

No. 670,392.

Patented Mar. 19, 1901.

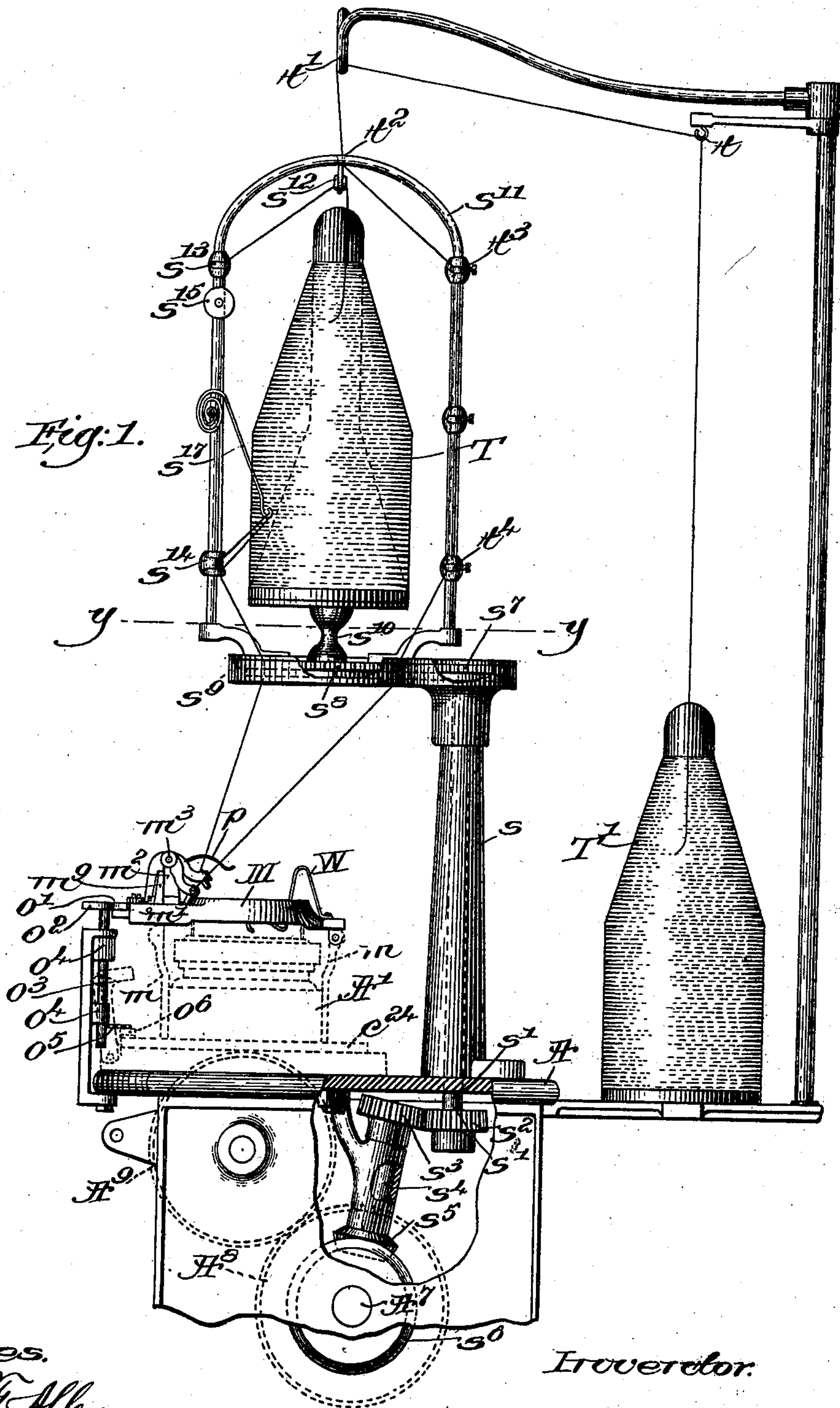
A. N. AMES.

THREAD CHANGING MECHANISM FOR KNITTING MACHINES.

(Application filed June 21, 1897.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses.

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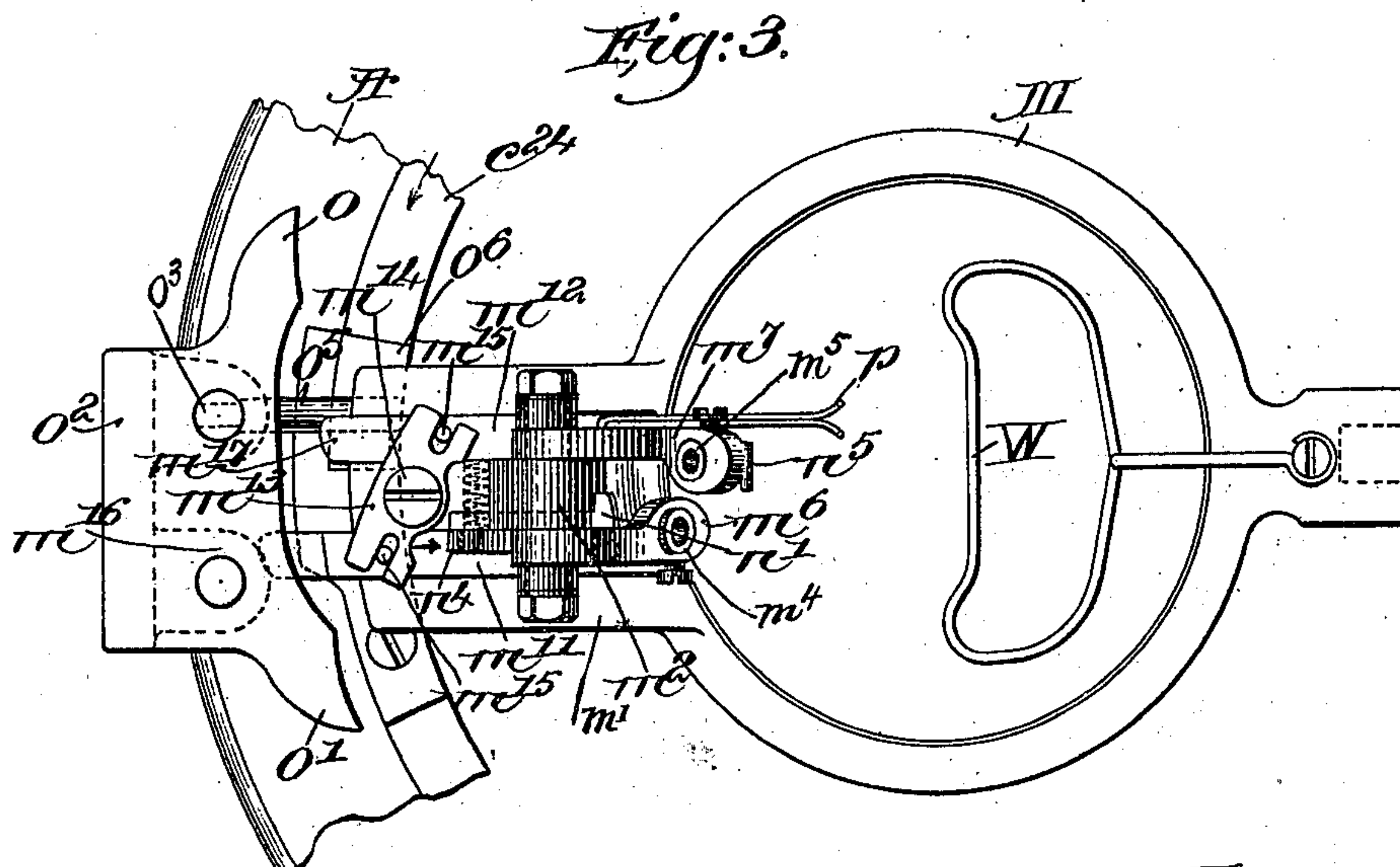
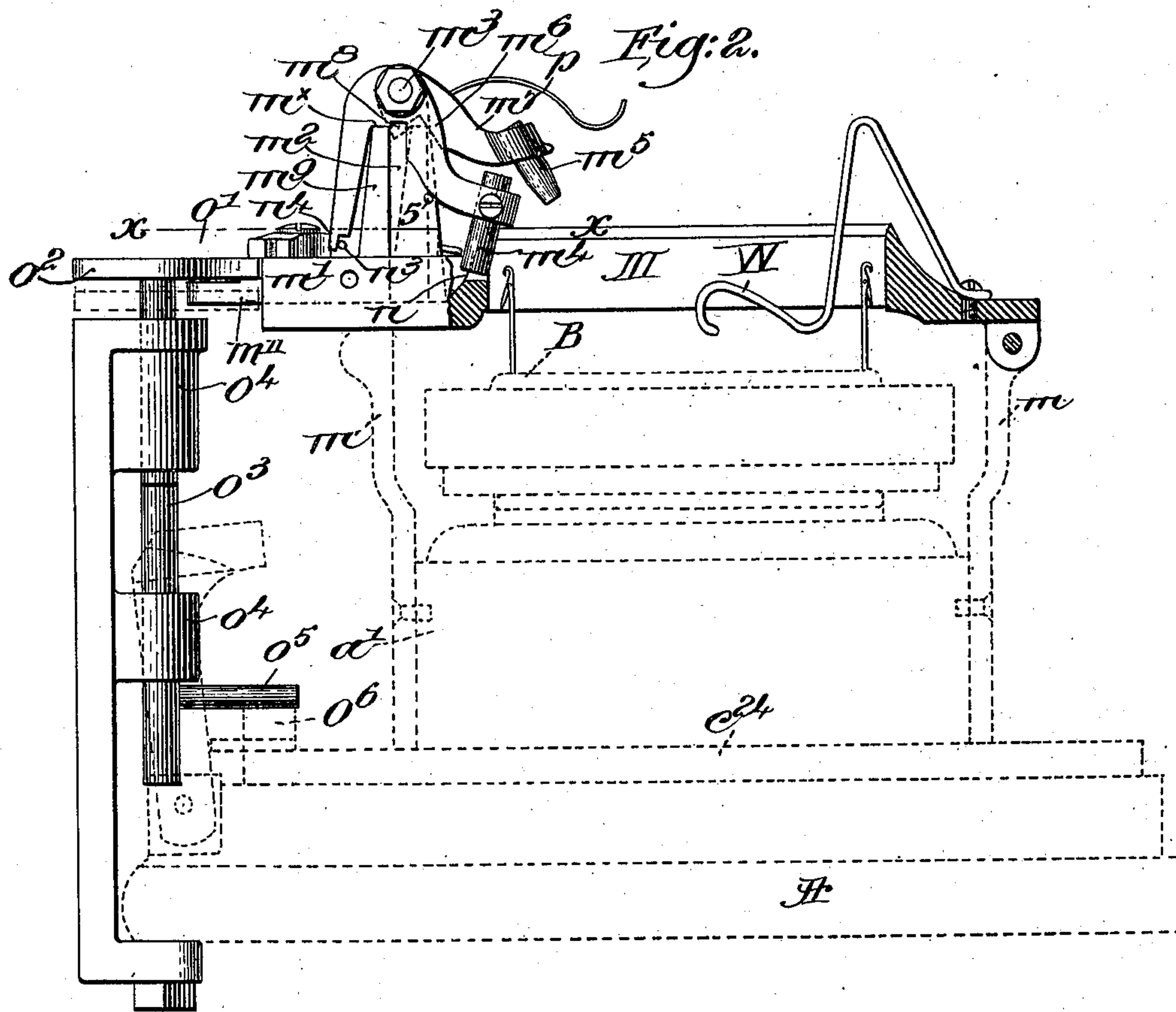
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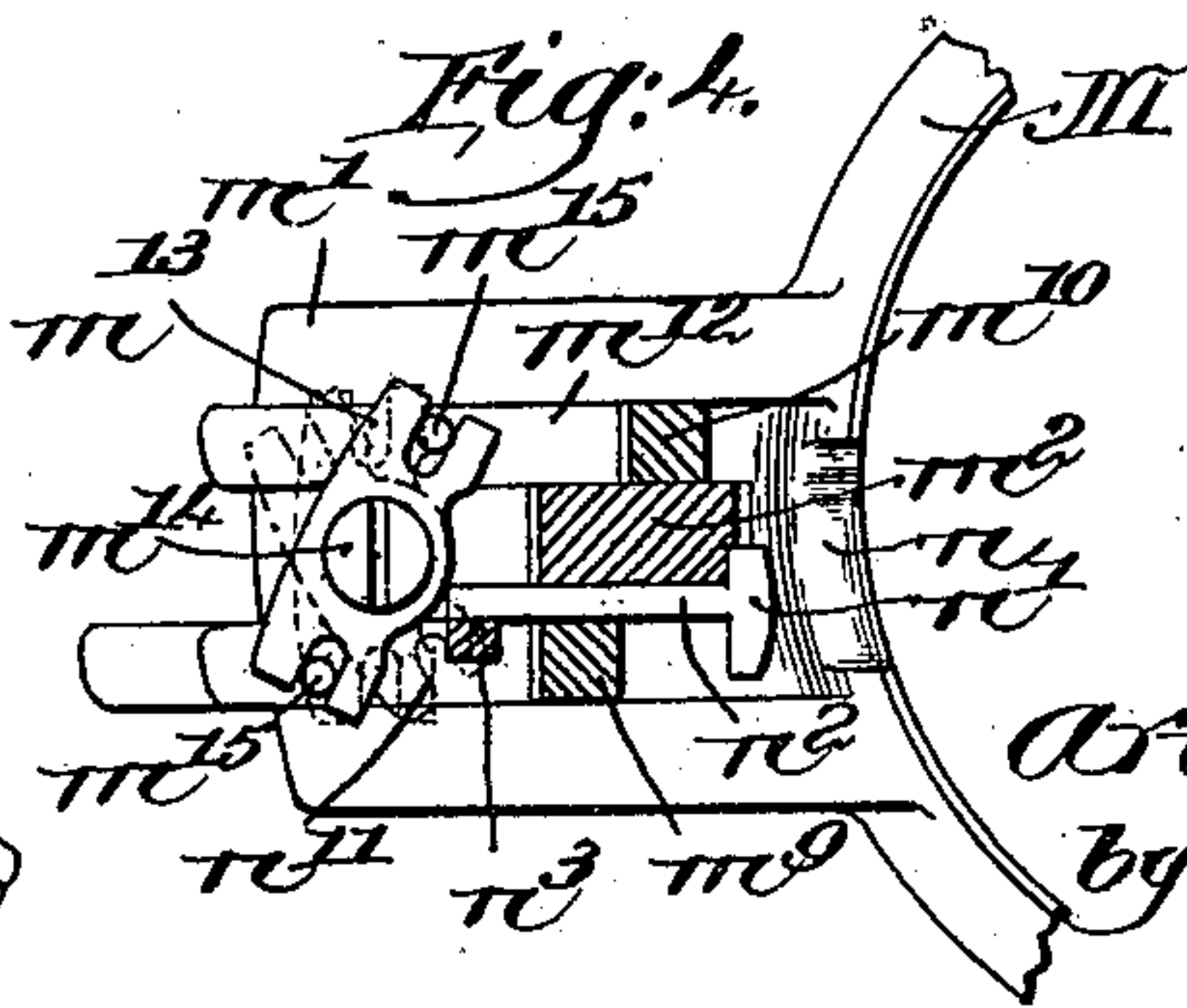
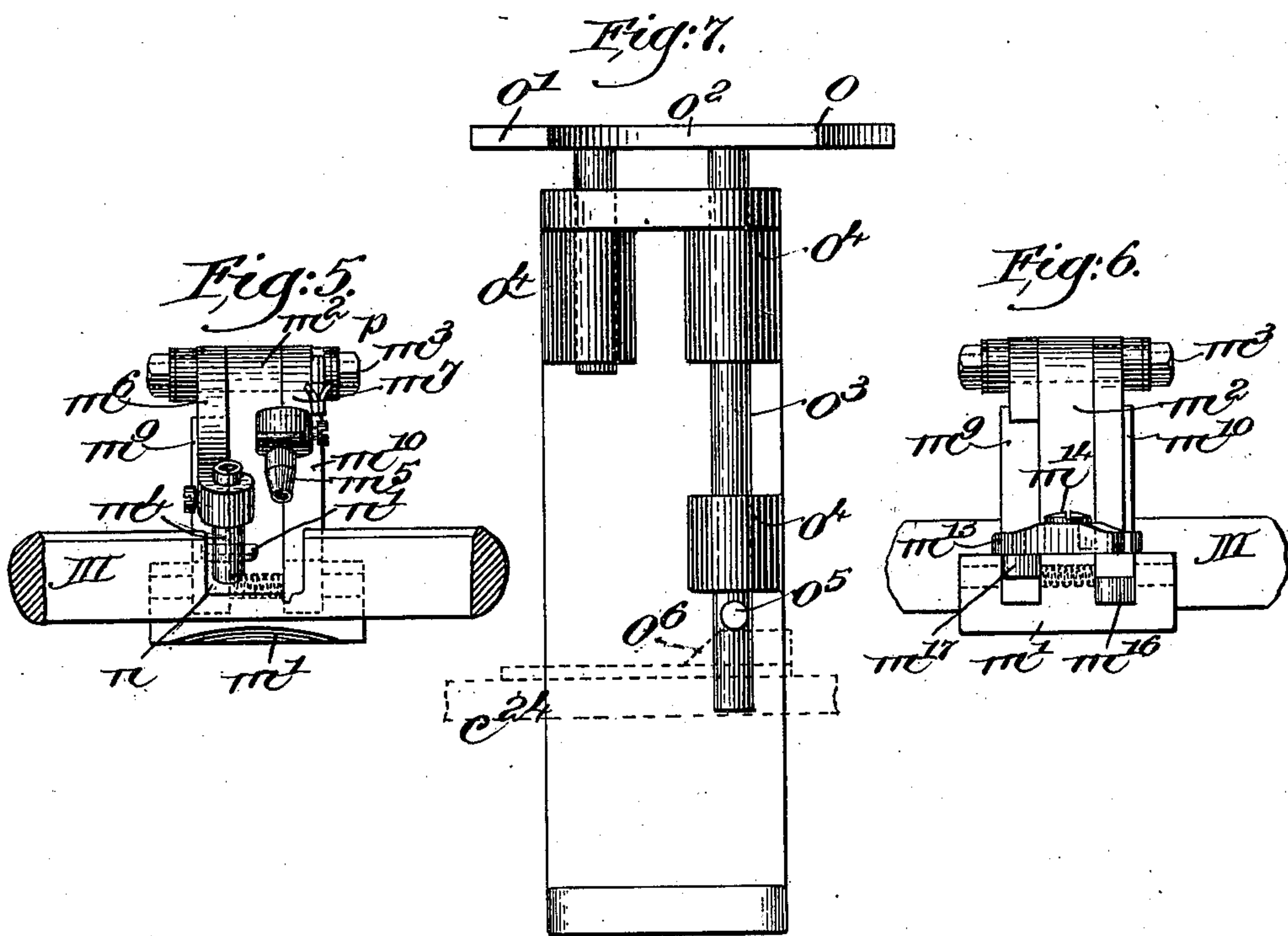
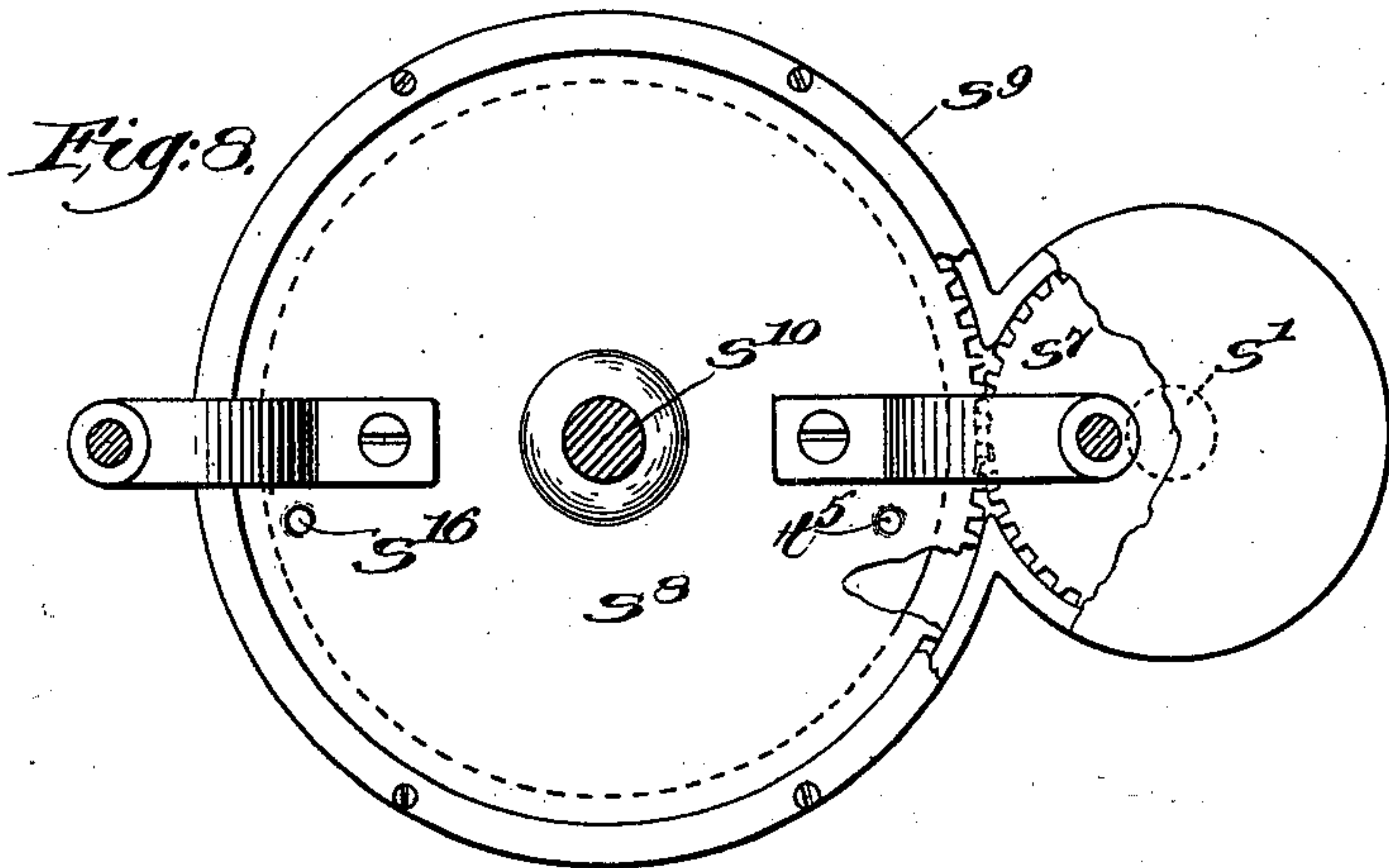
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(Application filed June 21, 1897.)

(No Model.)

3 Sheets—Sheet 3.



Witnesses
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UNITED STATES PATENT OFFICE.

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

THREAD-CHANGING MECHANISM FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 670,392, dated March 19, 1901.

Application filed June 21, 1897. Serial No. 641,650. (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
5 in Thread-Changing Mechanism for Knitting-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

10 This invention in knitting-machines relates to what is commonly known as a "thread-changing" mechanism—that is, a mechanism for automatically changing from one to another thread or yarn or for substituting one
15 for another thread or yarn.

The object of my invention is to simplify and improve mechanisms of this kind; and my invention consists in the various features hereinafter fully set forth and claimed.

20 In the drawings, Figure 1 in elevation and partial section shows a sufficient portion of a knitting-machine equipped with one embodiment of my invention to enable the latter to be understood; Fig. 2, an enlarged sectional
25 detail of a portion of Fig. 1; Fig. 3, a top or plan view of Fig. 2; Fig. 4, a horizontal section on the dotted line xx , Fig. 2, looking down; Fig. 5, a view of the thread-guides looking from the right, Fig. 2; Fig. 6, a view
30 of the same looking from the left, Fig. 2, or from the back, Fig. 5; Fig. 7, a view of the thread-guide-actuating cam and support therefor looking from the right, Fig. 2; and Fig. 8, on an enlarged scale, a horizontal section looking down, taken on the dotted line
35 yy , Fig. 1.

Referring to the drawings, A indicates the table of a knitting-machine, B the needle-cylinder carried thereby, and A' the cam-cylinder, rotated by a beveled gear A⁹, in mesh with
40 a gear A⁸ on the main shaft A⁷, which is at times rotated, as when circular knitting is being done, and at other times is reciprocated, as when narrowing and widening are being
45 done, said parts being all substantially of usual or well-known construction—for example, such as is illustrated in United States patent to Mayo, No. 461,357, dated October 13, 1891, to which reference may be had, although
50 it should be understood that my invention is

equally applicable to any other well-known or desired machine.

As herein shown, the cam-cylinder A' is provided with suitable supports m for the latch-guard M, which of course necessarily rotates
55 with the cam-cylinder, said latch-guard or a laterally-extended portion m' thereof being provided with a suitable standard m^2 , (see Fig. 2,) to the opposite sides of which are pivoted at m^3 the two thread or yarn guides
60 $m^4 m^5$, shown as adjustably mounted on the arms $m^6 m^7$. These thread-guides $m^4 m^5$ have swinging movements about their common pivot m^3 to carry their threads from positions
65 outside the circle of the knitting-machine needles to positions within the circle of the said needles, and to impart such movements to the said guides I have herein provided their
70 carrying-arms, respectively, with notches or pockets m^8 , which receive the upper ends of vertical arms $m^9 m^{10}$ of thread-guide actuators
75 $m^{11} m^{12}$, arranged to slide in suitable bearings in the laterally-extended portion m' of the latch-guard referred to, said actuators for the best results being preferably connected
80 for concordant movement by a beam m^{13} , fulcrumed at m^{14} and forked at its ends to engage pins or projections m^{15} , rising from the said actuators. When either one of these
85 actuators is moved inwardly or to the right, Fig. 1, its vertical arm referred to will engage its notched thread-guide arm and move the same to its innermost position, with its thread-guide within the circle of the needles,
90 and at the same time, through the beam m^{13} , the other actuator is moved in an opposite direction, causing its vertical arm to engage an opposite wall of the notch of its guide-arm and move the latter outwardly to carry its thread-guide to a position outside of the circle of the needles.

It will be noticed by reference to Fig. 2 that when the vertical arm of either actuator is moved outwardly to carry its connected
95 thread-guide from within to the outside of the circle of needles the said arm will, after having given a complete movement to its thread-guide arm, pass in its further movement beneath the locking-surface m^x on the
100 hub of the guide-arm, as in Fig. 2, and as the

said locking-surface, as herein shown, is flat it coöperates with the flat or squared upper end of the said vertical arm to lock the said guide-arm against movement in either direction from its said position.

Suitable stops 5 are provided for limiting the movements of the respective guide-arms as they arrive in their operative position, the latter in their swinging movements working through a suitable notch or opening n in the ring-like guard referred to.

For moving the actuators in the proper time I have herein provided a plate o^2 , having switches or cam-surfaces o^1 , the said cam-surfaces being such a distance apart as to provide for feeding thread to a greater or less number of needles upon which it may be desired to supply threads when one thread is to be changed for another one. This cam-plate is carried by a vertically-sliding rod or bar o^3 , represented as provided with a laterally-extended pin or projection o^5 , adapted to be acted upon at suitable times by a suitable cam-surface o^6 , (indicated by dotted lines in Fig. 7,) said cam-surface being formed upon or carried by the usual shifting-ring c^{24} , common to the ring similarly lettered in United States Patent No. 461,357, hereinbefore referred to. When in the operation of the machine it is desired to shift the thread-guides, the shifting-ring c^{24} referred to will be actuated to cause the cam-surface o^6 thereof to meet the projection o^5 and raise the slide-bar o^3 , and with it the cam-plate, this change of position being made at the proper point in the rotation of the machine just prior to the time in which it is desired to change the threads. The plate o^2 in the form in which my invention is herein illustrated occupies its upper position when the thread-guide m^4 is to be put into its operative position and occupies its lower position, as represented by dotted lines, Fig. 2, when the thread-guide m^5 is to be put into its operative position. The drawings Figs. 1 to 3 show the thread-guide m^5 controlling, let it be supposed, the thread for narrowing and widening in its inoperative position and the thread-guide m^4 presenting thread to the needles for circular knitting in its operative position, it being understood that the actuators were operated to put the thread-guides into the positions shown in said figures at a previous rotation of the cam-cylinder. Each actuator is provided near its pivot or fulcrum with a notch, as m^8 , and a locking-shoulder m^x , one of said vertical arms coöperating with the shoulder of the thread-guide which is feeding thread to the needles to thereby lock it in its inoperative position, the vertical arm of the other actuator working against one side of the notch of the other thread-guide, keeping it in its operative position. As herein provided for, each actuator when operated to change the threads is moved two steps consecutively, the first step being effected by striking the cam or switch o and

the second by striking the cam or switch o' , and this first step unlocks the actuator holding the thread-guide then supplying thread to the needles and moves into its operative position the actuator controlling the thread-guide next to supply threads to the needles, and both the thread-guides maintain this position after a partial rotation of the cam-cylinder, while both thread-guides act to supply threads to several needles, and then the actuator controlling the thread-guide which is being put out of operative position is further moved a second step by the cam o' , putting the thread-guide controlled by that actuator into its inoperative position, the final movement of said actuator moving the opposite actuator and causing it to lock in its operative position the thread-guide just put into such operative position. Now to change the thread-guides and put the thread-guide m^5 , containing, let it be supposed, the thread for narrowing and widening, into its operative position and the thread-guide m^4 in its inoperative position the cam-plate o^2 will be lowered into the dotted-line position, Fig. 2, so that as the cam-cylinder in its rotation in the direction of the arrow, Fig. 3, brings the actuator m^{11} opposite the end o of the cam o^2 said actuator will be slid in the direction of the arrow thereon in Fig. 3, the movement of the actuator being sufficient to remove the end of the arm m^9 from engagement with the locking-shoulder m^x , leaving said arm standing in the notch m^8 , but without moving at all the lever m^6 , carrying the thread-guide m^4 . This movement, however, of the actuator m^{11} will, acting through the beam m^{13} , bring said beam into the dotted-line position, Fig. 4, such movement of the beam moving the actuator m^{12} far enough to turn the lever m^7 and put the thread-guide m^5 into its operative position, the position represented as occupied by the thread-guide m^4 in Fig. 2, and in this position of the actuators both thread-guides supply thread to the needles (any desired number) to properly secure in the fabric the end of the thread being inserted, so as to avoid holes, and, this done, in the further rotation of the cam-cylinder the actuator m^{11} meets the cam-surface o' of the plate o^2 , which will further move the said actuator in the direction of the arrow thereon in Fig. 2, causing the arm m^9 thereof, acting against the right-hand-side wall of the notch m^8 , to move the lever m^6 and put the thread-guide m^4 into its inoperative position, the position indicated in Fig. 2, by the thread-guide m^5 , and this same movement of the actuator m^{11} through the beam m^{13} , it then occupying the dot-and-dash position, Fig. 3, further moving the actuator m^{12} so that its vertical arm comes in contact with a shoulder m^x of the lever m^7 and locks the thread-guide m^5 in its operative position.

While I have herein shown two separate and distinct or connected cam-surfaces for

moving the actuator, it is evident that a single continuous cam-surface may be employed, if desired, or any other suitable means employed for imparting the necessary movement to the thread-guide arms and their guides.

A clamp *p*, represented as composed of a pair of springs, may be provided, and the operator may put into said clamp the end of the thread about to be inserted into the work to start the knitting, and thereafter the clamp is of no further use.

To close the thread-guide opening *n* in the latch-guard and prevent the entrance therein of the latches of those needles which are elevated and are not to be used for narrowing and widening, I have provided a closure *n'*, Fig. 4, mounted upon or forming a part of a radially-sliding member *n²*, provided with a pin or projection *n³*, which lies in front of a shoulder *n⁴* on the adjacent thread-guide arm *m⁶*, so that when the said guide-arm is moved to carry its thread-guide from the outer to the inner side of the needle-circle the said closure will be moved into position closing the opening or a portion of the opening, and when said guide is withdrawn from the inner to the outer side of the needle-circle said closure will remain in its position closing said opening until, as herein, the thread-guide itself or some other part strikes and moves it back to its normal position. Such portion of the opening as is not closed by the said closure *n'* is or may be closed by a cooperating closure *n⁵*, (see Figs. 3 and 5,) fast on the thread-guide arm *m⁷*.

Erected upon the table at one side of the head of the machine, where it will in no wise inconvenience the operator in handling the machine, is a suitable standard or pillar *s*, within which is journaled a vertically-arranged shaft *s'*, provided at its lower end, beneath the table, with the spur-wheels *s²*, in mesh with a corresponding wheel *s³* on one end of the short shaft *s⁴*, journaled in a suitable bracket and provided at its opposite end with a bevel-wheel *s⁵*, in mesh with and driven by a correspondingly-beveled wheel *s⁶* on the shaft *A⁷* of the machine. It is understood that the vertical shaft may be so arranged and geared as to be moved by any other convenient part of the running-works of the machine, if desired.

At its upper end the vertical shaft *s'* within the standard *s* is provided with a pinion *s⁷*, in mesh with and driving a larger carrier-wheel *s⁸*, which, with the said pinion, is inclosed within a suitable ring-like casing *s⁹*, open at its under side and mounted upon the said standard, said wheel constituting a carrier for the mass of wound thread *T* on any suitable bobbin or cop. The proportions of the wheel and the said gears and pinions intermediate it and the main shaft are such as to cause said wheel to rotate in unison with the cam-cylinder or the rotating part of the machine-head.

The carrier-wheel *s⁸* has mounted on it a

spindle *s¹⁰* or other suitable holder for the cop or mass *T* of thread, and it has also a yoke-like frame *s¹¹*, provided, as herein shown, at its crown with a thread-eye *s¹²*, through which passes the thread mass *T*, said thread or yarn being thence carried to one of the arms of the said frame and down along the said arm through suitable guides *s¹³* and *s¹⁴* and also preferably between suitable friction-disks *s¹⁵*, of suitable construction, said thread further passing through a suitable guide hole or opening *s¹⁶* in the carrier-wheel *s⁸* referred to, and to one of the thread-guides—as, for instance, *m⁴*—thence to the needles. A suitable or usual slack-thread controller or take-up arm *s¹⁷* may be employed, if desired, in connection with the thread, it being herein shown as mounted upon one of the arms of the yoke-like frame referred to. The other thread for the machine is taken from a suitable stationary supply, as *T'*, and is passed through usual guides *t* and *t'*, thence through a second eye *t²* at the crown of the frame and down along the other standard of said frame, also through suitable guide-eyes *t³* *t⁴* and through a second aperture *t⁵* in the carrier-wheel *s⁸* referred to, thence to the other thread-guide *m⁵* and to the needles.

In the normal operation of the machine the carrier-wheel *s⁸*, carrying the mass of thread *T*, and the yoke *s¹¹* move in unison with the cam-cylinder of the machine, such movement preventing any twisting of the threads employed and permitting the said threads to be continuously connected with the work whether or not they are for the time being incorporated in the work, the change from one to another of the threads for putting one or the other thereof into the work being effected by the shifting of the thread-guides, as previously described.

By mounting the rotating bobbin or mass of thread or yarn *T* upon a stationary stand or support erected at one side of the machine-head, as herein shown and described, the operator is in no wise hampered in his work and may apply and remove the latter and remove and replace the needle-cylinder and any other part required to be removed without hindrance and with the same facility as in machines having no rotating bobbin.

The mechanism throughout is simple and certain in its operation.

W is a work-depressor of suitable construction carried by the latch-ring or its support and rotatable with the cam-cylinder.

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

1. In a knitting-machine, the following instrumentalities, viz: a cam-cylinder, a plurality of thread-guides carried thereby, one to carry the thread used for circular knitting, and the other to carry the thread used for narrowing and widening; means to move one of said thread-guides into and the other out of working position when the change from cir-

cular to reciprocating knitting is to be made, and vice versa; a rotatable frame having eyes to guide the threads leading to said thread-guides; means independent of said cam-cylinder to rotate and to reciprocate said frame in unison with said cam-cylinder; and a plurality of thread-supplies, one at least of which partakes of the movements of said frame and cam-cylinder, while the other of said thread-supplies is supported independently of said rotatable frame and occupies a substantially stationary position, for the purposes set forth.

2. In a knitting-machine, a needle-cylinder adapted to receive a series of needles, a cam-cylinder, and means to rotate it for circular knitting and to reciprocate it for narrowing and widening, a support independent of and located above said cam-cylinder for a thread to be fed to the needles employed in reciprocating knitting for narrowing and widening; combined with means independent of said cam-cylinder to both rotate and reciprocate said support in unison with said cam-cylinder.

3. In a knitting-machine, a needle-cylinder adapted to receive needles, a cam-cylinder, and means to rotate it for circular knitting and to reciprocate it for narrowing and widening, a plurality of thread-guides, a toothed ring having a plurality of openings for threads, said toothed ring having mounted upon it a bobbin-holder carrying at least one source of thread-supply, and a support for said ring; combined with means to both rotate and reciprocate said ring and said bobbin-holder in unison with said cam-cylinder.

4. In a knitting-machine, a needle-cylinder to contain a series of needles, a cam-cylinder, and means to rotate it for circular knitting and to reciprocate it for narrowing and widening, a support independent of and located above said cam-cylinder for a thread to be fed to the hooks of the needles during the reciprocating movements of the cam-cylinder for narrowing and widening, and means to sustain independently of said support and of the cam-cylinder a bobbin carrying thread to be used when the cam-cylinder is being moved continuously in a circular direction for knitting a tubular fabric.

5. In a knitting-machine, a plurality of thread-guides, a bearing supporting suitable pivots for said thread-guides, a plurality of actuators, a beam slotted at its opposite ends and engaging projections carried by said actuators, and means to act twice in succession upon one and the same actuator when moving it into its operative position, the movement of said actuator through said beam moving the other actuator to put the thread-guide cooperating with it into its inoperative position.

6. In a knitting-machine, a pivoted thread-guide having a notch, and a locking-surface adjacent said notch, combined with an actuator which in its position farthest from the line of knitting cooperates with said locking-surface to lock the thread-guide in its oper-

ative position, means to move said actuator to remove its acting surface from contact with said locking-surface to enter said notch and to thereafter move the thread-guide into its inoperative position.

7. In a knitting-machine, a latch-guard having an opening, a movable thread-guide, and means to actuate the same to put its thread into or out of operative position, combined with a closure for said opening independent of said thread-guide but under the control thereof.

8. In a knitting-machine, a latch-guard having an opening therein, a thread-changing mechanism containing a plurality of thread-guides, one of said thread-guides having a closure fixed to it and adapted to close a portion of the opening in the latch-guard, and an independent spring-controlled closure to close the other part of the opening in the thread-guide, said closures acting alternately.

9. In a knitting-machine, a thread-changing mechanism containing a plurality of thread-guides; thread-guide actuators, one for each of said thread-guides; a slotted beam connected with each of said thread-guide actuators; independent means to operate either of said thread-guide actuators and effect the movement of the other actuator and its thread-guide and put it into its operative position; and means to thereafter further move said first-named actuator and cause it to put out of operation the thread-guide directly under its control, the second movement of said actuator also causing a second movement of the other actuator and its thread-guide into position to supply thread to the needles, whereby the threads are made to overlap at each point where the threads are changed, substantially as described.

10. In a knitting-machine, the following instrumentalities, viz: a cam-cylinder, means to rotate it for circular knitting, and to reciprocate it for narrowing and widening; two thread-guides, one to carry a thread for circular and the other a thread for reciprocating knitting, an actuator for each of said thread-guides, said actuators having projections at their ends occupying different horizontal planes, combined with a double cam to meet the projection of either actuator twice in succession while the cam-cylinder is moving in the same direction, to thus move said actuator partially and to then complete its movement in the same direction, and connections between the said moved actuator and the actuator of the other thread-guide whereby as said thread-guides are being put the one into and the other out of working position with relation to said needles, they shall stop temporarily to enable the interchanging threads to overlap and avoid making holes in the fabric when the threads are changed, substantially as described.

11. In a knitting-machine, a cam-cylinder, a latch-guard hinged thereto and provided with two thread-guides, actuators for said

thread-guides and guideways in said latch-guard for said actuators, combined with a stand, means to operate said actuators to cause them to change the positions of said thread-guides by a step-by-step movement to effect an overlapping of said two threads at each changing-point in the fabric.

12. In a knitting-machine, a cam-cylinder, a latch-guard pivoted thereon and provided with an opening, two thread-guides, a closure carried by one of said thread-guides to partially close the opening of said latch-guard, and an independent closure for said opening under the control of the other of said thread-guides, thread-guide actuators adapted to slide in wings in said latch-guard, combined with a stand, means to operate said actuators to cause them to change the positions of said thread-guides by a step-by-step movement to effect an overlapping of said two threads at each changing-point in the fabric.

13. In a knitting-machine, a plurality of

thread-guides, an actuator for each thread-guide, said actuators being located permanently in different horizontal planes; combined with a cam presenting a plurality of contacts located in the same horizontal plane and adapted to contact with and move each of said actuators two steps in succession in effecting a change of position of said thread-guides with relation to the circle of needles with which they coöperate to supply a thread, means to raise and lower the cam for moving said actuators, they when in one position moving one actuator and in the other position the other actuator.

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

ARTHUR N. AMES.

Witnesses:

E. B. S. SANBORN,
JAMES E. BARNARD.