

H. D. COLMAN.

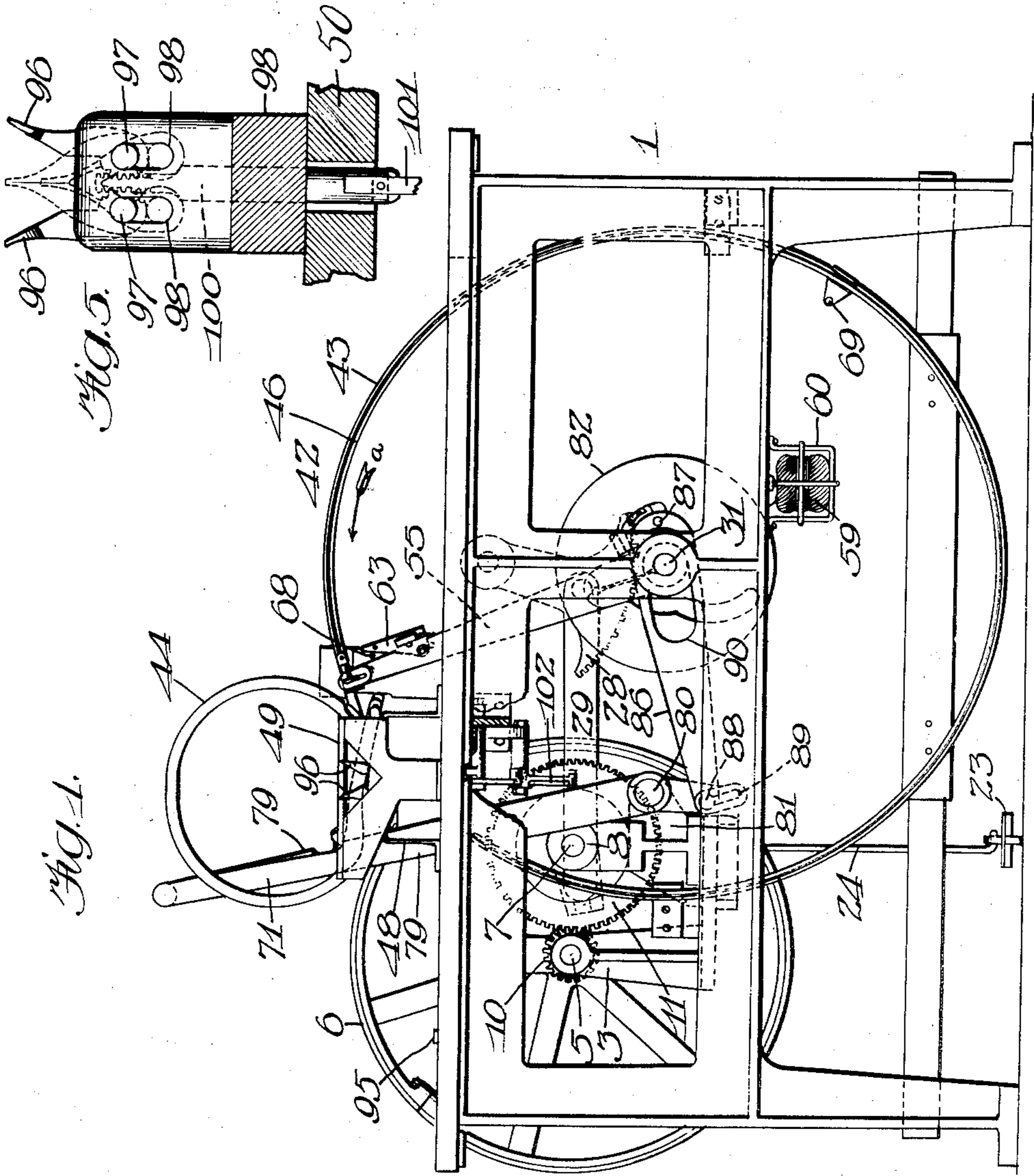
TYING MACHINE.

APPLICATION FILED FEB. 7, 1908.

905,793.

Patented Dec. 1, 1908.

4 SHEETS—SHEET 1.



WITNESSES—

Ed. D. Perry
Robt. H. W. Eir

INVENTOR—

HOWARD D. COLMAN.
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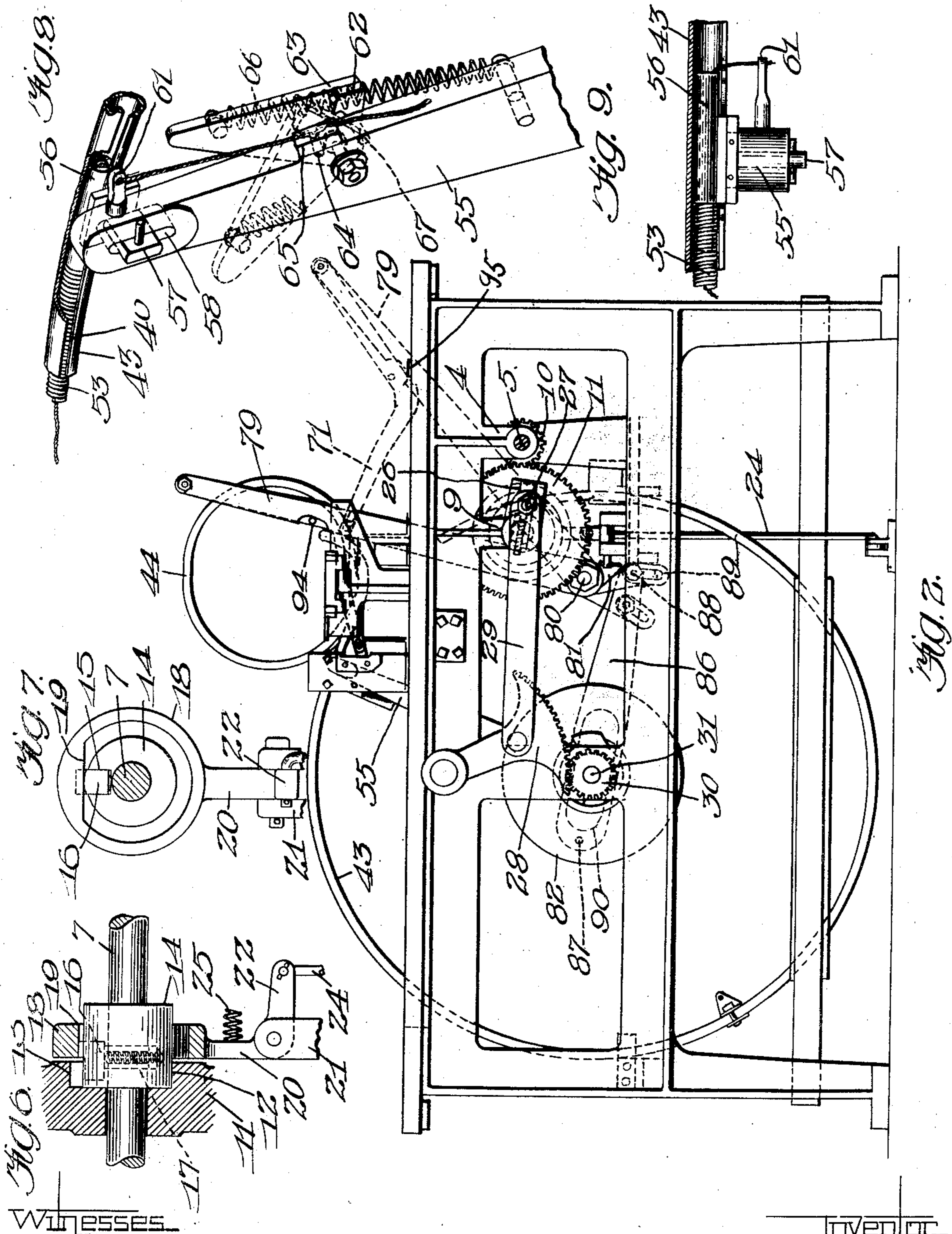
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Fig. 10.

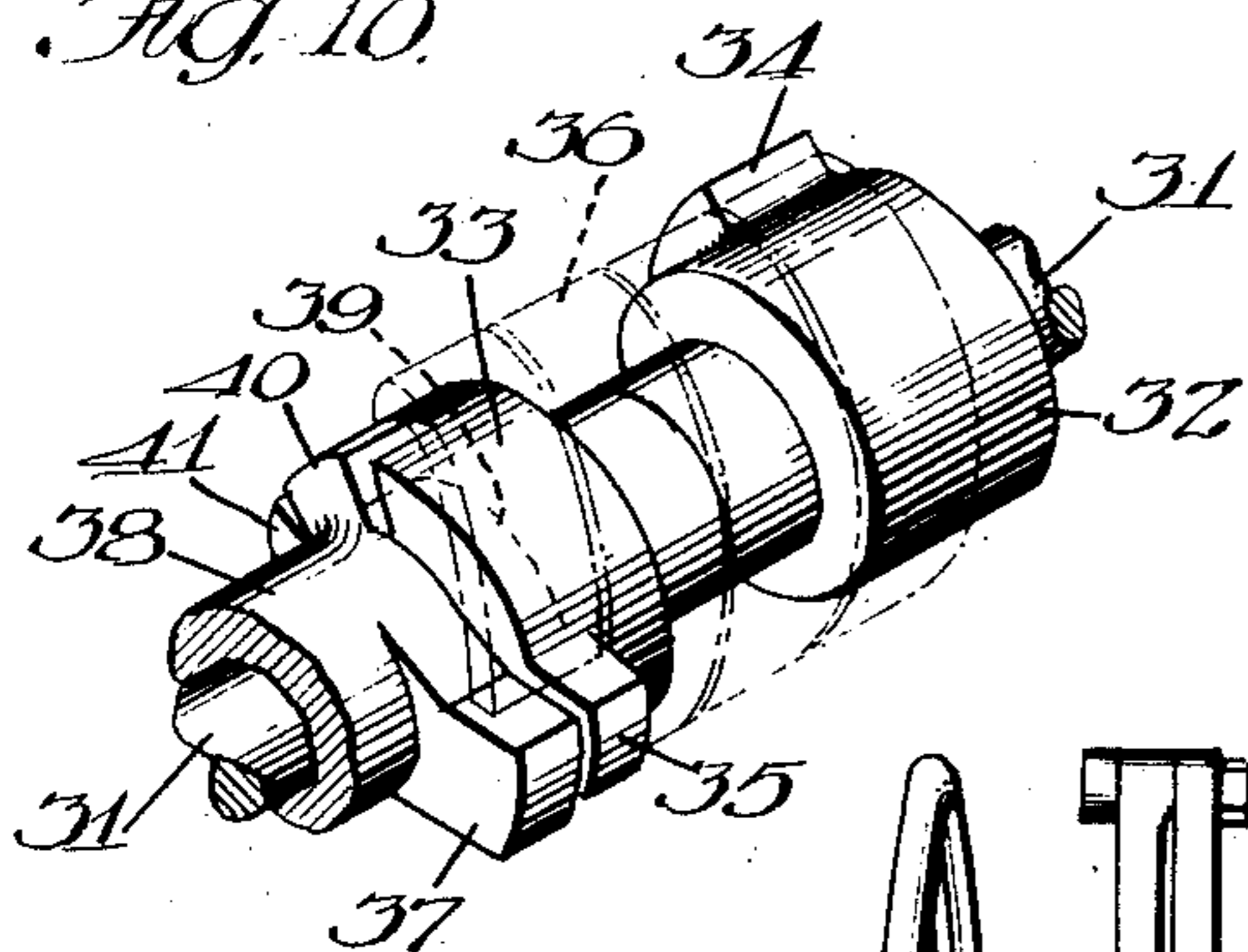
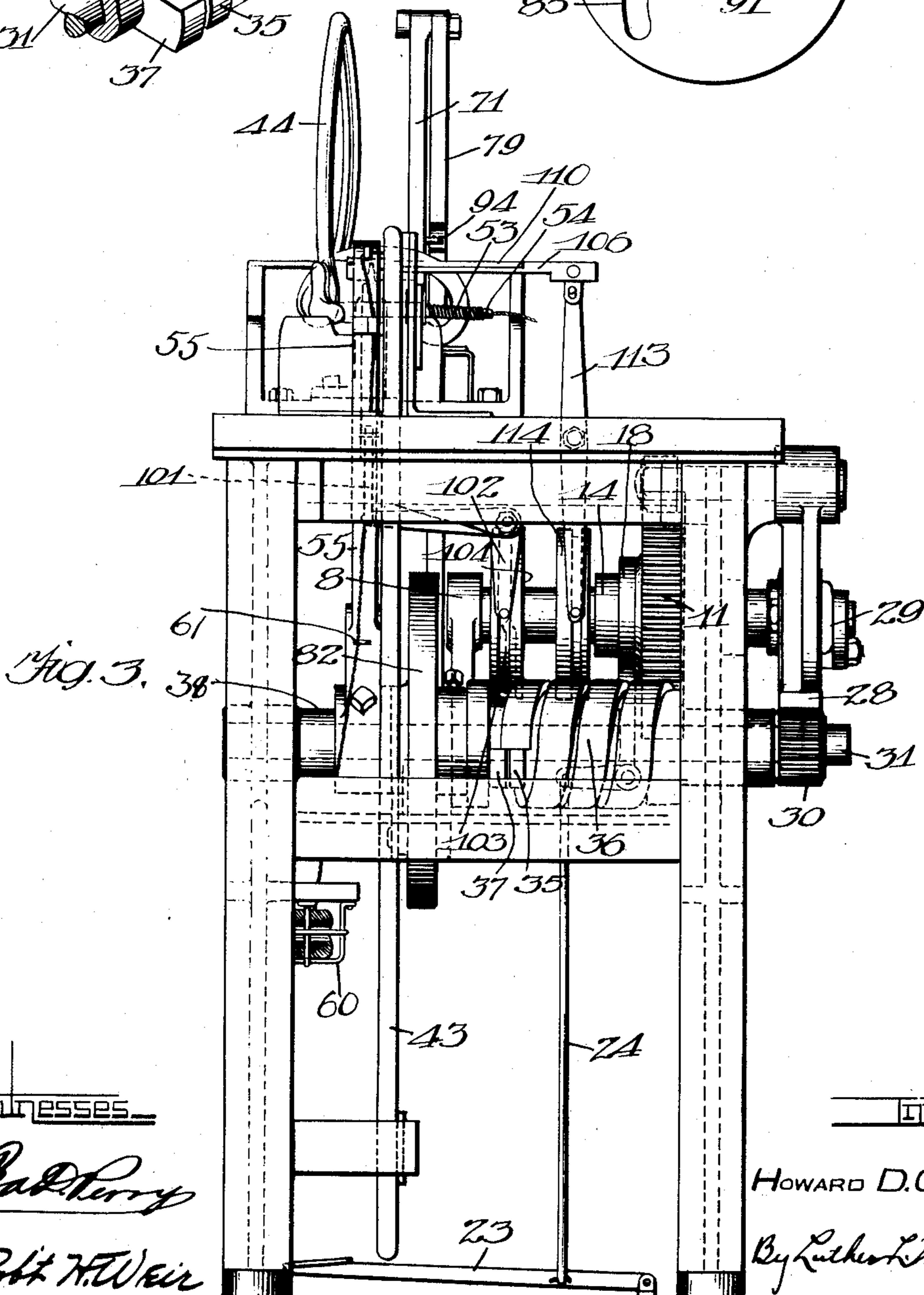
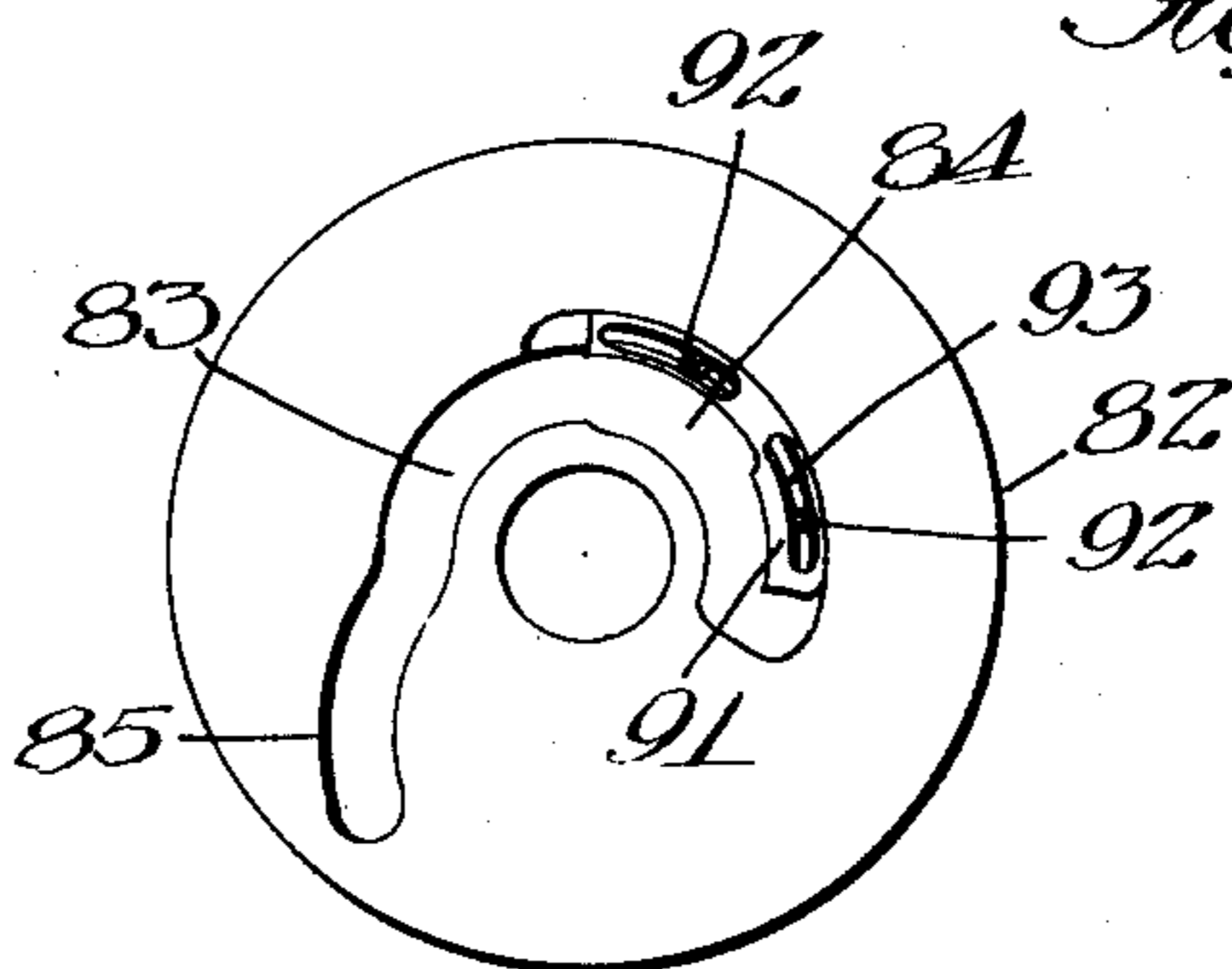


Fig. 11.



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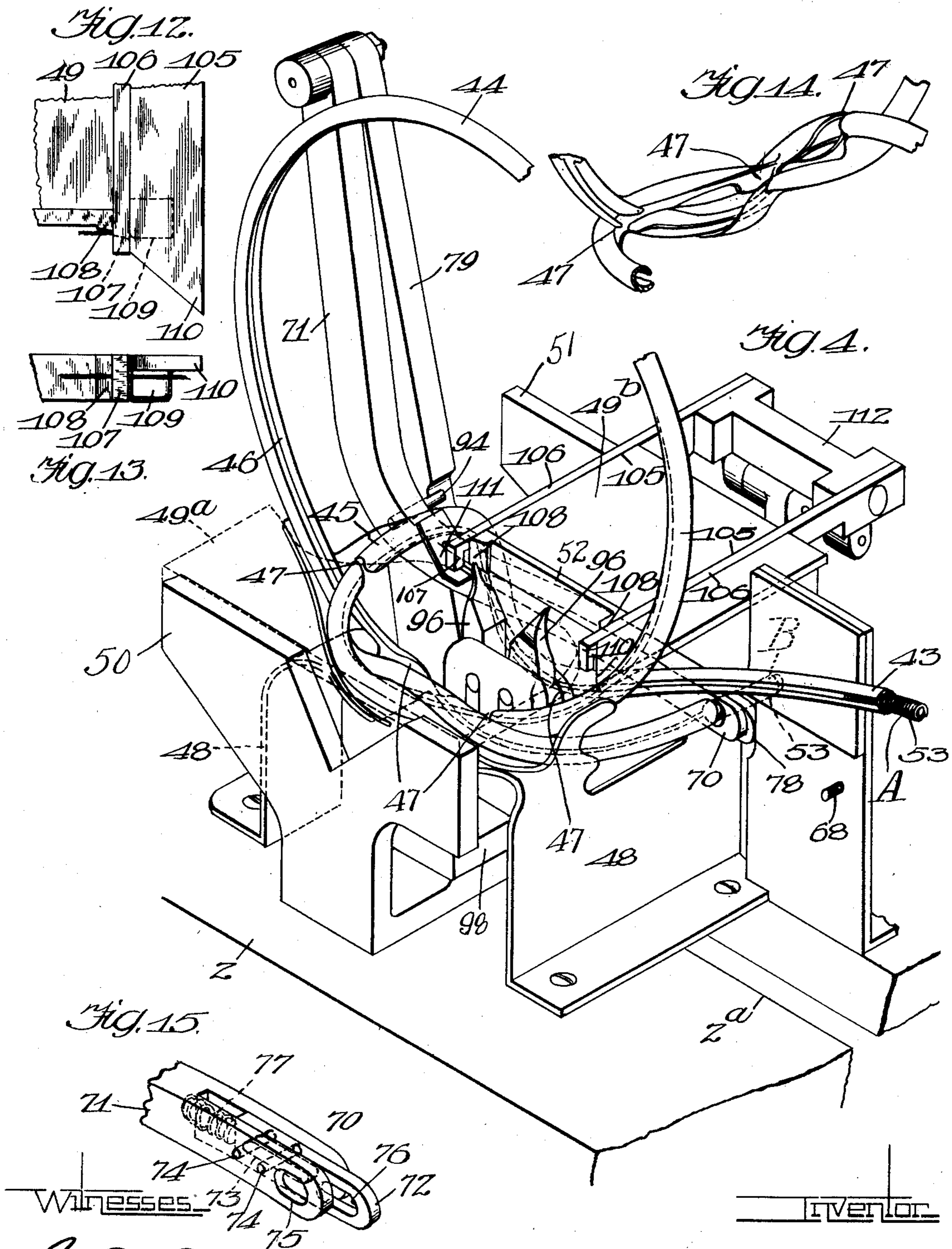
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UNITED STATES PATENT OFFICE.

HOWARD D. COLMAN, OF ROCKFORD, ILLINOIS, ASSIGNOR TO BARBER-COLMAN COMPANY,
OF ROCKFORD, ILLINOIS, A CORPORATION OF ILLINOIS.

TYING-MACHINE.

No. 905,793.

Specification of Letters Patent.

Patented Dec. 1, 1908.

Application filed February 7, 1908. Serial No. 414,681.

To all whom it may concern:

Be it known that I, HOWARD D. COLMAN, a citizen of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Tying-Machines, of which the following is a specification.

The object of this invention is to produce a machine for passing a cord or other securing element about an article or plurality of articles and tying a knot in said securing element.

The embodiment herein shown of my invention is particularly intended for tying such articles as may be properly held by passing a cord thereabout in only one direction, but it will be understood that certain features of the invention may be employed in the construction of mechanisms for tying or bundling packages or articles around which the securing device should be passed several times or in several directions.

In the accompanying drawings, Figure 1 is a front side elevation of a tying machine embodying the features of my invention. Fig. 2 is a rear side elevation of the machine. Fig. 3 is an end elevation thereof. Fig. 4 is a perspective view of the table upon which the articles to be tied are placed, and the mechanisms adjacent to said table. Fig. 5 is a detail view of a means for holding the knot loose until the slack in the cord has been taken up. Figs. 6 and 7 are views of a clutch comprised in the machine. Figs. 8 and 9 are detail views of a portion of the cord-placing and knot-tightening devices. Fig. 10 is a fragmental detail view of the yielding connection between certain of the mechanisms and the driving means therefor. Fig. 11 represents one of the cam disks. Figs. 12 and 13 are detail views of the shear. Fig. 14 is a perspective view of a portion of the guide tube. Fig. 15 is a perspective view of one of the cord clamps.

Before proceeding to a detailed description of the tying machine herein shown and described, I will first briefly outline its preferred organization, naming the several mechanisms and the order in which they operate.

The machine comprises a table or support for the articles to be tied together. The cord is carried around the articles placed upon said table by a longitudinally-movable flexible tube through which the cord extends,

said tube being guided in traveling around the articles by a fixed guide tube through which said cord-carrying tube travels. In order that the cord-carrying tube in its travel shall loop the cord into the form of a loose square knot, the fixed guide tube is given a substantially complete square-knot formation at one side of the loop or coil which encircles the article or articles to be tied. The cord carrier is of sufficient length to completely fill the fixed guide and project beyond each end thereof, one end of the carrier being connected to its actuator and the other end being adapted to present a cord to a clamp. It will thus be seen that as the cord-carrying tube is passed through said coil and square-knot formation a loose, substantially complete square knot will be formed in the cord. When the carrier with the cord has been passed through the convolutions of the knot formation, the free end of the cord is clamped and held stationary. The cord-carrying tube is then withdrawn from the coil and knot-formation, leaving the cord behind it. Said coil and knot-formation are slotted so that when the cord-carrying tube is withdrawn the cord will drop through the slot and fall about the article to be tied. The clamp in which the free end of the cord is held and the member that moves the cord-carrying tube are then moved in opposite directions to draw the cord tightly about the article and complete and tighten the square knot formed in said cord. The cord is then sheared at the opposite sides of the knot and the article removed.

The embodiment herein shown of my invention comprises a supporting framework 1, over the upper side of which extends a table top 2 having a slot 2^a therein (Fig. 4). In bearings 3 and 4 fixed in the supporting frame is rotatably mounted a drive shaft 5 carrying at one end a fixed drive pulley 6. Said drive shaft has a clutch connection with a shaft 7 from which the various mechanisms of the machine are driven, in order that said mechanisms may be stopped upon the completion of each tying operation and while an article or plurality of articles is being placed in position for the next tying operation. The shaft 7 is rotatably mounted in bearings 8 and 9 in the supporting frame. In this instance the connection between the shafts 5 and 7 is made through a pinion 10 fixed on the shaft 5 and meshing with a spur gear 11

loosely mounted upon the shaft 7. In one face of the spur gear 11 is formed a circular depression 12 (Fig. 6) having a recess 13 in one wall thereof. Upon the shaft 7 adjacent to the spur gear 11 is fixed a collar 14 extending into the depression 12. Slidably mounted in a groove 15 in the collar 14 is a plunger 16 which is arranged to be projected into the recess 13 by a coiled spring 17. When said plunger lies with its outer end in the recess 13 the spur gear 11 will rotate the shaft 7. The plunger 16 is depressed to move it out of the recess 13 by means of a clutch ring 18 encircling the collar 14 and having a portion 19 arranged to engage the plunger 16, move it out of the recess 13, and thus stop the rotation of the shaft 7. The means herein shown for shifting the clutch ring 18 consists of an arm 20 fixed with relation to said ring, said arm being pivotally mounted upon a suitable support 21 in the supporting frame. An arm 22 fixed with relation to the arm 20 is connected with a treadle 23 by means of a link 24. A coiled spring 25 attached at one end to the arm 20 and at its other end to a fixed portion of the supporting frame tends to move the clutch ring 18 into position to disconnect the shaft 7 from the drive shaft 5.

Upon one end of the shaft 7 is fixed a crank arm 26 (Fig. 2) having a crank pin 27 adjustably connected therewith in any suitable manner. Upon one side of the supporting frame is pivotally mounted a gear sector 28 which is connected with the crank pin 27 by means of the connecting rod 29. The gear sector 28 meshes with a pinion 30 fixed upon one end of a shaft 31. Two hubs 32 and 33 (Figs. 3 and 10) are fixed upon said shaft, said hubs having thereon lugs 34 and 35, respectively, against which lugs the opposite ends of a heavy coiled spring 36 bear. One end of said spring also overlies a lug 37 formed upon a sleeve 38 which is loosely mounted upon the shaft 31 adjacent to the hub 33. The adjacent end of the loosely mounted sleeve 38 extends into an annular recess 39 in the hub 33. On the sleeve 38 is formed a lug 40 adapted to lie within a recess 41 formed in one end of the hub 33, said recess being large enough to permit of a slight amount of movement between said hub and said sleeve. By providing the split shaft 31 and connecting the sections by the spring 36 any liability of accident, particularly to the cord, due to stopping or starting the machine may or will be reduced to a minimum, if not wholly avoided. Upon the sleeve 38 is mounted means for actuating the cord-placing and knot-tightening means, but before describing said means I will explain the construction of the fixed guide tube and related parts hereinbefore referred to.

Within and above the supporting framework 1 is rigidly mounted a guide tube 42

looped to form a circular coil 43, the major part of which lies within the supporting framework, and a smaller substantially circular coil 44 above the table top 2, the portion of said tube joining said coils being looped in the form of a loose, substantially complete, square knot 45 (Fig. 4). The guide tube 42 has a longitudinal slot 46 therein formed in one side of the coil 43, in the inner periphery of the coil 44, and in such portions of the knot formation 45 as will permit the twine to be readily drawn therefrom. At the points 47 in the knot formation 45 the tube is severed to permit the twine drawn from the adjacent portion of the coil 44 and adjacent coils of the knot to be drawn around the article and out of the tube (Fig. 14) as will appear more fully hereinafter. The coil 44 and the knot formation 45 are supported above the table top 2 by means of two members 48 rigidly fixed to said table top. In the present embodiment, the articles to be tied together rest upon a table 49 supported above the table top 2 in a horizontal plane passing through the coil 44, by means of standards 50 and 51. The table 49 comprises two sections 49^a and 49^b providing between them a throatway 52 through which the cord may pass when the knot is being tightened. In Fig. 4 the table section 49^a is shown in dotted lines.

While the coil 44 is herein shown as lying in a vertical plane, it is obvious that it may be disposed in any position necessary to place the cord about the article or articles to be tied.

Within the guide tube 42 is movably supported a means for carrying a cord or other securing element around the articles to be bundled and through the knot formation 45. In the present instance, said means comprises a flexible tube 53 consisting of a tightly coiled spring. The tube 53 is provided at one end with an eyelet 54 (Fig. 3) and is connected at its opposite end to an arm 55 rigidly mounted upon the sleeve 38 and extending through the slot 2^a in the table top. In this embodiment the connection between the flexible tube 53 and the arm 55 is made by means of a short tube 56 to which said flexible tube is attached, said short tube being fixed to a stem 57 (Figs. 8 and 9) slidably mounted in an elongated opening 58 in the outer end of the arm 55. The yielding connection just described permits the parts to accommodate themselves to any slight departure of the coil 43 from a true circular form. The carrier 53 is of sufficient length to extend from the point A, shown in full lines, Fig. 4, to the point B, shown in dotted lines, so as to carry the cord through the tubes 43, 45 and 44 and to the clamps 70 and 78 in the order named.

A supply of cord in any suitable form is provided at a convenient point on the ma-

chine. I have herein shown a ball 59 (Fig. 1) lying within a holder 60 fixed in the machine frame. From the holder the cord passes through eyes 61 fixed on the arm 55, through the slot 46, into the flexible tube 53, and through the eyelet 54 at the forward end of said tube.

At a suitable point upon the arm 55 the cord is arranged to be clamped at the proper time by means of the clamp illustrated in Fig. 8.

62 is a clamp member fixed to an arm 63, which arm is pivoted upon the arm 55. The member 62 is arranged to clamp the cord between itself and the arm 55, a groove 64 being formed in said arm to receive the forward end of the member 62. The cord lies between the arm 63 and a block 65 mounted on the arm 55, in position to be clamped whenever the arm 63 is thrown into clamping position. A spring 66 tends to hold said arm in either of two positions, the member 62 limiting the pivotal movement of said arm in one direction, its movement in the opposite direction being limited by a pin 67.

68 is a pin arranged to be engaged by the arm 63 for opening the clamp, and 69 is a pin for throwing said arm into clamping position.

While the knot is being tightened the free end of the cord is held in a clamp 70 located at one end of an arm 71 arranged to be projected through one loop of the knot formation 45, and, when withdrawn, to complete a square knot in the cord. One end of the arm 71 is bifurcated and in the bifurcation is mounted a slide 72 (Fig. 15) having an elongated guide opening 73 therein through which two pins 74 fixed in the arm 71 extend. An opening 75 extends through the outer end of the arm 71. In the slide 72 is formed a similar opening 76 adapted to register with the opening 75. A coiled spring 77 lying between the rear end of the slide 72 and the end wall of the bifurcation of the arm 71 tends to move the slide to throw the openings 75 and 76 out of register. When the arm 71 stands in the position shown in Fig. 4 the outer end of the slide 72 is pressed against a fixed member 78 and thereby forced rearwardly in its bifurcation far enough to bring the openings 75 and 76 into register.

The arm 71 has an upwardly extending portion which is pivoted to a lever 79 mounted upon a pivot 80, said pivot being carried by a bracket 81 fixed in the supporting frame. The lever 79 extends through the slot 2^a of the table top 2. The means herein shown for oscillating the lever 79 comprises a disk 82 (Fig. 11) rigidly mounted upon the sleeve 38 and having a cam groove 83 formed in one of its sides. The portion 84 of said groove is substantially concentric with the axis of the disk 82, the larger part of the

movements of the lever 79 being occasioned by the diverging portion 85 of said groove. The lever 79 is connected with the disk 82 by a connecting rod 86 carrying a pin 87 that lies in the cam groove 83, one end of said rod being adjustably attached to the lever 79 by a pivot pin 88 adjustably fixed within an elongated opening 89 in said lever. The rod 86 is slidably mounted upon and guided by the sleeve, said sleeve extending through a slot 90 in said rod. The portion 91 of the wall of the groove 83, when in engagement with the pin 87, holds the arm 71 pressed against the stop 78, thus keeping the cord-clamp 70 open. When the cam portion 91 is rotated away from the pin 87 the spring 77 closes said clamp. To permit of properly timing the operation of said clamp the part of the groove wall which bears the cam portion 91 may be made separate from the remainder of the disk and adjustably secured in place, as shown in Fig. 11, by set screws 92 extending through slots 93 in the adjustable section.

The arm 71 is positively carried into position to receive the cord by the engagement of the arm 79 with a pin 94 fixed in the arm 71. (Figs. 3 and 4). Said arm is yieldingly drawn through the knot formation 45 by reason of the pivotal connection between said arm and the lever 79. As the latter approaches the position shown in dotted lines in Fig. 2 the arm 71 strikes against a stop 95 fixed to the table top 2 and projecting into the path of said arm, thereby throwing said arm into the position indicated in dotted lines in Fig. 2, and raising the cord within the shear.

The cord is passed around the article by a movement of the arm 55 in the direction of the arrow *a*, Fig. 1, the flexible tube 53 being projected to the end of the knot formation 45 and through the clamp 70, as shown in Fig. 3. The arm 55 is then rocked in the opposite direction, withdrawing said flexible tube. As the end of said flexible tube slips out of the openings 75 and 76 the arm 71 is moved to the left (Fig. 1) sufficiently to clamp the end of the cord projecting beyond the eyelet 54 between the walls of said openings. As the flexible tube 53 is withdrawn from the coil 44 and the knot-formation 45 the cord drops through the slot 46, falling loosely about the package. The diverging part 85 of the cam groove 83 now causes the lever 79 to begin its outward throw. The continuing movement of the arm 55 and the lever 79 in opposite directions would tighten the knot before the loop extending around the article or package were drawn tight, unless means were provided for preventing the loops of the knot from drawing together. The means herein shown for this purpose consists of two fingers 96 (Fig. 5) each mounted upon a pivot pin 97 lying within vertical elongated open-

ings 98 in a bracket 99 fixed to the bracket 50. Upon the adjacent faces of the hubs of said fingers are formed gear teeth meshing with a double rack bar 100 slidably mounted 5 in said bracket. The lower end of the rack bar 100 is connected by means of a link 101 with one arm of a bell-crank lever 102 pivoted in the supporting frame. The other arm of said lever carries a roller stud lying 10 within a cam groove 103 in a disk 104 fixed upon the shaft 7. As the flexible tube 53 is withdrawn from the knot-formation 45 the loops of the knot are drawn about the fingers 96 by the lever 79. After said lever has 15 taken up the slack in the loop of cord extending about the article, the continuing movement of said lever tightens the knot, the rack bar 100 simultaneously closing together the fingers 96 and drawing them downward out 20 of the knot, as indicated in dotted lines in Fig. 5.

When the knot has been drawn tight, the cord is severed at opposite sides of the knot by means to be next described.

25 Slidably mounted in guide-ways 105 (Fig. 4) in the table 49 are two bars 106 carrying at their forward ends shear members 107 adapted to coact with stationary shear blades 108. At one side of one of the bars 30 106 is a stationary clamp member 109 between which and the shear member 107 the end of the cord running to the flexible carrier 53 is clamped before the cord is cut. The end of the cord held in the clamp 70 is guided 35 into the left-hand shear by a slotted guide plate 111, said plate also serving to prevent the cord drawn from the adjacent part of the knot-formation from catching upon the shear 107.

40 The rear ends of the bars 106 are connected by means of the cross bar 112. A lever 113 (Fig. 3) is pivotally mounted between its ends in the supporting frame. The upper end of said lever has a pin and slot 45 connection with the cross bar 112. The lower end of said lever carries a roller stud lying within a cam groove formed in a disk 114 fixed upon the shaft 7.

When the arm 55 and the lever 79 occupy 50 the positions shown in Fig. 1 the flexible tube 53 extends through the coil 44 and the knot formation 45 and through the thread clamp 70. The article or plurality of articles to be tied is placed upon the table 49. The operator now depresses the treadle 23, withdrawing the clutch ring 18 from engagement 55 with the plunger 16, which plunger is projected into the recess 13 as soon as said recess comes into register therewith. The operator releases the treadle as soon as the mechanism begins operating. The shaft 7 is now rotated and the sector 28 oscillated, swinging the arm 55 toward the right (Fig. 1), and thereby withdrawing the flexible tube 53 65 from the knot formation 45 and the coil 44.

By the time the carrier 73 has been withdrawn from the clamp 70, the cam part 91 has been rotated away from the stud 87, allowing the clamp 70 to seize the loose end of the cord. The movement of the arm 55 as it 70 withdraws the carrier 53 from the tube 44 and the knot formation pulls said carrier over a fresh supply of cord, the cord running from the holder 60, through the eyes 61, and into the carrier. As the arm 55 passes the 75 pin 69 the clamp 62 is operated to clamp the cord. The lever 79 now begins its outward movement, the loop about the article and the loops of the knot being tightened by the continued movements of the arm 55 and the 80 lever 79 in opposite directions. When the knot has been tightened the two shears 107 108 are operated to cut the cord at opposite sides of the knot. The tied package or article may now be removed. Upon the 85 return stroke of the arm 55 the carrier is pushed through the coil 44 and the knot-formation, the clamp 62 being opened when the arm 63 strikes against the pin 68. Before the carrier 53 reaches the end of the 90 knot formation the clamp 70 has been positioned by the lever 79 to receive said carrier. The plunger 16 has now completed one revolution and, engaging the portion 19 of the clutch ring 18, is moved out of engagement 95 with the gear wheel 11, the mechanisms coming to a stop in position for the next operation.

It will be apparent that various mechanical embodiments of the invention are 100 possible, and I therefore do not limit myself to the arrangement and construction shown.

I claim as my invention:

1. In a tying machine, the combination of a structure having a recess therein for the 105 reception of the article to be tied, and a knot-forming passageway surrounding said recess, and means for depositing cord or similar material within said passageway.

2. In a tying machine, the combination of 110 a structure having therein an aperture or recess for the reception of the article to be tied, said structure having also a passageway therein surrounding said aperture, the said passageway being so arranged as to form 115 the desired knot, and said structure having a slot connecting said passageway with said aperture or recess, and a flexible twine carrier adapted to be inserted into said passageway. 120

3. In a tying machine, the combination of a structure having an aperture therein for the reception of an article to be tied, and means for knotting twine around said article, said means comprising a flexible carrier hav- 125 ing a bore therethrough for the reception of twine, a support for said carrier, the said structure having a tortuous passageway therein of such shape as to give to the path of the carrier a shape corresponding to the 130

knot to be formed, and means for engaging the end of the twine and permitting the flexible carrier to be withdrawn from the passageway and slide over the twine during such withdrawal.

4. As a means for threading twine into a tortuous passageway to form a knot from said twine, a flexible carrier.

5. The combination of a structure having therein a passageway arranged to form a knot in twine or similar material, and a flexible tubular device for passing the twine through said passageway.

6. As a means for threading twine into a tortuous passageway to form a knot from said twine, a flexible tubular twine carrier.

7. In a tying machine, a structure having therein a passageway of knot formation, and a coiled spring for introducing twine or similar material into said passageway.

8. As a means for threading twine through a tortuous passageway to form a knot in the twine, the combination of a flexible carrier having a central bore therethrough and a hollow support for said carrier having a bore communicating with the carrier bore.

9. A tying mechanism comprising a tube and a flexible cord carrier for forming a square knot.

10. In a tying machine, a knot-loop-forming means comprising a tube looped into knot form.

11. In a tying machine, a tube arranged in the form of a knot, and a substantially circular tube communicating with the first mentioned tube.

12. In a tying machine, a tube arranged in the form of a knot, a substantially circular tube communicating with the first mentioned tube, a flexible twine carrier mounted in said tubes, and a pivoted arm for moving said carrier.

13. In a tying machine, a tube arranged in the form of a closed loop and in the form of a knot at one side of said loop; and means for placing twine or similar material in said tube.

14. In an apparatus of the character herein set forth, the combination of an element having therein a passageway arranged to form a knot in twine or similar material, and means for depositing the twine or similar material within said passageway.

15. In an apparatus of the character herein set forth, the combination of an element having therein means for forming twine or similar material into a knot, and a flexible carrier connected therewith for supplying twine or similar material thereto.

16. In an apparatus of the character herein set forth, the combination of an element having therein a passageway arranged to form a knot in twine or similar material, means for depositing twine or similar material within said passageway, and means for

retaining the twine or similar material within said element during the withdrawal of the depositing means.

17. In an apparatus of the character herein set forth, the combination of an element having therein a passageway arranged to form a knot in twine or similar material, means for depositing twine in said passageway, and means for automatically tautening the twine during the removal of the depositing means from said element.

18. In an apparatus of the character herein set forth, the combination of an element having therein an aperture for the reception of the article to be tied, and a tortuous passageway surrounding said aperture and arranged to form a knot in twine or similar material, and a channel establishing communication between said passageway and the aperture, means for depositing twine in said passageway, and means operative upon the withdrawal of the twine-depositing means for automatically drawing the twine through said channel into the aperture.

19. In an apparatus of the character herein set forth, the combination of an element having an aperture therein for the reception of the article to be tied, said element having therein a tortuous passageway surrounding said aperture and so arranged as to form a knot in twine or similar material, a gripping device for the twine operatively associated with said element, a flexible carrier for the twine, adapted to bring a portion of the twine carried thereby into operative relation to said gripping device, and a tension device adapted to automatically tauten the twine during the withdrawal of the carrier from the passageway.

20. In an apparatus of the character herein set forth, the combination of an element having an aperture therein for the reception of the article to be tied, said element having therein a tortuous passageway surrounding said aperture and so arranged as to form a knot in twine or similar material, and a channel communicating with said aperture, a passageway, a gripping device for twine operatively associated with said element, a flexible carrier for the twine, adapted to bring a portion of the twine carried thereby into operative relation to said gripping device, and a tension device adapted to automatically tauten the twine during the withdrawal of the carrier from the passageway.

21. In an apparatus of the character herein set forth, the combination of an element having an aperture for the reception of the article to be tied, a tortuous passageway extending through said element and surrounding said aperture and a channel in said element establishing communication between said passageway and said aperture, a gripping device adjacent to the outlet end of the passageway, and means for threading twine

through said passageway and bringing a portion thereof into operative relation to said gripping device.

22. In an apparatus of the character herein set forth, the combination of an element having an aperture for the reception of the article to be tied, a tortuous passageway extending through said element and surrounding said aperture, and a channel in said element establishing communication between said passageway and said aperture, a gripping device adjacent to the outlet end of the passageway, a flexible carrier for threading twine through said passageway and bringing a portion thereof into operative relation to said gripping device, and a tension device associated with said carrier.

23. In an apparatus of the character herein set forth, the combination of an element having an aperture therein for the reception of the article to be tied, and a tortuous passageway extending therethrough and surrounding said aperture and a channel extending between said passageway and said aperture, a tubular support adjacent to the inner end of the passageway, a gripping device adjacent to the outlet end of said passageway, a flexible carrier operatively mounted in said support and arranged to be threaded through said passageway and bring a portion of the twine into operative relation to the gripping device, a tension device associated with said carrier, and twine-severing means between said tubular support and the inlet end of the passageway.

24. In a tying machine, a tube arranged in the form of a knot; a tube communicating with the first mentioned tube; a flexible twine carrier mounted in said tubes; means for moving said carrier through said tubes; means for clamping the twine inserted in the first mentioned tube by said carrier; and means for supplying twine to said carrier during its movement away from the first mentioned tube.

25. In a tying machine, a tube arranged in the form of a knot; a substantially circular tube communicating with the first mentioned tube; a flexible twine carrier mounted in said tubes; an arm pivoted centrally of said circular tube for moving said carrier; means for supplying twine from a point near the pivotal center of said arm; and means for clamping the end of the twine inserted in the first mentioned tube.

26. In a tying machine, a tube arranged in the form of a knot; a substantially circular tube communicating with the first mentioned tube; a flexible twine carrier mounted in said tube; a pivoted arm for moving said carrier; means for clamping the end of the twine inserted in the first mentioned tube; a twine clamp on said arm; and means for operating said clamps.

27. In a tying machine, a tube arranged in the form of a knot; a substantially circular tube communicating with the first mentioned tube; a flexible twine carrier mounted in said tubes; a pivoted arm for moving said carrier; a clamp for the end of the twine inserted in the first mentioned tube; a twine clamp on said arm; means for opening said clamp after the twine has been inserted in the first mentioned tube; and means for closing said last mentioned clamp after the carrier has been withdrawn from said first mentioned tube.

28. A tying mechanism comprising means for forming an article-encircling loop and the loops of a knot; means for tightening said article-encircling loop; two fingers for holding the loops of the knot open while the article-encircling loop is being tightened; and means for withdrawing said fingers from the knot.

29. A tying machine comprising means for forming a loop about an article, means for bringing said loop into contact with said article and for tightening it, said means comprising a positively moved member and a yieldingly moved member.

30. In a tying machine, means for forming a loop to be placed about an article and for tightening said loop so as to bring it into contact with said member, said means comprising a positively moved arm, a cord clamp having a non-yielding connection with said arm, a movable arm, and a cord clamp having a yielding connection with said last mentioned arm.

31. In a tying machine, means for forming a loop of greater diameter than the article about which it is to be placed and means for reducing the diameter of the loop to bring it into contact with an article, said means comprising two oppositely movable cord clamps.

32. In a knot-tying mechanism, means for making a closed article-encircling loop with a loose knot in the loop; and means for reducing the size of the loop and at the same time tightening the knot.

33. A tying mechanism comprising means for forming an article-encircling loop with a loose knot, means for reducing the size of the loop to that of the article to be tied, and for tightening the knot, and means for preventing the loops of the knot from tightening before the article-encircling loop is tightened.

34. In a knot-tying mechanism, means for making a closed article-encircling loop with a loose knot in the loop; and means for reducing the size of the loop to that of the article to be tied and for tightening the knot; and means for cutting off the ends of the knot.

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Witnesses:

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