

No. 622,579.

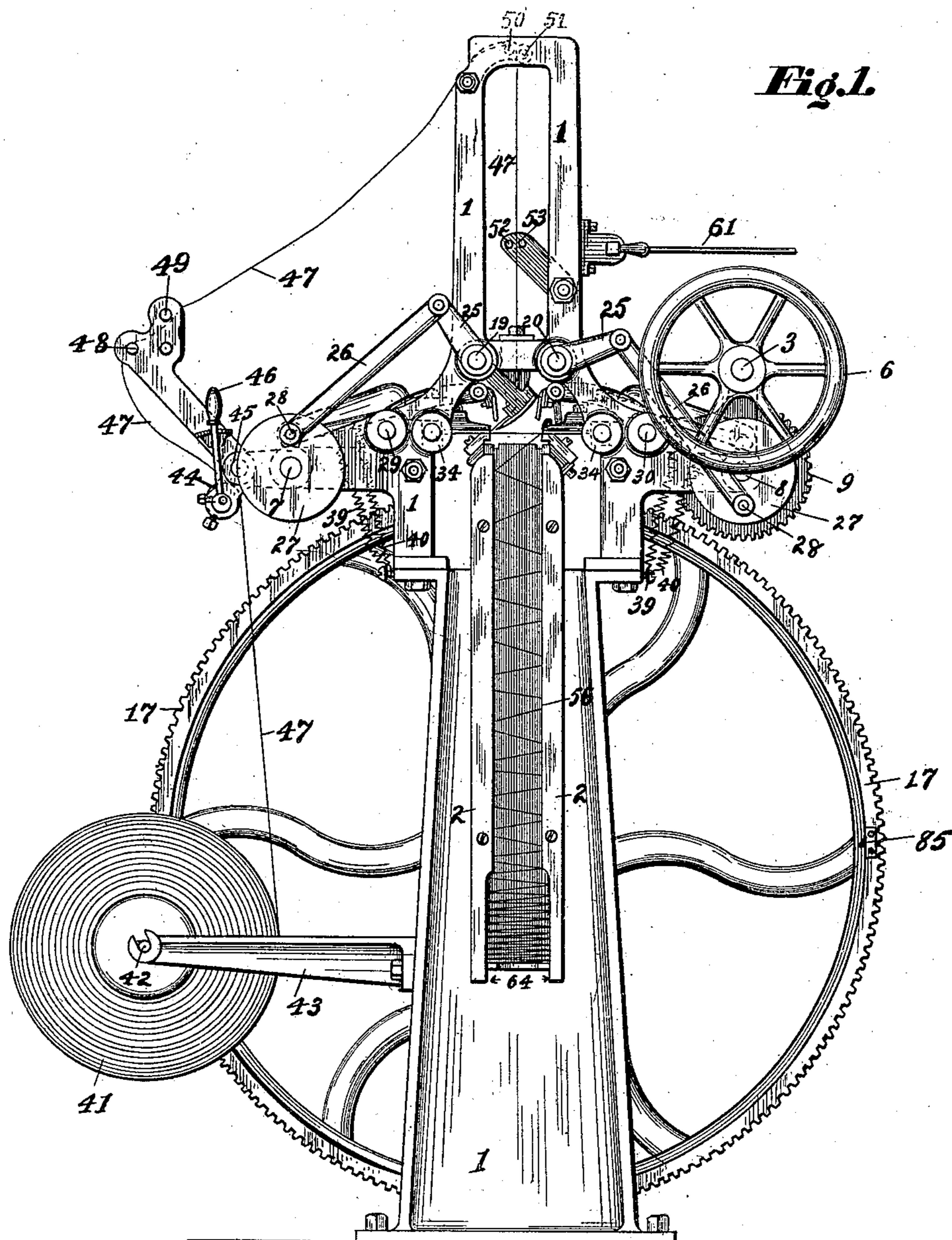
Patented Apr. 4, 1899.

J. WHITELOW.
PAPER FOLDING MACHINE.

Application filed July 28, 1897

(No Model.)

4 Sheets—Sheet 1.



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4 Sheets—Sheet 2.

Fig. 2.

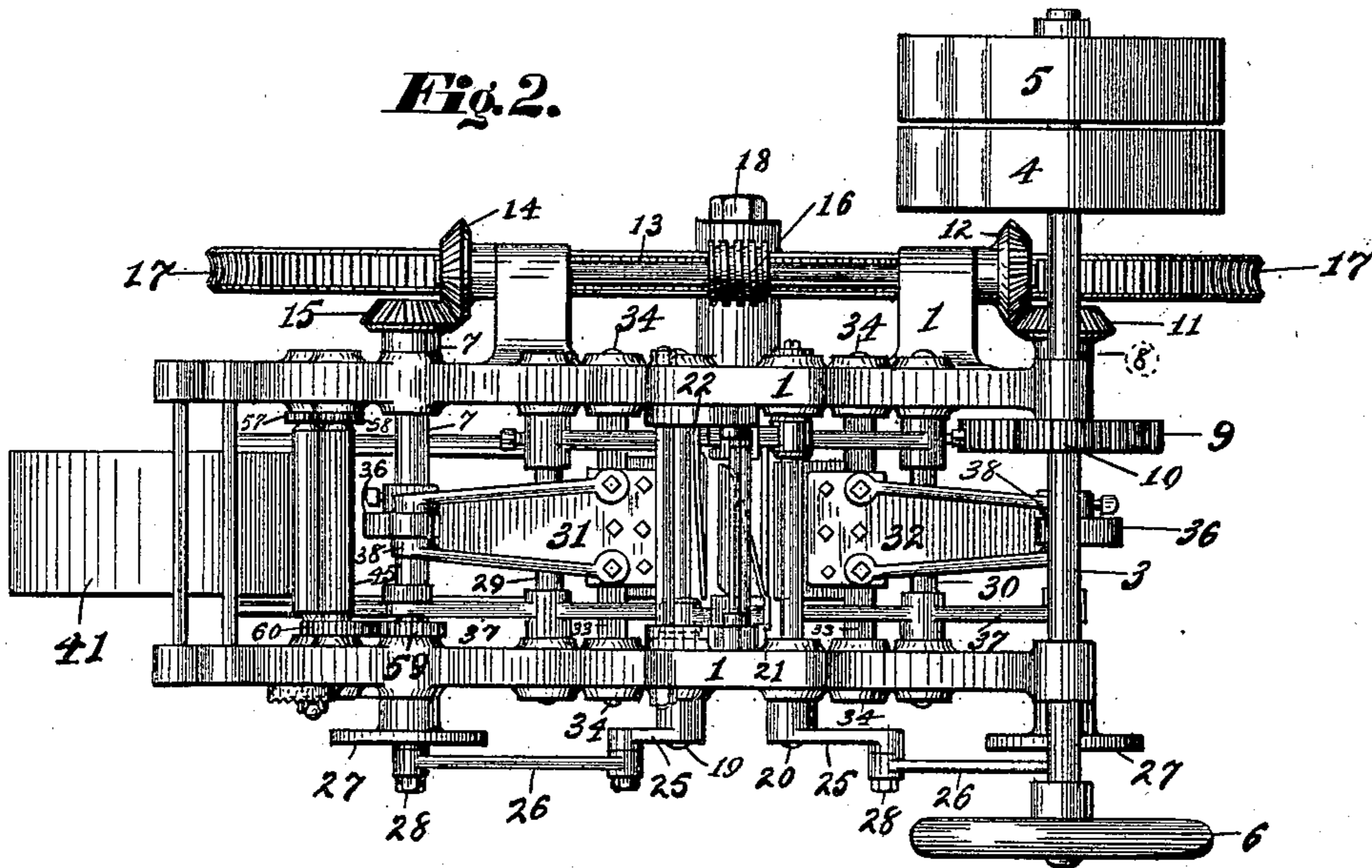
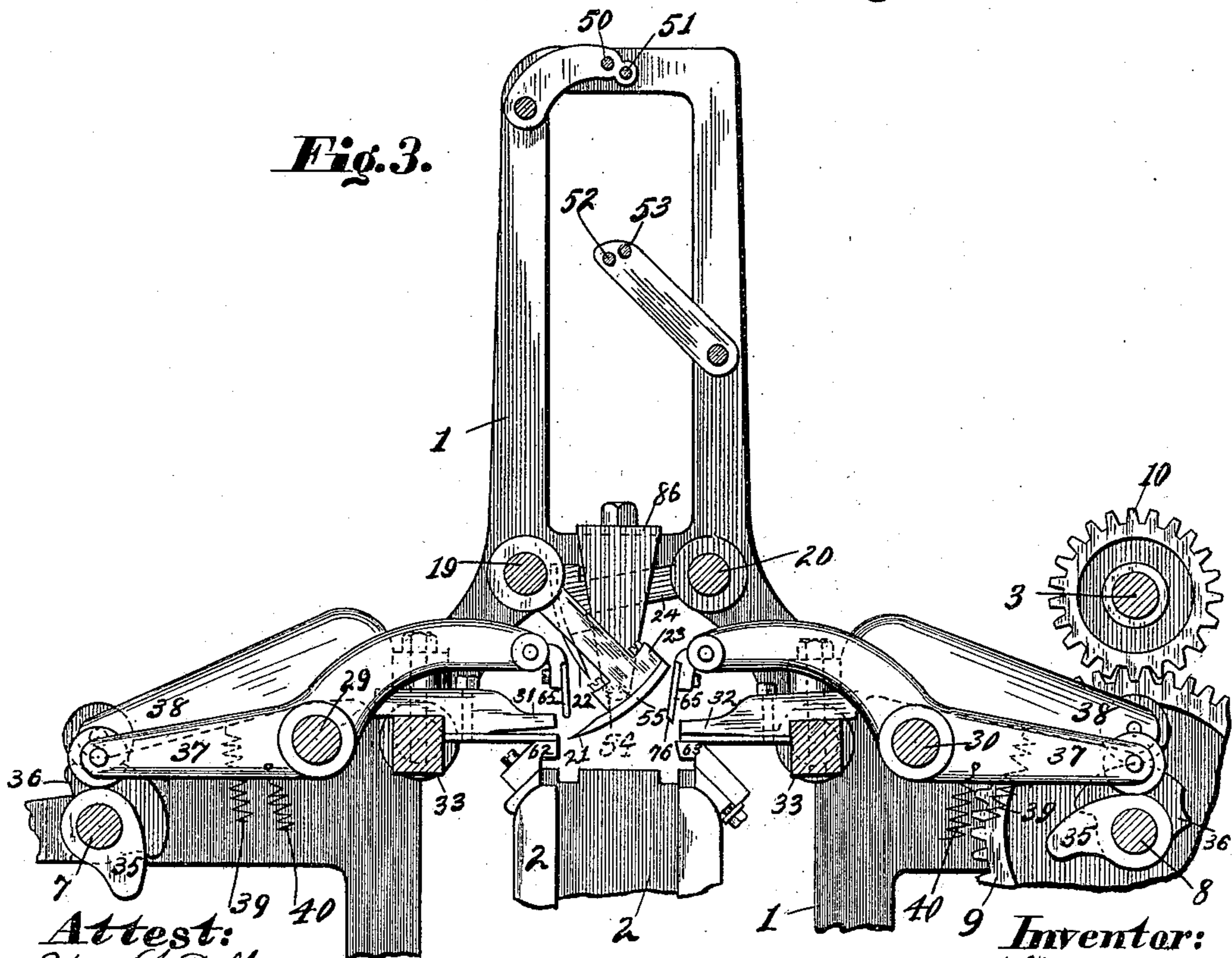


Fig. 3.



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Fig. 4.

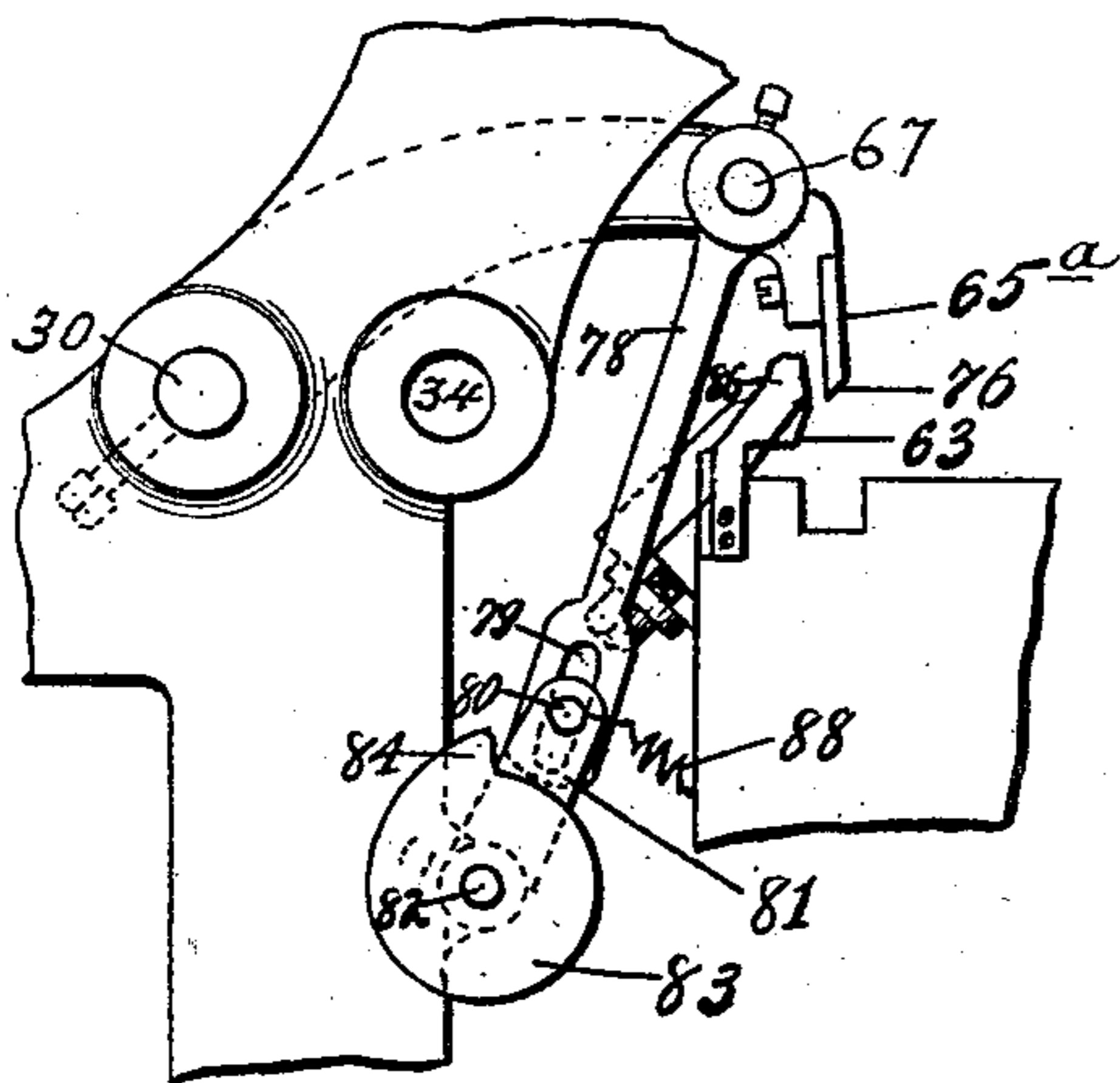


Fig. 5.

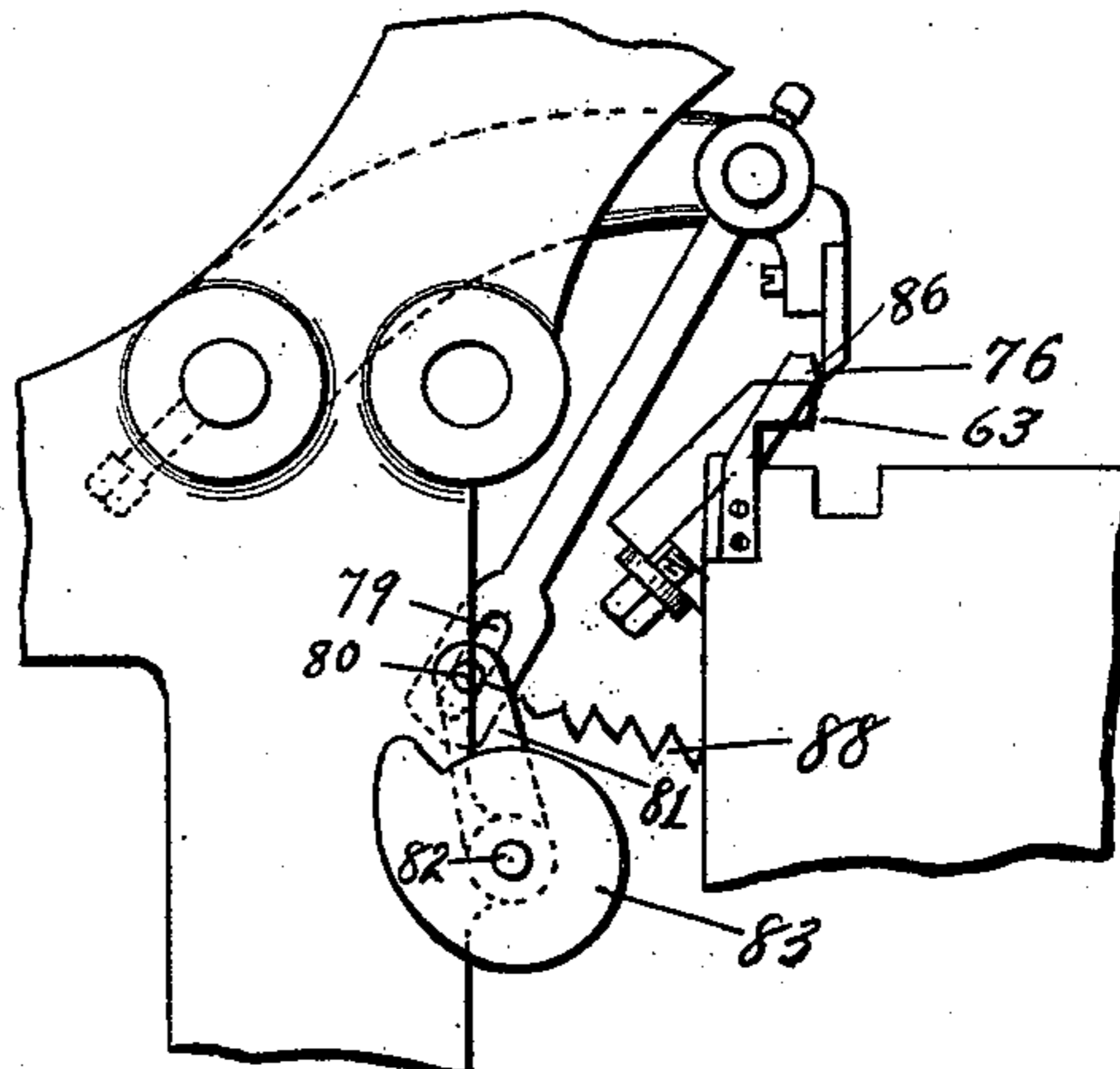


Fig. 6.

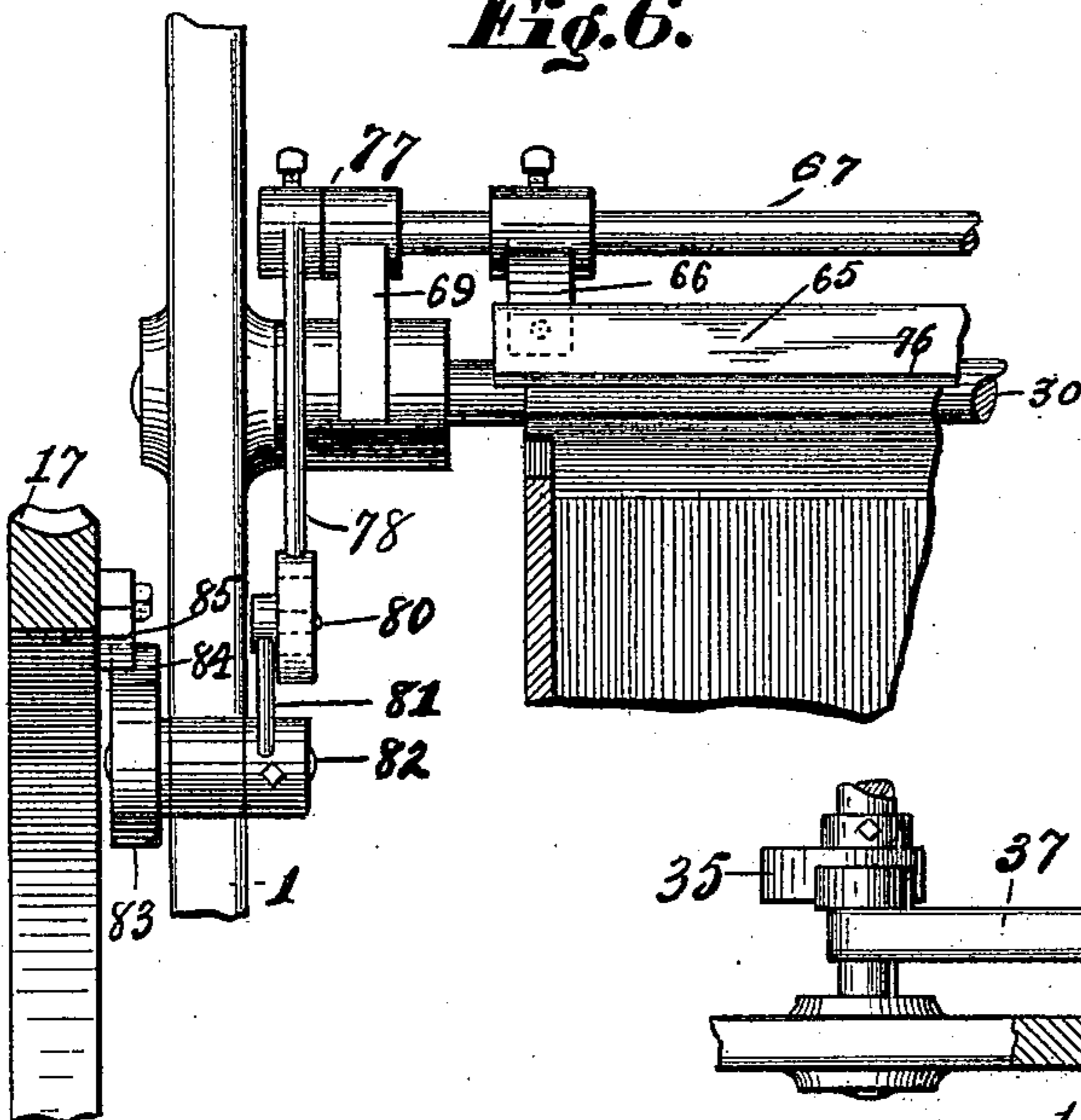
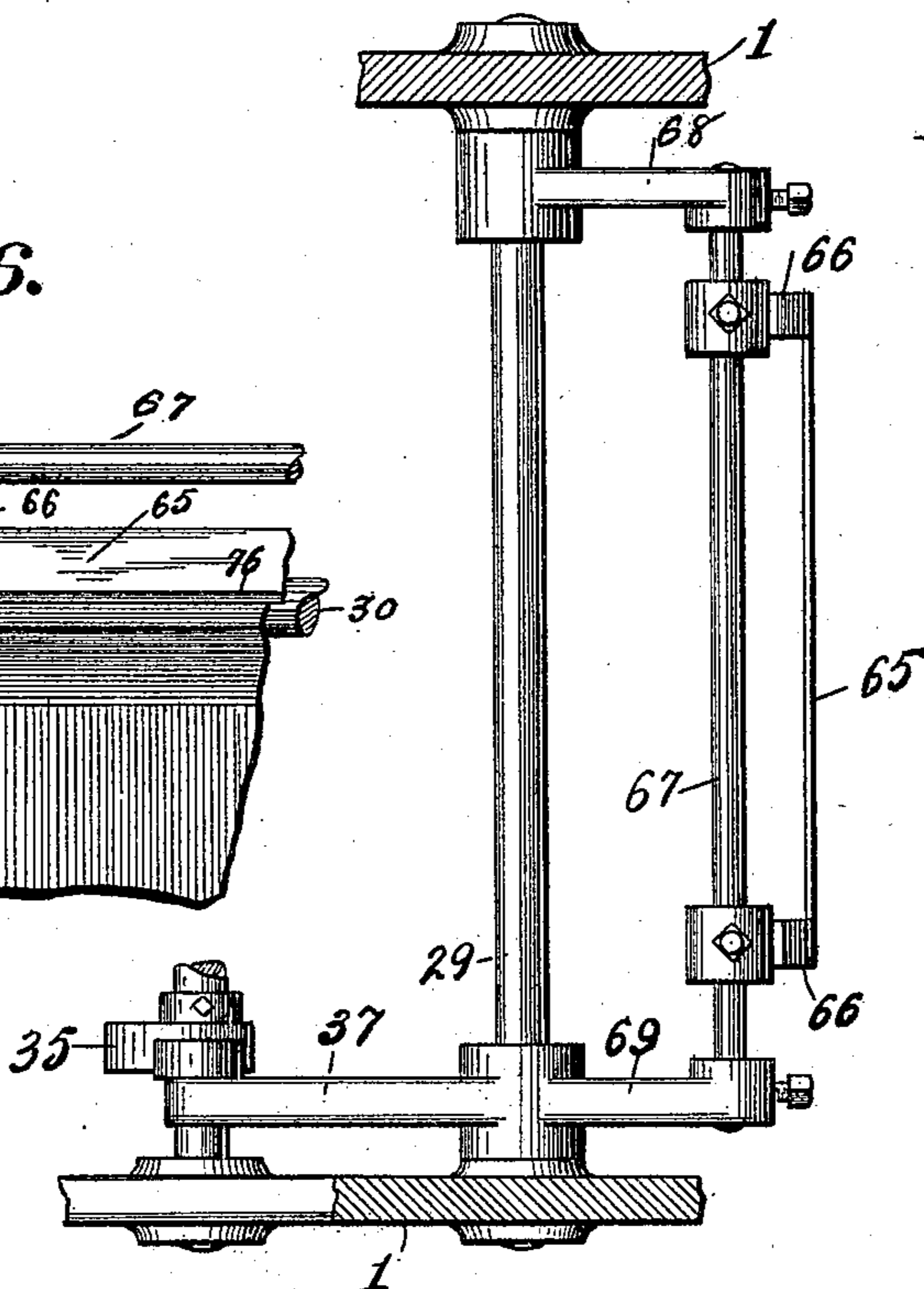


Fig. 7.



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Fig. 8.

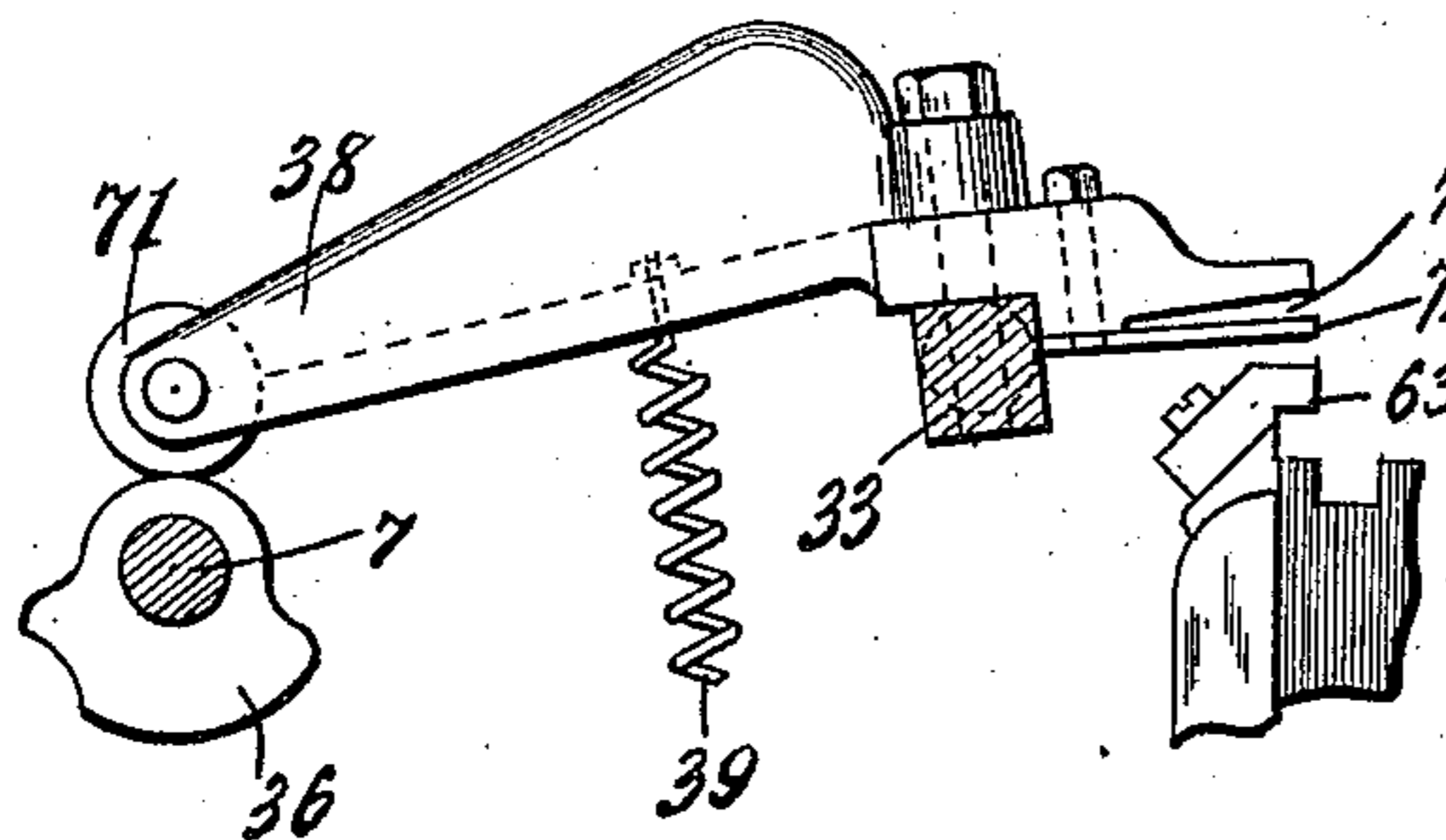


Fig. 9.

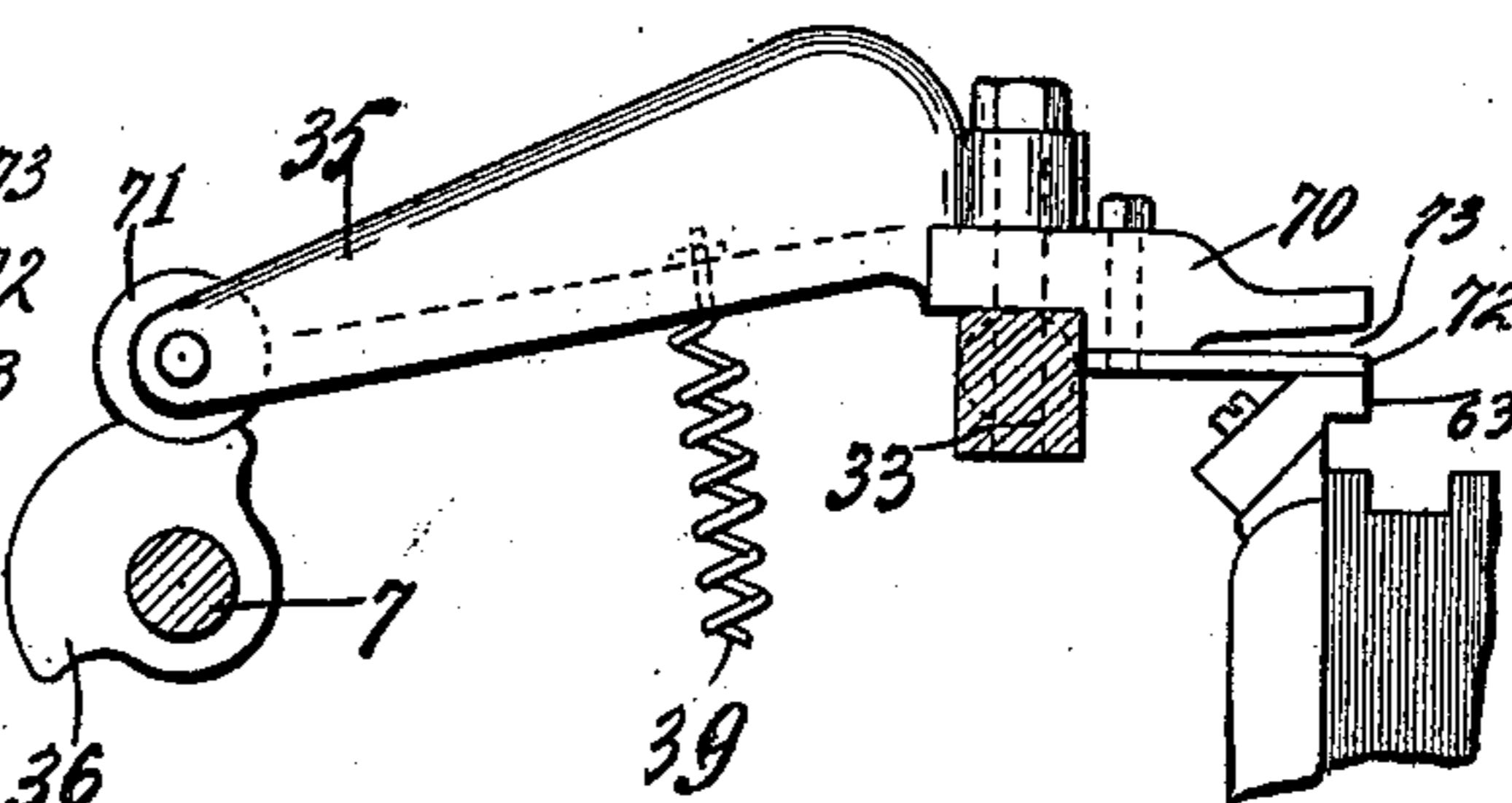


Fig. 10.

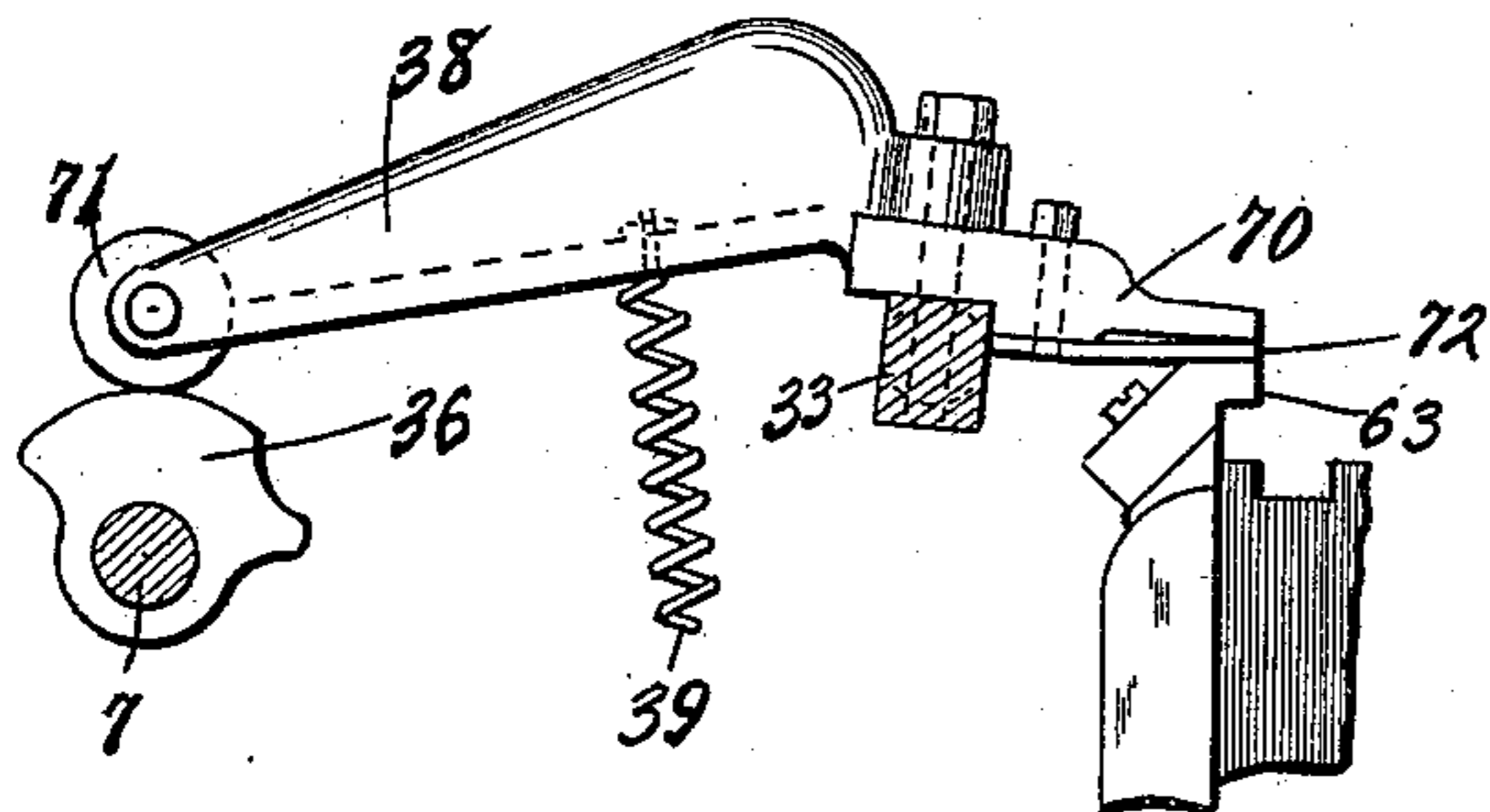


Fig. 11.

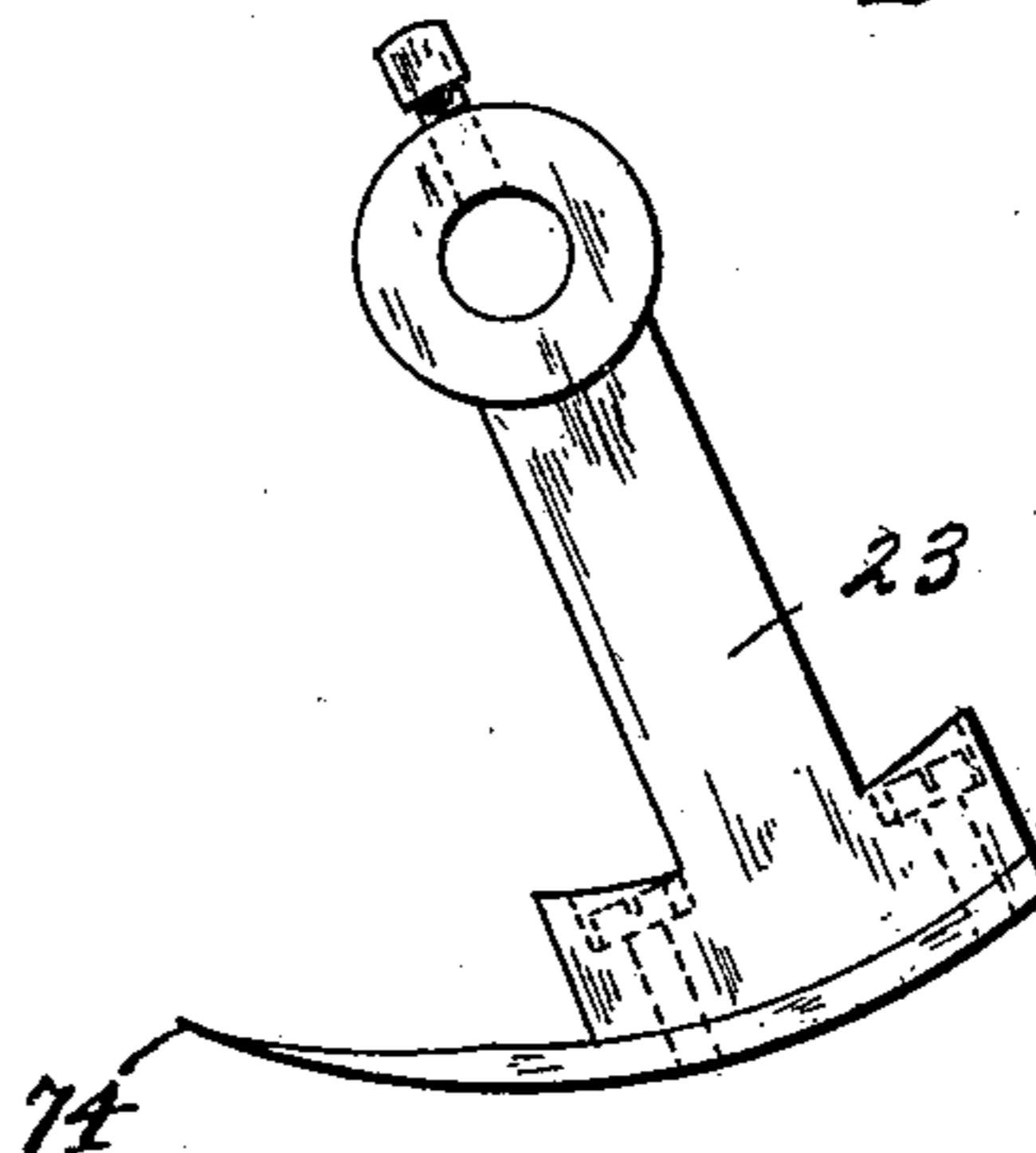
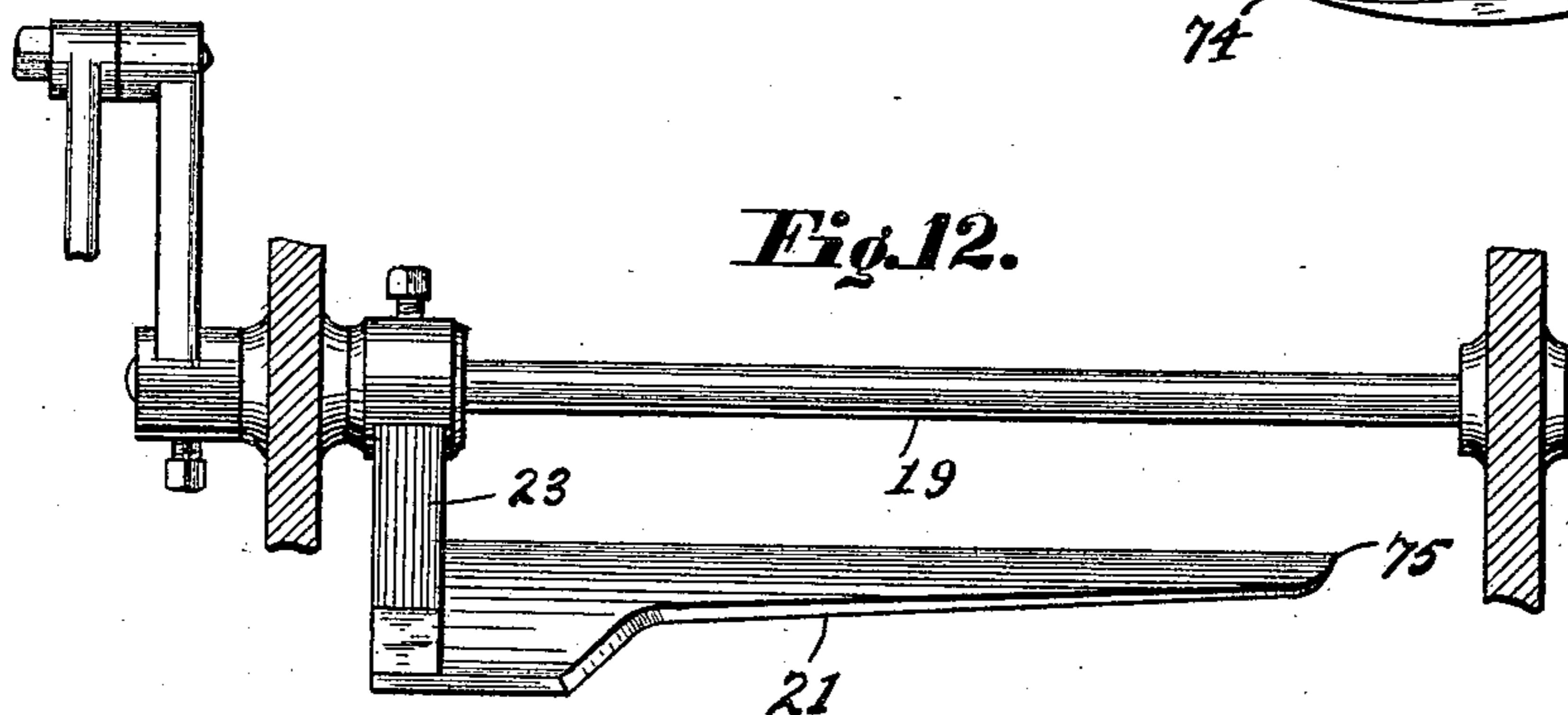


Fig. 12.



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UNITED STATES PATENT OFFICE.

JAMES WHITELAW, OF ST. LOUIS, MISSOURI, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE CARTER-CRUME COMPANY, OF WEST VIRGINIA.

PAPER-FOLDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 622,579, dated April 4, 1899.

Application filed July 28, 1897. Serial No. 646,220. (No model.)

To all whom it may concern:

Be it known that I, JAMES WHITELAW, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented a new and useful Improvement in Machines for Folding Paper, of which the following is a specification.

My invention relates to improvements in paper-folding machines adapted to fold strips of paper in reverse folds and cutting the folded paper off from the main strip or supply at suitable intervals to form separate books or banks of reversely-folded paper of any required size for any desired use to which paper in this form is applicable, but particularly for employment in autographic registers of the type described and illustrated in the application for Letters Patent of Leo Enrich, filed June 21, 1897, Serial No. 641,545, now pending in the United States Patent Office; and the objects of my improvement are, first, to provide a machine which will be simple and economical in construction and one which will expeditiously and economically perform its work; second, to provide a machine which will fold the paper into such tightly-pressed folds or creases that it will for the longest possible time and under the most adverse and rough use tend to preserve and maintain its folded form, even though it be frequently unfolded and even subsequently subjected to pressure by being passed between feed-rollers; third, to provide a machine of the character described that will be entirely automatic in operation and not require the constant attention of an attendant and one that will be directly fed from a continuous roll of strip-paper and not require to be stopped whenever it becomes necessary to cut the paper to form a book or bank of the required size or to remove such completed books or banks of paper from the machine. I attain the objects by the construction, mechanism, and arrangement illustrated in the accompanying drawings, of which there are four sheets, and in which—

Figure 1 is a side elevation of the complete machine; Fig. 2, a top or plan view of the same; Fig. 3, an enlarged detail view showing the folding and creasing mechanism; Figs. 4 and 5, detail side elevations of the cutting

mechanism; Fig. 6, a detail front elevation of the latter; Fig. 7, a detail plan view showing the mechanism employed to detach or dislodge the folded paper from the creasing mechanism; Figs. 8, 9, and 10 detail side elevations of the creasing mechanism; Fig. 11, a detail side elevation of one of the folding-blades, and Fig. 12 a detail front elevation of the folding mechanism.

Similar reference-numerals refer to similar parts throughout the several views.

1 represents the frame of the machine; 2, a chute down which the folded paper falls; 3, the main driving-shaft of the machine; 4 and 5, respectively, tight and loose pulleys for said shaft; 6, a hand-wheel for starting the machine; 7 and 8, two cam-carrying shafts by means of which to operate the creasing mechanism and the mechanism for detaching or dislodging the folded paper from said creasing mechanism; 9, a gear-wheel fast on the shaft 8, by means of which said shaft is driven through the instrumentality of the pinion 10, fast on the main driving-shaft 3; 11, a bevel gear-wheel fast on the shaft 8 and meshing with a second bevel gear-wheel 12, carried by shaft 13, which in turn carries at its opposite end a third bevel gear-wheel 14, which latter in turn meshes with a fourth bevel gear-wheel 15, carried by the shaft 7, which latter is driven through the agency of the said four bevel gear-wheels; 16, a worm fast on the shaft 13 and meshing with a worm-wheel 17, which latter turns upon the stud 18; 19 and 20, two oscillating shafts carrying the folding-blades 21 and 22 by means of the arms 23 and 24; 25 and 26, respectively, the levers and cranks by means of which the shafts 19 and 20 are oscillated through the instrumentality of the wheels 27, carrying the crank-studs 28, one of said wheels 27 being fast on and rotated by the shaft 8 and the other being fast on and rotated by the shaft 7.

29 and 30 are two shafts which serve as a means of pivotally supporting the mechanism which detaches or dislodges the folded paper from the creasing mechanism.

31 and 32 represent the creasing mechanism, which latter is pivotally supported in the frame of the machine by means of the shafts 33, which are trunnioned in the frame at 34.

35 is a cam fast to its supporting-shaft and designed to operate the heretofore-mentioned detaching or dislodging mechanism.

36 is a cam fast to its supporting-shaft 7 and designed to operate the creasing mechanism.

The cam 35 engages with the lever 37, forming part of said detaching mechanism, and the cam 36 engages with the lever 38, forming part of the creasing mechanism. These cams operate said levers against the counteracting force of springs, such as 39 and 40.

41 represents the roll of paper to be folded, 42 the spindle which carries said roll, and 43 brackets which project from the main frame of the machine and serve to support the spindle 42.

44 and 45 are feed-rollers for feeding the paper to the folding mechanism and intended to keep the folding mechanism supplied with slack paper. The roller 44 is eccentrically mounted in the well-known manner, so as to vary the pressure between the rollers 44 and 45 by means of a lever 46, which serves to rotate its eccentric bearings.

47 represents the strip of paper to be folded, and 48 to 55 represent guide-rollers for said paper.

56 represents the paper after it has been folded and while it is falling down the chute to form the desired book or bank of reversely-folded paper.

The feed-rollers 44 and 45 are geared together by means of pinions 57 and 58, and the feed-roller 45 is driven from the shaft 7 by means of a pinion 59, which meshes with the pinion 60, carried by said roller 45.

61 is simply a belt-shifter.

62 and 63 are rigid ledges, upon which the paper is alternately laid in reverse folds by the folding-blades preparatory to being individually and separately creased by the creasing mechanism.

64 is an opening in the chute through which to remove the books or banks of folded paper.

The mechanism for detaching or dislodging the paper from the creasing mechanism and from the ledges 62 and 63 and pushing it into the chute 2 consists, as shown in Fig. 7, of a bar 65, supported at both ends by means of the arms 66, mounted upon the shaft 67, the latter being, in turn, supported at each end by means of the arms 68 and 69, which latter are in turn pivotally carried by the main frame of the machine by means of the shaft 29, a similarly-constructed detaching mechanism being also provided on the opposite side of the machine and carried by the shaft 30, with the exception, however, that in the drawings I have illustrated the bar 65^a, carried by shaft 30, with a sharp or cutting edge 76, though of course it will be understood that the opposite blade or bar 65 may have been so constructed instead of bar 65^a, if desired. The whole detaching or dislodg-

ing mechanisms, as described, are oscillated or rocked on their pivotal points of attachment to the main frame by means of the levers 37, which form a part of or are attached to said mechanism and project upon the other side of their pivotal points of support. The levers 37 are moved up and down by the cams 35, with which they engage, and in this way the dislodging or detaching mechanism is moved up and down at the proper time.

The creasing mechanism, as shown in detail in Figs. 3, 8, 9, and 10, consists of a substantially-built rocking plate 70, mounted upon a square shaft 33, which shaft at its ends is provided with trunnions which serve to pivotally mount it in the frame of the machine. This plate projects back upon one side of the shaft 33 to form a lever 38, which lever in turn carries a roller 71, which roller engages with the cam 36, carried by the shaft 7. The rotation of the cam 36 moves the lever 38 up and down, and this, in turn, alternately moves the plate 70 up and down and causes it to alternately press down upon the ledge 63 and then move away from it, thus creasing and then releasing the paper, which has been previously laid in a fold upon the ledge 63 by the oscillating blades of the folding mechanism.

72 represents a spring or elastic finger made of elastic metal and fastened beneath the plate 70, with a slight space between the two at their outer extremities and over the part of the said spring which contacts with the ledge 62 or 63.

There are two creasing mechanisms, one upon each side of the machine.

The folding mechanism, as shown in detail in Figs. 3, 11, and 12, consists of an L-shaped lever composed of an arm 23, which carries at its free end a curved blade 21, having a tapering edge 74. The arm 23 is fastened to the shaft 19. There are two of these folding-blades, one upon each side of the machine and arranged to swing in curved lines across each other's path; but they do not interfere one with the other, since they are hung from one end only and since the arm which supports the second blade 22 sweeps through the open space represented at 75 of Fig. 12.

The cutting mechanism, as shown in detail in Figs. 4, 5, and 6, consists of the following parts: As a knife I utilize one of the bars 65, forming part of one of the mechanisms for detaching or dislodging the folded paper from the creasing mechanism. I do this by sharpening its edge, as shown at 76, and providing a mechanism for moving the edge of this bar into contact with the edge of the ledge 63 at the proper time for cutting the paper. Normally the bar 65^a stands away from the ledge 63; but whenever the paper is to be cut the ledge 63 and the bar 65^a, provided with the sharpened edge 76, must be brought into contact. I effect this at the proper time by mounting the shaft 67, which carries this special bar, loosely in the arms 68 and 69, as shown

at 77 in Fig. 6. Upon the end of this shaft 67, carrying the said special bar, I fasten a rocker-arm 78, the lower end of which is provided with a slot 79, which latter engages a pin 80, projecting from one end of a crank-lever 81, fastened to one end of a shaft 82, the other end of which shaft has rigidly fastened to it a disk 83, provided with a lug 84, adapted to engage with a lug 85, suitably placed on the wheel 17, the position and number of engaging lugs so mounted on the wheel 17 being dependent upon the size of the books or banks of folded paper required.

86 represents an upwardly-projecting lug which serves as a stop and guide for the knife to prevent its impinging upon the ledge 63.

Having thus fully described in detail the various parts of the machine, I will now proceed to describe its operation.

The paper is led from the roll 41 upward and passed between the feed-rollers 44 and 45, thence over the guide-roller 48 and under guide-roller 49, thence over roller 50 and between it and roller 51, thence straight down between rollers 52 and 53, thence continuing downward until it passes between the last guide-rollers 54 and 55 (shown in dotted lines in Fig. 3) at the end of the tapering plate 86, which is provided for the support of said rollers, thence the paper passes to one or the other side and its end is placed on one of the ledges—say 62—and then held while the hand-wheel 6 is slowly turned until the spring-finger 72 for said ledge grasps the paper and the creasing-plate 31 firmly presses the paper between said spring-finger and the ledge 62. The machine being now ready to start, the belt-shifter 61 is moved in the direction to shift the belt from the loose to the tight pulley, when the various mechanisms begin to perform their several functions as follows: First the curved folding-blade 22, carried by the arm 24 and oscillating or rocking from the shaft 20, moves down in a curved path and strikes the paper just below the guide-rollers 54 and 55 and between said rollers and the point where the paper is firmly held on the ledge 62, as above described, and carries the paper across to the opposite ledge 63, laying it thereon, whereupon it is grasped by the creasing mechanism 32, which creasing mechanism has been rocked into action by the cam 36, attached to the shaft 7, having revolved to bring the point of the cam 36 against the roller 71, thus depressing the forward end of the creasing-plates 32 or 31, as the case may be, and grasping the folding-blade with the paper between the ledge and the spring-finger, slightly creasing the paper, so that when the folding-blade is withdrawn, during which operation the paper may also be slightly withdrawn thereby, the slight crease made while the folding-blade was between the ledge and the creasing mechanism will insure the paper dropping or folding at the proper point to be thoroughly and more completely creased. The cam 36 continuing

to revolve permits the roller 71 on the end of the arm of the creasing-plate 31 or 32 to drop into the low portion of the cam, as seen in Fig. 9, thus slightly reducing the creasing pressure first applied by the creasing-plate, during which period the folding-blade 22 slips out and returns to its elevated position, (shown in Fig. 3,) where it is out of the paths of movement of the other parts. During the upward movement of said folding-blade 22 the creasing-plate 31 has released the paper upon the opposite side and the detaching or dislodging bar 65, oscillating from the shaft 29, has moved down and detached or dislodged the paper from the ledge 62 and the creasing-plate 31, pushing it down into the chute 2. Next the curved folding-blade 21 moves downward in a curved path, striking the paper just below the guide-rollers 54 and 55 and between the latter and the ledge 63, where the paper is now held firmly by the creasing-plate 32, and carrying the paper across to and laying the fold thus made upon the ledge 62, where it is grasped by the spring-finger attached to the creasing-plate 31, which latter next comes down firmly on the spring-finger over the paper and completes the crease, the folding-blade 21 in the meantime having escaped before the rigid creasing-plate 31 contacted with the free extremity of the spring-finger, and thus the process continues, the paper being carried first to one side of the machine by one of the folding-blades, where its fold is grasped and pressed by the creasing mechanism, and next carried to the opposite side of the machine by the other folding-blade, where its fold is grasped and pressed by the creasing mechanism upon that side of the machine. When a sufficient number of folds have been thus made to form a book or bank of paper of the required size, the lug 85 upon the wheel 17 will have moved around with the said wheel to a point where it will engage with the lug 84 on the disk 83, which will rotate the shaft 82 and move the crank-lever 81 to the left, carrying with it the rocker-arm 78, which will move the bar 65, having the sharpened edge 76, up against the curved stop 86, which is made flush with the sharpened edge of the ledge 63. Hence when the dislodging-bar now moves down in its customary manner to dislodge the paper it will cut it off, and as soon as the lug 85 slips over the lug 84 the bar 65 is returned to its original and ordinary position by means of the springs 88, which are fastened at one end to the frame of the machine and at the other to the crank-lever 81. In this way the cutting is effected without having to stop the machine and replace the paper to recommence the folding, it of course being understood that before the cutting-bar 65 is actuated the folding-blade 21 has folded the strip of paper onto the opposite ledge 62 and beneath the spring-finger and is returning to its normal position when the cutting-bar 65 on the opposite side of the machine descends and

cuts the paper on the ledge 63, where it has been creased by the creasing-plate 32, which plate 32 is returning to its normal position, during which operation the creasing-plate 31
 5 has been depressed on the spring-finger on the opposite ledge 62, firmly holding and creasing the paper. The folding-blade 22 now descends and strikes the paper below the guide-rollers 54 and 55 and between the rollers and the ledge 62, where it is still held,
 10 since the cutting-bar on the opposite side of the machine cuts the paper on the opposite ledge 63, the operation of the machine being as before described.

15 Having thus fully described the construction and operation of my invention, what I claim is—

1. In a paper-folding machine, the combination of folding mechanism mounted on
 20 shafts, means for rocking said shafts and oscillating the folding mechanism, said folding mechanism arranged to contact with the strip of paper and fold same into reverse folds, with cooperating receivers to grip the paper folds
 25 and crease same, substantially as and in the manner specified.

2. In a paper-folding machine, the combination of folding mechanism mounted on shafts, means for rocking said shafts and oscillating the folding mechanism, and feed-rollers arranged to feed the paper to said folding mechanism, with cooperating receivers to grip the folds of paper and crease same, substantially as and in the manner shown and
 35 described.

3. In a paper-folding machine, having brackets for supporting the paper, the combination of folding-blades mounted on shafts eccentrically operated whereby said folding-
 40 blades are oscillated, feed-rollers arranged to feed a strip of paper to said folding-blades, and cooperating creasers arranged to receive the folding-blades and the folds of paper, with detaching-bars arranged to alternate with
 45 said folding-blades, substantially as shown and in the manner specified.

4. In a paper-folding machine, the combination of oscillating folding-blades, rollers arranged to feed the paper to said folding-
 50 blades, and cooperating creasers arranged to alternately receive the folds of paper, with detaching-bars alternating with said folding-blades, one of said detaching-bars having a blade to act as a knife and means for bringing
 55 said knife into cutting position at predetermined intervals, substantially as and in the manner specified.

5. In a paper-folding machine, feed-rollers arranged to feed a strip of paper from a roll,
 60 guide-rollers to receive said strip of paper and guide same to a point near the path of oscillating folding-blades mounted on eccentrically-operated shafts, in combination with cooperating cam-controlled creasers arranged
 65 to receive the folding mechanism and the folds of paper, and detaching-bars alternat-

ing with said folding mechanism, substantially as and in the manner specified.

6. In a paper-folding machine, feed-rollers arranged to feed a strip of paper from a roll, guide-rollers to receive said strip of paper to be guided, and receiving-creasers, in combination with folding-blades oscillating in a path between the point to which the strip of paper is guided and the receiving-creasers, said creasers arranged to receive the folding-
 blades with the folds of paper and crease the latter, of alternating detaching-bars, and worm-wheel mounted on a suitable shaft, one of said detaching-bars provided with intermediate mechanism between said bar and worm-wheel, whereby said bar is brought into contact with the corresponding creaser, to cut the folds of paper at predetermined intervals, substantially as and in the manner specified.

7. In a paper-folding machine, the combination of alternately-oscillating folding mechanism mounted on rocking shafts, creasers arranged to cooperate with said folding mechanism, means for rocking said creasers whereby the creaser-jaws are closed and the paper gripped, and detaching-bars arranged to alternate with said folding mechanism, with means for separating the creasers at a predetermined interval, substantially as and in the manner specified.

8. In a paper-folding machine provided with a main shaft having pinion meshing with pinion on a secondary shaft, alternately-oscillating folding mechanism to fold the paper into reverse folds, cooperating creasers arranged to receive the folding mechanism with the paper folds, and rocking detaching mechanism, in combination with cams rigidly attached to the secondary shaft to rock the detaching mechanism and creasers at predetermined intervals, substantially as shown and in the manner specified.

9. In a paper-folding machine provided with a multiple of shafts, said shafts having intermeshing pinions, oscillating folding mechanism, cooperating creasers arranged to receive the folds of paper, detaching-bars, and cams arranged on said shafts to rock the creasers and detaching-bars at predetermined intervals, in combination with a vertically-arranged chute to receive the folds of creased paper, substantially as shown and in the manner described.

10. In a paper-folding machine provided with a multiple of shafts, said shafts having intermeshing pinions, the combination of oscillating folding mechanism, cooperating creasers arranged to receive the folds of paper, detaching-bars one of which is provided with a knife-blade, and cams arranged on said shafts to rock the detaching-bars and the creasers and produce an intermittent pressure on the folds of paper, with a worm-wheel having means for engaging with intermediate mechanism and bringing said detaching-bar with its knife-blade into contact with

the creased paper at a point adjacent the creaser to cut the paper at predetermined intervals, and permit the continual operation of the folding and creasing mechanism, substantially as shown and in the manner described.

11. In a paper-folding machine, the combination of oscillating folding mechanism, cooperating creasers, detaching-bars, one of said bars arranged to sever the folded paper, and a multiple of shafts provided with cams and intermeshing pinions, with connecting shaft provided with a worm and beveled pinion, whereby motion is transmitted from the main shaft, substantially as shown and in the manner specified.

12. In a paper-folding machine provided

with a main driving-shaft and worm-shaft, said shafts provided with intermeshing pinion, the combination of oscillating folding- 20 blades, cooperating creasers arranged to alternately receive the folds of paper, and detaching-bars alternating with said folding-blades, one of said folding-blades rockingly mounted to act as a knife, with mechanism 25 intermediate the worm-shaft and said rockingly-mounted folding-blade, whereby said folding-blade is brought into cutting position at predetermined intervals, substantially as shown and in the manner specified.

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Witnesses:

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LEO J. WENDEL.