting in the formation of the diamond, a front gripper adapted to hold the front lower ply of the blank at an elevation above the bed during the distention of the diamond, means for moving said front gripper toward and away from the bed, oscillating arms pivoted within the path of the rotating bed, folding mechanism carried by said arms and moving therewith at times in the direction of movement of the bed and at times in the opposite direction, means for causing the oscillating

folding mechanism to move also toward and away from the path of the bed and means for oscillating the said folding mechanism on an axis carried by the arms.

5 18. In a bag-machine, mechanism for forming diamond folds on bellows-sided blanks, including in combination, a blank-support mounted for rotation about a fixed axis, means for securing blanks to said support, oscillating arms, a member pivoted thereto, folding mechanism including a folding member pivotally secured to the first-mentioned member to turn about an axis with respect thereto and having a defining edge, means for oscillating said arms to carry said folding mechanism through an oscillatory path above and in the general direction of travel of the blank secured to said support, means for moving said first-mentioned member relative to said arms to carry the axis of the folding member toward and away from the surface of said blank-support, said folding member having its defining edge situated at a distance from its axis somewhat less than the greatest distance to which that axis is carried away from the rotary path of the support, whereby the said defining edge swings back and forth clear of the said support.

30 19. In a paper-bag machine, mechanism for forming diamond folds on bellows-folded blanks, having in combination a rotating folding-bed, means for turning back the upper ply of the blank to form the diamond fold, a holder for holding down the front end of the lower ply of the blank, and means for raising the said holder during the diamond-folding operation to allow the said front end to be raised and relieve the strain incident to the said operation.

40 20. In a paper-bag machine, mechanism for forming diamond folds on bellows-folded blanks, having in combination a rotating folding-bed, means for turning back the upper ply of the blank to form the diamond fold, a holder moving in conjunction with

the bed, and extending over the front end of the lower ply to hold it down, and means for raising the said holder during the diamond-folding operation to relieve the front end of the blank from strains incident to that operation.

21. In a paper-bag machine, mechanism for forming diamond folds on bellows-folded blanks having in combination a rotating folding-bed provided with a blank-supporting surface approximately conforming to the curvature of its path of rotation, means for turning back the upper ply of the blank to form the diamond fold, a holder appurtenant to and moving with the said bed, and extending over the front end of the lower ply of the blank to hold it down, and means for raising the said holder during the diamond-folding operation to relieve the front end of the blank from strains incident to that operation.

22. In a bag-machine mechanism for forming diamond folds on bellows-sided blanks, including in combination a rotary blank-support, a carrier-arm pivoted to oscillate about a center within the rotary path of the bed, a member pivoted to said arm, folding mechanism pivoted to said member, means for turning said arm about its center of oscillation, means for turning said member relative to said arm, and means for turning said folding mechanism on said member.

23. In a machine for forming diamond folds on bellows-sided bag-blanks, the combination of a rotary blank-support, means for securing the lower ply of a blank thereto, a yoke-carrier, a yoke pivotally connected thereto, blank-folding mechanism pivoted to said yoke, and mechanism for reciprocating the yoke-carrier, turning the yoke relative to the yoke-carrier and turning the folding mechanism relative to the yoke.

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Witnesses:

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