

No. 623,096.

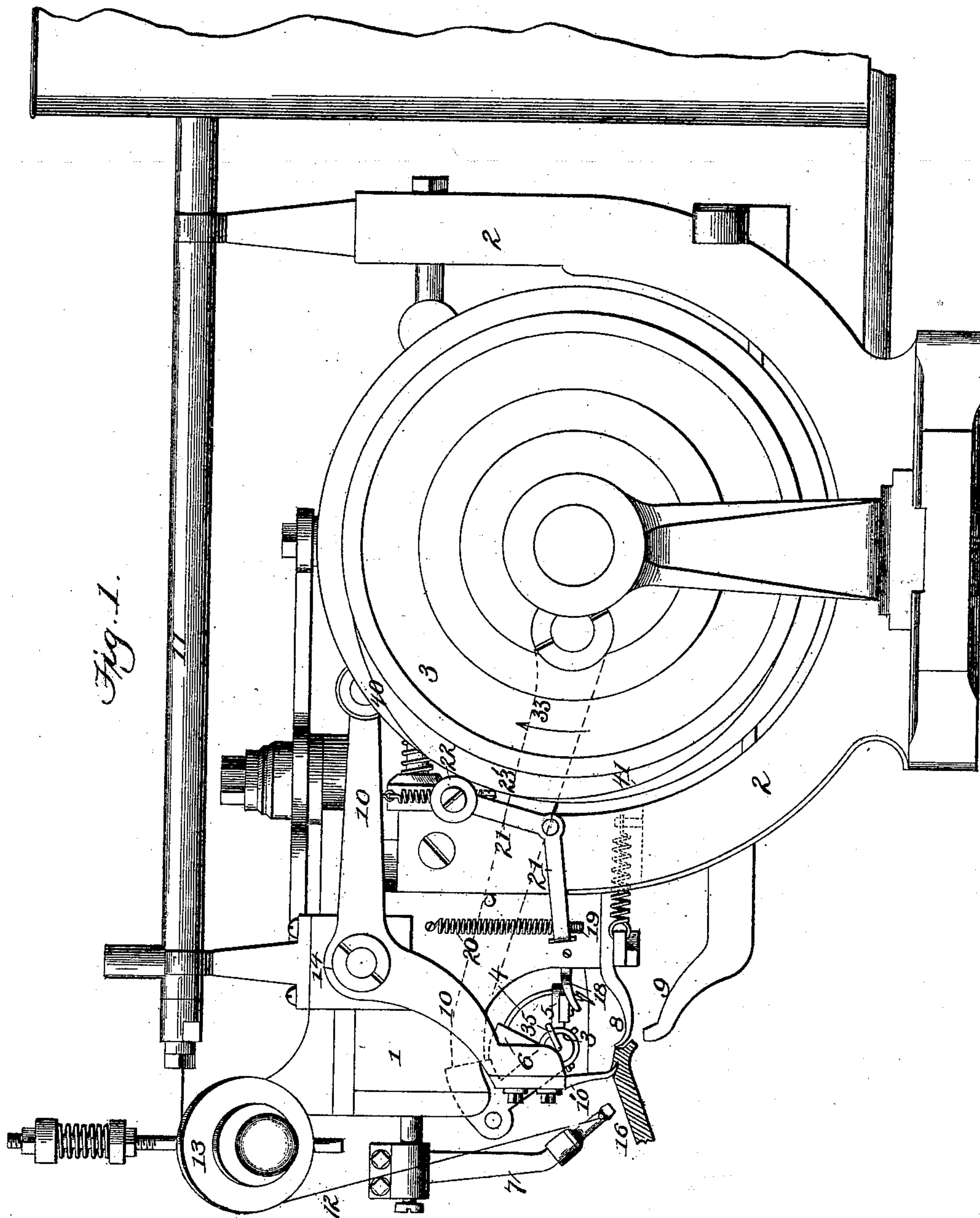
Patented Apr. 11, 1899.

F. A. MILLS.
SEWING MACHINE.

(Application filed May 20, 1895.)

(No Model.)

3 Sheets—Sheet 1.



WITNESSES:

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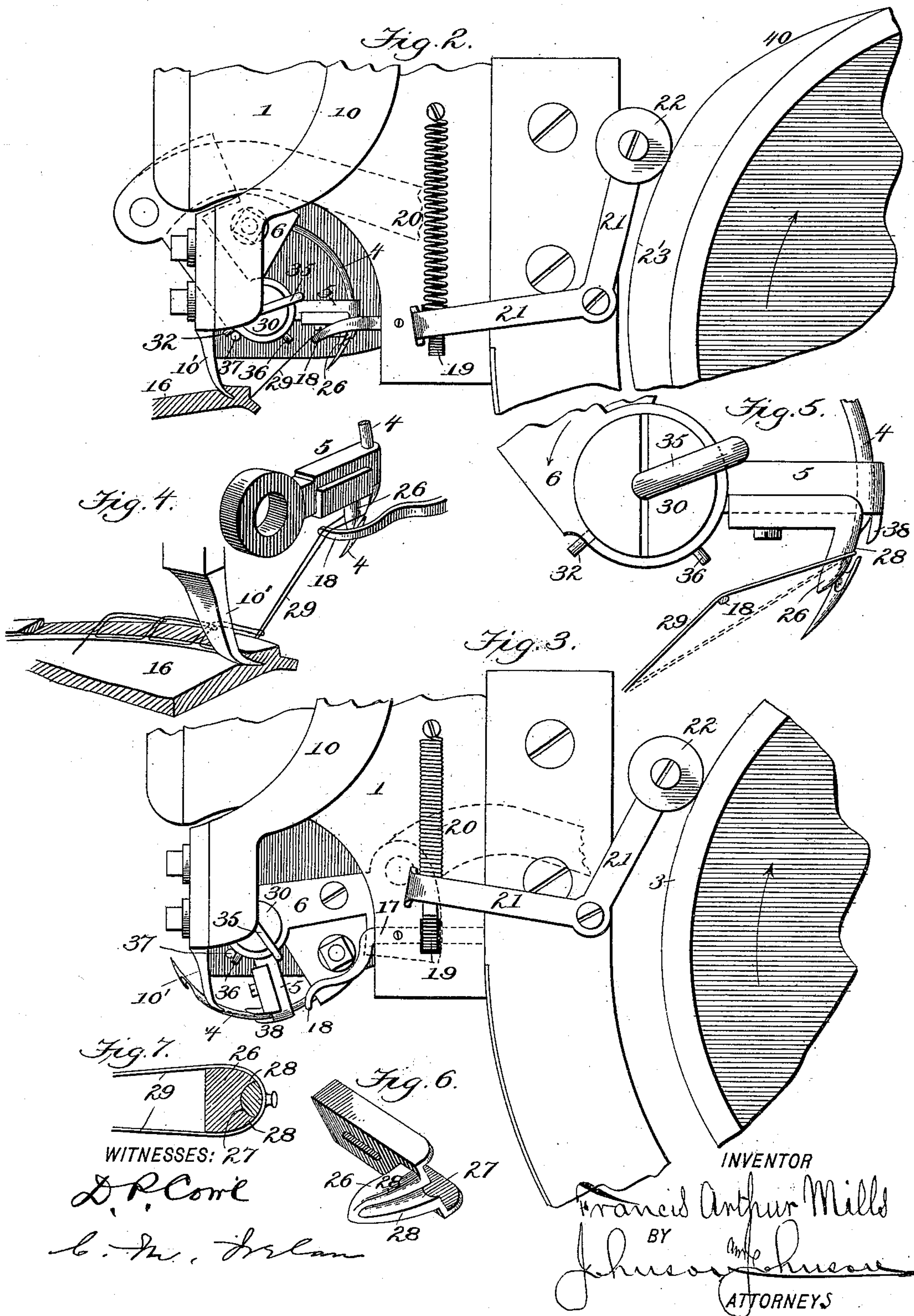
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Fig. 8.

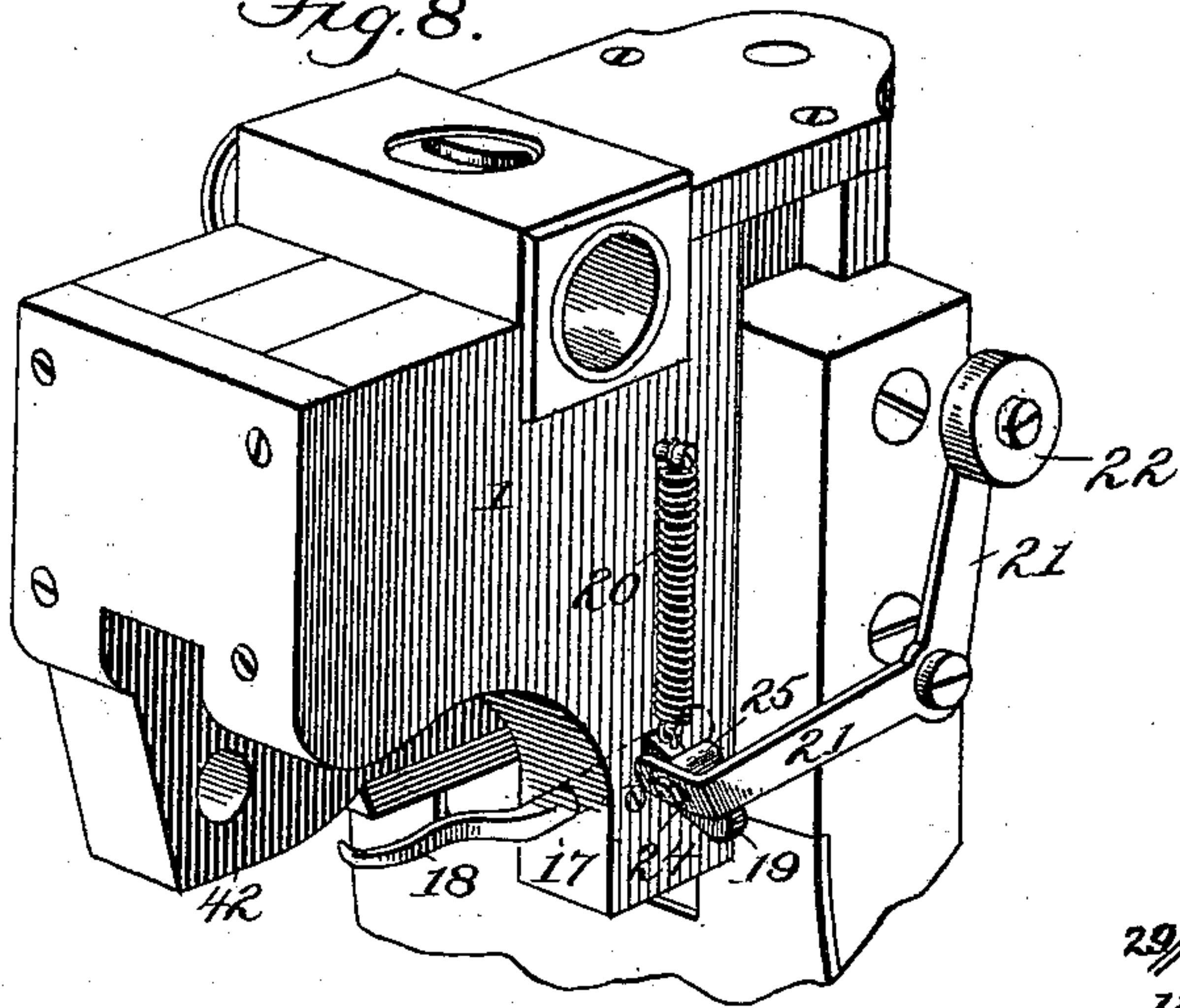


Fig. 13.

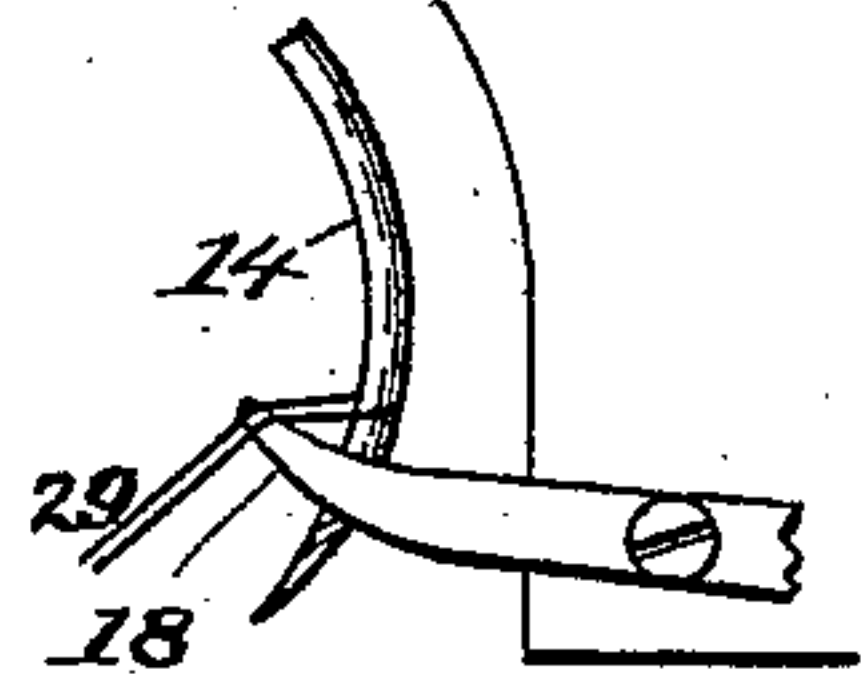


Fig. 9.

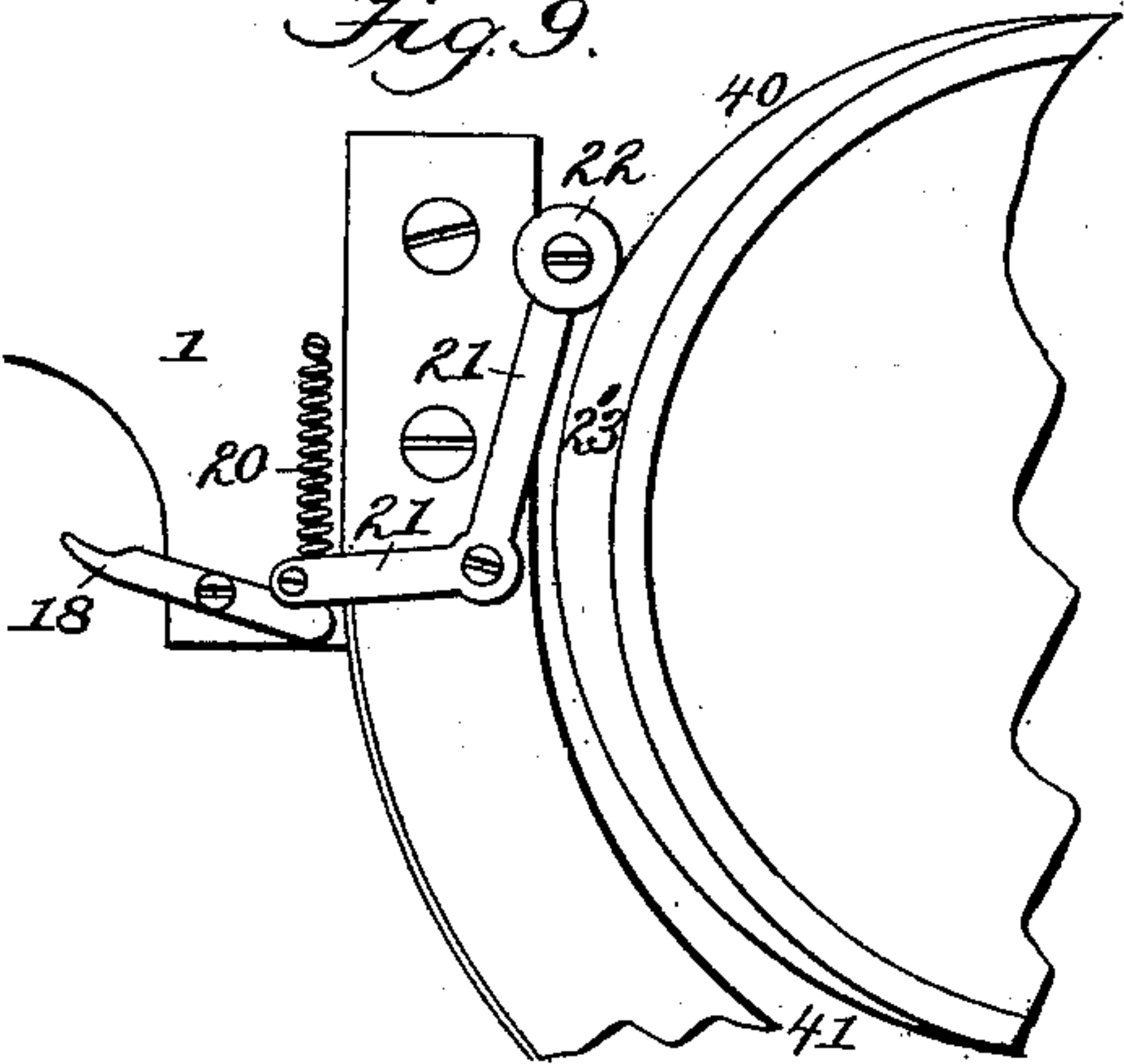


Fig. 10.

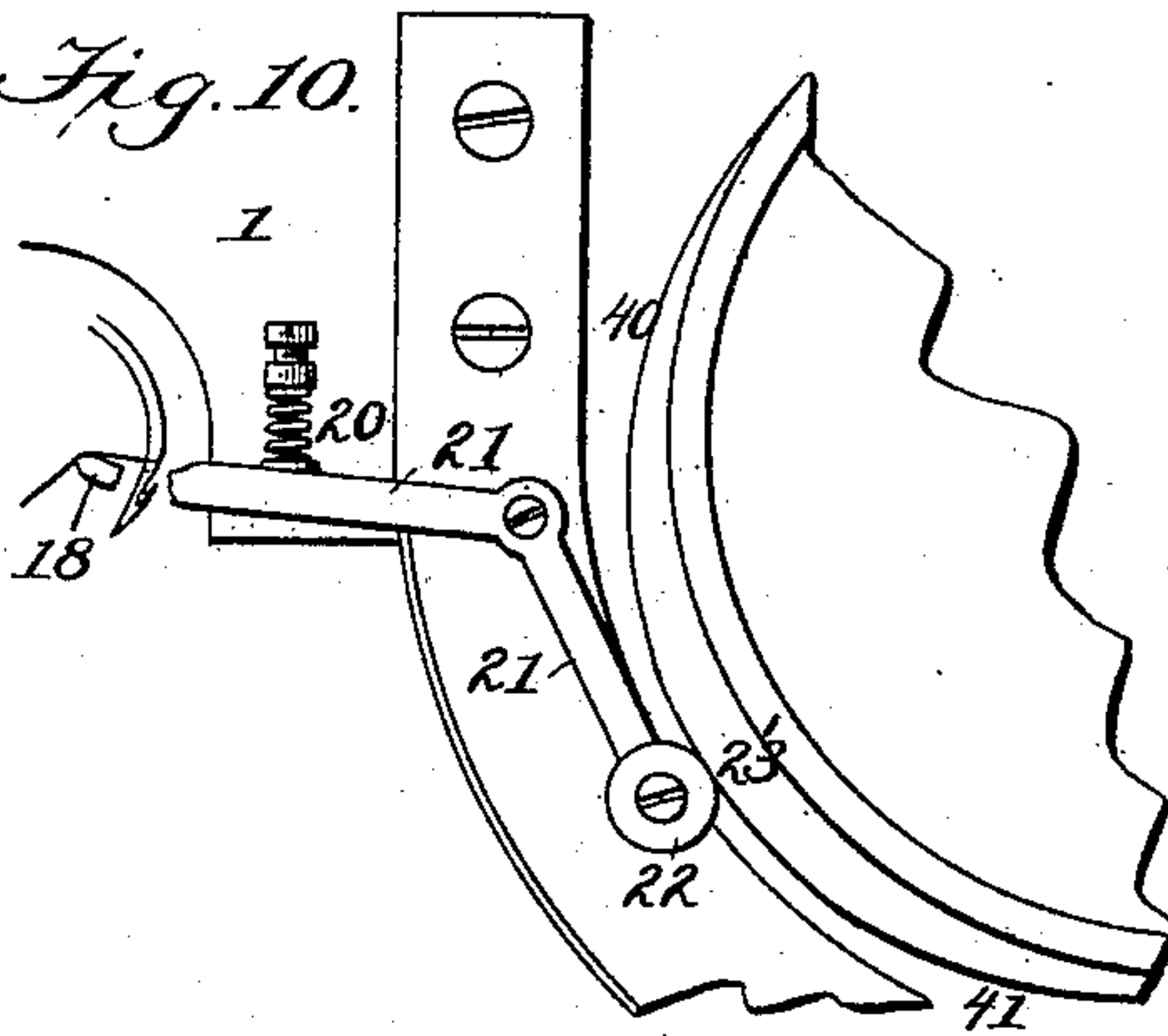
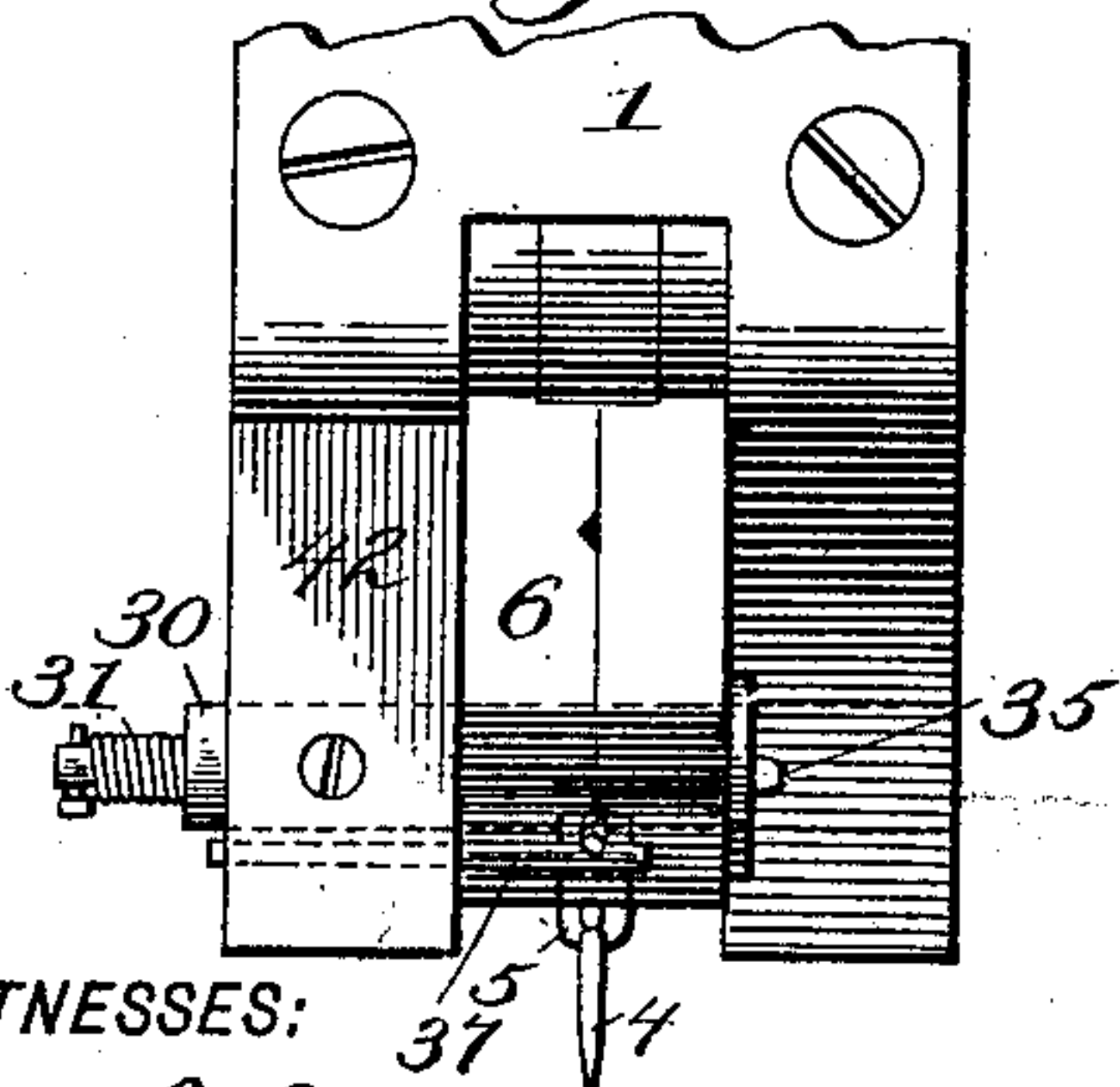


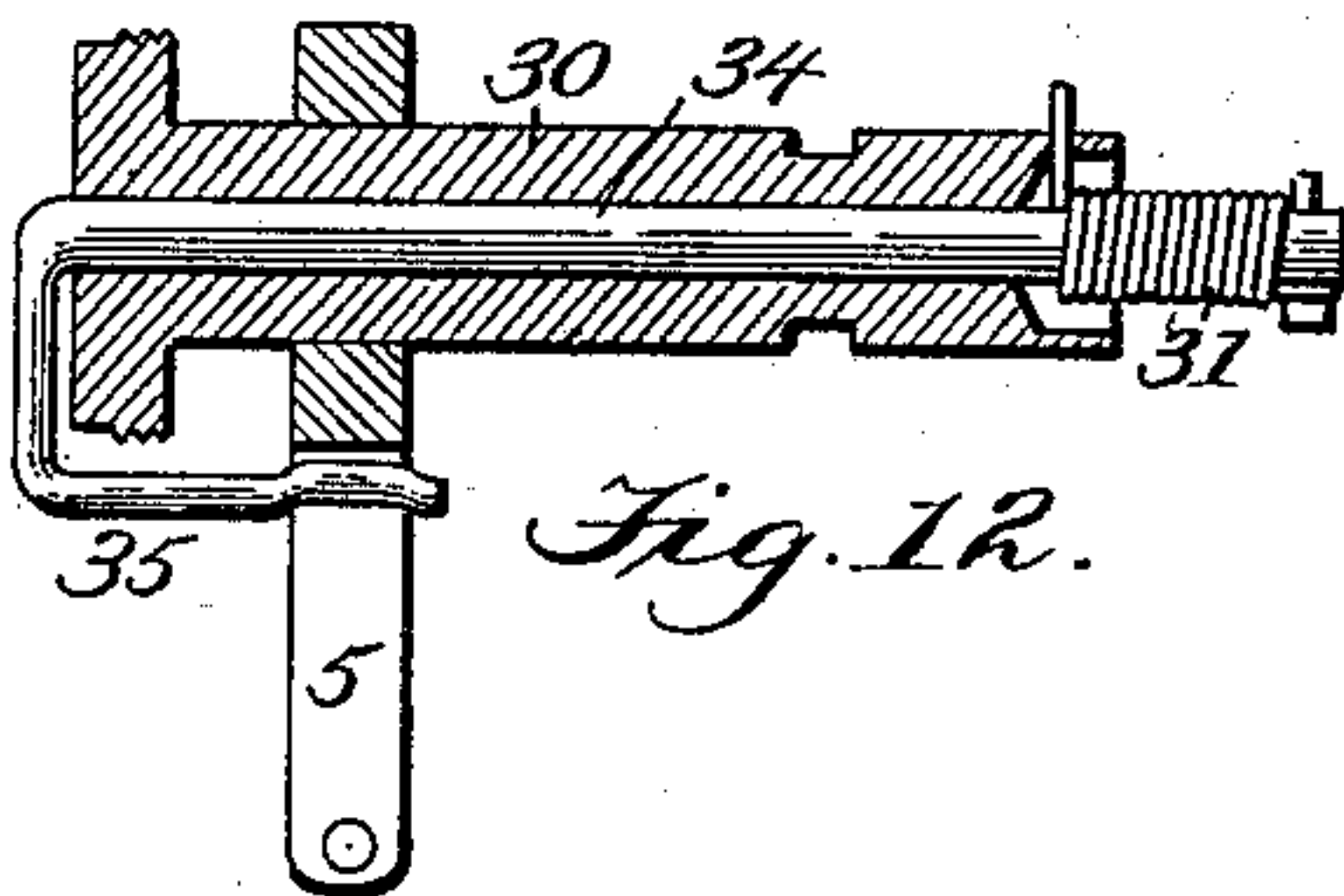
Fig. 11.



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Fig. 12.



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UNITED STATES PATENT OFFICE.

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SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 623,096, dated April 11, 1899.

Application filed May 20, 1895. Serial No. 549,940. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS ARTHUR MILLS, a citizen of the United States, and a resident of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Chain-Stitch Shoe-Sewing Machines, of which the following is a specification.

In loop-stitch sewing-machines the pulling of the loop by the eye of the needle acts to tighten and to set the stitches in the work. Take-up devices have been used for the same purpose.

My invention is directed to a different way and to different means whereby the stitches are tightened or set and the cutting and the breaking of the thread prevented; and my invention consists of devices and combinations of devices particularly pointed out in the claims concluding this specification, whereby these results are obtained.

The accompanying drawings, which form part of this specification, illustrate the barbed needle, the needle-carrier, and the needle-guide, the looper and the feed devices, and so much of a sewing-machine as illustrates the application and use of my invention of a take-up device for tightening and setting the stitches and for preventing the breaking of the thread at the time the stitches are being tightened and set in the form in which I prefer to employ it; but it will be understood that my invention is not limited to the forms herein shown or to its use in the particular machine shown, as various modifications may be made in the means for carrying out my invention without departing from its spirit or the scope of the concluding claims.

Referring to the drawings, Figure 1 shows so much of a wax-thread sewing-machine as illustrates the employment therein of my invention, the parts being in the positions they occupy when the stitch has been set in the work. Fig. 2 shows, enlarged, the stitch-forming parts in the same positions they occupy to the work in Fig. 1. Fig. 3 shows a similar view, the parts occupying the positions in which the loop of thread is received to form the next stitch and the stitch-tight-

ening finger device has moved out of the way of the needle in its forward movement. Fig. 4 shows the relation of the needle and the loop-manipulating finger device and loop-bearing device for tightening the stitch in the work. Fig. 5 shows in side view the finger device for the loop and a bearing device for the loop to slip upon behind the needle during the operation of setting the stitch and which sustains and relieves the loop from being pulled by the needle eye or barb to prevent the cutting and breaking of the thread and assists in setting the stitches. Fig. 6 shows the said bearing device which sustains the loop behind the needle in tightening the stitches, and Fig. 7 is a cross-section of said loop-sustaining device in its relation to the eye of the needle at the time the stitch is being tightened and set. Fig. 8 shows the sewing-head and the application thereto of the stitch-tightening finger device, and Figs. 9 and 10 show modifications of said device. Fig. 11 shows the needle-carrier in front view as applied to the sewing-head. Fig. 12 is an axial section of the bearing on which the needle-carrier and the needle-guide are mounted, showing the torsional spring-connected arm by which the needle-guide is moved forward; and Fig. 13 shows the action of the loop-manipulating finger device without the loop-sustaining device of the needle-guide.

Referring to Fig. 1, so much of the machine as is illustrated is organized to carry out my invention; but it is obvious that my loop-manipulating finger device for tightening the stitches can be used with other forms and constructions of machines adapted for sewing with the loop or chain stitch.

The sewing mechanism is mounted in a housing structure or head 1 at the front end of the supporting-frame 2, within or upon which are mounted suitable cams 3 for operating the several members of the mechanism employed in sewing.

A brief description of the loop-stitch-forming mechanism is deemed necessary in connection with my present improvements. The needle 4 is of the curved barb construction

and is supported by a guide 5 in the usual manner and is fitted in a carrier 6, which is mounted to have a reciprocating movement in the arc of a circle. In front of the needle
 5 a looper-arm 7 hangs and is mounted to have an oscillating movement in front of and around the needle to form and to place the loop in the barb. A back-gage 8 and a slide-rest 9 support the lasted shoe in position to
 10 the sewing mechanism, while the feed-lever 10 is mounted to operate in the channel of the sole to feed the shoe between each stitch, the work being held by the operator while the needle is moving to enter and to draw the
 15 loop through the between substances.

The machine is provided with suitable heating and waxing devices, which may be mounted upon the rear end, while the tension device is mounted upon the top of the sewing-head above the looper-arm, so that the
 20 conduit 11, containing the waxing-tube for the thread 12, will deliver the waxed thread in close proximity to the tension-wheel 13.

Referring to Figs. 1, 2, 3, and 8, the side
 25 plate of the sewing-head is shown as having an under curved or arched space at its lower front corner, within which space the feed-lever 10, which is pivoted at 14, works, with its feed-arm 10' in position to enter the channel of the sole 16 to feed the shoe. In or
 30 upon the wall of this arch is suitably mounted a horizontal rod 17, so that its end extends within the arched space and terminates in a finger 18, which is formed somewhat like a
 35 crank, so that when vibrated it will rise beneath the loop and have a lifting or pushing action thereon between the work and the needle to draw the thread and set the stitch of the preceding loop, as seen in Figs. 4 and
 40 13. The other end of this finger-rod is connected to or receives the action of the spring 20, which constantly tends to press the finger downward and outward and to hold it out of the way of the needle and its guide
 45 in their forward movement. A lever 21 is pivoted to the frame in position with one of its arms to connect with the finger-rod, the other of said arms having a roll 22, which engages a cam 23', adapted to give a positive
 50 upward movement to the finger 18, so that the rocking of the rod 17 by the lever 21 and the action of the cam 23' turns the finger 18 upward under the loop of thread, so as to lift it the distance required to tighten and set the
 55 stitch. For the purpose of adjusting the stroke of this loop-manipulating finger I make the engagement of the lever 21 with the arm 19 of the finger-rod by a slot 24 in said lever and a roll 25, mounted in said slot so as to
 60 bear upon said arm, so that the upward movement of the finger can be set the height to which the loop must be lifted to pull in and tighten the stitch. As seen in Fig. 13, this
 65 lifting action of the finger takes place when the loop is taut and pushes it out of the eye or barb upon the larger surface or body of the

needle over which the thread of the loop slips at the time the stitch is being set, and the loop is thereby relieved from the abrading and cutting action to which it would be sub-
 70 jected if sustained wholly upon the small surface in the throat or eye of the needle. In this way the finger device tightens and sets the stitches and the body of the needle forms a surface for the thread to slip upon and pre-
 75 vents the cutting and breaking of the thread while setting the stitch. As stated, this lifting of the loop to pull in and set the stitches is effected by the positive action of the cam 23', the construction of which at the point 40
 80 causes the finger to rise at the time the stitch is to be tightened by a comparatively quick movement. The cam part 23' holds the finger at its full elevation until the needle starts on its forward movement, when the finger will
 85 start to move back in the proper time to prevent the escape of the loop from the needle while the latter is moving forward to pierce the work for the next loop. The cam part 41
 90 gives a comparatively slow retracting movement to the finger. During this lifting of the loop to tighten and set the stitch the shoe is held firmly in position by the back-gage and the slide-rest, as seen in Fig. 1. In this way
 95 of setting the stitch the barb of the needle receives the thread to form the loop and pulls it through the hole in the shoe preparatory to setting the stitch; but while the stitch is being set the loop is not sustained in the eye or
 100 barb of the needle, as will be seen in Figs. 5 and 13.

For the purpose of providing a larger sustaining-surface for the loop to slip around than that given by the eye or body of the needle to prevent the cutting and breaking of
 105 the thread and to assist the lifting-finger in its function of tightening the stitch I may provide the needle-guide with a spreading and bearing device 26 for the loop arranged to supplement the needle and to form a sup-
 110 port for the loop back of the needle at the time the stitch is being set, so as to relieve it from the small surface of the eye or throat of the needle at the time the stitch is being tightened and at the same time assist in set-
 115 ting the stitch as the bearing moves back, as more clearly illustrated in Figs. 5, 6, and 7. This spreading and sustaining device for the loop is preferably applied to the forward side of the needle-guide and has a groove 27,
 120 which registers with the needle-passage in the needle-guide and conforms to the concave side of the needle, so that the needle moves in said groove and between the rounded bearing-surfaces 28 28, which sustain the loop
 125 back of the needle on a surface much larger than that given by the needle at the time the stitch is being set in the shoe, as seen in Fig. 7. This loop-bearing is pointed and stands toward the point of the needle, so as to cause
 130 it to enter and spread the loop 29 as the spreader and bearing moves back with the

needle, because such backward movement, being in the arc of a circle of which the bearing of the needle-carrier is the center, will cause the point of this loop spreader and bearing device to enter and support the loop as the needle draws it back upon the bearing-surfaces, as seen in Fig. 5. In entering the loop the pointed device spreads it, and the backward movement of the needle pulls the loop upon the enlarged surfaces 28 28, and in doing so the latter forms a large bearing-surface for the thread to slip upon while setting the stitch, and it takes the loop from the small bearing in the eye or throat of the needle and holds it free of contact therewith, so that this enlarged spreader-surface by its positive backward movement with the needle gives a large bearing-surface for the thread to slip upon and serves as the means for assisting in tightening and setting the stitches, while the needle-barb serves to place the loop upon the enlarged bearing preparatory to tightening the stitch. The bearing of the needle-guide, therefore, when used sustains the thread and assists in tightening and setting the stitches in cooperation with the stitch-tightening finger device.

Referring to Figs. 5 and 7, it will be seen that the bearing-surfaces 28 of the loop-diver are brought into action when the barb of the needle reaches the groove of the bearing. In this function of the loop-bearing the needle-guide must have a positive backward movement with the needle, and it must also have a positive forward movement with the needle to support and brace it while entering the shoe, as I will now describe. In the construction shown the needle-carrier 6 is mounted loosely upon its bearing 30, which is fixed in one of the walls 42 of the sewing-head, so that one end of said bearing projects beyond the outer side of this wall for connection by a spring 31 with the device 34, which bears against and moves the needle-guide forward. At its seat upon the bearing the needle-carrier is forked, as in Fig. 11, to receive the eyed end of the needle-guide 5, so that it will move together with the needle-carrier and also independently of it upon the fixed bearing. The eyed end of the needle-guide has a pin 32, placed to be struck by the needle-carrier, as seen in Fig. 5, when it is moved forward by its connected pitman-rod 33 (shown by dotted line in Fig. 1) to give an inward or retracting movement to the needle-guide to follow the needle as it draws the loop. For keeping the guide-arm in proper relation to the barb of the needle an arm 34 is fitted in an axial bore in the fixed bearing 30 and projects beyond the latter at both ends. At its inner end this arm has a return-bend 35, which forms a short arm which extends to and engages the guide-arm, as seen in Figs. 5 and 12. The other end of the axial arm has a coiled spring 31, which connects the said arm with the bearing 30, and there-

by gives a torsional action upon the said arm, which constantly tends to press the needle-guide forward. A second pin 36 on the needle-guide is placed in position to engage a stop 37, fixed and projecting inward from the sewing-head plate, and thereby limit the forward movement of the guide-arm in supporting the needle, as seen in Fig. 3, while the backward movement of the needle-guide is limited by the engagement of the pin 32 with said stop, as seen in Figs. 1 and 2.

In Figs. 1, 2, 3, and 8 the loop-manipulating finger-rod is shown fitted in an interior bearing in the sewing-head and has an arm 19, which projects through an opening in the wall, while in Figs. 9 and 10 the loop-manipulating finger is shown as pivoted upon the outer wall and in Fig. 10 is made in one piece with the cam-actuated lever, and the spring 20 is arranged to constantly press the finger down out of the way of the needle.

From the foregoing construction it will be seen that the stitch is tightened or set by a finger device mounted upon the sewing-head, which acts to pull up the loop between the shoe and the needle, so as to draw the stitch tight in the work, while the loop-spreader and thread-slipping surface carried by the needle-guide forms a large bearing upon which the loop is sustained to prevent the cutting and breaking of the thread while tightening the stitch and which assists in such tightening action while the loop is moving up with the finger. In this operation we will say the needle has pierced the work, as seen in Fig. 3, and received the loop of thread and pulled it through the work, leaving the needle-guide in its full forward position. After the loop is pulled through the work the needle-guide is caused to be moved back with the needle by the needle-carrier moving forward and by its front side coming in contact with the projection 32 on the pivoted end of said guide, as seen in Fig. 11. Just as the needle is completing its backward movement with the loop on its barb the finger is timed to move to the position shown in Figs. 1, 2, 5, and 13 to lift or push the loop out of the eye and tighten and set the stitch. In doing this the loop will be sustained on the large bearing-surface of the spreader at its needle-connected end, and the thread will be drawn by said finger from the loop last formed in the work, and thus tighten and set the stitch. This lifting action pushes the loop out of the eye or throat of the needle and upon its back when the loop-spreader bearing is not used, as seen in Fig. 13, or upon the spreader-bearing, as seen in Fig. 5. The needle and its guide-arm will then be caused to move toward the work to repeat the operation, and it is at the beginning of this return movement that the loop-finger is moved out of the way of the path of the needle, as seen in Fig. 3. The employment of the loop-spreader bearing allows a greater tension to be given to the thread than

is possible in tightening the stitch by the eye, throat, or body of the needle.

The shoe is placed upon the last and held by the hands of the operator, who commences
 5 by inserting the foot of the feed-lever in the channel of the sole. The back-gage and the slide-rest then act to support the work in a well-known way. The needle penetrates the welt edge of the upper and the base of the
 10 channel-flap, the looper rotates and places the thread in the barb of the needle, and the loop is formed and pulled in the usual way, but the stitch is set by the lifting or pushing action of the finger device. As seen in the
 15 drawings, I have shown this finger device as used without the loop-bearing device; but I prefer to use them together to insure the best results in the two important things—the tight-
 20 ening and the setting of the stitches and preventing the cutting and breaking of the thread. It will be understood that when the loop-bearing device is used the barb is formed on the back of the needle, as shown in Fig. 5, to allow the latter to work close in the groove
 25 of said bearing.

So far as I know and can find I am the first to tighten and set a loop-stitch by a positive tension or pulling action applied to the loop drawn through the work by the needle by a
 30 force exerted at a point between the needle and the work, and although I have described and shown a device for effecting this result by the lifting action or pushing up of the finger upon the loop at such point, yet it is ob-
 35 vious that applying such force in any manner upon the loop between the needle and the work would be within the scope of my invention, and this whether the needle be moving backward or forward. I am also the first to
 40 employ in an organized machine including a hooked needle and take-up a loop-bearing device to support the loop free of and back of the needle at the time of setting and tighten-
 45 ing the stitches. My device for tightening the stitches gives the advantage of preventing the escape of the loop from the barb of the needle after it has pulled the loop through the work to set the stitch, and thereby pre-
 vent the skipping of stitches.

I believe myself to be the first to have de-
 50 vised and used a take-up of any kind which is caused to engage the loop after it is drawn through the work by the needle and to operate upon said loop in order to set and tighten
 55 the stitches, the first to place a finger between the needle and the work to operate upon the loop, and the first to use a bearing device arranged and operating to transfer the loop from the barb of the needle and to hold the
 60 loop independent of the needle during the operation of setting and tightening the stitches, and therefore, without restricting myself to the details and to the general construction and arrangement of the parts hereinbefore
 65 described in illustration of my invention,

I claim as my improvement—

1. In a loop-stitch sewing-machine, the combination with a barbed needle, and oper-
 ating means therefor, of a stitch-tightening
 70 device or take-up, on the needle side of the work, and means for actuating said device to cause it to engage the loop of thread drawn through the work by the needle, and to
 75 tighten and set the stitch while the needle is out of the work.

2. In a hook-needle sewing-machine, and in combination with the needle, a stitch-tighten-
 ing take-up adapted to engage the loop after
 80 it has been drawn through the work by the needle, and actuating mechanism whereby said take-up is caused to draw upon the thread to set and tighten the stitch.

3. In a sewing-machine, and in combination with a looper, a hook-needle and actuating
 means, of a stitch-tightener or take-up on the
 85 needle side of the work, means for actuating said take-up to cause it to engage the thread, and means whereby the stroke of the take-up may be adjusted to give the required pull on
 90 the loop for the purpose specified.

4. In a sewing-machine, and in combination with a looper, a hook-needle and actuating
 means, of a stitch-tightener or take-up con-
 95 sisting of a finger mounted in the frame, means to cause the finger to extend across beneath the loop, to engage the loop and to
 tighten and set the stitch while the needle is out of the work.

5. In a sewing-machine, and in combination with stitch-forming mechanism, including a
 100 hook-needle, a stitch-tightening take-up and actuating mechanism to cause the take-up to engage and force the loop upward on the needle and to draw upon the thread to set and
 105 tighten the stitch.

6. In a sewing-machine and in combination with stitch-forming mechanism including a
 hook-needle and a take-up, a loop-bearing
 110 device constructed and arranged to enter and engage the loop to receive it from the barb of the needle and to sustain it in the opera-
 tion of tightening the stitch.

7. In a sewing-machine, and in combination with stitch-forming mechanism including a
 hook-needle, a stitch-tightening device or
 115 take-up to engage and bear against the loop for the purpose of tightening and setting the stitch, and a bearing device for the loop, arranged to receive the loop from the barb of the needle, and actuating means.
 120

8. In a sewing-machine, and in combination with stitch-forming mechanism, including a
 hook-needle, of a stitch-tightening device or
 125 take-up to engage and bear upon the loop, at a point between the needle and the work and a bearing device to receive the loop from the needle and sustain it in the setting and tight-
 ening of the stitch, and actuating means.

9. In combination in a sewing-machine, stitch-forming mechanism, including a hook-
 130

needle, a stitch-tightener or take-up arranged to engage and push or force the loop in front of the needle and a bearing device to receive the loop from the needle, and actuating means.

5 10. In combination in a sewing-machine, stitch-forming mechanism including a hook-needle, a stitch-tightener or take-up to engage and bear upon the loop at a point in

front of the needle, and a bearing device to receive and sustain the loop independent of the needle in the way and for the purpose stated.

FRANCIS ARTHUR MILLS.

Witnesses:

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