(No Model.) 7 Sheets—Sheet 1.

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MACHINE FOR CUTTING PAPER TUBES.

No. 583,426. Patented May 25, 1897.

Fig. 1.

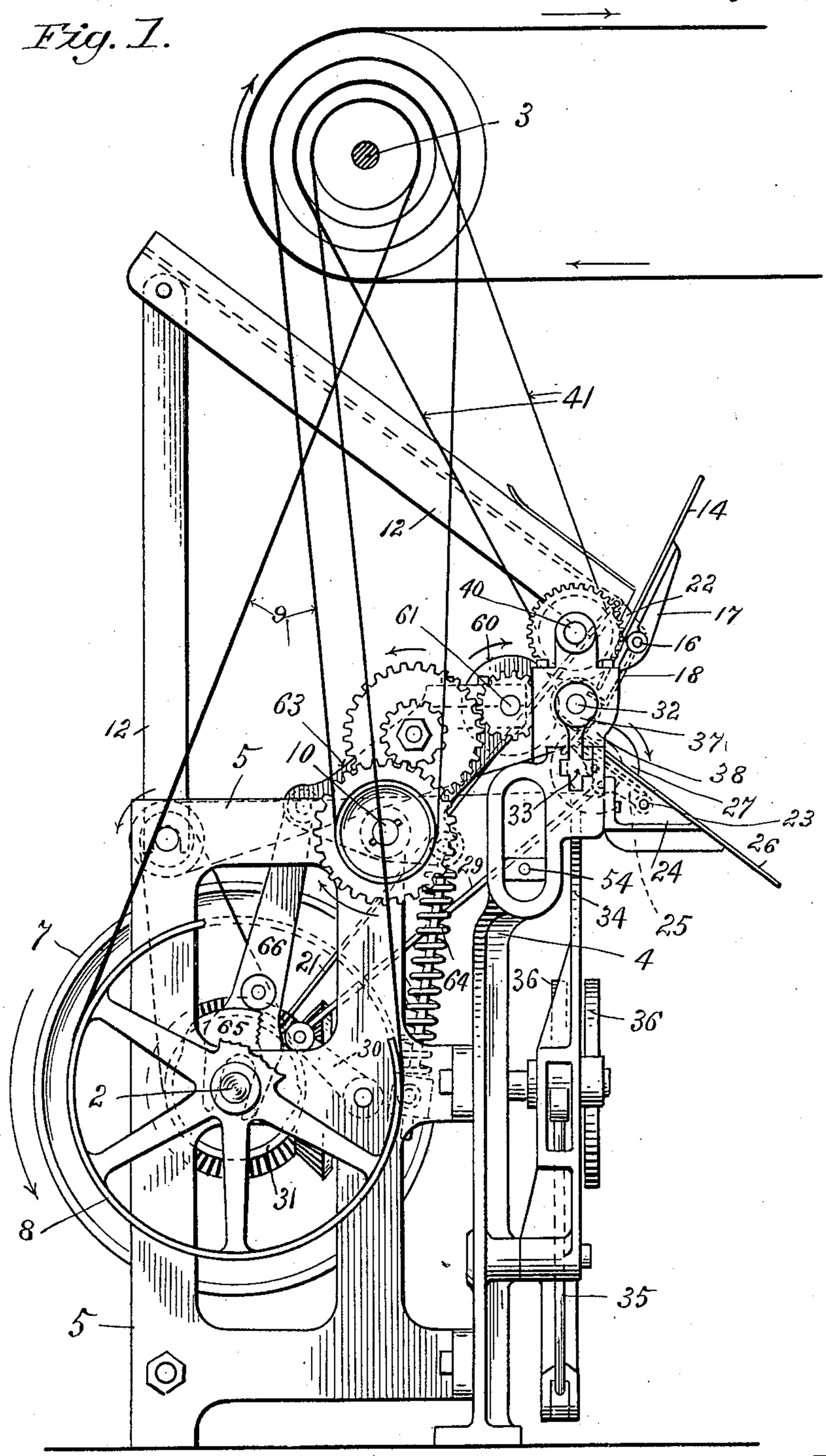

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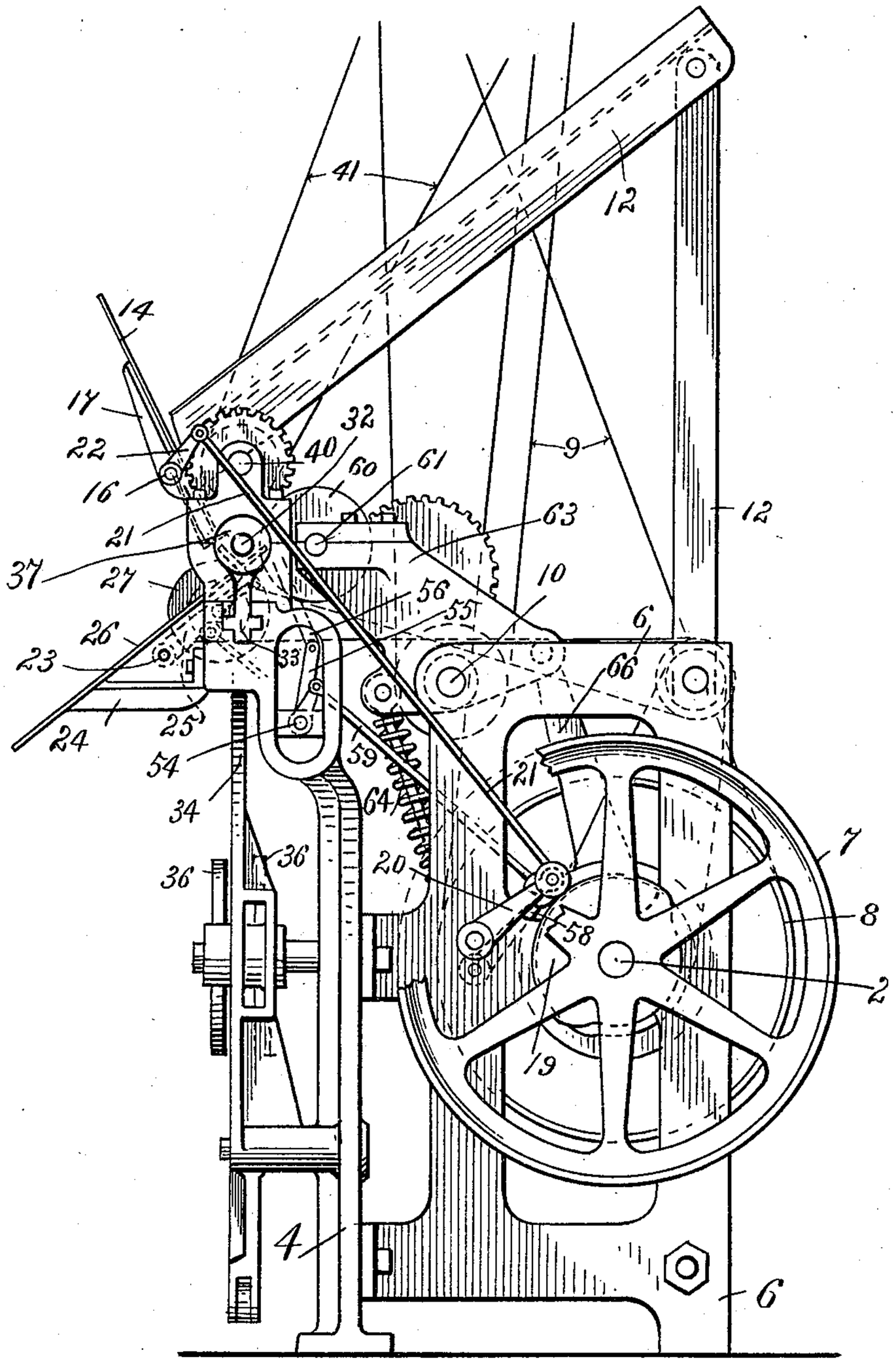
Fig. 2.



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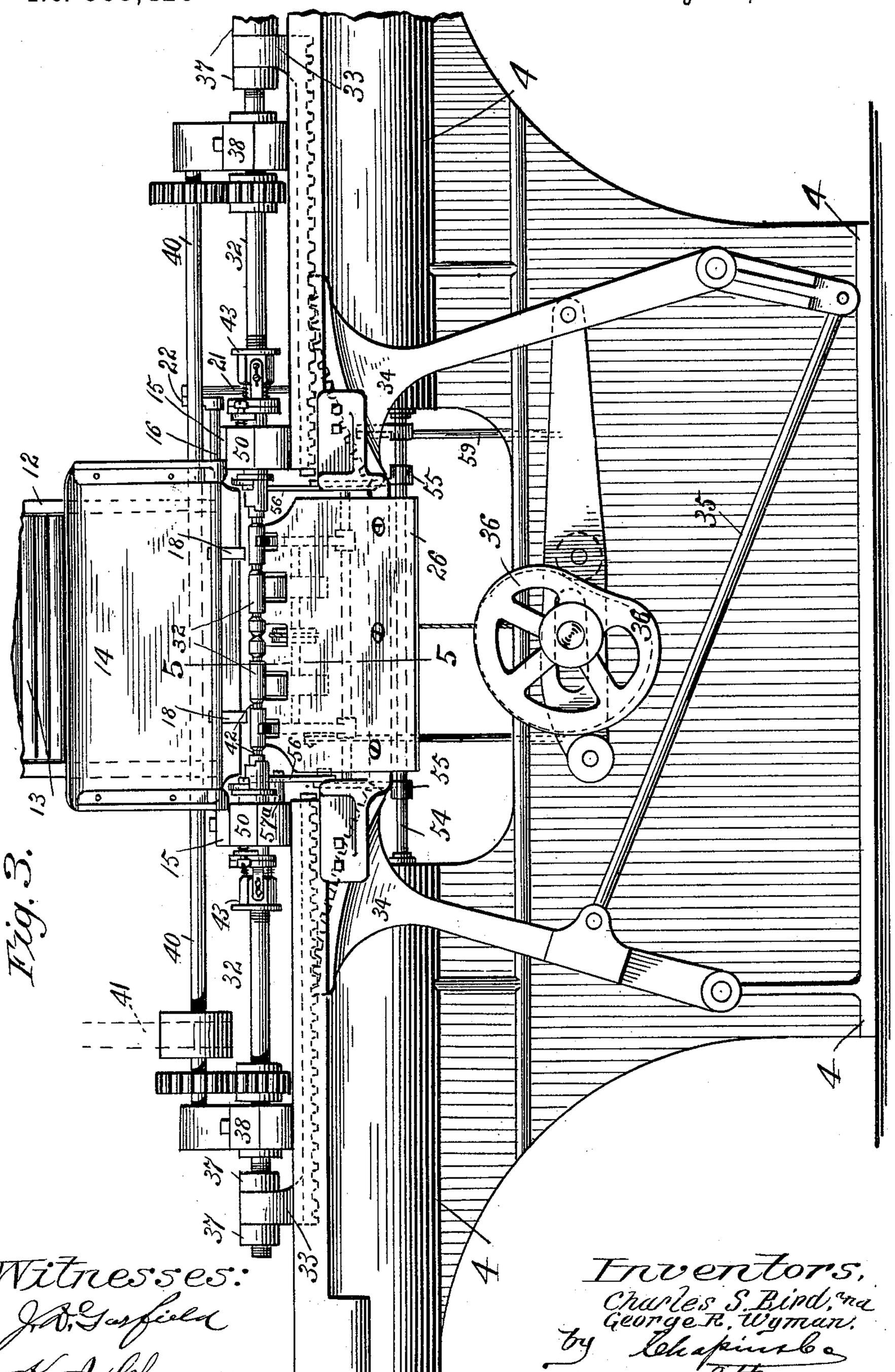

Fig. 3.

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Fig. 4.

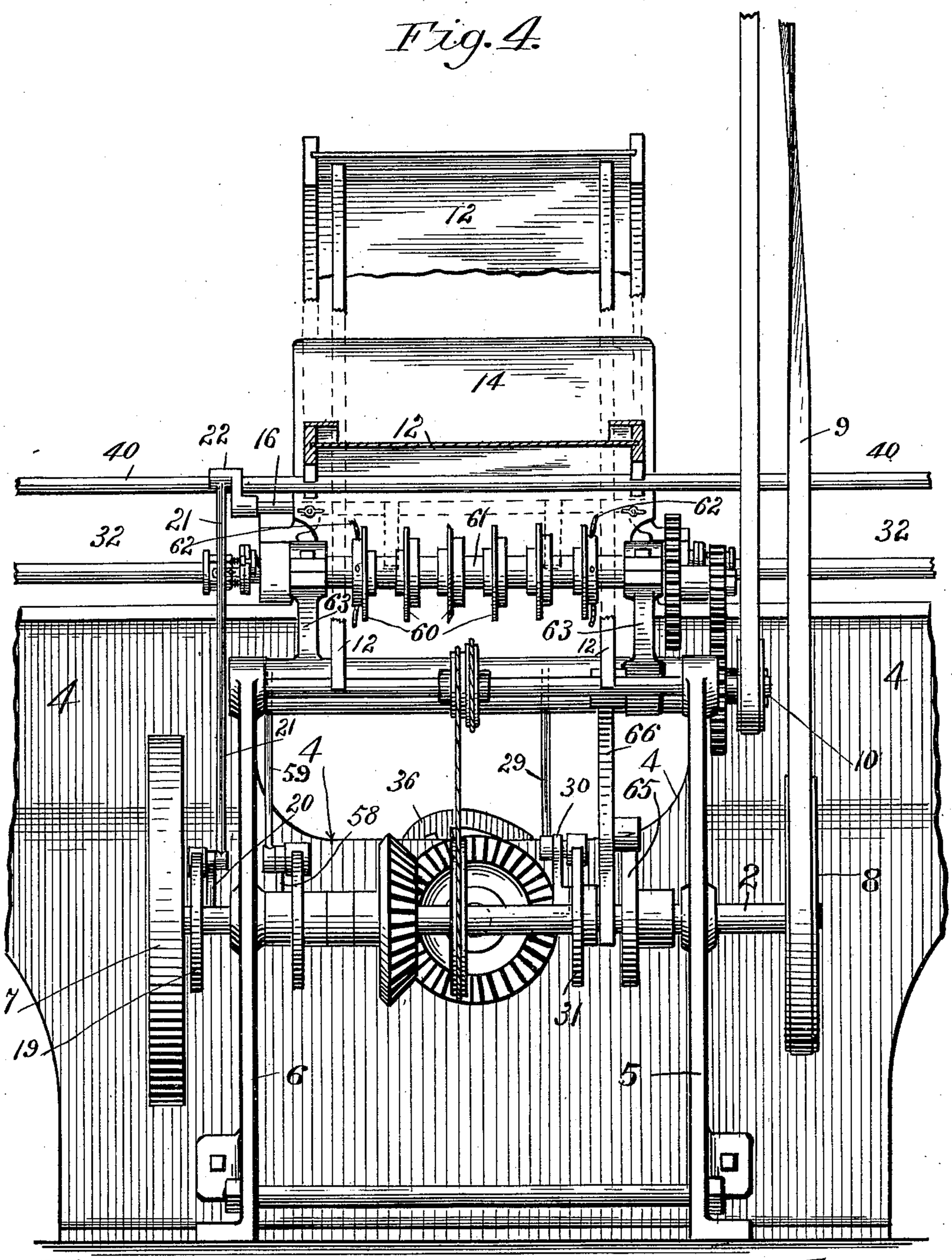

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Fig. 5.

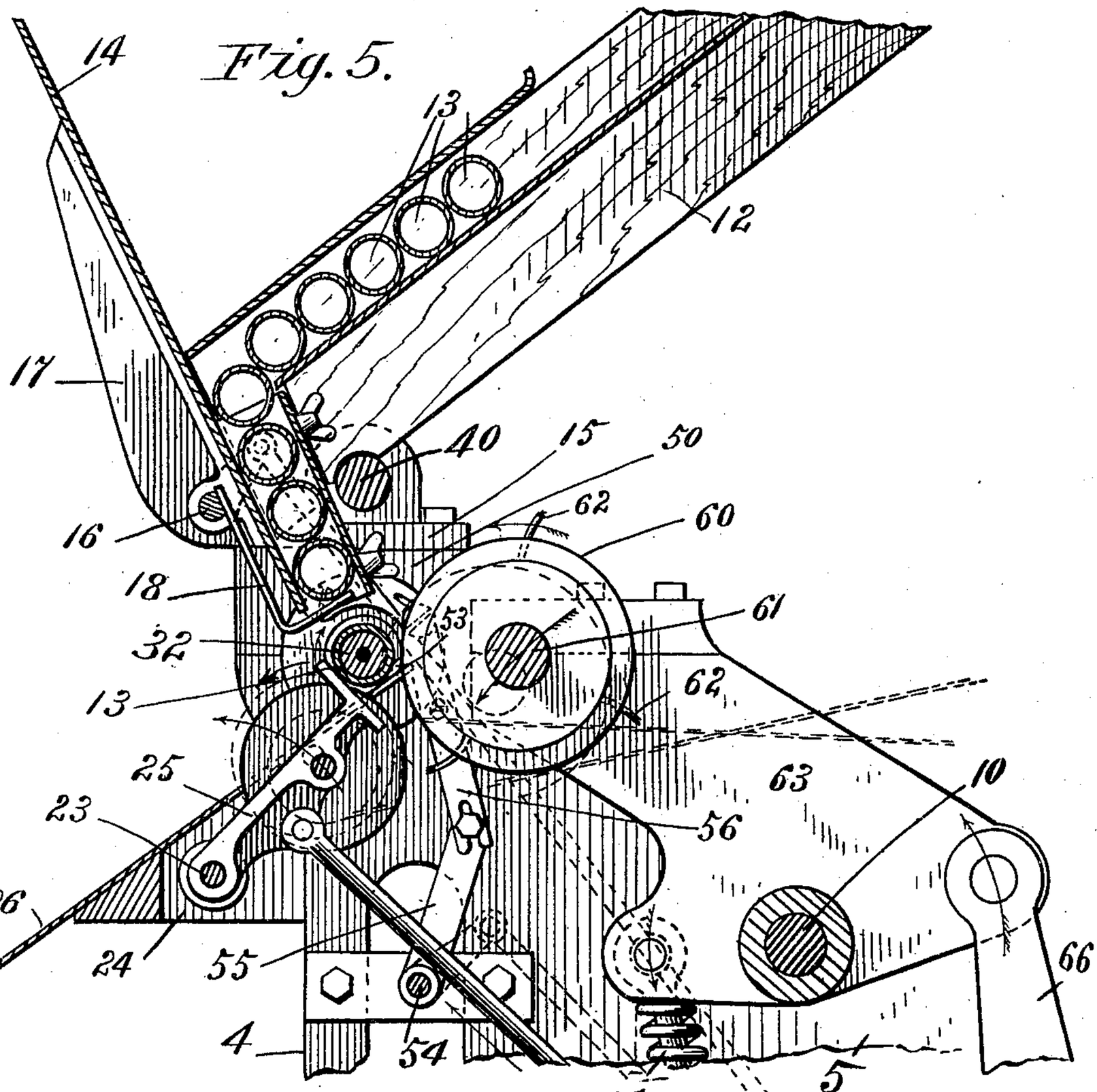

Fig. 6.

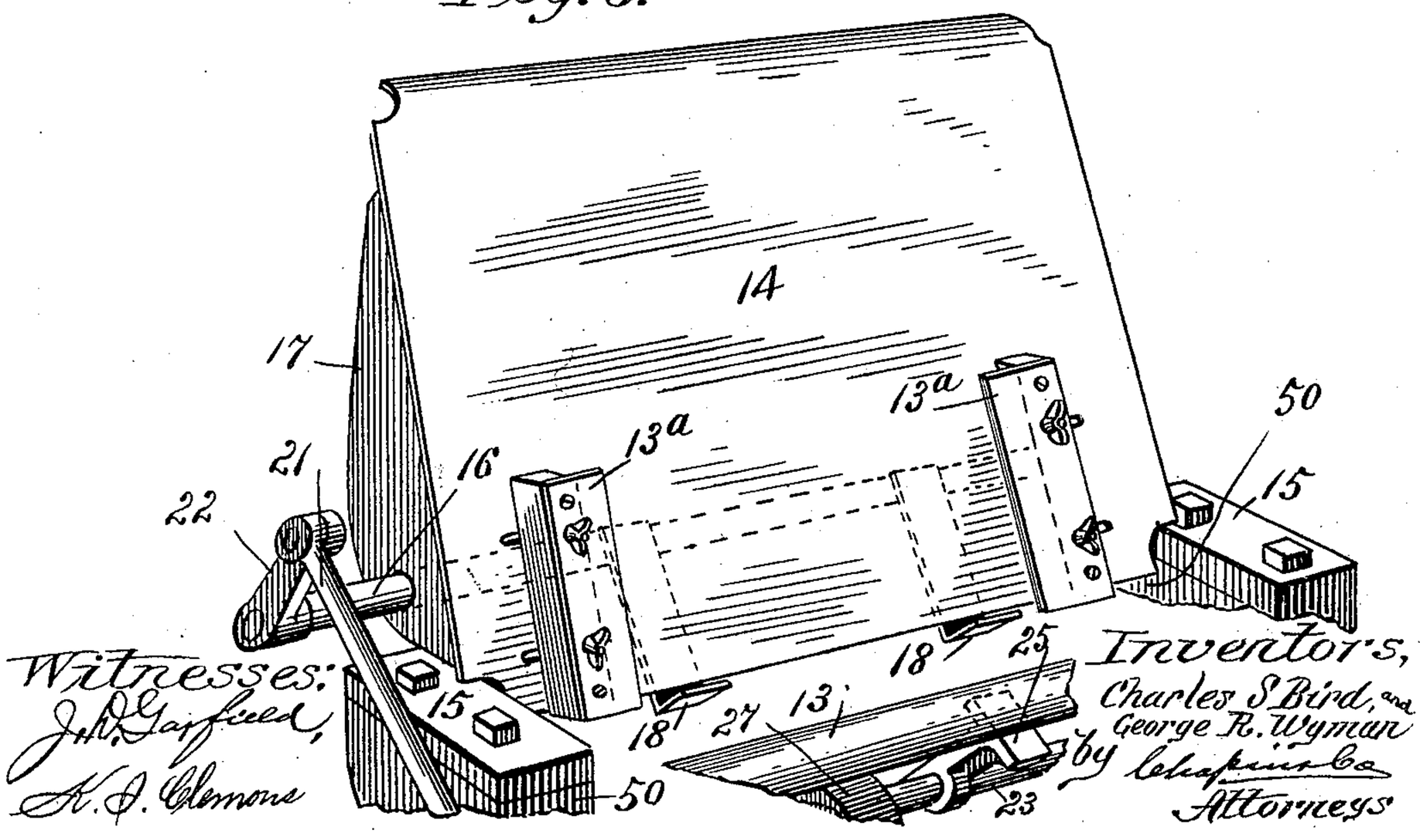

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Fig. 7.

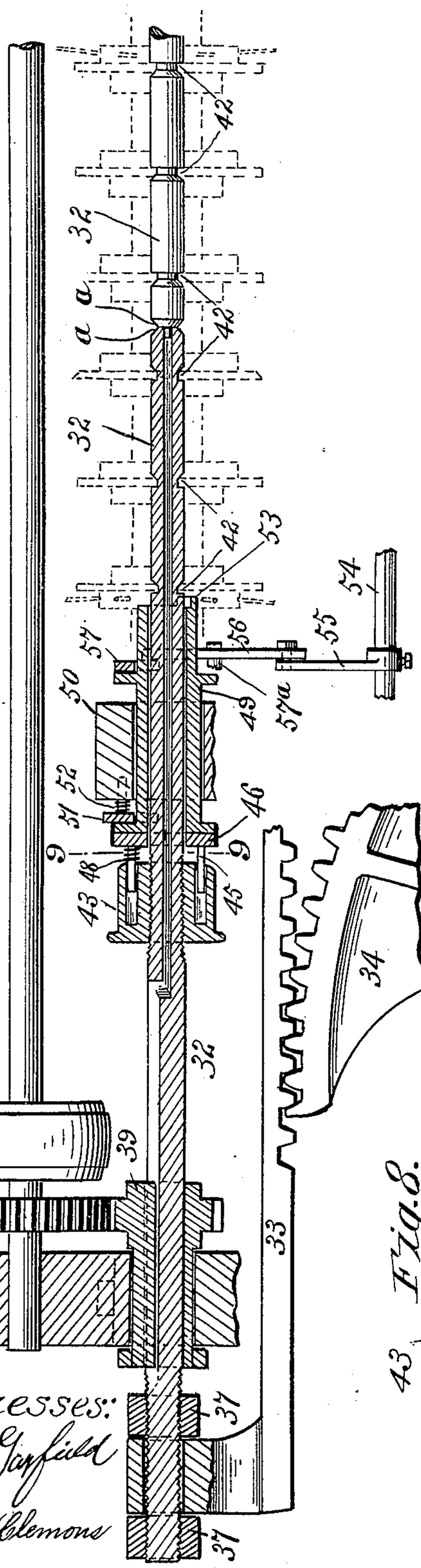

Fig. 9.

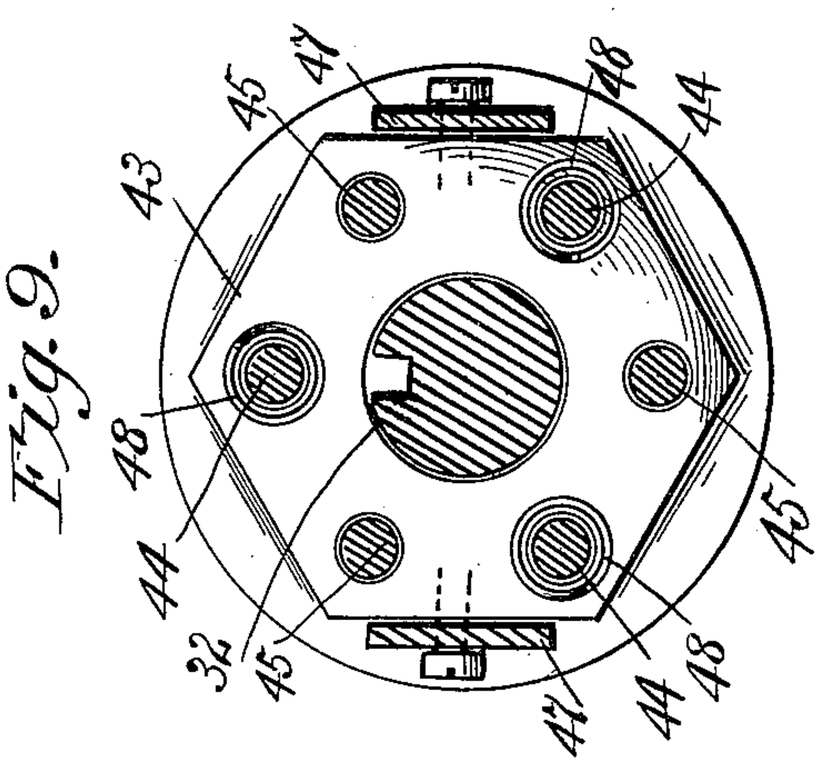

Fig. 8.

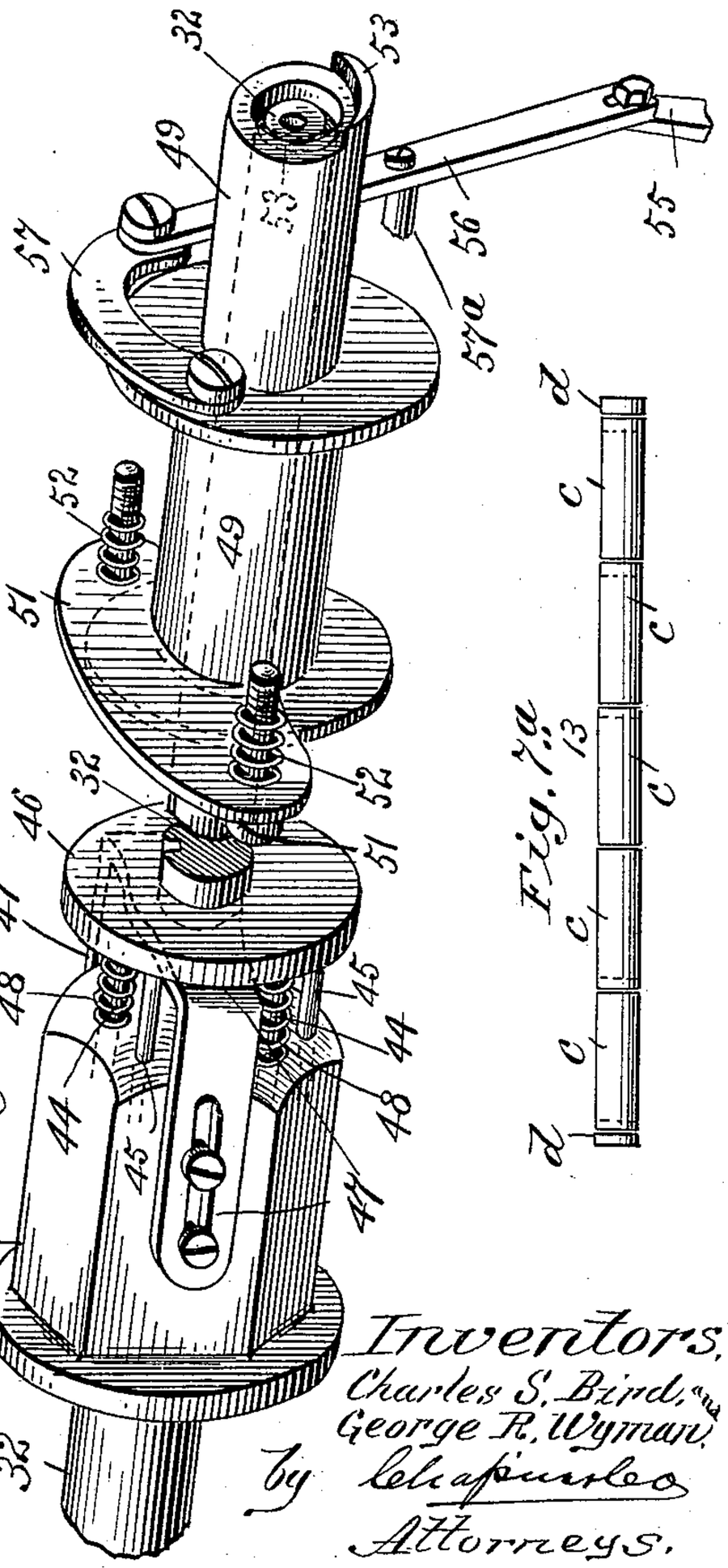

Fig. 7a.

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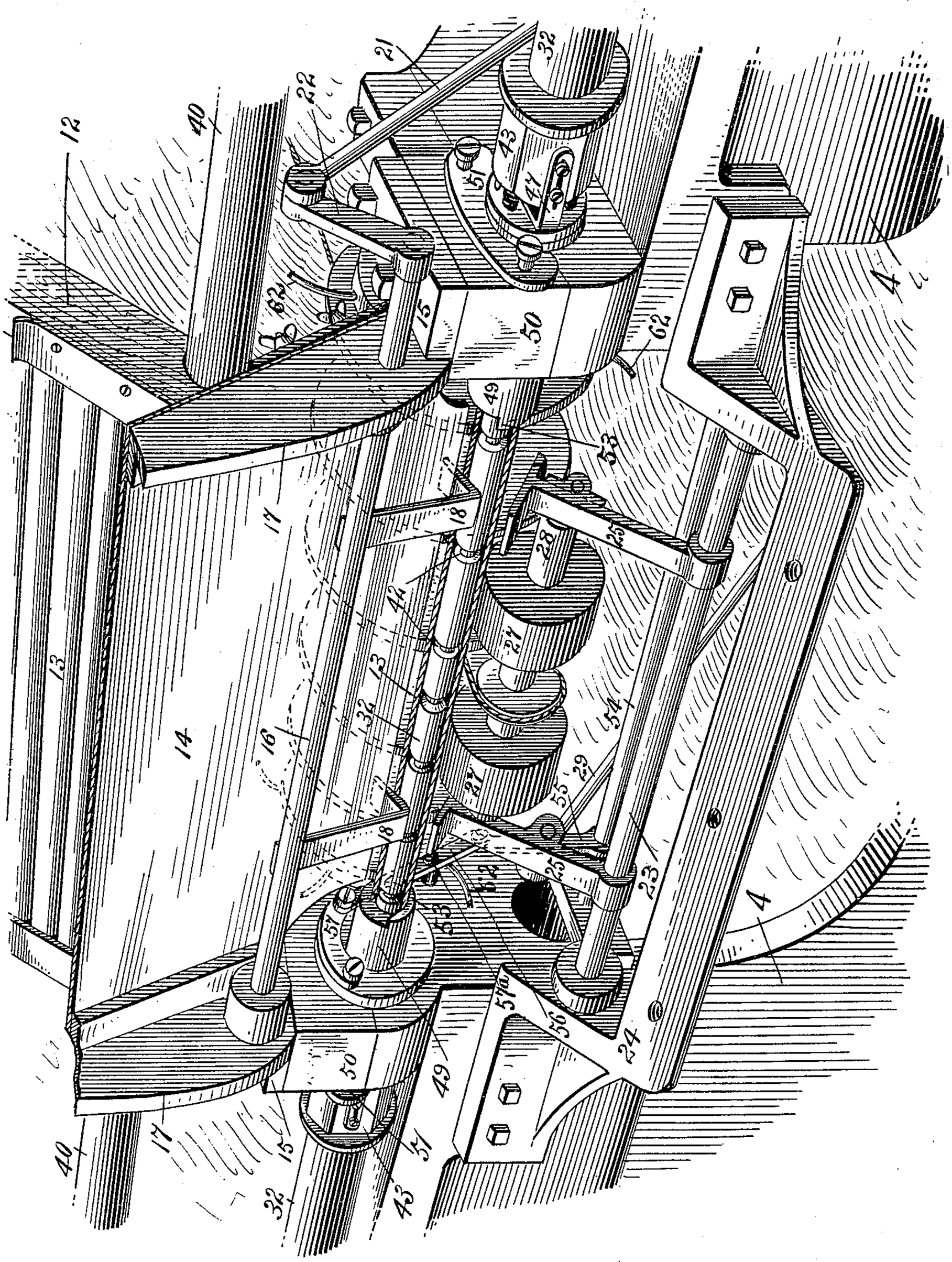

Fig. 10.

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UNITED STATES PATENT OFFICE.

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SAID WYMAN ASSIGNOR TO SAID BIRD.

MACHINE FOR CUTTING PAPER TUBES.

SPECIFICATION forming part of Letters Patent No. 583,426, dated May 25, 1897.

Application filed August 29, 1896. Serial No. 604,252. (No model.)

To all whom it may concern:

Be it known that we, CHARLES S. BIRD and GEORGE R. WYMAN, citizens of the United States, residing at East Walpole, in the county of Norfolk and State of Massachusetts, have invented new and useful Improvements in Machines for Cutting Paper Tubes, of which the following is a specification.

This invention relates to machines for cutting paper tubes into longitudinal sections of given lengths, the object being to provide an improved machine for so cutting paper tubes to provide shells for shotgun and other cartridges; and the invention consists in the peculiar construction and arrangement of the several parts of the machine which contribute to said object, all as hereinafter fully described, and more particularly pointed out in the claims.

In the drawings forming part of this specification, Figures 1 and 2 are side elevations of the opposite ends of the machine. Figs. 3 and 4 are respectively front and rear elevations. Fig. 5 is a sectional view on line 5 5, Fig. 3. Fig. 6 is a perspective view of detailed parts of the machine hereinafter described. Fig. 7 is a side and sectional view of the tube-supporting arbors and contiguous parts hereinafter described. Fig. 7ª illustrates a cut paper tube as it appears before the cut sections are dropped from the arbors. Fig. 8 is a perspective view of portions of the mechanism operating with the tube-supporting arbors and is fully described below. Fig. 9 is a section and side elevation on line 9 9, Fig. 7. Fig. 10 is a perspective view, partly in section, of detailed parts of the machine and more especially the tube-supporting arbors and contiguous parts, as below described, a paper tube being shown in longitudinal section in this figure on the arbors by which it is supported and on which it is cut.

In the drawings, 2 is the main or driving shaft of the machine, to which motion is imparted from a suitable counter-shaft 3 (see Fig. 1) by belt or other connections, as illustrated in said Fig. 1, said counter-shaft being adapted in the usual way to be started and stopped, whereby the machine is caused to operate or its action to be arrested.

The frame of the machine is composed of three parts, 4 indicating the main or rear portion thereof and 5 and 6 indicating the side portions. Said main driving-shaft is hung to rotate in bearings in said frame parts 5 and 6, as clearly shown in Fig. 4. A balance-wheel 7 is secured on one end of said main driving-shaft 2 and a driving-pulley 8 is fixed on the opposite end thereof, and is connected by a cross-belt 9 with the counter-shaft 3, which is shown in Fig. 1.

An arbor 10 (see Figs. 3, 4, and 5) is fixed across the frame of the machine and its purpose is hereinafter described.

The several groups of mechanisms which are comprised in this machine consist, first, of means for conveying paper tubes, one by one, to mechanisms for cutting them into suitable lengths for single cartridges; second, to mechanism for supporting, engaging, and rotating said tubes; third, to mechanism for supporting and rotating cutters to act upon said tubes, and, fourth, to mechanism for disengaging the cut tubes and bringing the tube-supporting parts into position to receive another uncut paper tube.

The said first group of mechanisms comprises a hopper 12, adapted to receive a mass of paper-tubes 13 thereon or therein, substantially in the order shown in Figs. 3, 5, and 10, whereby they are moved downwardly and rearwardly by gravitation. End guides 13ª are adjustably attached to said hopper between which said paper tubes move toward the mandrel 32, thereby insuring a proper presentation of each tube thereto. A shield or tube-guide 14 is secured at the lower end of said hopper, against which said paper tubes 13 move and by which their direction of movement is changed, whereby they move nearly at right angles to their first movement and are brought one after the other into proper proximity to other mechanisms below described, which engage said tubes one by one. Said shield or tube-guide is secured to the end pieces 17, and the latter and said shield are supported on the parts 15, which are firmly attached to or form parts of the frame of the

machine. A rock-shaft 16 is hung in said end pieces 17, and to said last-named shaft are attached two arms 18, whose lower or free ends extend forwardly at right angles to the main parts of said arms and under the lower edge of said shield or tube-guide 14. The lower ends of said arms 18 serve to temporarily retain the tubes and drop them one by one, as required, for the action of the machine thereupon, owing to a vibratory motion which is imparted thereto through said rock-shaft 16, on which they are hung. The said shaft 16 has a rocking motion imparted thereto by means of its connection with a cam 19 on said main driving-shaft 2, which acts against the extremity of an arm 20, whereby a vibratory motion is imparted to the latter, and a rod 21 connects said arm 20 with an arm 22, fixed on the end of said rock-shaft 16.

By the operation of the said first group of mechanisms a tube 13, which lies against the lower extremities of said arms 18, is, by the movement of said arms outwardly from the position shown in Figs. 5 and 10, dropped to the position of the paper tube shown in said figures, and said arms swing immediately back under the succeeding tube. The action of the second group of mechanisms above referred to then takes place, which last-named group comprises a rock-shaft 23, hung in the auxiliary frame part 24, which is bolted onto said frame part 4, as shown in Fig. 10. On said shaft 23 are supported two upwardly-inclined arms 25, having flat upper ends, which have a vibratory motion under the below-described tube-holding mandrel 32, on which the paper tubes are cut. The said arms swing to such a position at the instant that the tube drops, as aforesaid, from said hopper as to cause them to constitute a temporary support for said tube in connection with an inclined bed-plate 26, whose upper end extends, as indicated in Figs. 3 and 5, so that momentarily said tube lies in an angle formed by the face of the upper ends of said arms 25 and the adjoining side of said plate 26 and in position to be engaged by the mandrel 32, on which the paper tube is cut.

Two rollers, of resilient material, (indicated by 27, (are supported on the shaft 28, which shaft is supported to rotate on the rear side of said arms 25, and said shaft and rollers are driven, preferably, by a round belt, as shown, having indirect connection with said main shaft 2. The said rollers 27 have their surfaces adjusted to such position relative to the plane of the upper ends of the said arms 25 that they engage under a paper tube 13, held on the supporting-mandrel, instantly that said tube takes up a rotation imparted thereto by said mandrel and said rollers, which latter have a rotary motion coinciding with that of the outer surface of said tubes when rotated by said mandrel; the purpose of said rollers, which are preferably of rubber, being to insure a positive rotation of the paper tube on the mandrel with such an amount of force as shall effect the positive rotation of the tube when the cutters, hereinafter described, are brought to bear against the tube for cutting the same into sections for cartridge-shells. The vibratory motions of said rock-shaft 23, arms 25, and rollers 27 are produced by the connection of one of said arms by a rod 29 with a pivoted arm 30, the end of which engages with a cam 31, carried on said main shaft 2. The vibratory motion of said arms 25 is such that immediately after said tube-cutters have effected the cutting of the paper tube the said rollers 27 swing clear of the latter.

The aforesaid tube-holding mandrel 32 is constructed in two longitudinal sections, substantially as described and shown in my Patent No. 537,560, dated April 16, 1895, the meeting ends of which have a mutual engagement when they come together, and, as shown at *a a*, Fig. 7, said ends of said mandrel are beveled off to facilitate the entrance thereof into the opposite ends of a tube 13, whereby the said tube becomes properly placed on said mandrel for cutting the same. The said mandrel parts have the required reciprocating longitudinal movements imparted thereto by means of a rack and sector 33 and 34 for each section of said mandrel, as clearly shown in Fig. 3. Said sectors are connected for simultaneous vibratory movements toward and from each other by a uniting-rod 35, as shown in Fig. 3, and one of said sectors is connected with a cam 36, (indicated in dotted lines in said Fig. 3,) which is supported on the shaft extending at right angles to said shaft 2 and having a gear connection therewith, as shown in Fig. 4. Each of said racks 33 has a sliding motion in a part of the frame of the machine, as shown, and on the outer extremity thereof is an upstanding hub to which each section of said mandrel is connected, as shown in Figs. 3 and 7, such connection with said hub being by means of adjusting-nuts 37, whereby the meeting ends of said mandrel-sections are adjusted for a proper engagement and said mandrel has a free rotary movement in said hub. The said mandrel extends from said hub through a second bearing 38 on said frame, but through a rotating sleeve 39, which has a spline connection with said mandrel, to the end that the latter may move longitudinally through said sleeve and also be rotated thereby. Said sleeve has rotary motion imparted thereto by a gear connection with a shaft 40, which is driven by a belt 41, having suitable connection with said countershaft 3. (See Fig. 1.)

Through the above-described mechanism, which is connected with each section of said tube-holding mandrel 32, the two sections thereof are moved apart and are caused to approach and mutually engage the ends thereof passing into and supporting one of said pa-

per tubes 13, (see Fig. 10,) while the latter is operated upon for cutting it into short sections *c*, having the length of an ordinary cartridge-shell, as illustrated in Fig. 7ª, and leaving a waste piece *d* at each end. The said mandrel 32 has a series of concentric grooves 42 formed thereon, one side of which groove has a face at right angles to the axis of the mandrel, constituting an acute border against which the cutting edge of a revolving cutter operates with a shear cut for severing the said sections, as aforesaid. Said concentric grooves are separated suitably, according to the length of cartridge-shells to be cut. The opposite sides of said concentric grooves 42 are beveled, as shown in Figs. 3, 7, and 10, to the end that the cutting may be facilitated and that when said mandrel-sections are drawn apart through the cut sections of cartridge-tubes the ends of the latter cannot have any engagement with the borders of said grooves, thereby avoiding any injury that might take place to said cartridge-tubes from engagement with the mandrel during the separating movement of the latter. Cushion devices are provided for each of the said mandrel-sections which form a yielding abutment against the opposite ends of the tube which is to be cut when said mandrel-sections are brought together, whereby the tube by the adjustment of said abutments is brought to the required central position to be operated upon and is so held for cutting. Said yielding or spring abutments provided on each mandrel-section 32 consist of a nut 43, screwed onto each section, said nut having perforations in the end thereof to receive the ends of several spring-holding pins 44 and several guide-pins 45. Said pins 44 and 45, Fig. 8, are rigidly fixed to and project from one face of a disk 46, having a free sliding motion on said mandrel 32 and guided in respect to the latter and through said nut 43 by a yoke-strap 47, to which said disk is secured, and which is attached to the opposite sides of said nut 43 for free sliding movement, whereby said disk 46 is supported and held by said nut. A series of coiled springs 48 are placed on said pins 44 between said nut 43 and disk 46, whereby the said disk constitutes a cushion supported by said springs, and the pins thereon have a movement in and out of said perforations in the nut. A sleeve 49, having a limited longitudinal movement thereon, is applied to said mandrel 32, adjoining said disk 46, having its extremity extending to or over the end of the mandrel 32 and having thereon two disk-shaped heads, and is supported loosely in the bearing 50 on the frame of the machine, Figs. 3 and 7, which is narrower than the space between said heads, to the end that said sleeve may have said longitudinal movement on said mandrel. The said sleeve is held in the position illustrated in Fig. 7—that is, with neither of said heads in engagement with said bearing 50—so that it may be pressed forward to a position to be engaged with the end of a tube on the mandrel 32 when one end thereof is in engagement with said disk 46. (See Fig. 7.) A plate 51 is supported on suitable pins or screws on one side of said bearing 50, on which pins are springs 52 between said plate 51 and said bearing 50, the combined force of which last-named springs is less than that of said coiled springs 48. Therefore when the mandrel 32 and the said nut 43 are drawn away from said sleeve 49 the said springs 52 act to retract said sleeve from the position it occupied when the tube was cut, and immediately after said cutting operation the said sleeve 49 is turned slightly on said mandrel 32, whereby a projecting lip 53 on said sleeve is turned more or less upwardly, thereby dropping what is called a "waste end" *d* of said tube, Fig. 7ª, and clearing it from the devices, so that it shall not impede the subsequent engagement of the mandrel with the end of a new tube 13, and said sleeve 49 is turned on the mandrel 32 to effect the above by the below-described connections.

Referring to Figs. 3 and 5, 54 is a rock-shaft supported on the frame of the machine, on which are attached two arms 55, each of which has a pin through its upper end, having a slot engagement with the end of a lever 56, and this last-named lever is pivotally hung on a stud 57ª, fixed on said frame. Said two levers 56 are pivotally connected to two crooked arms or straps 57, which straps have one end loosely pivoted on said heads on sleeves 49. A vibratory motion is imparted to said arms 55 by the connection of said shaft 54 with the end of an arm 58, which engages with a cam on said main shaft 2 by a connecting-rod 59. (See Fig. 2.)

Said third group of mechanisms comprises the above-referred-to cutters 60, which act against the tube 13 on said mandrel parts 32, as above described, and are hung on a shaft 61, and said shaft is hung to rotate in a frame consisting of two end plates 63. (See Figs. 2, 4, and 5.) Said arbor 10 constitutes the support for said frame, and the latter rocks thereon, and thereby said tube-cutters 60 are moved against a paper tube to cut it and away therefrom after said tube shall have been cut. Said shaft 61 and the cutters thereon are rotated by gear connections with said shaft 10, which shaft is driven by the belt 9 from the counter-shaft 3, as aforesaid. (See Fig. 1.) Said last-named frame, carrying said cutters 60, has a swinging movement imparted thereto by means of a suitable connection with a cam 65 on said shaft 2 and a connecting-rod 66 between said frame and cam, whereby the cutters are given a positive movement against the tube to cut it, and said frame is then swung away from the mandrels 32 by a spring 64 acting thereagainst, Figs. 1, 2, and 5. Wipers on flexible arms 62, of leather or similar material, are attached by one end on said revolving cutter-disks for

action against said waste end, thereby insuring its discharge from said lip 53.

Said fourth group of mechanisms comprise said sectors 34 and means for imparting a vibratory motion thereto whereby the said mandrels 32 on which the tubes are held and cut, as described, are separated and retired in opposite directions, whereby the cut sections *c* of the tube are freed and allowed to drop into a suitable receptacle and said mandrels are brought to position to enter another uncut tube.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a machine for cutting paper tubes, a hopper comprising a platform on which said tubes are laid side by side, and devices for guiding said tubes downwardly from said platform, combined with a pair of vibratory hook-shaped tube-engaging arms the extremities of which swing to and fro under the delivery end of said hopper, thereby alternately engaging and releasing each tube in succession, an inclined plate 26, on which each released tube drops, a second pair of vibratory arms one opposite each edge of said plate having flat upper extremities, which extremities together with said plate form an angular receptacle momentarily holding each tube, and mechanisms for vibrating said two pairs of arms, substantially as set forth.

2. In a machine for cutting paper tubes, a revoluble mandrel comprising two separable sections, which sections have simultaneous reciprocating longitudinal movements whereby they enter a tube, and hold the same for cutting, and are subsequently separated, combined with one or more friction-faced rollers engaging the surface of a tube on said mandrel, thereby contributing to the positive rotation of said tube with said mandrel, and means for imparting rotary motions to said mandrel-sections and rollers, and said reciprocating movements to said mandrel-sections, substantially as set forth.

3. In a machine for cutting paper tubes, a revoluble mandrel holding a tube to be cut, comprising separable sections having concentric grooves therein, combined with one or more friction-faced rollers engaging the surface of a tube on said mandrel, means for revolving said rollers, a rock-shaft carrying said rollers on arms attached to said shaft, whereby said rollers are moved against and from said tube, a series of circular cutters fixed on a revoluble shaft in separate relations coinciding to the separation of said grooves, a rocking frame supporting said cutter-shaft, whereby said cutters are carried against and away from a tube on said mandrel, and means for rotating said mandrel and cutters, and for imparting a rocking motion to said frame and a rotary motion to said cutter-shaft thereon, substantially as set forth.

4. In a machine for cutting paper tubes, a revoluble mandrel for receiving said tubes thereon, comprising two longitudinally-separable sections, means for imparting reciprocating longitudinal movements to said sections whereby their extremities are brought together within a tube, combined with cushion devices on each of said sections for engagement against the ends of said paper tube, comprising a loose sleeve 49, on said section for engagement with the end of said tube, having heads thereon, and a free sliding movement in a fixed part 50, of said machine, a nut 43, adjustably secured on said mandrel, and a spring-cushion between said nut and said sleeve, and springs between said fixed part and a head of said sleeve, following the cutting of said tube, whereby following the rearward movement of said mandrel, said sleeve is retracted, substantially as set forth.

5. In a machine for cutting paper tubes, a revoluble mandrel for receiving said tubes thereon comprising two longitudinally-separable sections, means for imparting reciprocating longitudinal movements to said sections whereby their extremities are brought together within a tube, combined with cushion devices on each of said sections for engagement against the ends of said paper tubes, comprising a loose sleeve 49, on said section for engagement with the end of said tube, having a free endwise movement in a fixed part of the machine, and the lip 53, on its outer extremity, and having circular heads thereon, a nut 43, adjustably secured on said mandrel, spring-cushion devices between said sleeve and nut, and springs between said sleeve and fixed part, acting to retract said sleeve on said mandrel, and means for imparting a slight rotary motion to said sleeve whereby said lip thereon is turned upwardly and a piece of tube-waste resting thereon is caused to drop therefrom, substantially as set forth.

6. The rock-shaft 54, the articulated levers 55 and 56, the former connected to said shaft, and means for rocking the same, combined with the sleeve 49, the arm 57, pivotally attached to said sleeve and pivotally connected to said lever 56, by its outer end, whereby the rocking movement of said shaft is imparted to said sleeve, substantially as set forth.

7. In combination with a mandrel-section 32, and means for imparting longitudinal reciprocating movements thereto, the perforated nut 43, adjustably secured on said mandrel, the disk 46, having pins thereon entering said perforations, cushion-springs 48, on certain of said pins, the yoke-strap 47, secured to said disk 46, and having a sliding connection with said nut, the plate 51, attached adjustably to a fixed part of the machine, springs 52, interposed between said plate 51, and said fixed part, and the sleeve 49, adapted to slide on said mandrel, and having a head thereon for engagement with said

disk 46, and with said plate 51, substantially as set forth.

8. In a machine for cutting paper tubes, a mandrel-section 32, the sleeve 49, carried on said mandrel and engaging one end of a tube and having the lip 53, thereon, combined with one of the revoluble cutter-disks having one or more flexible arms or wipers 62, thereon for engagement against said lip, substantially as described.

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