

No. 839,241.

PATENTED DEC. 25, 1906.

W. C. WETHERELL.
MACHINE FOR TYING A SLIP NOOSE.

APPLICATION FILED JUNE 13, 1906.

7 SHEETS—SHEET 1.

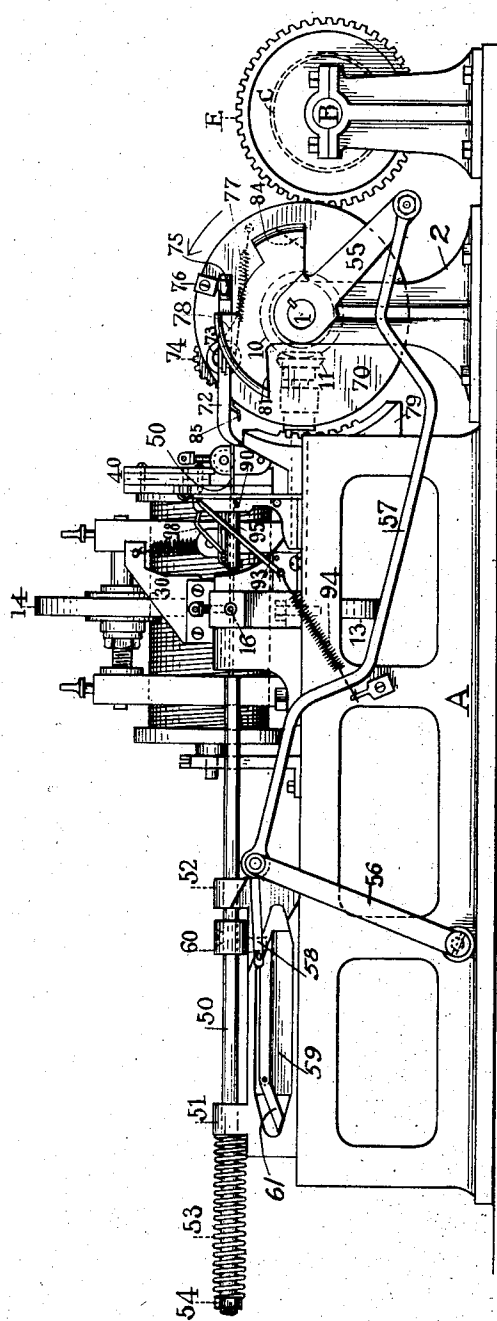


Fig. 1.

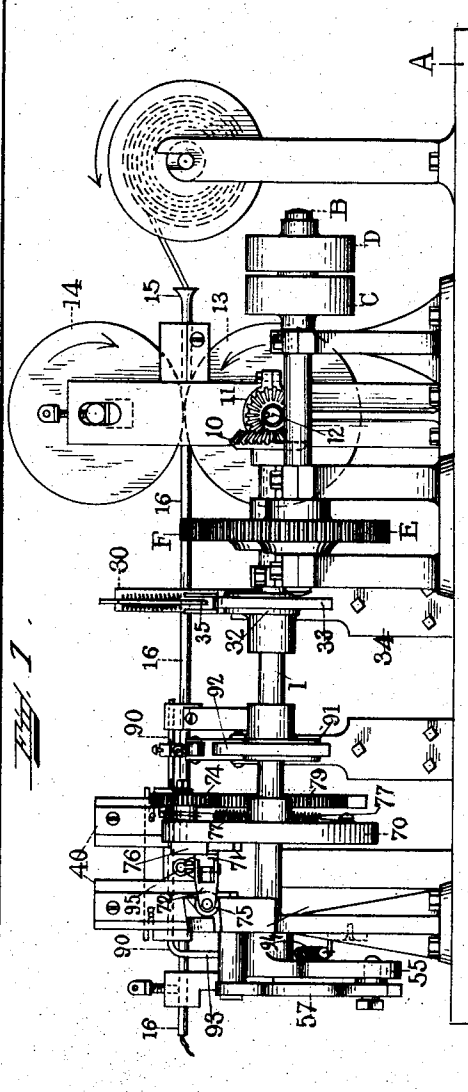


Fig. 2.

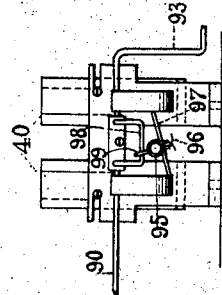


Fig. 3.

Witnesses:
H. E. Kinnick,
H. E. Kinnick Jr.

Inventor:
Winford C. Wetherell
by his attorney
Charles F. Richardson

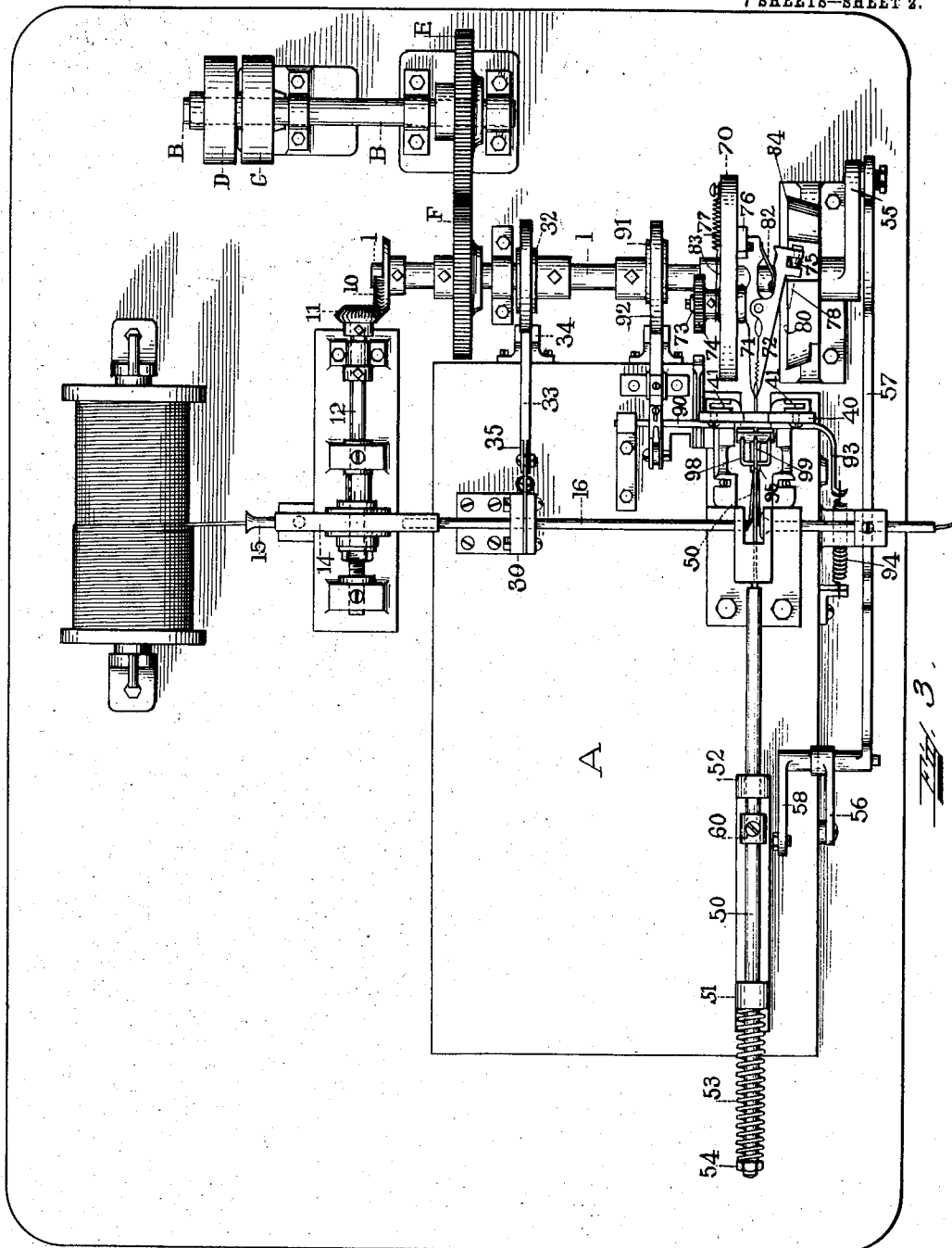
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7 SHEETS—SHEET 2.



Witnesses:
H. E. Purvick
H. E. Purvick Jr.

Inventor:
Wm. C. Wetherell
by his attorney
Charles F. Richardson

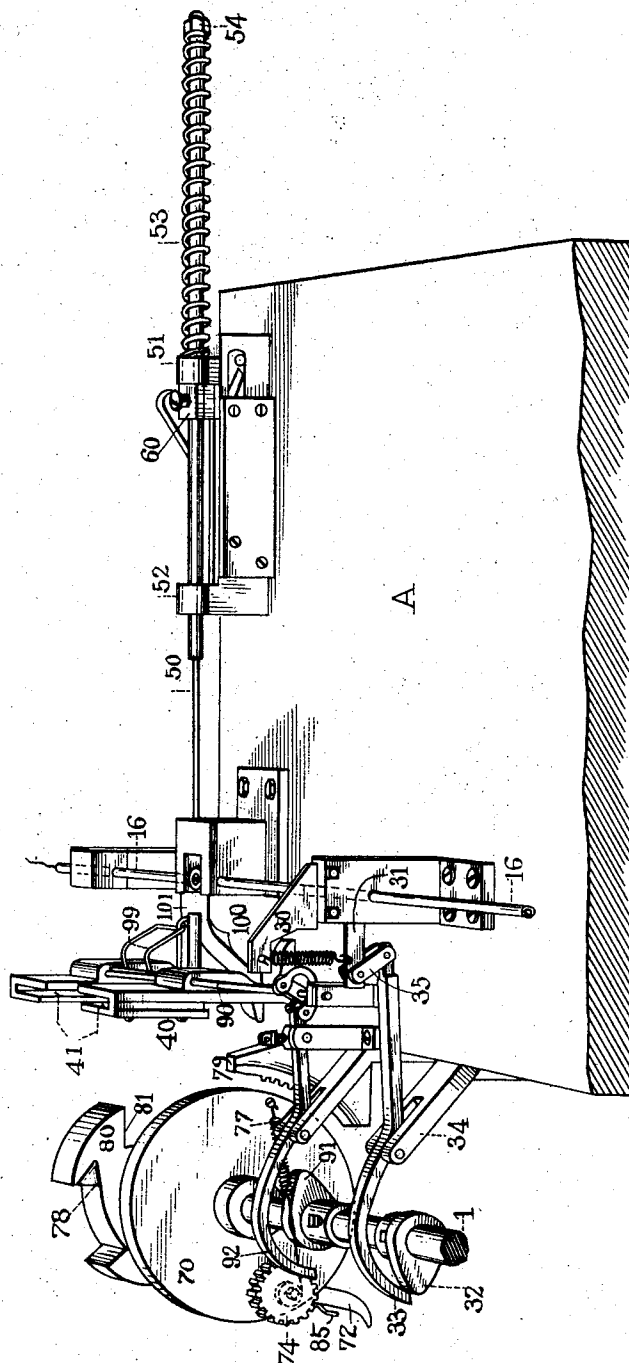
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7 SHEETS—SHEET 3.



Witnesses:

W. E. Rennie

W. E. Rennie

Inventor:

Winford C. Wetherell

by his attorney

Charles F. Richardson

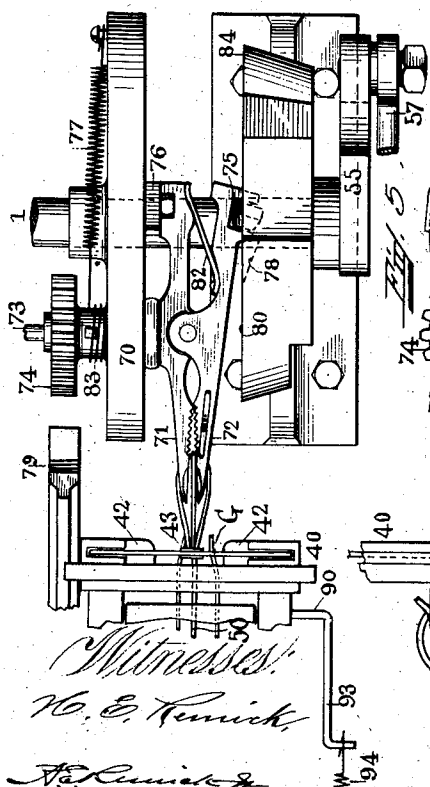
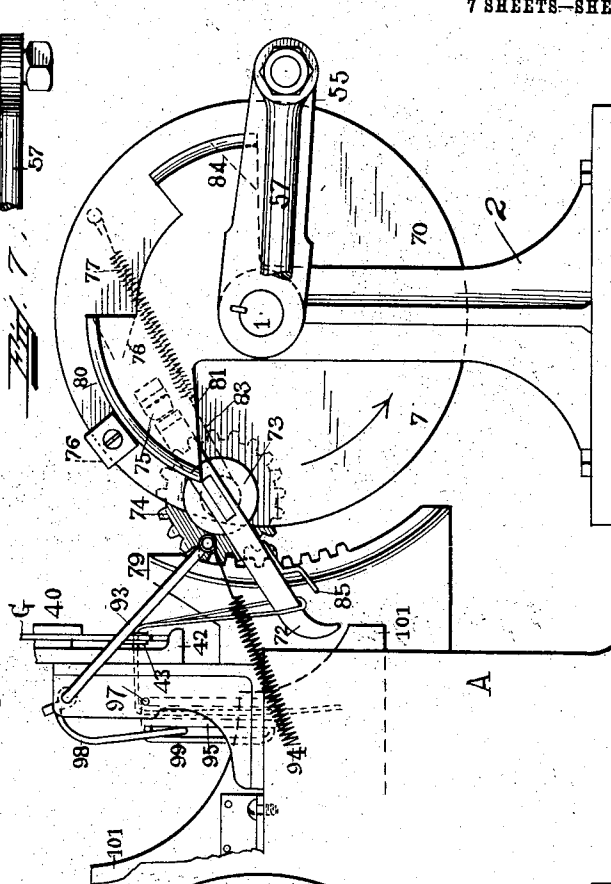
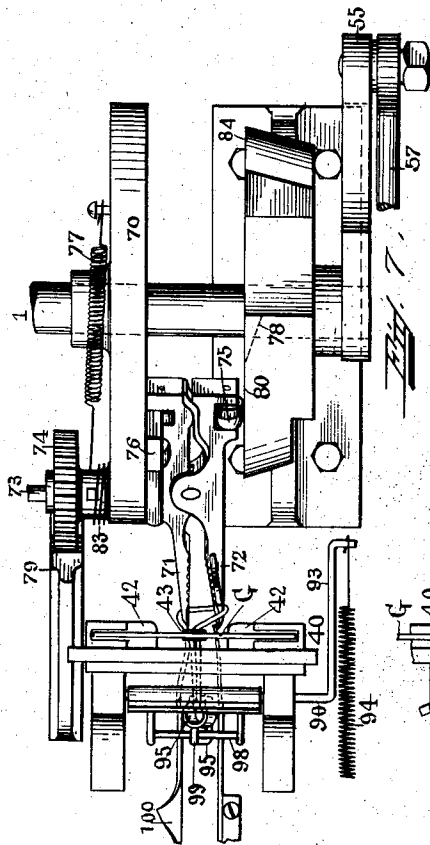
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7 SHEETS—SHEET 4.



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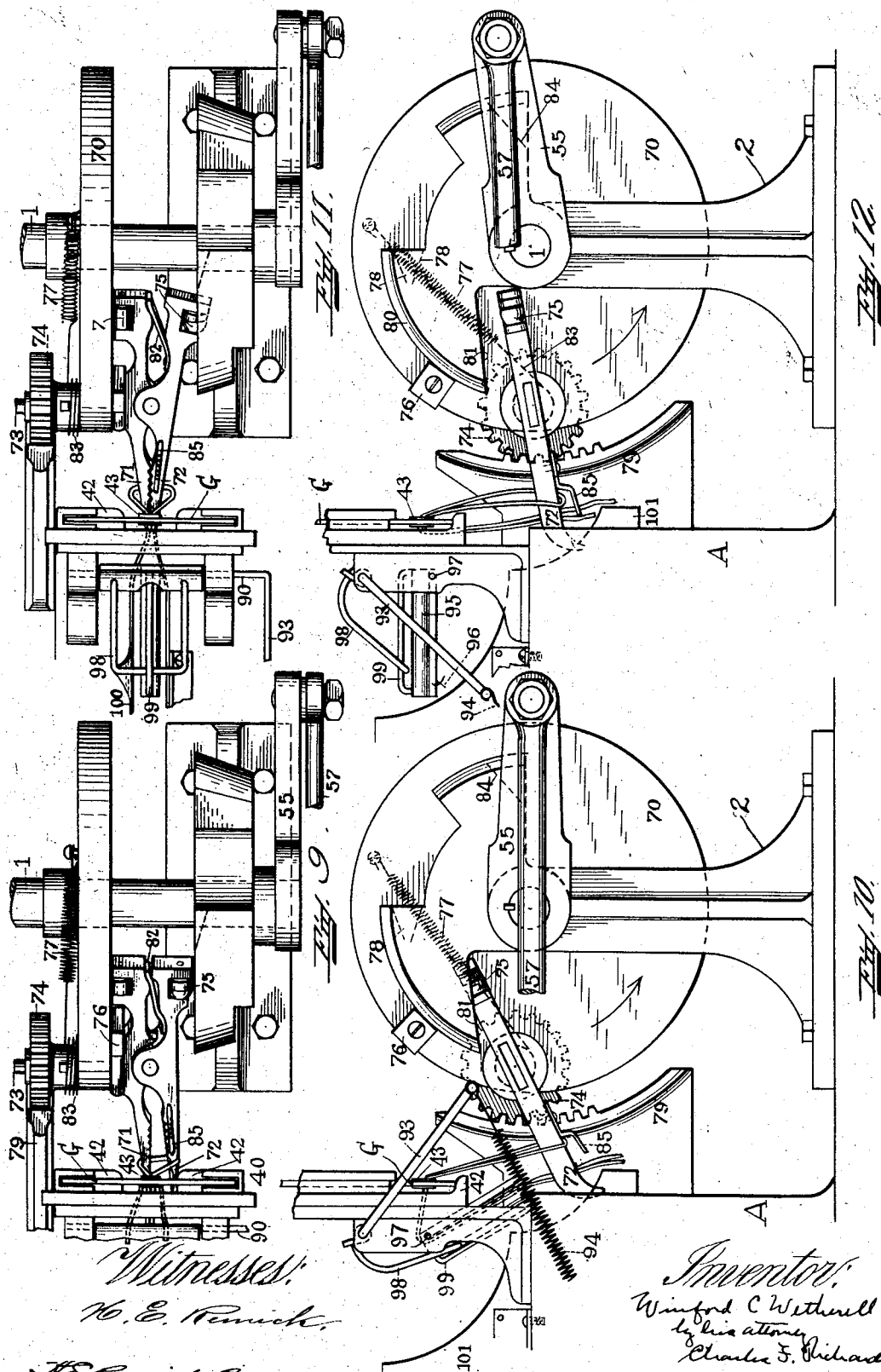
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7 SHEETS—SHEET 6.



Witnesses:
H. E. Remick.

H. E. Runkle Jr.

Inventor:
Winford C Wetherell
by his attorney
Charles F. Richardson

Winford C Wetherell
by his attorney
Charles F. Richardson

by his attorney

Charles F. Richardson

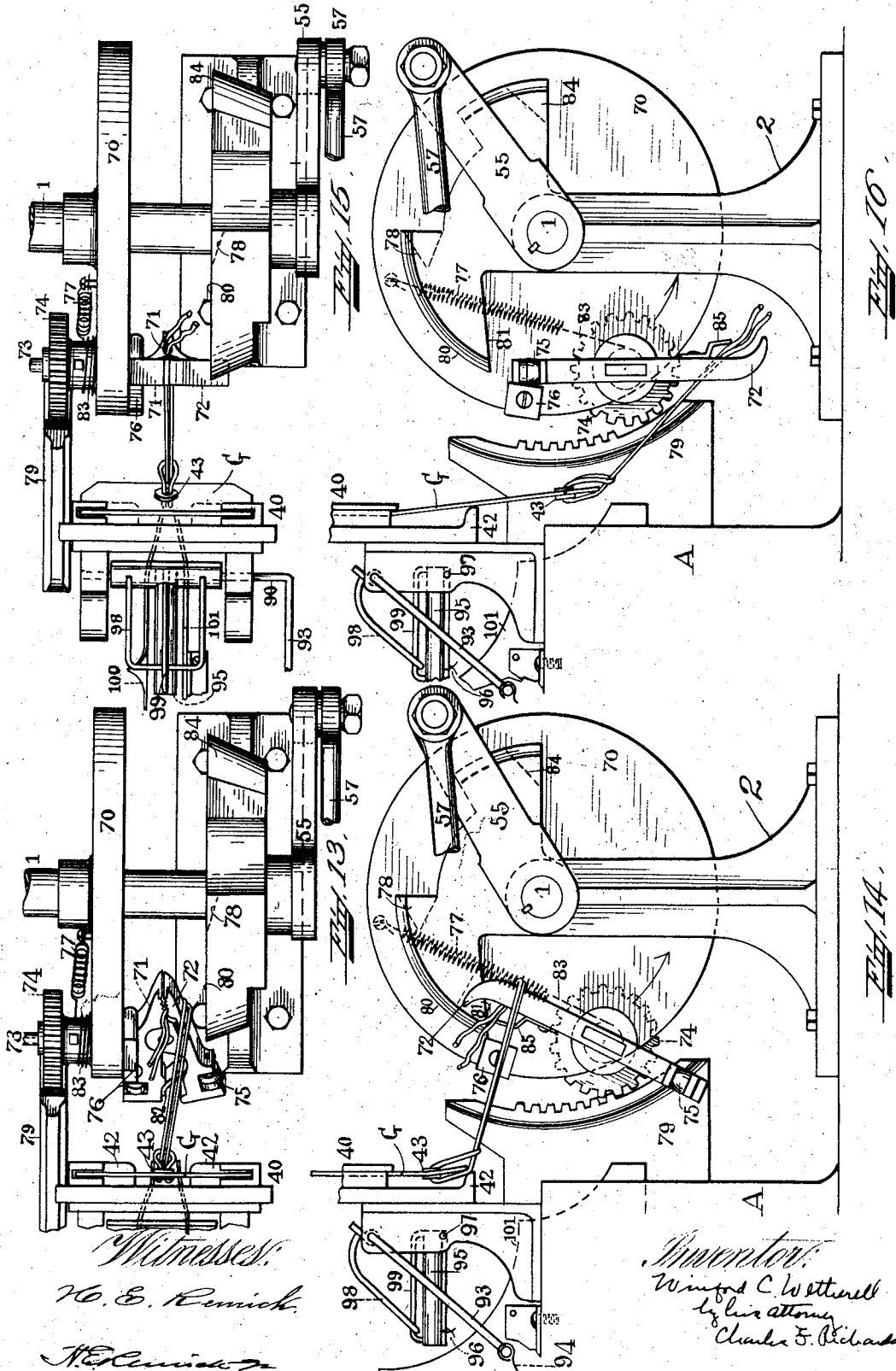
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7 SHEETS—SHEET 6.



Witnesses:
H. E. Remick
H. Remick

Inventor:
Wingard C. Wetherell
by his attorney
Charles F. Richardson

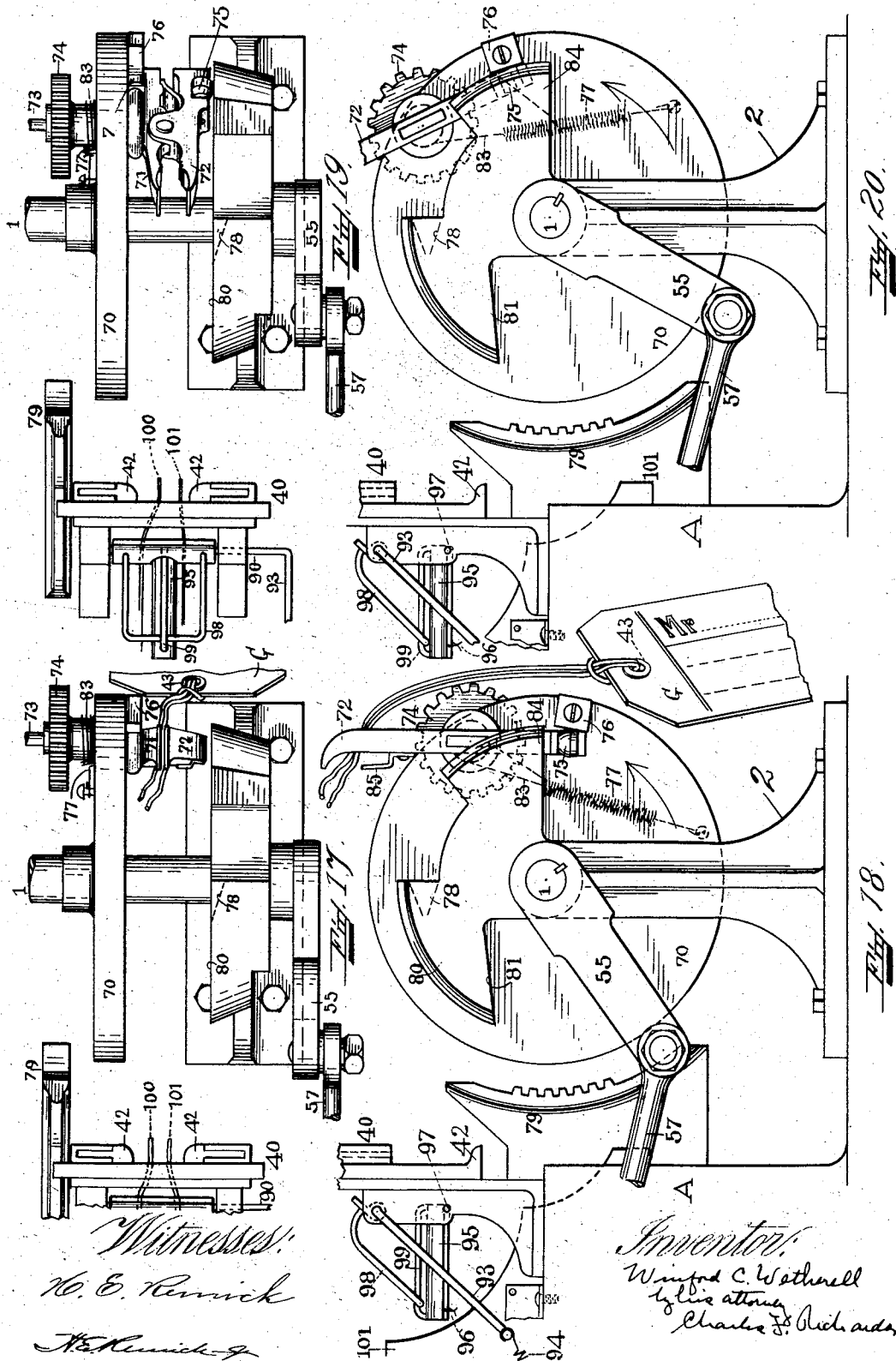
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7 SHEETS—SHEET 7.



UNITED STATES PATENT OFFICE.

WINFORD C. WETHERELL, OF FALL RIVER, MASSACHUSETTS.

MACHINE FOR TYING A SLIP-NOOSE.

No. 839,241.

Specification of Letters Patent.

Patented Dec. 25, 1906.

Application filed June 13, 1906. Serial No. 321,586.

To all whom it may concern:

Be it known that I, WINFORD C. WETHERELL, a citizen of the United States, residing at Fall River, in the county of Bristol and State of Massachusetts, have invented a certain new and useful Machine for Tying a Slip-Noose, of which the following is a specification.

My invention relates to a machine for providing an object with a flexible cord, of fiber or metal, with which the object may be fastened to another object; and it consists of various devices and of combinations thereof, the construction and the operation of which will become plain hereinafter.

My invention may be employed for different purposes and in different environments without departing from the spirit of my invention; but for the purpose of illustrating the principles involved the machine I have chosen is designed to thread tags with string.

It operates with speed and certainty and does away with what is commonly known as "hand-threading," a method now necessarily employed notwithstanding the existence of other machines designed to obviate that method.

Figure 1 is a front view of my invention in elevation. Fig. 2 is a side elevation. Fig. 3 is a plan. Fig. 4 is a perspective view for more clearly showing the thread-cutting, the thread-looping, and the thread-end-delivery apparatus of my invention. Fig. 4^a is a front view of thread-end-delivery device. Figs. 5 and 6, 7 and 8, 9 and 10, 11 and 12, 13 and 14, 15 and 16, 17 and 18, 19 and 20, are views respectively in plan and elevation, showing some of the succeeding positions of certain mechanisms while employed in threading a tag and releasing it and in returning to normal position.

The complete machine may in a general way be described as made up of any suitable driving mechanism, tag holding and releasing mechanisms, string-feeding mechanism, mechanism for looping string through a tag, mechanism whereby the free end portions of the looped string may be delivered to gripping mechanism, and gripping mechanism whereby these end portions may be seized, drawn through the loop, and the tag removed from the tag-holding mechanism and then allowed to fall away from the gripping mechanism, and means for returning the above mechanisms to their normal positions.

The whole machine is shown mounted upon

a cast-iron base A. The driving mechanism consists of a driving-shaft B, mounted in suitable bearings and operated and controlled by a fast and a loose pulley C D, provided with a power-belt. A gear-wheel E, fixed to the shaft, meshes with a gear-wheel F, fast on a main shaft 1, having bearings in standards 2. Through the main shaft power and movement are imparted to the various operating mechanisms referred to heretofore in a general way.

To the main shaft 1 is fixed a bevel-gear 10, provided with gear-teeth for only a portion of its circumference for the purpose of controlling the string-feeding mechanism. It meshes with a bevel-gear 11 on a feed-roll shaft 12, which is mounted in bearings in a feed-roll standard, and has thereon a string-feed roll 13, so that for a period of time during each revolution of the main shaft the feed-roll shaft 12, with the feed-roll 13, moves a predetermined distance and then remains idle until the main shaft 1 completes its revolution and the feed-roll shaft again turns through said distance and stops, as just described. Located above the feed-roll 13 and rolling in frictional engagement therewith is a second feed-roll 14, held in proper relations with the former roll by suitable bearings.

In the particular construction shown the bevel-gear 11 is in diameter one-half that of the bevel-gear 10, so that it and the feed-rolls make one complete revolution during one-half a revolution of the bevel-gear 10 and main shaft and remain idle during the second half of the revolution of the main shaft. Further, the diameter of the feed-roll 13 is made such that the circumference equals the length of string to be supplied to the thread-looping mechanism, so that while the bevel-gears are in coöperative engagement the feed-rolls push to the looping mechanism the length of string required. Of course it is to be understood that the relation between the diameter of the bevel-gear 10 and that of the bevel-gear 11 need not necessarily be that of two to one or that the feed-roll 13 must revolve just once to supply the length of string wished.

It is desirable that the feeding apparatus shall furnish the supply of string to the looping mechanism before the latter shall begin its operation and shall remain idle until all other apparatus shall return to normal position. Whether or not these periods of action and inaction shall depend upon an exact half-revolution of the main shaft is imma-

terial, all that is required is that the feeding apparatus shall supply the right length of string at the right time.

The string is furnished as from a spool rotatably mounted in standards and passes through a funnel-shaped tube 15, leading to the advancing circumferential surfaces of the feed-rolls, which seize the string and push it through sections of a string-guide tube 16, leading to the string-cutting mechanism and the string-looping mechanism. When the feed-rolls stop, the string is retained in position in the guide-tube for the operations of cutting and looping.

The cutting mechanism is found upon the delivery side of the feed-rolls. The string-tube extends to a knife-standard 30, in which is pivotally mounted a knife-blade 31, (see Fig. 4,) held away from the axis of the tube by a spring secured to the standard. The cutting of the string is brought about by a cam 32 on the main shaft. It operates a lever 33, pivoted to a bracket 34 on the base, and a link 35, connecting said lever with the free end portion of the knife, and causes the knife to cut the string by moving against the opposition of the spring and across the axis of the string-tube. After the string is cut the cam releases the lever, the spring lifts the knife, link, and lever, and the string-cutting mechanism assumes normal position. This cam 32 is fixed in such relation to the main shaft that it causes the knife to cut the string just after the right length of string has been provided—that is, after the bevel-gears 10 11, controlling the string-feeding mechanism, have ceased to engage each other.

A tag holding and releasing device 40 consists of a standard having two slots 41, Figs. 3, 4, and supports 42, which sustain tag G during the operation of threading and then permit its withdrawal. The tag has an eye 43 and is slipped into the slots, its advancing edge is pushed into engagement with the supports, and the next mechanism to be employed is ready for action. This is used for looping the cut string and passing the loop through the eye 43 of the tag. To accomplish these objects, a looping-rod 50 moves in the plane of the string and through the eye of the tag. This loop-rod 50 is mounted in guides 51 52 on the base, and for the purpose of preventing it from interfering with the string-feeding operation it is held in its outward position by a spiral spring 53, which abuts the guide 51, and also a nut 54 upon the free end portion of the loop-rod. The looping portion of the rod is notched transversely to engage the spring, and is thinned down vertically to permit certain gripping members, to be described later, to pass freely into the loop, but between it and each side of the rod. To give a looping movement to this rod, I employ a crank 55, fixed to the main shaft 1; a rod 56, pivoted to the base A; a rod

57, connecting the crank and said pivoted rod, and a link 58, the free end portion of which moves in an endless guide-slot 59, Fig. 1.

A block 60 is fixed to the loop-rod 50 between the guides 51 52 and depends downward into a portion of said slot, so that the link in each of its forward movements engages the block, moves the rod inward the desired distance, is guided out of engagement with the block, and allows the spring 53 to return the rod to its normal or outward position. The free end of the link having completed its forward movement continues along the endless slot, but in a rearward direction, back to its normal position. However, in so doing it passes under the free end of a latch 61, Fig. 1, which lies in its path and which afterward drops back into the slot. When the link on the next revolution of the crank moves forward, it passes up and over the latch and again into engagement with the block on the loop-rod in the manner already described.

The crank 55 is so adjusted and fixed to the driving-shaft 1 that the forward movement of the looping-rod 50 takes place just after the string has been cut the desired length. The axis of the loop-rod is located so that the notch on the rod engages the string at the middle of its length and in its forward movement forces the string, the two halves following side by side, through a string-delivering device, later to be described, and through the eye 43 of the tag. (See Figs. 1, 3, 5, and 6.) The string-loop and the rod are now in position for the gripping mechanism to operate for the purpose of securing the string to the tag. Fixed to the main shaft 1 (see Figs. 1, 2, 3, 5, 6) is a member 70, upon which is mounted near its periphery two string-gripping jaws 71 72, one of which—say 71—by means of a shaft 73 passing through the member 70 is fixed to a reversing gear-wheel 74. The other jaw—say 72—is pivoted to the jaw 71 and has on its end opposite to its gripping end a ball-bearing 75, designed to engage certain cam-surfaces for the purpose of opening the jaws. A stop 76 is fixed to said member and by means of a spring 77, operating upon the hub of the gear-wheel 74, tends to hold the rear portions of jaws in contact with the stop 76. When the loop-rod 50 and the loop of string are in the position just described, the gripping-jaws 71 72 are about to engage the loop and the ball-bearing 75 on the jaw 72 to engage expanding cam-surface 78 for moving the gripping portion of jaw 72 away from gripping portion of jaw 71. Just as the ball 75 (see Figs. 5 and 6) engages the cam-surface the gripping portion of the jaw 71 passes between one side of the looping-rod 50 and the loop and the other jaw 72 between the other side of the rod and the other side of the loop. As the main shaft continues to move in the direction indicated by the

arrow the gripping portions of the jaws continue to open, move downward through the loop, thereby pulling the loop farther through the eye of the tag and increasing the size of the loop to facilitate the later withdrawal of the jaws, the loop being caught in a hook 85 on jaw 72; but at this time the crank 55, controlling the link 58, which releases the loop-rod 50, advances and permits the link 58 to release the block 59 and allow the spring 53 to snap the loop-rod 50 back to normal position to again upon the next revolution of the main shaft push the next piece of string through the eye of the next tag to be threaded. The jaws having begun to move downward, those portions of the string that have not been drawn through the tag must be delivered to the gripping portions of the jaws. Mounted in the tag-holding standard 40 is a rod 90, having oscillating movements, the forward movement being brought about by a cam 91 on the main shaft 1, positively operating a lever 92, which in turn through a curved connecting-link and an arm on the rod causes the latter to move correspondingly. On this rod 90 is an arm 93, operated by a spring 94 to return the rod to normal position. Below this rod is a hollow cylinder 95, the axis of which when the cylinder is in normal position is the axis of the loop-rod 50. The under side of the cylinder is slotted throughout its length; but this slot is closed by two crossed string-retaining wires 96, Fig. 4^a, which, however, can be separated by the pressure of the end portions of the string when the gripping-jaws, as will appear later, seize and pull upon these end portions.

The cylinder is pivoted to the standard by a rod 97, Fig. 4^a, lying in a plane of the driving-rod 90, but inclined at an acute angle to the axis of said rod 90. An arm 98, fixed to the rod 90, extends horizontally rearwardly and engages a guiding member 99, arranged above the top of the string-cylinder 95. The cam 91, operating through the lever 92, the rod 90, and arm 98 and guiding member 99, forces the string-delivery cylinder 95, with the string ends therein, downwardly about its pivot-rod 97 against the tension of the spring 94, the end portions of the string being carried downward between string-guide plates 100 101, which in turn insure the delivery of the end portions of the string between the jaws 71 72, said guide-plates at that time lying between the jaws and the said end portions of the string, as appears in Figs. 9 and 10. The said string end portions are thus delivered with certainty into position for the jaws to grip them. Meanwhile as main shaft 1 and the member 70 continue their forward and downward movement, the reversing-gear 74, fixed to the jaws 71 72, engages a curved rack 79 and causes the jaws to turn in a direction opposite to

that of the main shaft—i. e., the gripping portions of the jaws move upward outside of the string-guide plates 100 101, the end portions of the string lying between the jaws, as in Figs. 9 and 10, while the ball-bearing 75 on the rear portion of the jaw 72 moves downwardly along the cam-surface 80 on the standard 2 and toward its releasing edge 81. When this edge is reached, the jaw 72 is released, and a jaw-spring 82 forces the jaw and the string ends into engagement with the other jaw 71, and the string ends are thus held fast within the closed jaws. By the next operation, the cam 91, operating the string-cylinder 95, releases the latter, and the spring 94, attached to the rod 90 by the arm 93, snaps the string-cylinder back into its normal position, and the end portions of the string that formerly lay in the slotted string-cylinder, leave it through the slot and crossed wires 96, Fig. 4^a. The reversing-gear 74 still being in engagement with the rack 79 the gripping portions of the jaws continue to move upward and rearward, and thereby draw more and more of the end portions of the string through the eye of the tag, and consequently to move the slip-noose closer to the tag, all of which appears in Figs. 13 and 14. At about this time the reversing-gear 74 (see Figs. 15 and 16) disengages the rack 79, and the spring 77, acting on the wire 83, coiled about the hub of the reversing-gear 74, snaps the jaws forward to their normal position, the rear jaw bringing up against the stop 76 on the member 70. This return to normal position draws the noose still closer to the tag, and the bottom edge of the latter is pulled outward and over the tag-retaining support 42 of the slotted tag-holder and then down and out of the holder. The tag is now completely strung. The jaws are closed upon the string ends and the tag continues to move on with the main shaft until the tag has reached a suitable position to be released. When such position is reached, (shown, for example, in Figs. 17 and 18,) the ball-bearing 75 on the rear portion of the jaw 72 engages a tag-releasing cam-surface 84 on the standard 2, the jaws separate, the string becomes disengaged from between the jaws, and the tag drops, say, into some suitable receptacle.

After the strung tag has dropped away from the grippers the jaws when the ball-bearing slips off from the releasing-cam surface 84, close and they then move into their normal position, and the cycle of the operations of the apparatus is complete. Meanwhile another tag has been supplied to the holder, another length of string pushed through the string-tube and cut, and the threading-rod has pushed the middle portion of the cut string through the eye of the tag, and the jaws are about to engage the loop and repeat the operations already described.

While from the above description it is apparent that the apparatus successfully threads a tag, it is also plain that the movements of the jaws, the looping device, and the string-delivering device are such that a slip-noose may be formed about any article, provided said article is held within the space bounded by the loop, the path described by the free ends of the gripping members, and that by the thread-end-delivering device.

Having described my invention and the principles involved and desiring to claim my invention and its various combinations and subcombinations in the broadest manner legally possible, what I claim is—

1. Gripping members; a shaft having said gripping members operatively mounted thereon; means whereby said gripping members may be opened and closed; and means whereby said gripping members may be caused to turn a partial revolution upon themselves in one direction; and means to restore said members in an opposite direction to normal position.

2. Gripping members a shaft; a member fixed thereto; said gripping members being pivotally mounted upon said member; a pinion operatively connected to the gripping members; and a rack with which said pinion, by the rotation of said shaft, is moved into and out of engagement; thereby causing the gripping members to turn on their pivot a partial revolution; and means to restore said members in an opposite direction to normal position.

3. Gripping members; a shaft; a member fixed thereto; another shaft mounted in said member; said gripping members being fixed to said latter shaft; a pinion fixed to said latter shaft; and a rack, with which said pinion is moved into and out of engagement, thereby causing the gripping members to turn a partial revolution in one direction; and means to restore said members in an opposite direction to normal position.

4. Gripping members; a shaft; a member fixed thereto; said gripping members being pivotally mounted upon said member; a pinion operatively connected to the gripping members; and a rack with which said pinion, by the rotation of said shaft, is moved into and out of engagement; thereby causing the gripping members to turn on their pivot a partial revolution in one direction; and means to cause the gripping members to turn in an opposite direction, return to, and remain in normal position, when said rack and pinion are not in engagement.

5. Gripping members; a shaft having said gripping members operatively mounted thereon; means for presenting a loop of flexible material to said gripping members; moving with said shaft, whereby the gripping members may move into said loop; means for delivering to said gripping members, while in said loop, por-

tions of said material to be carried through said loop; means for closing said gripping members while in said loop whereby said material may be gripped and securely held by said members; and means whereby said gripping members together with said material to be drawn through said loop presented, are withdrawn through said loop, in a direction other than that of the moving shaft; means for opening said grippers to release the material therefrom.

6. Gripping members; a shaft having said gripping members operatively mounted thereon; means for presenting a loop of flexible material to said gripping members, moving with said shaft, whereby the gripping members may move into said loop; means for delivering to said gripping members, while in said loop, portions of said material to be carried through said loop; means for closing said gripping members while in said loop whereby said material may be gripped and securely held by said members; and means whereby said gripping members together with said material to be drawn through said loop presented, are withdrawn through said loop, in a direction other than that of the moving shaft; means for opening said grippers to release the material therefrom; and means for restoring apparatus to normal position.

7. A main shaft; a device for delivering flexible material; means whereby said device is operatively controlled by said main shaft; gripping members operatively mounted upon said main shaft; means for presenting a loop of said flexible material to said gripping members moving with said shaft, whereby said gripping members may be moved into said loop; means for opening the gripping members; means for delivering to said gripping members while in said loop, material which is to be carried through said loop; means for closing said gripping members while in said loop, whereby said material may be securely held in said gripping members; means whereby said gripping members together with said material to be withdrawn through the loop presented, are moved through said loop in a direction other than that of the moving shaft; means for opening the grippers to release said material therefrom; and means to restore the whole apparatus to normal position.

8. A main shaft; a device for delivering flexible material; means whereby said device is operatively controlled by said main shaft; means for cutting said flexible material; means whereby said cutting means are operatively controlled by said main shaft; gripping members operatively mounted upon said main shaft; means for presenting a loop of said flexible material to said gripping members moving with said shaft, whereby said gripping members may be moved into said loop; means for opening the gripping

members; means for delivering to said gripping members while in said loop, material which is to be carried through said loop; means for closing said gripping members while in said loop, whereby said material may be securely held in said gripping members; means whereby said gripping members together with said material to be withdrawn through the loop presented, are moved through said loop in a direction other than that of the moving shaft; means for opening the grippers to release said material therefrom; and means to restore the whole apparatus to normal position.

9. Gripping members; a shaft having said gripping members operatively mounted thereon; means for holding an object to be threaded; means for passing a loop of flexible material through said object and presenting said loop to said gripping members moving with said shaft, whereby the gripping members may move into said loop; means for delivering to said gripping members, while in said loop, portions of said material to be carried through said loop; means for closing said gripping members while in said loop whereby said material may be gripped and securely held between said gripping members; and means whereby said gripping members together with said material to be drawn through said loop presented, are withdrawn through said loop, in a direction other than that of the moving shaft.

10. Gripping members; a shaft having said gripping members operatively mounted thereon; means for holding an object to be threaded; means for passing a loop of flexible material through said object and presenting said loop to said gripping members moving with said shaft, whereby the gripping members may move into said loop; means for delivering to said gripping members, while in said loop, portions of said material to be carried through said loop; means for closing said gripping members while in said loop whereby said material may be gripped and securely held between said gripping members; and means whereby said gripping members together with said material to be drawn through said loop presented, are withdrawn through said loop, in a direction other than that of the moving shaft; means for opening said grippers to release the material therefrom.

11. Gripping members; a shaft having said gripping members operatively mounted thereon; means for holding an object to be threaded; means for passing a loop of flexible material through said object and presenting said loop to said gripping members moving with said shaft, whereby the gripping members may move into said loop; means for delivering to said gripping members, while in said loop, portions of said material to be carried through said loop; means for

closing said gripping members while in said loop whereby said material may be gripped and securely held between said gripping members; and means whereby said gripping members together with said material to be drawn through said loop presented, are withdrawn through said loop, in a direction other than that of the moving shaft; means for opening said grippers to release the material therefrom, and means for restoring apparatus to normal position.

12. A main shaft; a device for delivering flexible material; means whereby said device is operatively controlled by said main shaft; gripping members operatively mounted upon said main shaft; means for holding an object to be threaded; means for making and passing a loop of said flexible material through said object and presenting said loop to said gripping members moving with said shaft, whereby said gripping members may be moved into said loop; means for opening the gripping members; means for delivering to said gripping members while in said loop, material which is to be carried through said loop; means for closing said gripping members while in said loop, whereby said material may be securely held in said gripping members; means whereby said gripping members together with said material to be withdrawn through said loop presented are moved through said loop in a direction other than that of the moving shaft; means for opening the grippers to release said material therefrom; and means to restore the whole apparatus to normal position.

13. A main shaft; a device for delivering flexible material; means whereby said device is operatively controlled by said main shaft; means for cutting said flexible material; means whereby said cutting means are operatively controlled by said main shaft; gripping members operatively mounted upon said main shaft; means for holding an object to be threaded; means for making and passing a loop of said flexible material through said object and presenting said loop to said gripping members moving with said shaft, whereby said gripping members may be moved into said loop; means for opening the gripping members; means for delivering to said gripping members while in said loop, material which is to be carried through said loop; means for closing said gripping members while in said loop, whereby said material may be securely held in said gripping members; means whereby said gripping members together with said material to be withdrawn through said loop presented are moved through said loop in a direction other than that of the moving shaft; means for opening the grippers to release said material therefrom; and means to restore the whole apparatus to normal position.

14. Gripping members; a shaft having

said gripping members operatively mounted thereon; means whereby said gripping members may be opened and closed; means whereby said gripping members may be caused to
 5 turn upon themselves in a direction other than that of the moving shaft; means whereby a loop of flexible material may be presented to said gripping members; means to move the free end portions of said material to said
 10 gripping members; and plates to guide said end portions to and between said gripping members; said members closing upon said plates and end portions, while said members are turning upon themselves.

15 15. Gripping members; a shaft; a member fixed thereto; said gripping members being pivotally mounted upon said member; a pinion operatively connected to the gripping members; and a rack with which said pinion,
 20 by the rotation of said shaft, is moved into and out of engagement; thereby causing the gripping members to turn on their pivot in a direction opposite to that of the moving shaft; means to open said gripping members;
 25 means whereby a loop of flexible material may be presented to said gripping members; means to move the free end portions of said material to said gripping members; plates to guide said end portions to and between said
 30 open gripping members; means to close said gripping members so that they will engage the outer sides of said plates, and thus not fail to grip the said free end portions.

35 16. Gripping members; a shaft; a member fixed thereto; said gripping members being pivotally mounted upon said member; a pinion operatively connected to the gripping members; and a rack with which said pinion,
 40 by the rotation of said shaft, is moved into and out of engagement; thereby causing the gripping members to turn on their pivot in a direction opposite to that of the moving shaft; means to open said gripping members;

means whereby a loop of flexible material may be presented to said gripping members; 15
 means to move the free end portions of said material to said gripping members; plates to guide said end portions to and between said open gripping members; means to close said gripping members so that they will engage 50
 the outer sides of said plates, and thus not fail to grip the said free end portions; and means to cause the gripping members to return to and remain in normal position in relation to the shaft when said rack and pinion 55
 move out of engagement.

17. A main shaft; a delivery-shaft; means whereby said main shaft is operatively connected to the delivery-shaft; a member fixed to said delivery-shaft, and having an opening 60
 throughout its length; elastic means for closing said opening; means for holding said member in its normal position; means for pushing a loop of flexible material through said opening while said member is in its normal position; gripping mechanism to engage 65
 said loop; means to withdraw said pushing means from said member; means whereby the main shaft causes the delivery-shaft to move, thereby moving said member with 70
 said flexible material, into position for the latter to be seized by the gripping mechanism; means to cause said member to move back to normal position; the tension upon the flexible material being such that it causes 75
 the said flexible material to leave the open space in said member by overcoming the resistance offered to its passage by said elastic means.

In testimony whereof I affix my signature 80
 in presence of two witnesses.

WINFORD C. WETHERELL.

Witnesses:

MARY R. HOLT,
 RICHARD P. BORDEN.