No. 725,311. PATENTED APR. 14, 1903.

A. N. AMES.

KNITTING MACHINE.

APPLICATION FILED SEPT. 6, 1895.

NO MODEL. 2 SHEETS—SHEET 1.

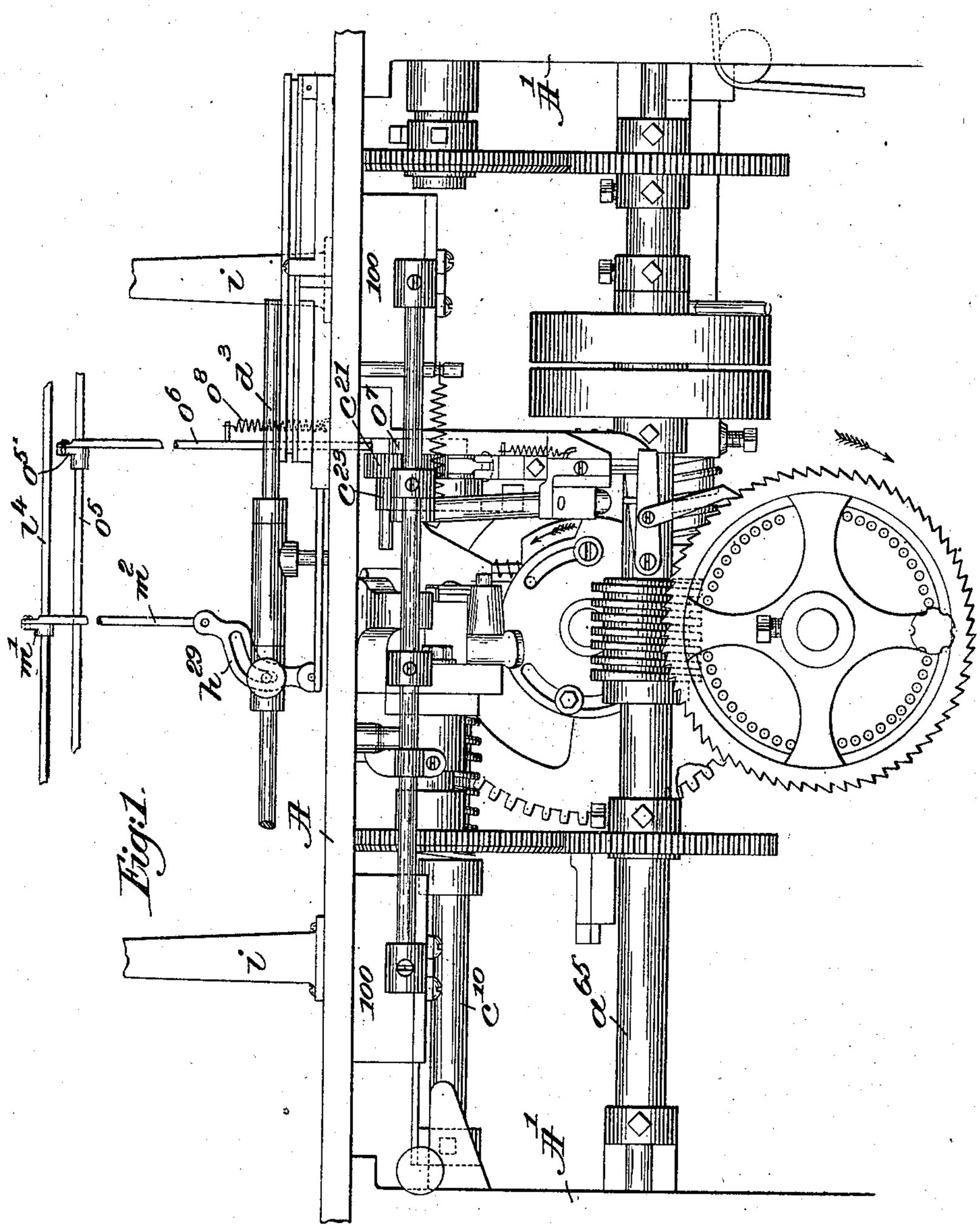

Fig. 1.

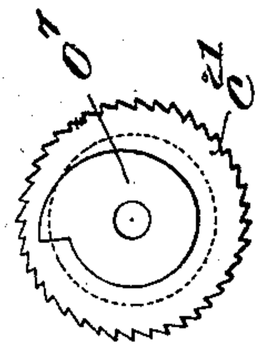

Fig. 5.

Witnesses.
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NO MODEL. 2 SHEETS—SHEET 2.

Fig: 2.

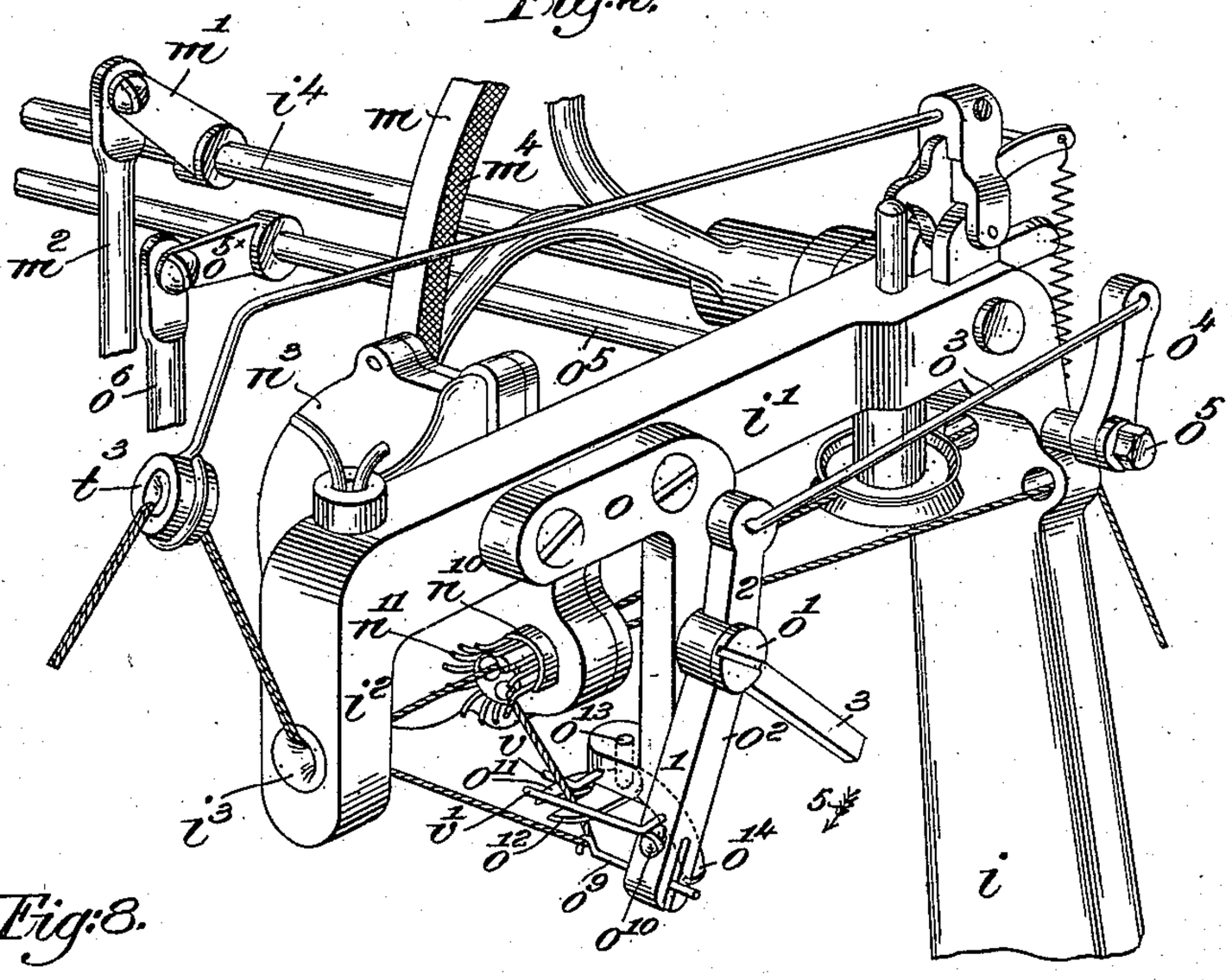
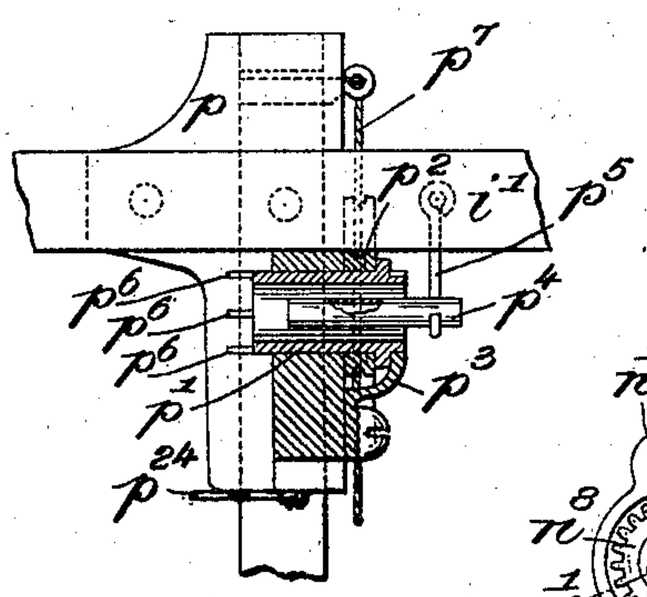


Fig: 8.

Fig: 3.



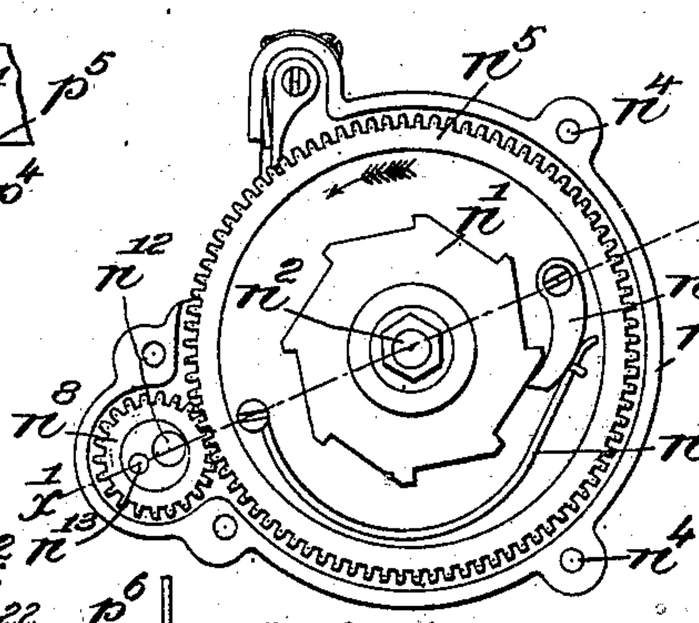


Fig: 7.

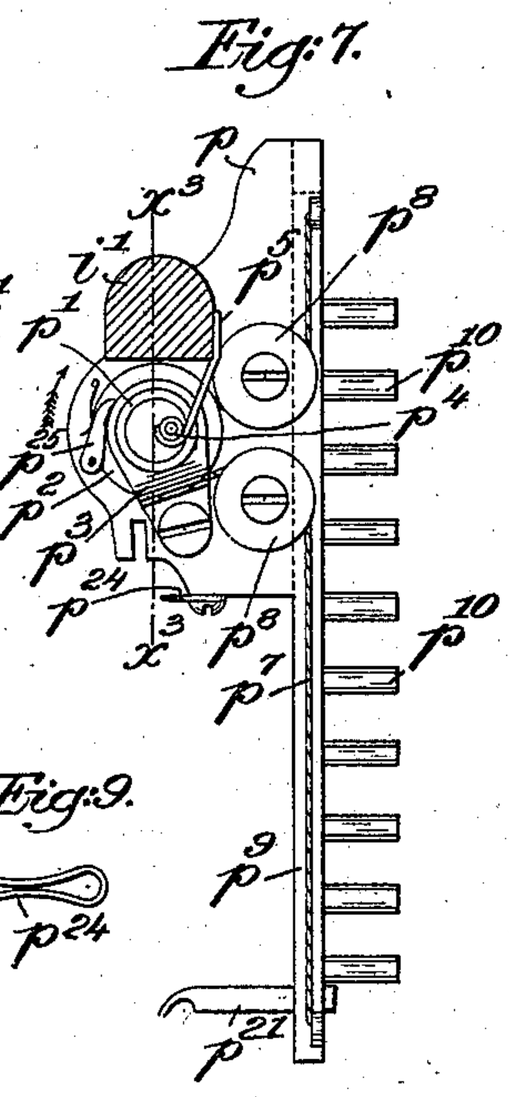


Fig: 6.

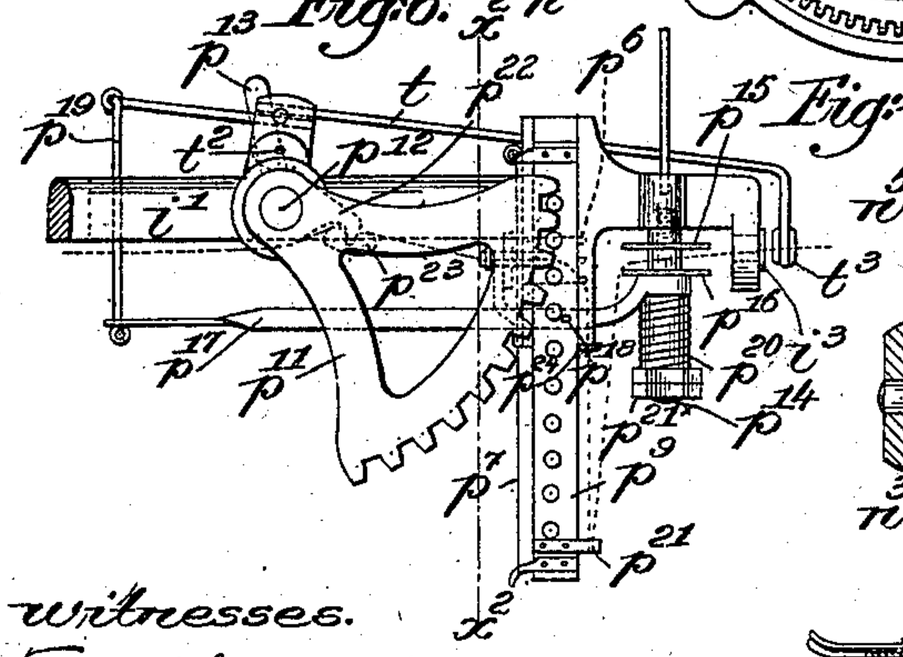


Fig: 4.

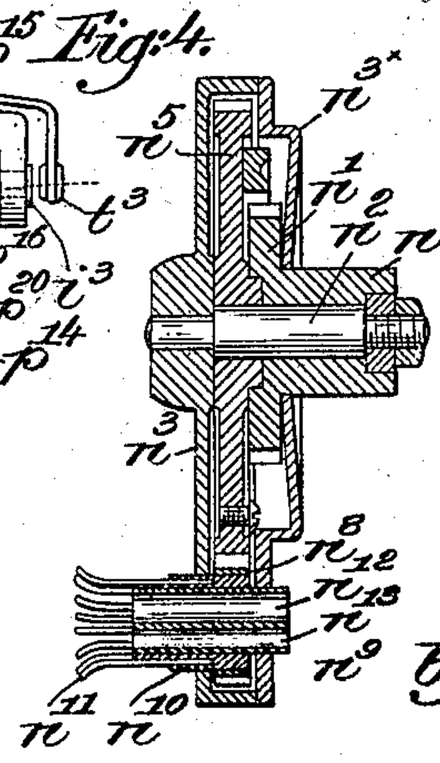


Fig: 9.

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UNITED STATES PATENT OFFICE.

ARTHUR N. AMES, OF FRANKLIN, NEW HAMPSHIRE, ASSIGNOR TO MAYO KNITTING MACHINE AND NEEDLE COMPANY, A CORPORATION OF NEW HAMPSHIRE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 725,311, dated April 14, 1903.

Application filed September 6, 1895. Serial No. 561,607. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR N. AMES, of Franklin, county of Merrimack, State of New Hampshire, have invented an Improvement in Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention in knitting-machines has special reference to mechanisms for introducing into the work when needed additional or different threads.

My invention comprehends a device for winding one thread about another without requiring that the spools, cops, or sources of supply of said threads be movable and without putting into the threads back of the winding device an objectionable reverse or opposite twist.

My invention also comprehends a holding device to hold the free end of the severed thread previous to the twisting of said thread about another, and also a finger or device for drawing one of the threads to one side its normal line of travel for engagement with said holding device.

My invention also comprehends suitable means for severing one of the threads when its further use is not desired.

In the drawings, Figure 1 in face view shows sufficient portions of a knitting-machine of well-known construction to which one embodiment of my invention is applied, the figure being sufficient to enable my invention to be understood; Fig. 2, a perspective detail showing the rotary winder and the cutting mechanism of the embodiment of my invention Fig. 1; Fig. 3, a vertical section through the winder and showing the operating parts therefor in elevation; Fig. 4, a cross-section on the dotted line x', Fig. 3; Fig. 5, a detail showing the cam o^7; Fig. 6, a detail showing a modified form of my invention. Fig. 7 is an enlarged section on the dotted line $x^2\ x^2$, Fig. 6, looking to the right, with the sector omitted; and Fig. 8, a sectional detail, the section being taken on the dotted line $x^3\ x^3$, Fig. 7, some of the parts being shown in elevation; Fig. 9, a detail of holding device p^{24}.

Referring to the drawings showing one embodiment of my invention, herein selected as an illustration of the same, the top plate A, supported by suitable standards A′, provided with the curbs 100, each containing a cam-cylinder operated from the shaft a^{65}, the sliding rod d^3, connecting the two cam-rings of the two cam-cylinders and moved to shift said rings at the beginning of the reciprocations of the cam-cylinder for narrowing and widening, the pattern-wheel c^{23}, actuated by its attached ratchet-wheel c^{21} and making one complete rotation at each operation of narrowing and widening, and other parts shown in Fig. 1 are and may be substantially like corresponding parts similarly lettered in the Mayo machine illustrated in United States Patent No. 474,671, dated May 10, 1892, said parts being constructed and operated substantially as set forth in said patent, to which reference may be had, further description of the same herein being deemed unnecessary.

Upon the top plate of the machine, Fig. 1, I have herein arranged two standards $i\ i$, broken off in said figure to enable the latter to be arranged upon the sheet, but shown more fully in Fig. 2, the said standards having their ends bent at substantially right angles, as shown, to form overhanging arms $i'\ i'$, said arms in turn having their ends turned downwardly at i^2 and provided with eyes i^3, vertically above and constituting guides through which the yarn or thread is fed to the needle-cylinders. Extended between the standards $i\ i$ and journaled at its ends therein is a shaft i^4, upon which are fixed two like sectors $m\ m$, one for and at each standard, said shaft at its middle (see Figs. 1 and 2) having an actuating-arm m' connected by a rod m^2 with a slotted lever h^{29}, connected to and vibrated by the sliding rod d^3, referred to. These mechanisms upon the standards $i\ i$ referred to are similar, and it will therefore be necessary to describe but one in detail, it being understood that both are alike and operated by the common shafts i^4 and o^5, to be referred to. Each sector m along the side of its curved periphery is shown provided with a friction-strip m^4 of rawhide or other suitable friction material to engage the preferably milled or otherwise roughened periphery of the hub n

(see Fig. 4) of a ratchet-wheel n', (see Fig. 3,) loosely journaled upon a stud n^2, projecting from the interior of an inclosing shell n^3, bolted at n^4 or otherwise suitably attached to the overhanging arm i' on the adjacent standard i. Close to the ratchet-wheel n' and loosely journaled upon the same stud n^2 is a toothed wheel n^5, provided with a pawl n^6, engaging the teeth of the ratchet-wheel n', (see Fig. 3,) a spring n^7 maintaining the said pawl in operative engagement with the said ratchet-teeth, rotation of the hub n and its ratchet-wheel in one direction giving a like rotation to the toothed wheel n^5, while rotation of the said hub and ratchet-wheel in the opposite direction takes place independently of and without moving the said toothed wheel n^5. The toothed wheel n^5, as herein shown, (see Fig. 3,) meshes with and drives a pinion n^8, which (see Fig. 4) is loosely journaled about a stud n^9, firmly held in the cover $n^{3\times}$ of the inclosing shell n^3. The pinion n^8 is, as herein shown, provided with an annular lip or sleeve n^{10}, extending laterally to one side and surrounding the projecting end of the stud n^9, (see Fig. 4,) and to the inner grooved face of this annular lip n^{10} I have in the present instance secured a plurality of projections n^{11}, preferably of wire or bristles, the ends of the said projections or wires being, as shown, curved or flared outwardly.

The stud n^9, as herein shown, is provided with two longitudinal holes n^{12} and n^{13}, which constitute, respectively, yarn or thread guides, one yarn or thread being passed through the guide n^{12}, thence through the eye i^3 in the overhanging arm, and through the eye t^3 of a suitable take-up to the needles, the second thread being passed through the guide n^{13} and having its end drawn to one side (see Fig. 2) in position to be acted upon by one or another of the projections or bristles n^{11} on the pinion n^8 when the latter is rotated.

To facilitate the description of the operation of my device, I will assume that the thread passing through the guide n^{12} is the usual main thread of the machine, and the thread passing through the guide n^{13} is a thickening-thread and that it is desired to introduce the latter thread at certain portions of the work—for example, at the heel or toe of a stocking—in the formation of which it is necessary to reciprocate the cam cylinder or cylinders.

In the present instance when the slide-rod d^3 is moved to the right, Fig. 1, to shift the cam-rings preparatory to reciprocating the cam-cylinder such movement of the said rod acting through the lever h^{29}, the rod m^2, and sector m will rotate the ratchet-wheel n', its toothed wheel n^5, and the pinion n^8 in the direction indicated by the arrows thereon in Fig. 3 to cause the end of the thickening-thread to be acted upon by the projections on the pinion and be rapidly wound about and upon the main thread passing through the thread-guide n^{12} to the needles, so that the said main thread will draw the thickening-thread with it, as indicated in Fig. 2, to the work. It now remains to sever the thickening-thread at the end of the reciprocations of the cam-cylinder, when the said thread is no longer needed.

The mechanism employed in the construction Figs. 1 to 5, inclusive, is best shown in Fig. 2, wherein o is a bracket secured to one side of the overhanging arm i' of the standard, and to the side of this bracket, upon a screw o', is pivoted the three-armed lever o^2, its three arms being herein distinguished by the figures 1, 2, and 3. The arm 2 of the three-armed lever o^2 is herein shown as connected by a rearwardly-extended link o^3, with one arm o^4 (see Fig. 2) fast on one end of a shaft o^5, journaled at its ends in the two standards $i\ i$, previously referred to, and provided at its middle, between said standards, with an arm $o^{5\times}$, to which is jointed one end of a rod o^6, which (see Fig. 1) extends downwardly through the top plate of the machine and at its lower end rests upon the peripheral surface of a cam o^7, fast on the shaft of the pattern-wheel c^{23} and shown separately in Fig. 5, a spring o^8 (see Fig. 1) acting to retain the said rod o^6 always in operative contact with the said cam. The arm 1 of the three-armed lever o^2 is shown as split to receive a finger o^9, hooked at its outer end, as shown, and clamped in the said arm by means of a clamping-screw o^{10}.

The cutting device proper consists of two cutting-blades o^{11} o^{12}, the latter of which is fixed to the bottom of the bracket o, while the former is pivoted thereto at o^{13} and is provided with an arm o^{14}, which stands in a position (see Fig. 2) between and adapted to be struck by the arms 1 and 3 of the three-armed lever o^2 when the latter is vibrated.

Assuming the thickening-thread to have been wound upon the main thread, and thereby drawn into the work, and that it is now desired to sever the thread and hold it out of operation, the mechanism described operates as follows, viz: The pattern-wheel c^{23} rotates, as stated, once during the narrowing and widening of the work—that is, once from the beginning to the end of the reciprocations of the cam-cylinder. During the rotation of this pattern-wheel the cam o^7 is rotated thereby and gradually raises the rod o^6 and turns the three-armed lever o^2 in the direction of the arrow 5, Fig. 2, raising its hooked finger o^9 above the thickening-thread passing to the work, the said thread being pushed to one side by and to permit the raising of the said hooked finger. This movement of the three-armed lever o^2 causes its finger 3 to strike the arm o^{14} of the cutting-blade o^{11} and move the latter away from its companion blade o^{12} to open the two cutter-blades like a pair of scissors, as shown in Fig. 2. Immediately before the pattern-wheel completes its rotation and stops the reciprocations of the cam-cylinder the end of the rod o^6 acted upon by the spring o^8 drops from the highest point of the cam o^7 to

the lowest point thereof, permitting the said spring to depress the rod o^6 and return the three-armed lever o^2 again to its normal full-line position, Fig. 2, in a direction opposite the arrow 5, said return movement of the three-armed lever causing its hooked finger o^9 to catch the thickening-thread and draw it down or to one side its line of movement, as shown in Fig. 2, between two of the clamping projections n^{11} on the pinion n^8 and between the two cutting-blades o^{11} o^{12}, further and final movement of the said three-armed lever causing its arm 1 to strike the arm o^{14} of the movable cutting-blade o^{11} and move the latter toward its companion blade to sever the thickening-thread. While the end of the thickening-thread thus left drawn to one side by the hooked finger, as described, may be left free, if desired, I prefer to provide a suitable holding device to engage and hold this end in its position in front of and in position to be engaged by one of the projections of the winding-pinion, when the latter will be again set in position. In the embodiment of my invention Figs. 1 to 5, inclusive, this holding device comprises a wire v on the bracket and a coöperating, preferably resilient, wire v' on the arm 1 of the three-armed lever o^2. At the moment the thread is severed by the cutting mechanism or immediately before or after the severing of said thread the two wires v' and v come together, as will be understood by reference to Fig. 2, and clamp the end of the severed thread frictionally between them and drawn across the end of the thread-guides and between two of the projections on the pinion n^8 in position to be engaged by them upon rotation of the pinion, as described. When the pinion is rotated to wind this free end of the thread in the guide n^{13} about the other thread, said free end is by the winding operation drawn out from the holding device without necessary movement or opening of the latter. The portion of the thickening-thread beyond the cut is drawn to the machine and incorporated in the work before the reciprocations of the cam-cylinder are terminated by the pattern-wheel c^{23} reaching the end of its rotation. The slide-rod d^3 is now returned to the left into its normal position to return the cam-rings to their normal positions for circular word, and thereby the sector m again into its lowermost position, Fig. 2, such return movement of the sector, however, failing to rotate the pinion n^9 with its projections because of the pawl-and-ratchet connection between the ratchet-wheel and the toothed wheel n^5. The rotatable connected projections n^{11} constitute one form of what I term a "rotatable winder" for winding the free end of one thread about another.

In the embodiment of my invention Figs. 1 to 5, inclusive, the projections are so far separated one from the other that the thread is not clamped by the same when drawn between them, although in a patent, No. 600,761, granted to me March 15, 1898, I have shown a mechanism in which the projections constructed and operated substantially like the projections herein shown are arranged in such close proximity to each other that a thread drawn between any two projections will be clamped and held thereby.

I have herein shown a take-up substantially like that shown in my said Patent No. 600,761; but I desire it to be understood that my present invention in no way relates to the take-up and may be used with any desired take-up, or, so far as the invention is concerned, without any take-up.

I have herein shown my novel mechanism as applied to the well-known Mayo machine; but my invention is not restricted in its use to the Mayo machine alone, for it may be applied to or used in connection with any knitting-machine known to me and connected to suitable parts to actuate the winder and cooperating parts at the proper times.

In Figs. 6, 7, and 8 I have shown a modified form of my invention, which I will now describe. The overhanging arm i' of the standard i may be as in the construction Figs. 1 to 5, and in a bracket p thereon is journaled the tubular barrel p', (see Figs. 7 and 8,) constituting the hub or journal of a grooved pulley p^2, the outer end of the barrel or journal being herein shown as having a bearing in a thin bracket p^3. Within this tubular barrel p, and preferably at one side thereof, (see Fig. 7,) is arranged a smaller tube or thread-guide p^4, shown as supported at its outer end by a depending bracket or arm p^5, secured to the arm i'. The inner end of the tubular barrel p' is shown as provided with a plurality of projections p^6, (shown as four in number,) adapted to catch and wind the free end of one thread upon another, as in the construction Figs. 1 to 5, described. The barrel p' and its projections or pins, which in this construction constitute the winder, are rotated by means of a cord or belt p^7, passed about the grooved pulley p^2 and the idler-pulleys p^8, carried by the bracket p, (see Fig. 7,) and attached at its opposite ends to the ends of a vertically-moving rack p^9, fitted to slide in suitable guides in the arm i' or the bracket p carried thereby. This rack p^9 is shown provided at one side with a series of laterally-projecting pins or teeth, adapted for engagement with the teeth of the sector p^{11}, pivoted at p^{12} upon a shaft journaled in the arm i'. This shaft p^{12} and its sector p^{11} are acted upon and vibrated in suitable manner—as, for instance, such as shown and described in connection with Figs. 1 to 5, inclusive—said shaft p^{12} being shown as provided with an arm p^{13} to engage and operate in usual manner the take-up t, pivoted at t^2 and provided at its end with an eye t^3, through which the thread is passed. Between the eye i^3 in the end of the arm i' and the winder is arranged a depending spindle p^{14}, near the upper end of which is fixed one plate p^{15} of a tension device, the coöperating or movable

plate p^{16} being supported by a lever p^{17}, pivoted at p^{18} to the bracket p and having its arm connected by a link p^{19} with the take-up t, a spring p^{20} being interposed between the nuts p^{21} and the said lever p^{17} to move the tension-plate p^{16} normally toward its coöperating plate p^{15}. The rack p^9, near its lower end, is provided with a forwardly and laterally extended finger p^{21}, (see Fig. 6,) which at its under side is preferably sharpened more or less like a knife, and the shaft p^{12} is shown as provided with a clamping-arm p^{22}, which at times coöperates with a clamping anvil or block p^{23} on the arm i', all for a purpose to be described. A holding device p^{24} is shown arranged between the axis of the winder and the finger p^{21}, it being shown (see Fig. 9) as a U-shaped spring having its ends brought together, so that a string or thread passed between them would be clamped or held thereby. A back-stop pawl p^{25} (see Fig. 7) acts upon the milled or toothed periphery of the barrel p' and permits rotation of the latter only in the direction of the arrow, Fig. 7. When in use, one of the threads is passed through the hollow barrel p' outside the tubular guide p^4, said barrel constituting a thread-guide, and the other thread is passed through the tubular guide p^4, and the operation of the modified device is as follows, viz: Assuming the two threads to be in use and it is desired to withdraw one—for instance, a thickening-thread passed through the guide p^4—the sector p^{11} will be dropped, as in the device Figs. 1 to 5, inclusive, and will also slide the rack p^9 into its lowermost position, causing the cord or belt p^7 to travel about the grooved pulley p^2 of the winder without rotating the latter, inasmuch as the tendency of the cord during the downward movement of the rack is to rotate the winder in a direction opposite the arrow, Fig. 7, which is prevented by the pawl p^{25}. This downward movement of the rack causes its finger p^{21} to catch the thread passed through the guide p^4 and draw the same down or to one side the path of movement, as in the device Figs. 1 to 5, inclusive, the thread thus drawn to one side being laid across the face of the winder, between two projections p^6 thereon, and also drawn through to be held by the holding device p^{24}. Just before the rack reaches the end of its downward movement the clamping-arm p^{22}, beneath which the thread of the guide p^4 passes, presses the said thread upon and clamps it against the block p^{23}, thereby clamping the thread at that point—that is, between the winder and source of the thread-supply—with sufficient tension to cause the knife-like or sharpened under edge of the finger p^{21} to sever the thickening-thread at the said finger, the opposite or severed end being drawn to and knitted into the work by the needles of the machine, the other or the remaining end of the thread being held clamped by the holding device p^{24}. When it is desired to again introduce the severed thread held by the holding device p^{24}, the sector p^{11} is raised as in the construction Figs. 1 to 5, inclusive, causing the cord to rotate the winder in the direction of the arrow, Fig. 7, the projections on the winder catching the end of the thread held by the holding device, withdrawing it from the latter and winding it a plurality of times about the other thread passing through the tubular barrel p'.

In the construction Figs. 6 to 8, inclusive, when the sector drops to withdraw the second thread at the end of the reciprocations of the cylinder its arm p^{13} throws the take-up down into its position Fig. 6, at the same time through the link p^{19} separating the tension-plates p^{15} p^{16} to enable the single thread to travel to the machine free from tension. When the sector is raised for the introduction of the second thread prior to the reciprocations of the cylinder, the take-up is permitted to rise as usual, and at the same time by the link p^{19} drops the long arm of the lever p^{17} and permits the spring p^{20} to raise the friction disk or plate p^{16} toward the plate or disk p^{15} to thereby place a sufficient tension upon the two threads moving to the needles to permit the reciprocations of the needle-cylinder to be properly carried out.

The modification Figs. 6 to 8, inclusive, is a single illustration of the fact that my invention may be variously modified within the spirit and scope of the invention, which is not, therefore, restricted to the particular embodiment herein shown.

A distinguishing feature of my invention is that the sources of supply of the different threads may be fixed and two threads twisted together by carrying the free end of one one or more times about another without putting into the threads back of the winding device a reverse or opposite twist. My invention therefore enables a device for winding or twisting the two threads together to be made much simpler than in other devices for the purpose wherein the sources of the thread-supply must themselves be rotated, and devices wherein the ends of the threads are clamped and twisted back of the clamped ends, and is also free from the objectionable opposite or reverse twist put into the threads by the construction last referred to.

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

1. In a knitting-machine, the combination with a guide device for a plurality of threads, of a rotary winder for carrying the free extremity of one thread one or more times about another, means independent of said winder for engaging the thread outside of said winder and for drawing it to one side of the line of travel of the thread and devices other than said engaging and drawing means for engaging and holding the thread after it is drawn to one side of its line of travel by the said means.

2. In a knitting-machine, the combination

with a guide device for a plurality of threads, of a rotary winder for carrying the free extremity of one thread one or more times about another, means independent of said winder for engaging the thread outside of said winder and for drawing it to one side of the line of travel of the thread, and devices other than said engaging and drawing means for engaging and holding the thread after it is drawn to one side of its line of travel by the said means, and means for severing one of said threads.

3. In a knitting-machine, the combination with a guide device for a plurality of threads, of a rotary winder for carrying the free end of one thread one or more times about another, a holding device independent of said winder and means for drawing one of said threads to one side of its line of travel into position for engagement with said holding device, a member of said holding device being operable with said means.

4. In a knitting-machine, the combination with a guide device for a plurality of threads, of a rotary winder for carrying the end of one thread one or more times about another, a holding device independent of said winder, means for drawing one of said threads to one side of the line of travel, a member of said holding device being operable with said means to clamp the thread as the same is drawn to one side of its line of travel and means for severing said thread.

5. In a knitting-machine, the combination with a guide device for a plurality of threads, of a rotary winder for carrying the end of one thread one or more times about another, a holding device independent of said winder, means for drawing one of said threads to one side of the line of travel, a member of said holding device being operable with said means to clamp the thread as the same is drawn to one side of its line of travel, and a cutter intermediate said means and holding device for severing one of the said threads.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ARTHUR N. AMES.

Witnesses:

JAMES E. BARNARD,

MAUDE R. BARNARD.