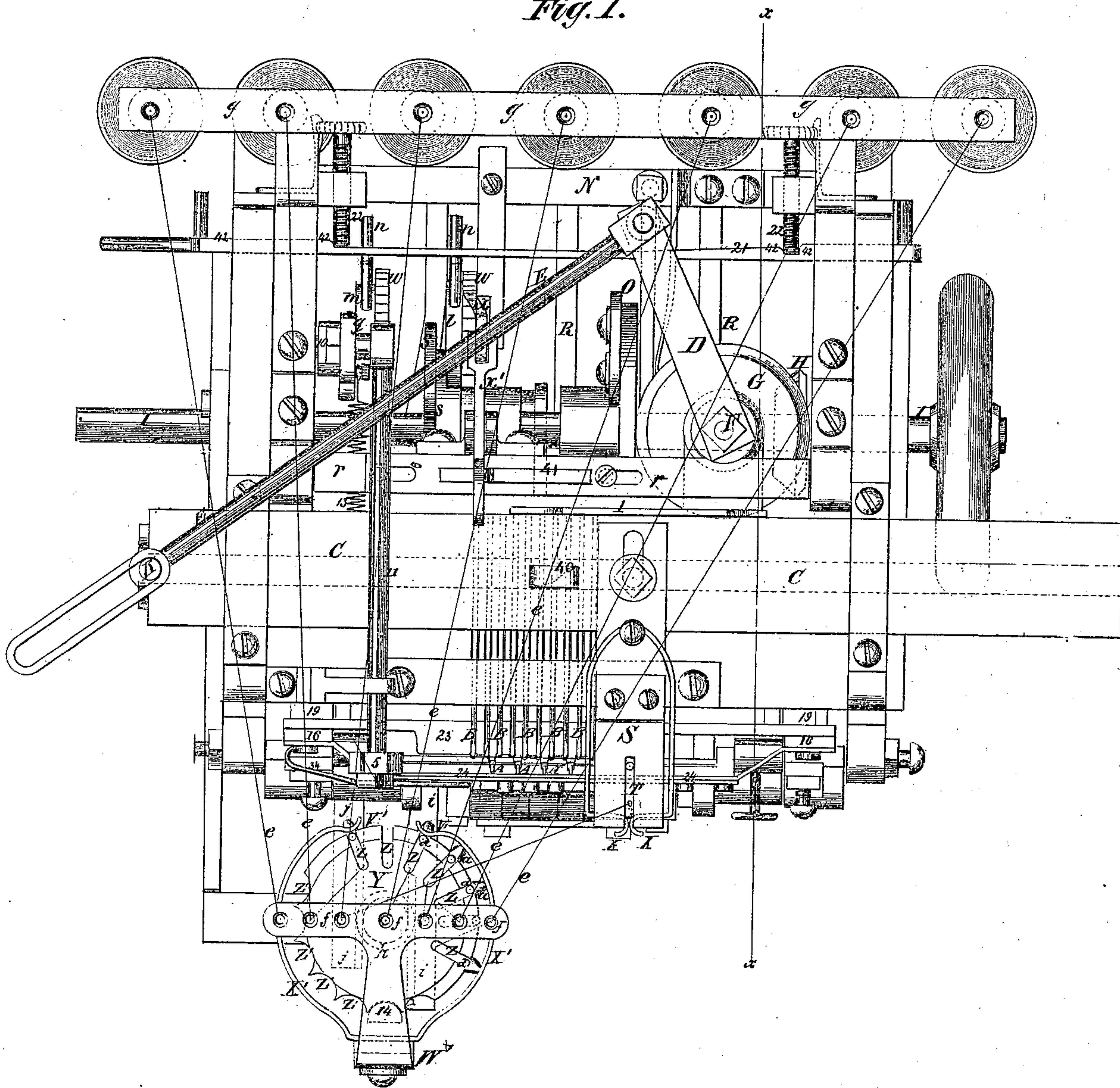


J. & M. LEE & W. CARTER.
KNITTING MACHINE.

No. 110,479

Patented Dec. 27, 1870.

Fig. I.



Witnesses:

Lysdag Dietrich
S. S. Water

Inventor:

John Lee, Mark Lee, W. Carter

PER

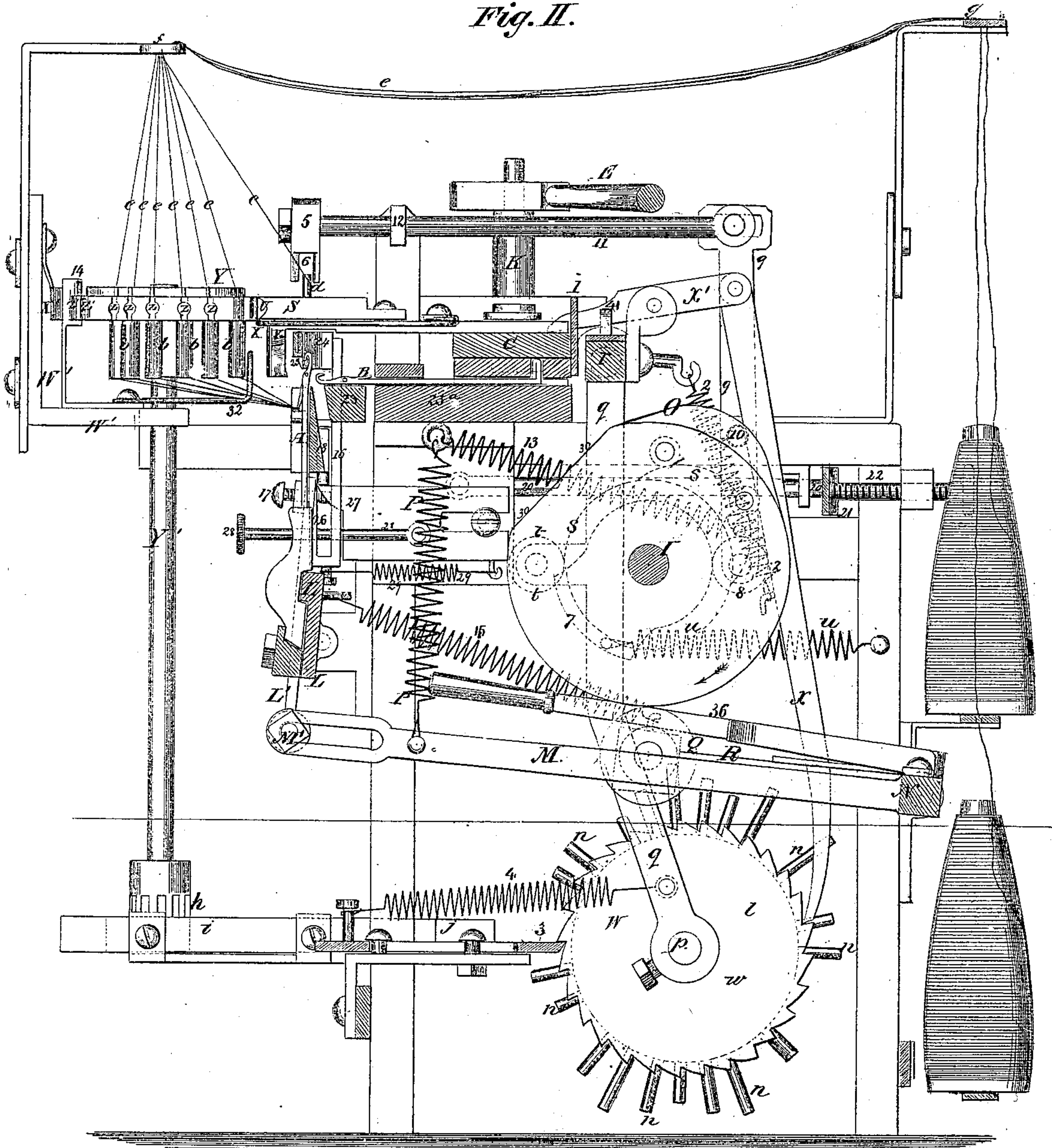
Mmm
Attorneys.

J. & M. LEE & W. CARTER.
KNITTING MACHINE.

No. 110,479

Patented Dec. 27, 1870.

Fig. II.



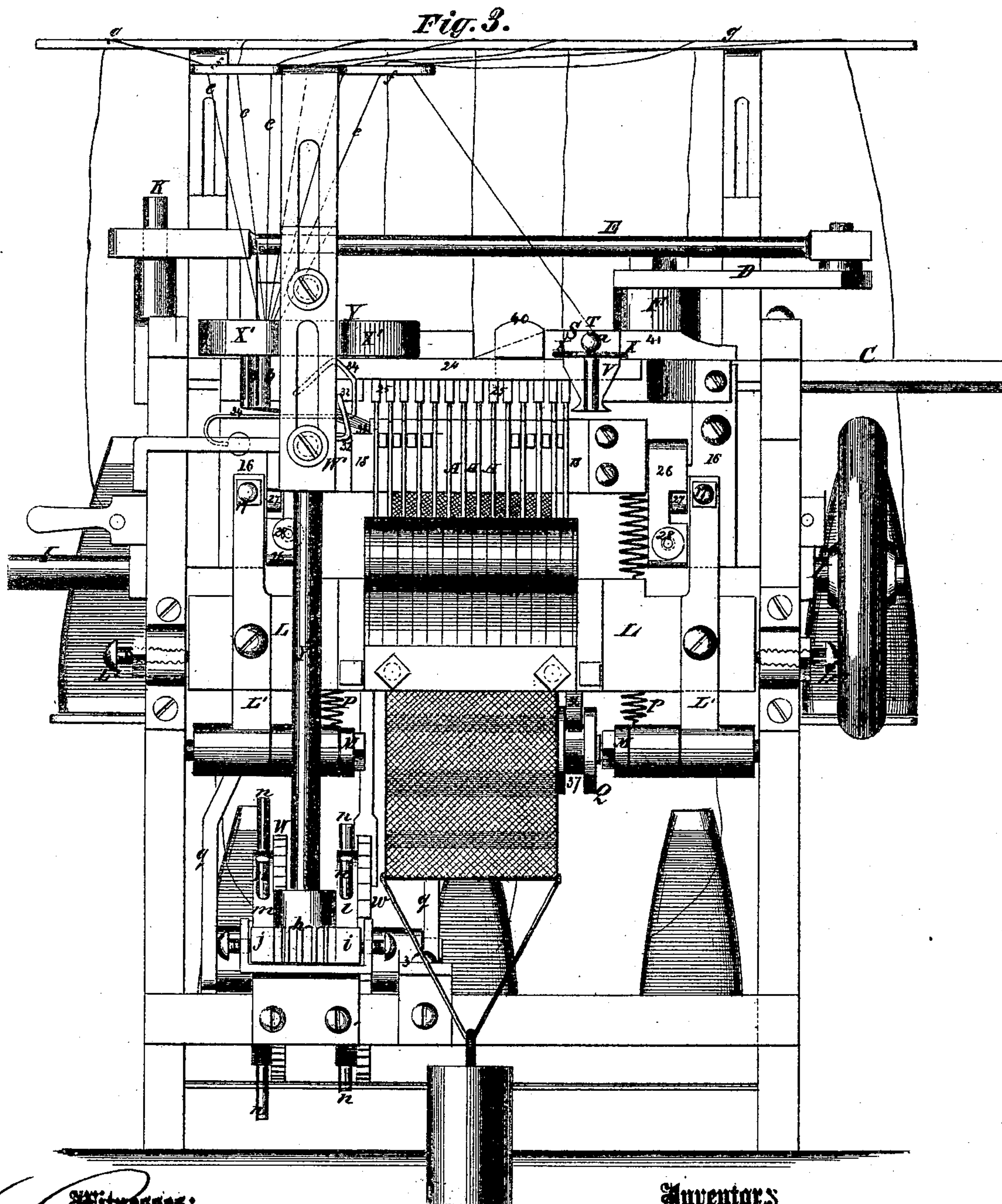
Witnesses:
J. S. Dietrich
L. S. Water

Inventor's
John Lee, Mark Lee, Wm. Carter
PER *Marion*
Attorneys.

J. & M. LEE & W. CARTER.
KNITTING MACHINE.

No. 110,479

Patented Dec. 27, 1870.



Witnesses:

August Dietrich
L. S. Baker

Inventors

John Lee, Mark Lee, Wm. Carter.

PER

Mmm
Attorneys.

J. & M. LEE & W. CARTER.
KNITTING MACHINE.

No. 110,479

Patented Dec. 27, 1870.

Fig. 4.

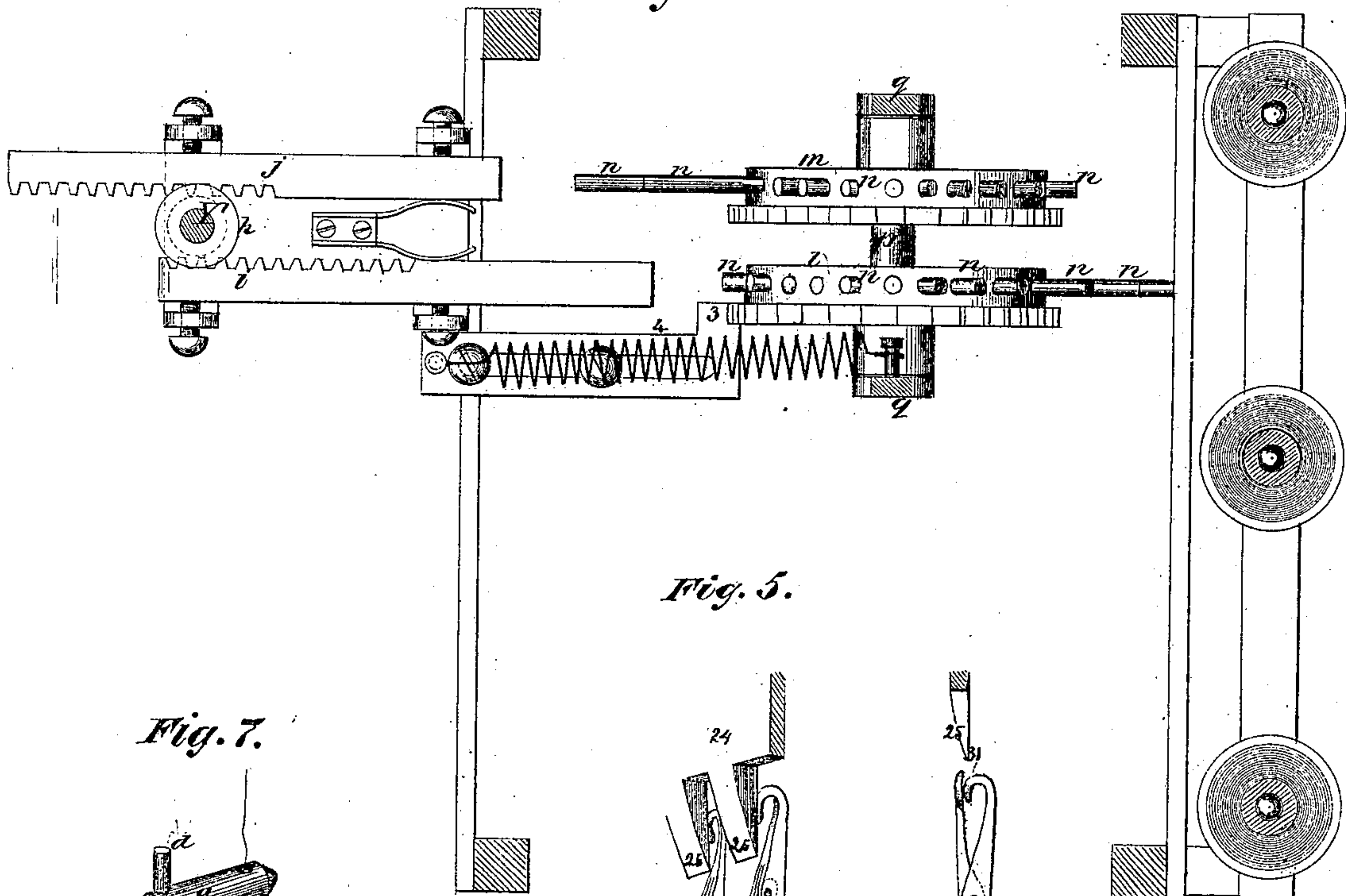


Fig. 5.

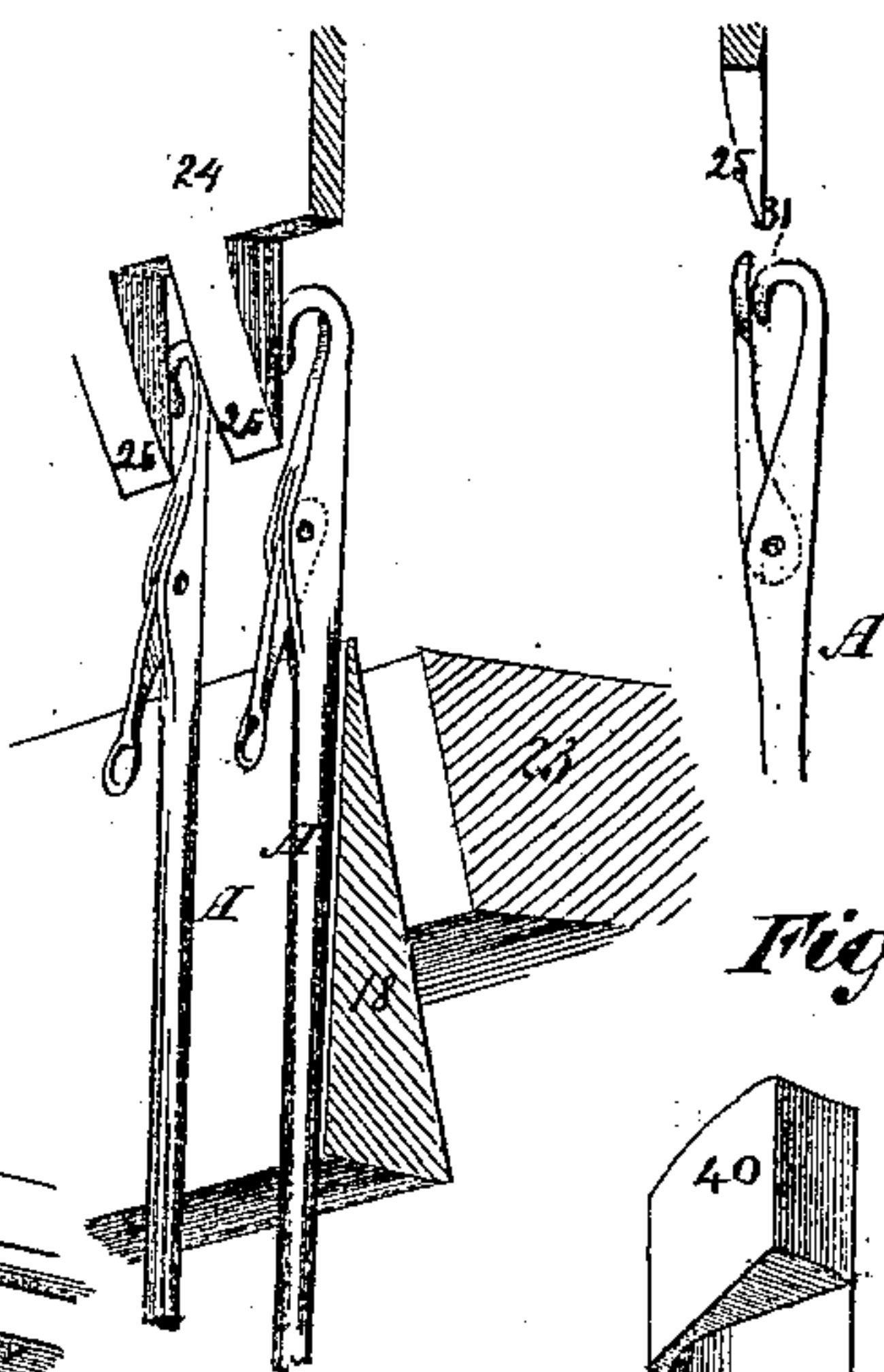


Fig. 7.

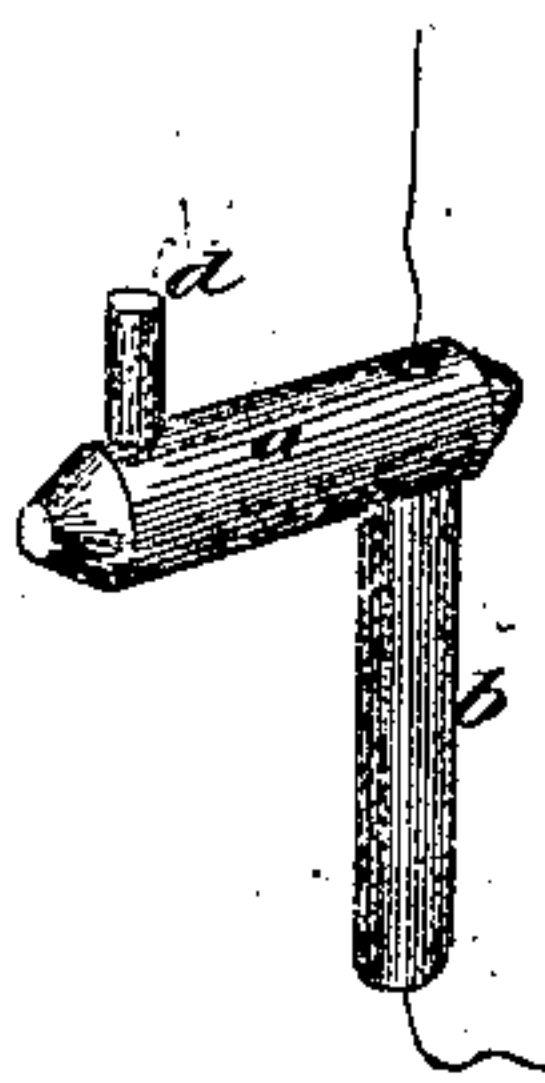


Fig. 6.

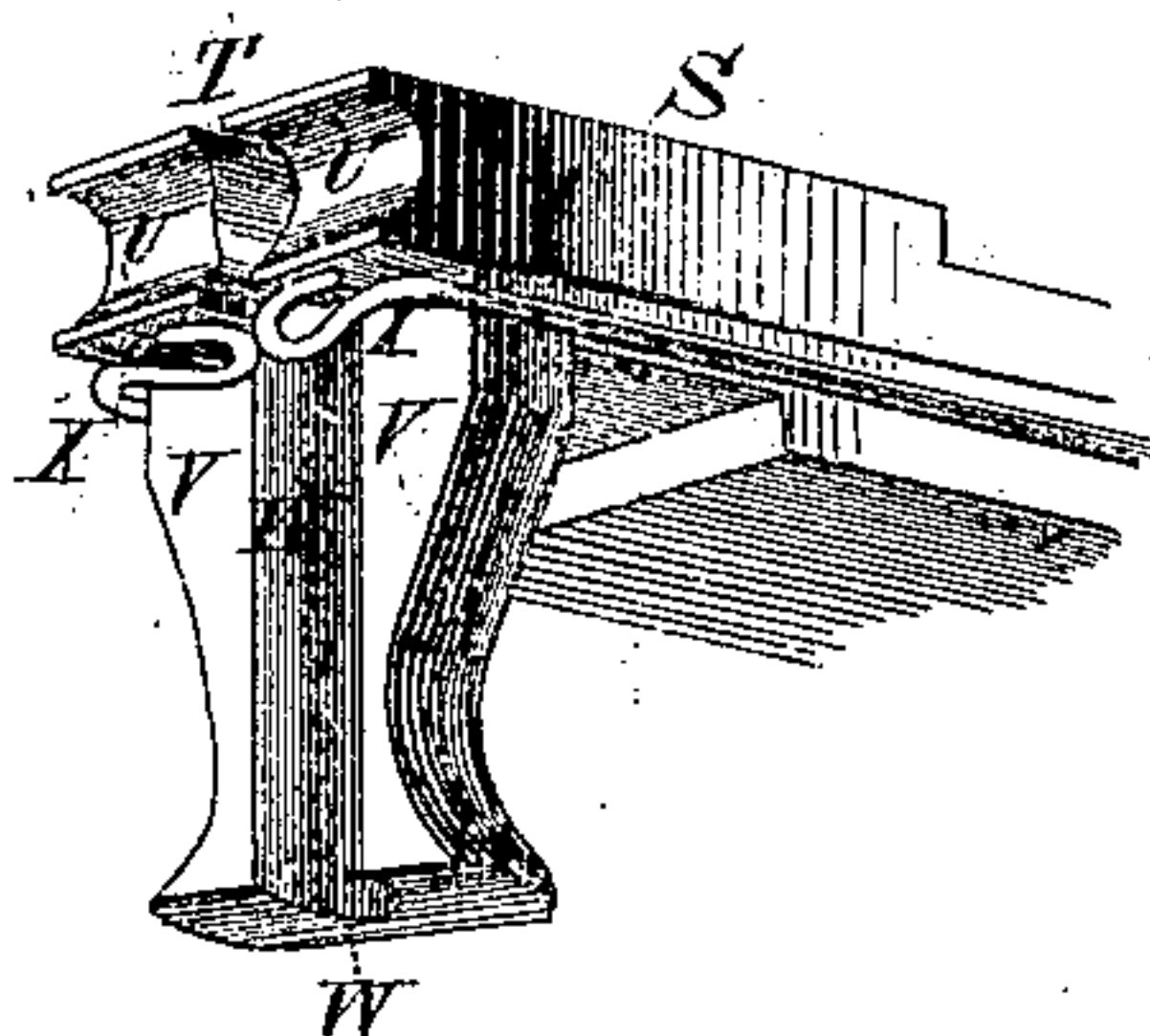
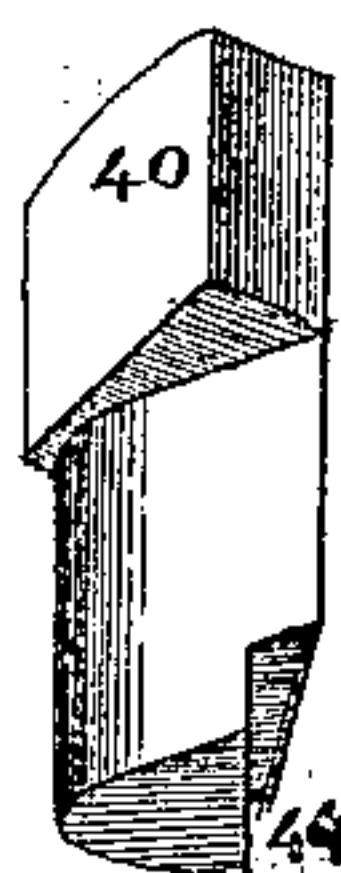


Fig. 8.



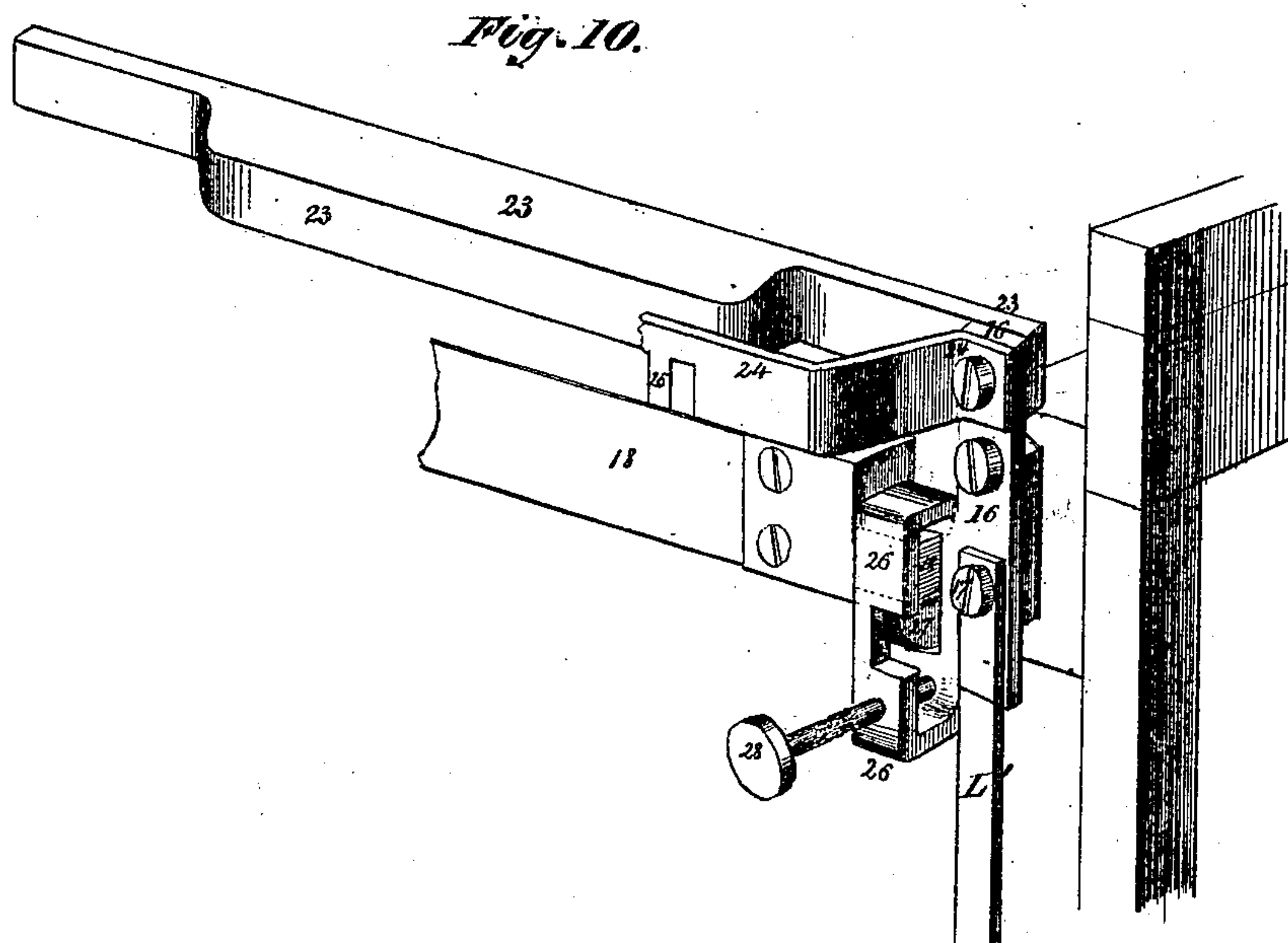
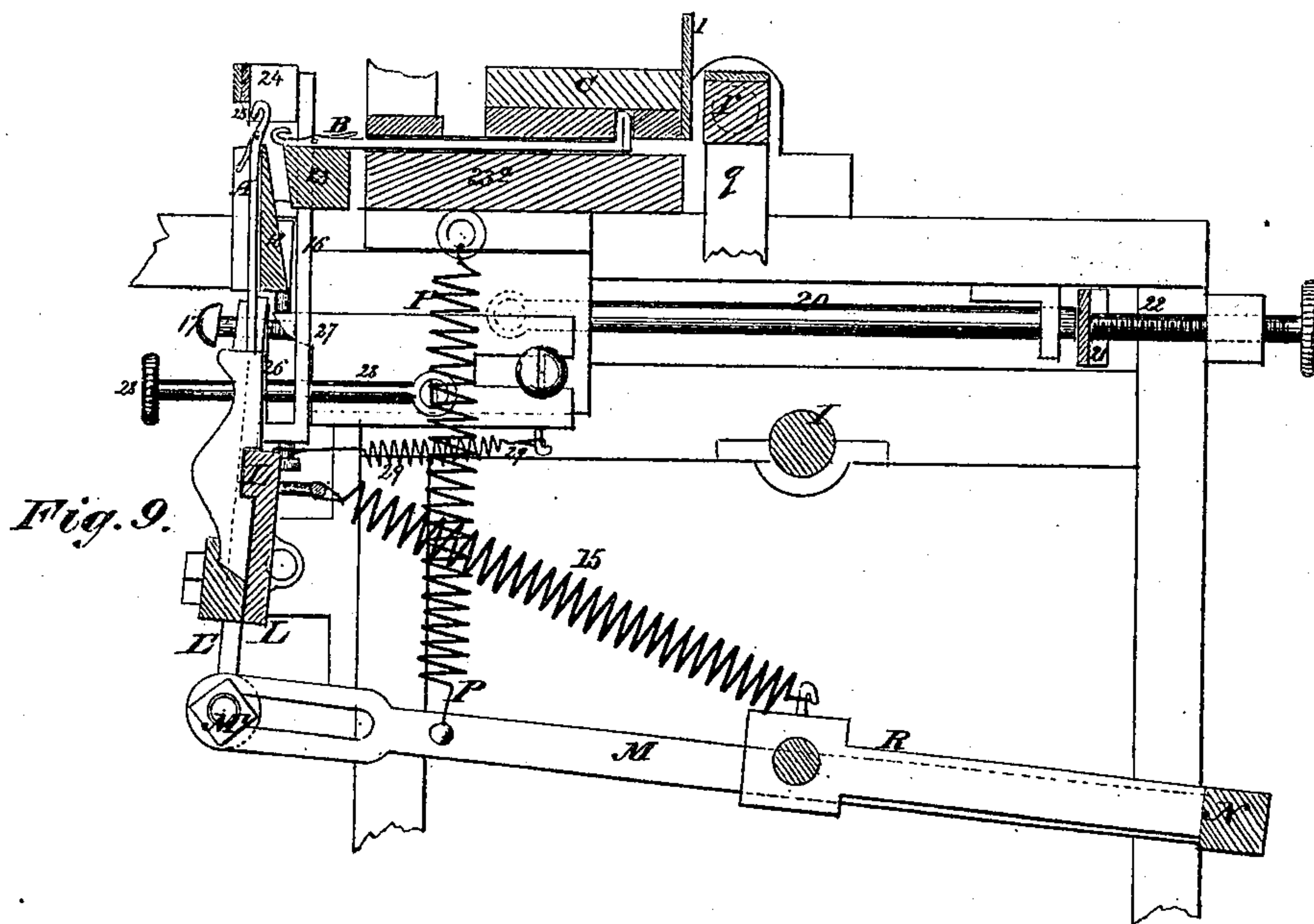
Witnesses:
Gustave Dieterich
S. S. Moore

Inventors
John Lee, Mark Lee, W. Carter
PER *Wm. Lee*
Attorneys.

J. & M. LEE & W. CARTER.
KNITTING MACHINE.

No. 110,479

Patented Dec. 27, 1870.



Witnesses:
Cusave Dietrich
L. S. Maber

Inventors
John Lee, Mark Lee, W. Carter
PER *Mumford*
Attorneys.

United States Patent Office.

JOHN LEE, MARK LEE, AND WILLIAM CARTER, OF NEEDHAM,
MASSACHUSETTS.

Letters Patent No. 110,479, dated December 27, 1870.

IMPROVEMENT IN KNITTING-MACHINES.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that we, JOHN LEE, MARK LEE, and WILLIAM CARTER, of Needham, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Knitting-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification.

This invention relates to improvements in knitting-machines, and consists in a combination, with a knitting-machine, of a shifting-receiver and holder and automatic operating devices therefor for carrying yarns of different colors, and changing them to be woven into the fabric, according to any required order or pattern.

The invention also consists in certain improvements in the arrangements of the operating and adjusting devices of the knitting apparatus, all as hereinafter described.

Figure 1 is a plan view of our improved machine.

Figure 2 is a sectional elevation of the same taken on the line *xx* of fig. 1.

Figure 3 is a front elevation of the same.

Figure 4 is a horizontal section, showing the apparatus for shifting the yarn-guide receiver or holder.

Figure 5 is a detail, in perspective, showing improved latch-openers, which we have applied to the vertical needles.

Figure 6 is a perspective view of a part of the yarn-carrier.

Figure 7 is a perspective view of one of the shifting yarn-guides.

Figure 8 is a perspective view of a key used for releasing the horizontal needles for removal.

Figure 9 is a detail section on the line *xx* of fig. 1, showing the arrangement of means for adjusting the vertical needles relatively to the others; and

Figure 10 is a perspective view of some of the said parts.

Similar letters of reference indicate corresponding parts.

A represents one set of latch-needles, and

B, the other set of a common frame for knitting ribbed goods for stockings and other articles.

The one set, A, is arranged vertically, and the other horizontally. Their operations are mainly the same as in other machines.

The ones, B, are worked by the reciprocating cam-plate C, which is worked by the crank D and rod E.

The said crank is attached to the vertical shaft F,

which is worked by the wheels G H, the latter being on the driving-shaft I and the rod E, which is slotted to allow the plate C the requisite periods of rest at the end of each movement, engages the stud K in its slot, as clearly shown in fig. 1.

The needles A are supported by the bar L, which is supported by the bars L' on the free slotted ends of the oscillating bars M, pivoted on a shaft, N, and forced down by the cam O on the driving-shaft I, and up by the spring P, the said cam working on a friction-roller, Q, mounted on the end of an arm, R.

The slotted bars M hold the pivot-pins M', so that the lower ends of bars L may be adjusted to or from the frame.

S is the yarn-guide carrier. It is attached to the bar O, and moves with it.

It has a longitudinal vertical slot, T, in the front end; also the groove U, and has the block V projecting downward from the front end, said block having a vertical groove, W, for the thread-guides.

X represent spring-catches attached to the carrier for receiving and holding the yarn-guides, which will presently be described.

Y represents a disk of metal or other substance, having a series of radial slots, Z, in one side, and a series of fluted grooves or notches, Z', in the other side.

It is mounted on a vertical shaft, Y', arranged in front of the position, where the yarn-guide carrier S stops at the end of the movement to the left, the said disk being about as high as, or a little higher than, the top of the carrier, and the shaft extending below nearly to the bottom of the frame.

X' represents a spring-guard attached to the support W', and extending around the disk each way a suitable distance from the edge thereof nearly to the opposite side, terminating a little short of the point where they should meet, if continued, so as to allow a space thereat, but bending up at each end against the disk previous to the termination, as shown at V', to make room for the yarn-guide carrier. These springs are for the purpose of retaining the yarn-guides in the receiver.

The shifting yarn-guides are composed of the horizontal cylindrical or otherwise-formed blocks *a*, vertical guide-tubes *b*, and the vertical studs *d*, the latter attached at one end, and rising above the blocks *a*, and the tubes attached to the other end, and projecting downward from the lower side. These tubes are secured in holes extending through the blocks *a*, and through them the yarn passes, as shown in fig. 7.

These yarn-guides are fitted into the disk Y, which,

in addition to the radial slots *Z*, above referred to, has radial holes in connection with them, so arranged that the blocks *a* will slide into them with the ends carrying the tubes *b* innermost, and the ends carrying the studs *d* outermost, the tubes projecting below the plate, and the studs above, as clearly shown in figs. 1 and 2.

As many of these guides are to be used as there are to be differently-colored yarns, the said yarns *e* being strung through them, first passing through the guide-bars *f* and *g*, above and at the opposite side of the machine, or in any other suitable location.

These yarn-guides are to be shifted into the carrier and back again, according to the order of the colors required for the pattern to be knit, and for this purpose we have employed, in this instance, first, a shifting apparatus for effecting the necessary changes of the receiver, and next, a transferring bar or shifter, for shifting the guides to the carrier, and *vice versa*.

For shifting the receiver, a toothed pinion, *h*, is provided at the bottom of the shaft *Y'*, gearing with the sliding racks *i j*, one on each side, to be moved simultaneously in opposite directions.

These racks are moved by the disks *l m*, having the radial pins *n* projecting from their peripheries, and being swung forward after being turned on their axes, so that the pins strike the racks, the pin of one disk to cause the movement and the other to act as a stop.

These disks are mounted on the shaft *p*, suspended by the bars *q* from the oscillating shaft *r*, mounted on journals at the top of the frame.

These bars and the disks are moved forward by the cam *s* on the main shaft *I*, and shown dotted in fig. 2, acting on the friction-roller *t* attached to the side bars or to arms attached thereto. They are moved back by the spring *u*.

The disks are provided, either one or both, with a ratchet-disk, *w*, to be turned a notch at a time by the long pawl *x*, suspended by the lever *x'*, mounted at the top of the machine, as shown, to be thrown up to force the pawl down by the cam-plate *1* on the cam-plate *c*, and be forced back by the spring *2*, which is attached to the pawl, and raises it when the cam-slide *c* goes back.

41 is a sliding stop-plate arranged in the top of the shaft *r*, to be thrust under the lever *x'*, to prevent the action of the pawl and the turning of the disks *m*; when only one yarn is used and it is not required to make any changes of yarn-guides.

The ratchet-disks *W* are also used for arresting and holding the disks *l m* in the right position for the pins to act properly on the rack-bars by a sliding holding-pawl *3*, or one to each disk, so arranged that they will be pressed back by the inclined walls of the ratchet-teeth of the wheels *w* when they move, and be forced into the notches again by springs *4*.

The pins *n* of the disks *l m* are arranged in different lengths and in any required order, for changing the yarn-guides to produce the pattern required, and they are attached to the disks by screwing into them, or it may be by any other way, so that they may be changed to produce different patterns, the pins of each disk acting together on the bars *i j* are always so adjusted as to length, that when the disks are brought forward to actuate the said bars, each pin will bear against its respective bar at the end of the movements of the latter, so that one pin (the short one) acts as a stop for the movement imparted by the other, thereby making the operation positive and reliable.

We may, however, operate these bars by means of one disk with pins, a spring, and a holding-pawl, the disk operating the same as in this case, upon one rack-bar, throwing it forward, the spring drawing it back and the holding-pawl holding the rack-bar against the action of the spring until tripped by the disk or some other device, just about the time the disk ceases its

forward motion to bring a new pin into action with the rack-bar.

The turning of the disk by the pawl *x* is effected just previous to the arrival of the cam-bar *c* at the end of its movement to the left, and then, while the bar *c* stands, and the carrier *S* is at rest in front of the receiver *Y*, the disks are moved forward to shift the receiver; but previous to this movement of the disks the guide-shifter *5* is moved forward to receive in its notch *6* the stud-pin *d* of the guide to be shifted by the action of the cam *7* on the shaft *I*, acting on the friction-roller *8* in the end of the lever *9*, which is pivoted at *10* and jointed at the upper end to the rod *11*, on the end of which the shifter *5* is, and which slides back and forth in a bearing, *12*.

This lever *9*, rod *11*, and shifter *5* are moved in the other direction by the spring *13*.

This movement takes place as soon as the cam *7* passes beyond the roller *8*, and the shifter going back draws the yarn-guide, which happens to stand opposite the carrier, from the receiver into the said carrier, forcing the tube *b* between the springs *x*, which are for holding the guide in the said carrier.

The carrier, like the disk *Y*, has a hole, in connection with the slot *T*, for the block *a* of the guide.

When the shifter has thus drawn the guide into the carrier it stops and rests in that position during the time the guide is carried forward and back again to deliver the yarn to the needles, and until the carrier again stops in front of the receiver, at which time the stud *d* of the guide will again stand in the notch *6* of the shifter.

Then the shifter moves forward again and returns the guide to the receiver, which is either turned to carry away the guide last out and bring another, with another color or not, according to the pattern and the arrangement of the pins in the disks *l m*.

If not turned the same guide goes out again, and so on as long as the same color is to be used; but, if the disk is turned, then the guide, brought thereby to the front of the carrier, goes out, and the one just returned remains until its turn comes again.

The receiver *Y* is held where it stops by the spring-holder *14*, which engages in the notches *Z*.

The supporting-bar *L* for the vertical needles *A* has a spring, *15*, connected to it, and arranged to press the arms *L'* against the vertical plates *16*, against which they, or the set-screws *17* therein, bear at the top in working up and down.

These set or gauge-screws are employed for adjusting the needles *A* to or from the slide-bars *18*.

The bars *L'* are connected to the arms *M* by joints, which admit of this oscillation on them.

The plates *16*, against which the said arms *L'* bear, are mounted on the ends of bars *19*, capable of sliding forward and back slightly in the frame of the machine, and having the rods *20*, which extend to the rear of the machine, attached to them.

These rods bear at the rear ends against the bar *21*, which is set forward to force the bars *19* toward the front by the gauge-screws *22*.

The plates *16* support the bar *23*, which supports the horizontal needles at the front and causes the loops to be cast off from them.

They also support the bar *24*, carrying the latch-openers *25* and the slotted bars *26*, in which the ends of the slide-bar *18* are confined.

All these parts, together with the bars *L'* and *L*, may, therefore, be adjusted forward and back relatively to the needles *B* by the screws *22* and the spring *15*, for varying the texture of the goods.

The bar 21, which is introduced between the ends of the rods 20 and the gauge-screws 22, is arranged to slide lengthwise, and has thickened parts 42, which, being shoved in front of the screws 22, will force the needles A and the bar 18 forward so that the stitches then made will be very slack, which it is desirable they should be, for at least one course at the end of a stocking, to facilitate running it onto the needles of the frame for making the heel or foot.

The said bar is drawn back again after the slack course is made to the position represented in fig. 1, to allow the needles A to assume their normal position.

It will be observed that the bar 23 is separate from the bar 23^a behind it, which supports the needles B, and that it may be adjusted relatively to the needles independently of the said bar 23^a, thereby greatly simplifying the arrangement of it with the needles for casting off the stitches.

The bar 18 rests at the ends on the sliding supports 27, which have push-pins 28 connected to them, so that, being pushed back, they will let the bar 18 drop away from the tops of the needles, to facilitate running on the work, which may become detached by the yarn breaking or from other causes.

The sliding supports 27 have springs 29 for forcing them back under the ends of the bar 18 when it is raised again.

The lateral adjustment of the bars L and L¹ is effected by the screws L².

The loops are formed on the needles and cast off much in the same way as in other machines, except that we have provided for throwing the loops on the vertical needles below the latches before the new loops are taken on, and for this purpose we have provided the depression 30 in the face of the cam-wheel O, for allowing the needles A to rise, after the old loops are cast off, higher than the position for receiving the yarn for the new loops, so as to raise the latches high enough to insure the escape of the loops, after which they are moved back again to the position for receiving the new loops; and we have provided the latch-openers 25 to act at this time to open or throw down any latches which may not have been thrown down by the loops; for instance, in case a needle may not have had a loop formed on it by the breaking of the yarn or from any cause.

They also serve, by bearing on the latches below their pivots, to prevent the needles B from pushing the latches of needles A out or raising them up when the said needles B move forward.

The latch-openers 25 consist of a series of teeth formed on or attached to a plate, 24, as shown in fig. 5.

The needles B are so arranged that, when moved forward, their points, after passing over the plate 18, enter the spaces between the teeth 35; whereas, if the latch-openers formed a continuous edge, the latches of the needles would, in being opened and closed to form the stitch, usually or frequently come in contact with it, and the loops, being thereby prevented from rendering over the latches, would be broken, resulting in holes and bad places in the work; and also, in the backward movement of these needles, the latches themselves would be bent or broken, since as they, in that case, incline backward, their raised ends would strike the continuous edge of the latch-openers.

These latch-openers are so arranged above the needles that, when the latter rise up to them, the edges are received between the hooks and the ends of the latches, as represented in fig. 5, so that the latter are thrown down.

To prevent the latches getting behind the latch-openers in this operation, the said latches are made

longer than they commonly are, and project slightly above the hooks, as shown at 31.

A bent-wire yarn-guide, 32, is attached to the support of the shaft Y', and arranged as shown in figs. 2 and 3, for preventing the several yarns, which extend from the guides held in the receiver to the edge of the fabric over the top of bar 18 and at the left of the needles, as shown at 33, from being brought into contact with the needles in any way, especially by the turning of the receiver; and

34 is a spring-guard arranged above these yarns, so that, when the carrier S moves back to that end, it will be forced down by the said carrier on the said yarns and prevent them from being caught by the latch-opening points 35 of the carrier.

We have arranged the friction-roller Q, against which the cam-wheel O works, for forcing the needles A down, so that it will slide on its spindle, and have provided a shifting-bar, 36, therefor, which works in the groove 37 so that we can slide the said roller along its spindle out of the position to be acted on by the cam, so that the needles will not be forced down.

This is done whenever it is desired to accumulate two or more rows of loops on the needles A, as in making the welts at the top of a stocking.

40 represents a key arranged in the plate c so that it may be readily taken out to release the shanks of the needles B, to admit of drawing them out when required, and for putting in others.

This is effected by arranging the wall 44 of the rebate at the lower end of the key to form a part of the wall of the cam-groove, which, being removed, lets the needles, opposite the place where the key is contained, free.

Any of the needles B may be thus released by moving the plate, so that the place made vacant by the withdrawal of the key is brought to the needle it is desired to remove.

Having thus described our invention,

We claim as new and desire to secure by Letters Patent—

1. The yarn-guide carrier S, constructed and arranged substantially as specified.

2. The shifting rotary yarn-guide receiver Y, constructed, arranged, and operating substantially as specified.

3. The combination, with the receiver, of the springs X' and the spring-stop 14, substantially as specified.

4. The yarn guides *a d b*, constructed and arranged substantially as specified.

5. The combination, with the rotary yarn-guide receiver Y, of the toothed racks *i j* and the oscillating shifting disks *l m* and pins *n*, the said disks and pins arranged for operating the receiver for changing the yarn guides, all substantially as specified.

6. The combination, with the disks *l m* and pins *n n*, of the ratchet-wheels *w*, the pawl *x*, arms *q*, cam 7, springs *u*, sliding-pawl 3, and the spring 4, all substantially as specified.

7. The shifter 5, rod 11, lever 9, cam 7, and spring 13, combined and arranged substantially as specified.

8. The bar 24, provided with the latch-openers 25, constructed as described and arranged relatively to the needles A and B, as and for the purpose specified.

9. The combination of the adjusting-bars 19, rods 20, screws 21, spring 15, with plates 16, bars 23, 18, and L, all substantially as specified.

10. The arrangement of the bar 18, the slotted bar 26, the spring-stops 27, and push-pins 28, substantially as specified.

11. The combination, with the receiver Y and the

yarn-guide carrier, of the guard-wire 34, substantially as specified.

12. The combination, with the receiver, of the yarn-guide 32, substantially as specified.

13. The combination, with the cam-wheel O, of the sliding friction-roller Q and the shifting lever 36, the bar M, and the needle-bar L, substantially as specified.

14. The combination, with the gauge-screws 22, the

rods 20, and the needles A, of the bar 21, arranged and operating substantially as specified.

JOHN LEE.

MARK LEE.

WILLIAM CARTER.

Witnesses:

CHARLES C. GREENWOOD,

MYRA S. GREENWOOD.