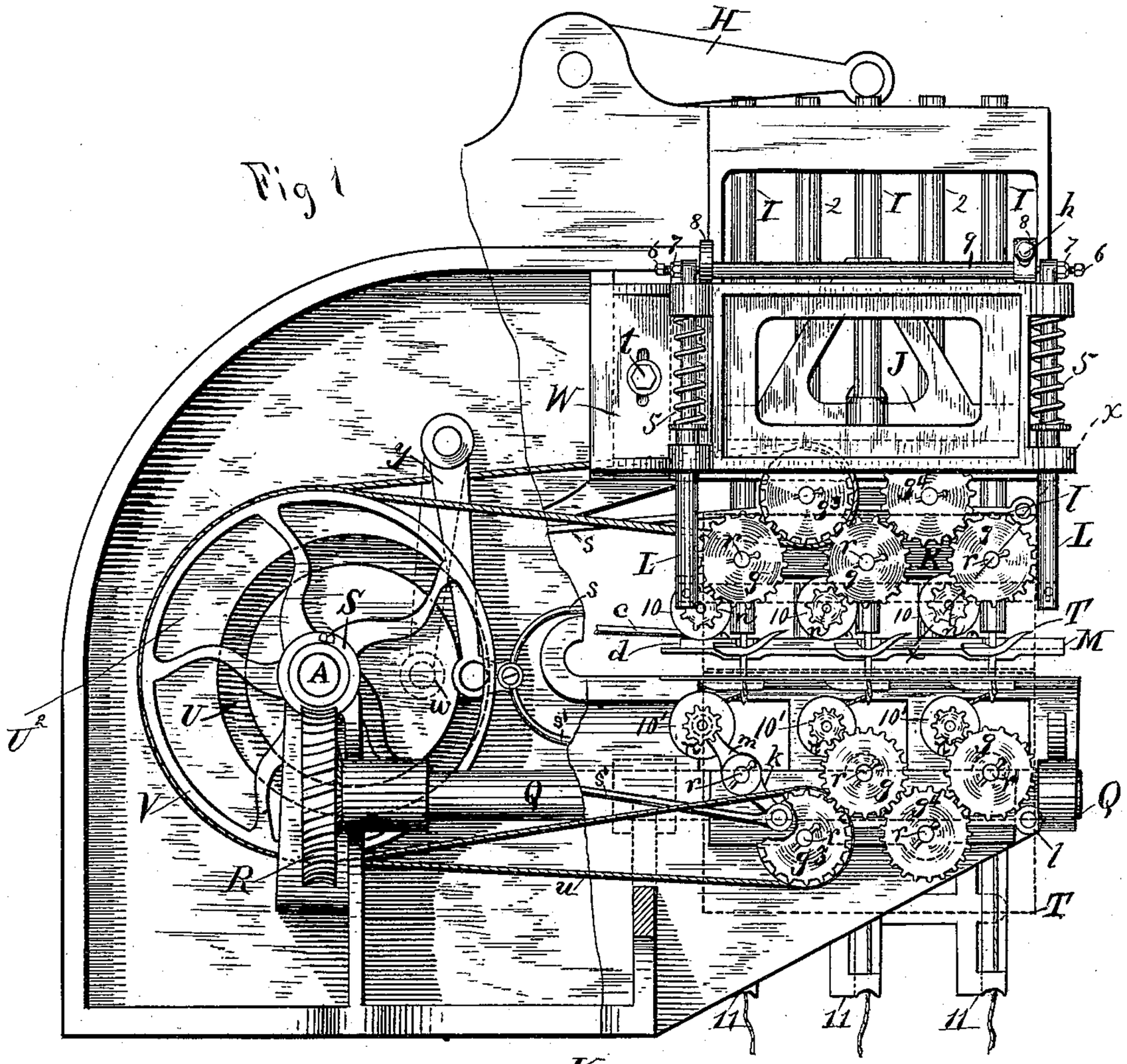
(No Model.) 6 Sheets—Sheet 1.

G. R. PEARE.

MACHINE FOR STAYING LAYERS OF FLEXIBLE MATERIAL.

No. 333,248. Patented Dec. 29, 1885.

Fig 1



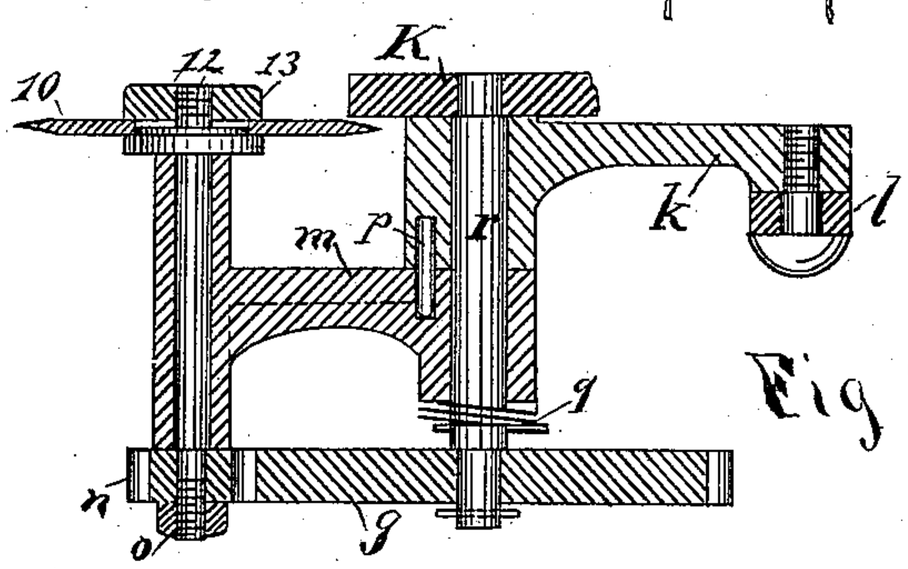


Fig 9

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(No Model.) 6 Sheets—Sheet 2.

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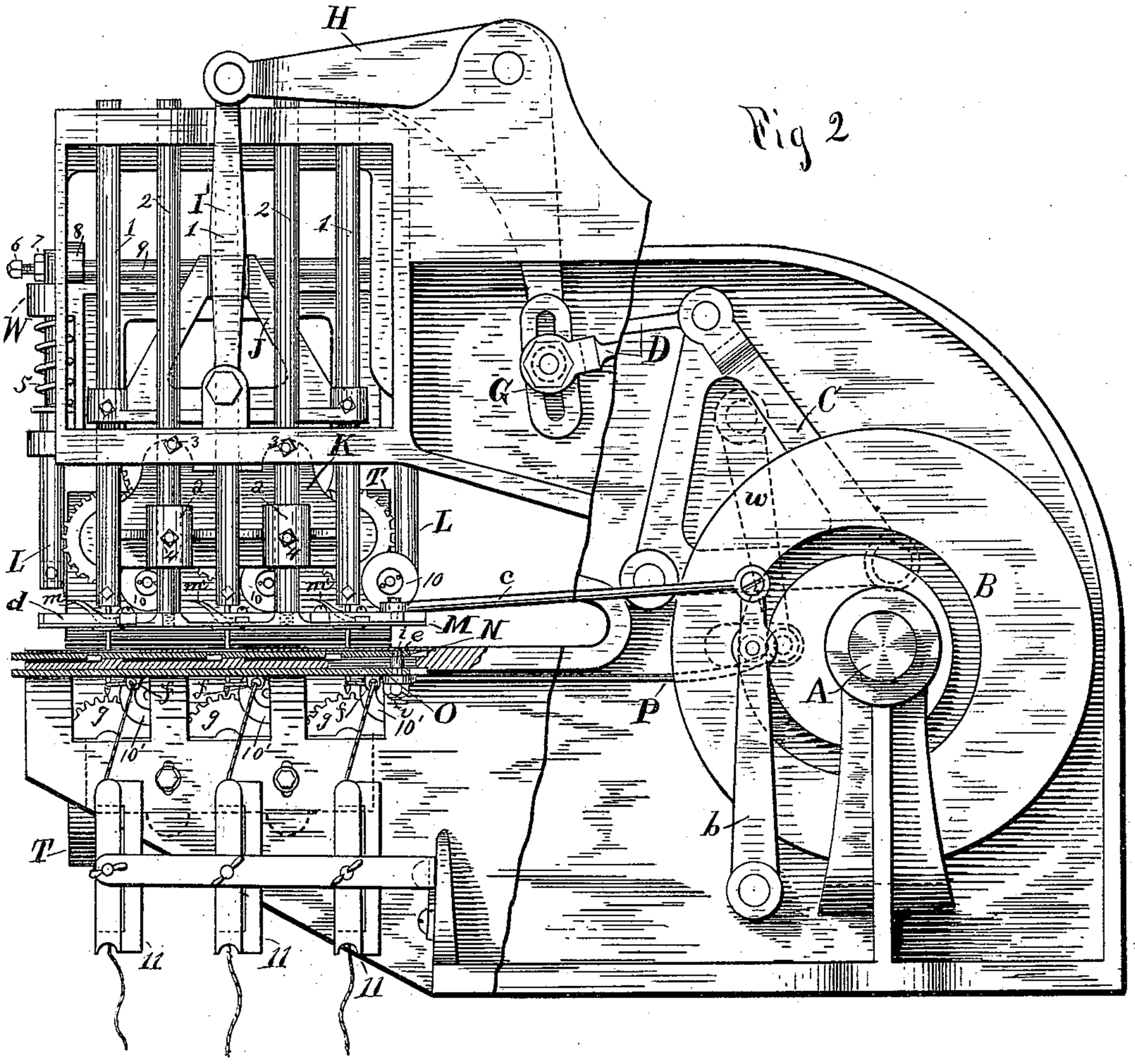
MACHINE FOR STAYING LAYERS OF FLEXIBLE MATERIAL.

No. 333,248. Patented Dec. 29, 1885.

Fig 2



Witnesses.
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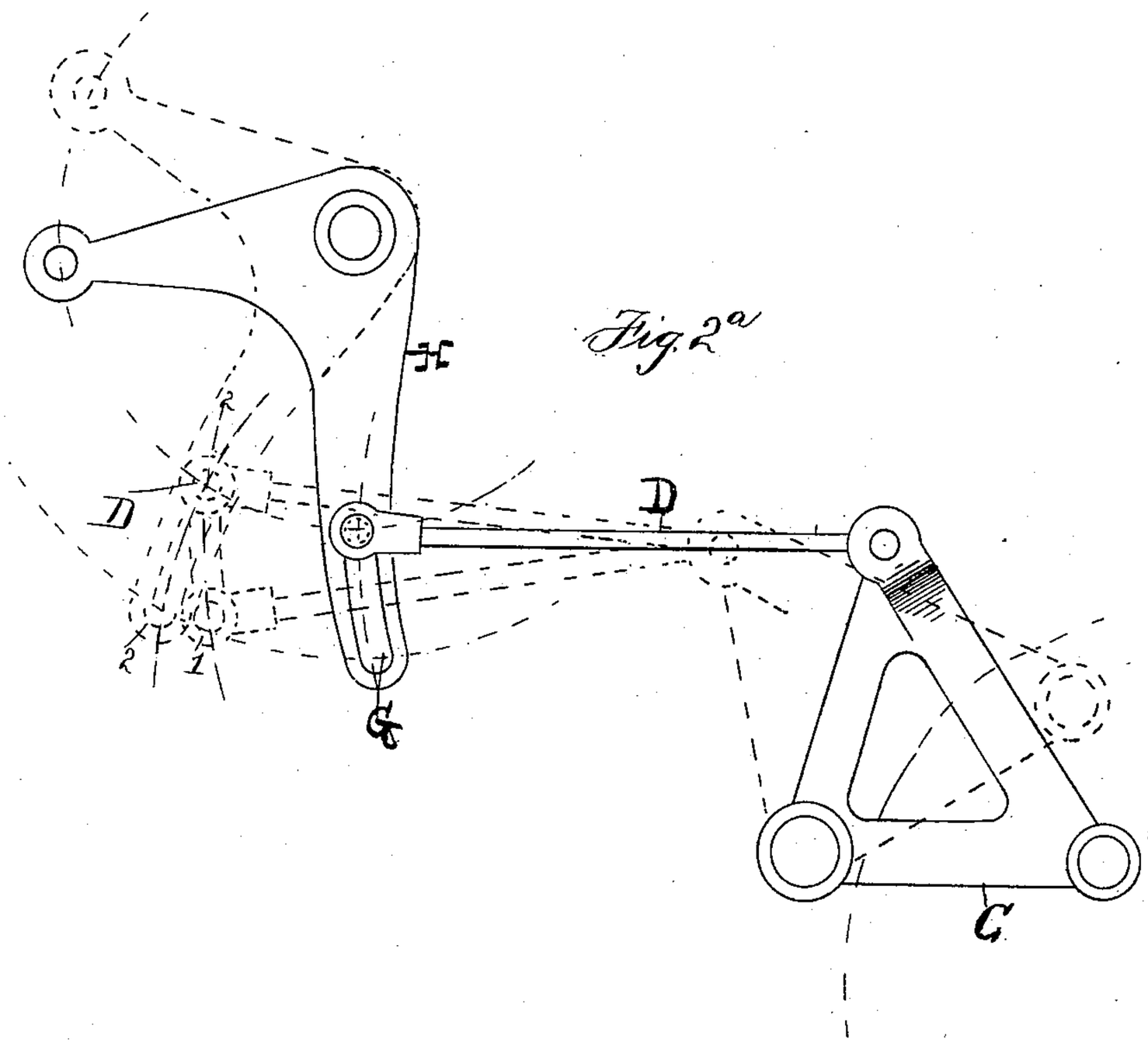
(No Model.) 6 Sheets—Sheet 3.

G. R. PEARE.

MACHINE FOR STAYING LAYERS OF FLEXIBLE MATERIAL.

No. 333,248. Patented Dec. 29, 1885.



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(No Model.) 6 Sheets—Sheet 4.

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MACHINE FOR STAYING LAYERS OF FLEXIBLE MATERIAL.

No. 333,248. Patented Dec. 29, 1885.

Fig 3

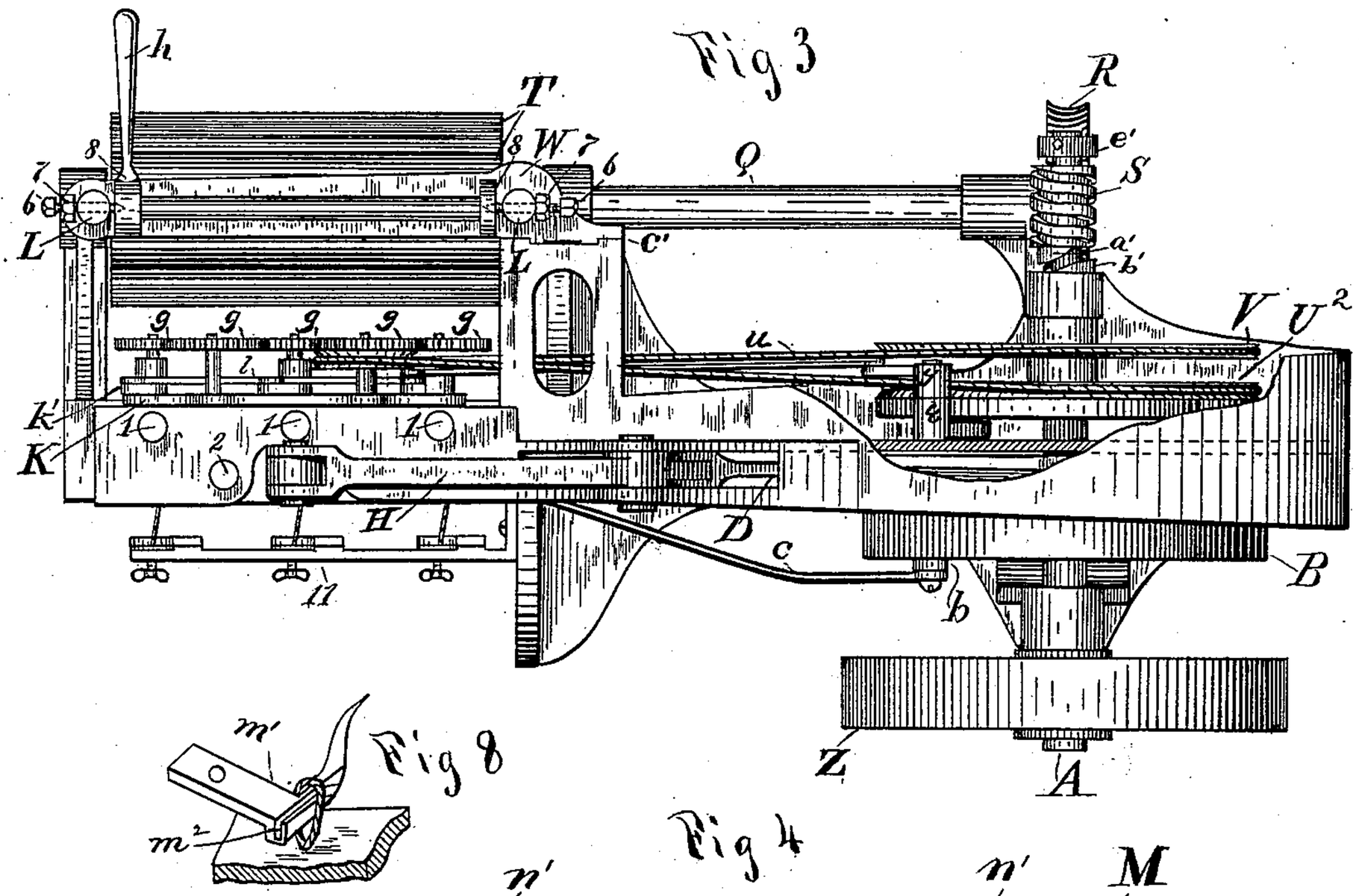


Fig 8

Fig 4

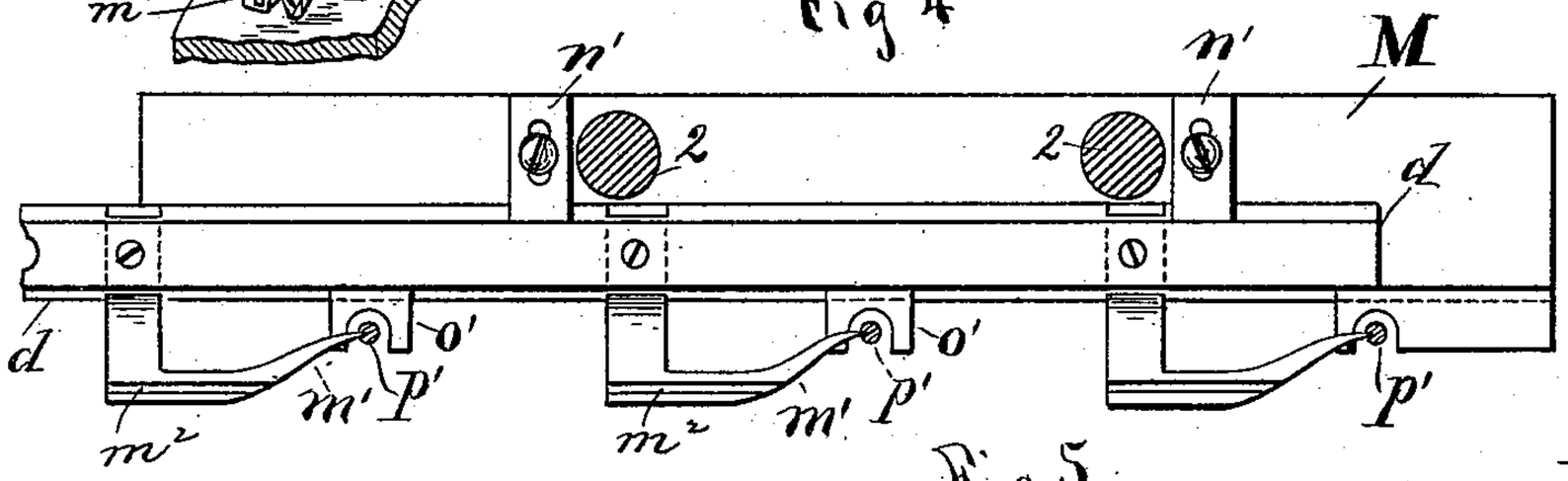


Fig 5

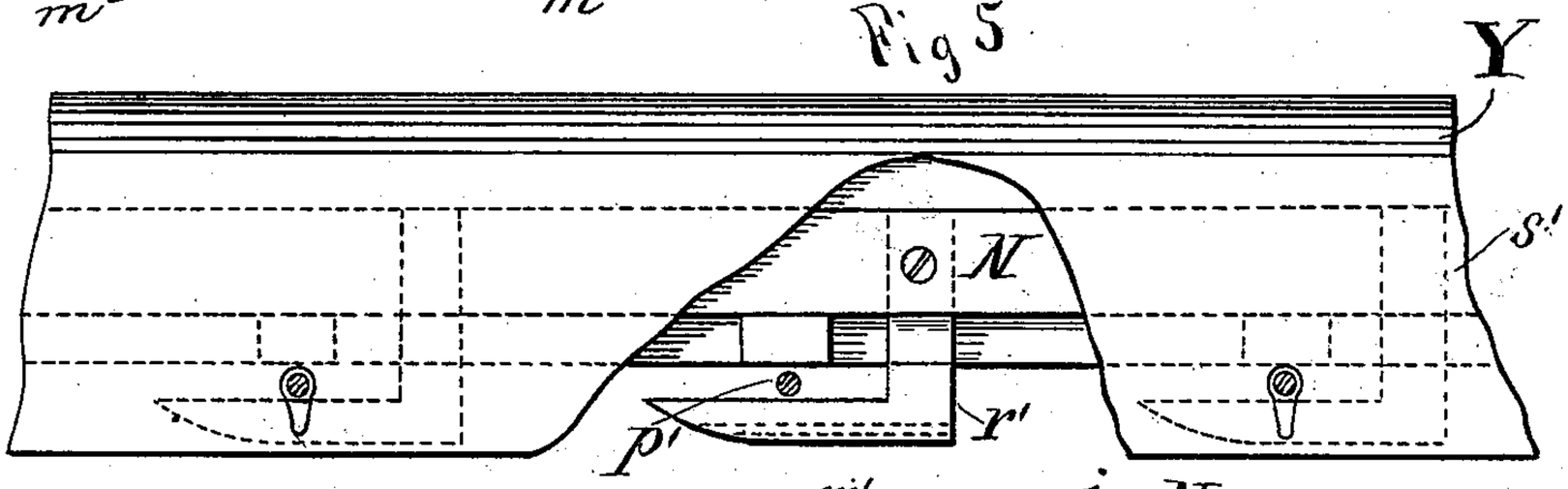


Fig 7

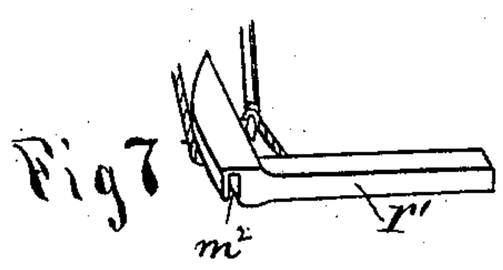
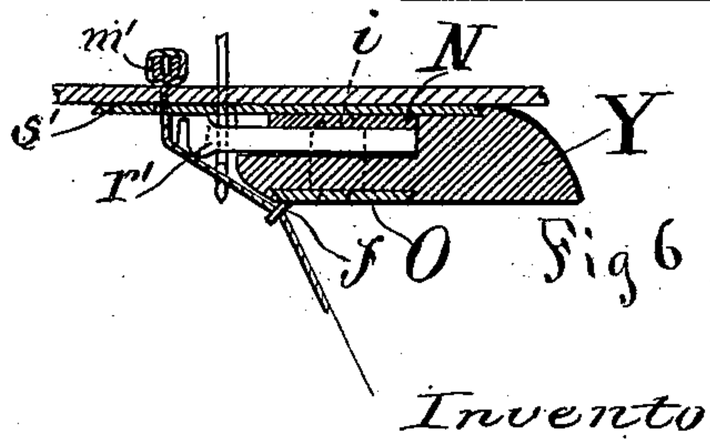


Fig 6



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MACHINE FOR STAYING LAYERS OF FLEXIBLE MATERIAL.

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Fig. 10.

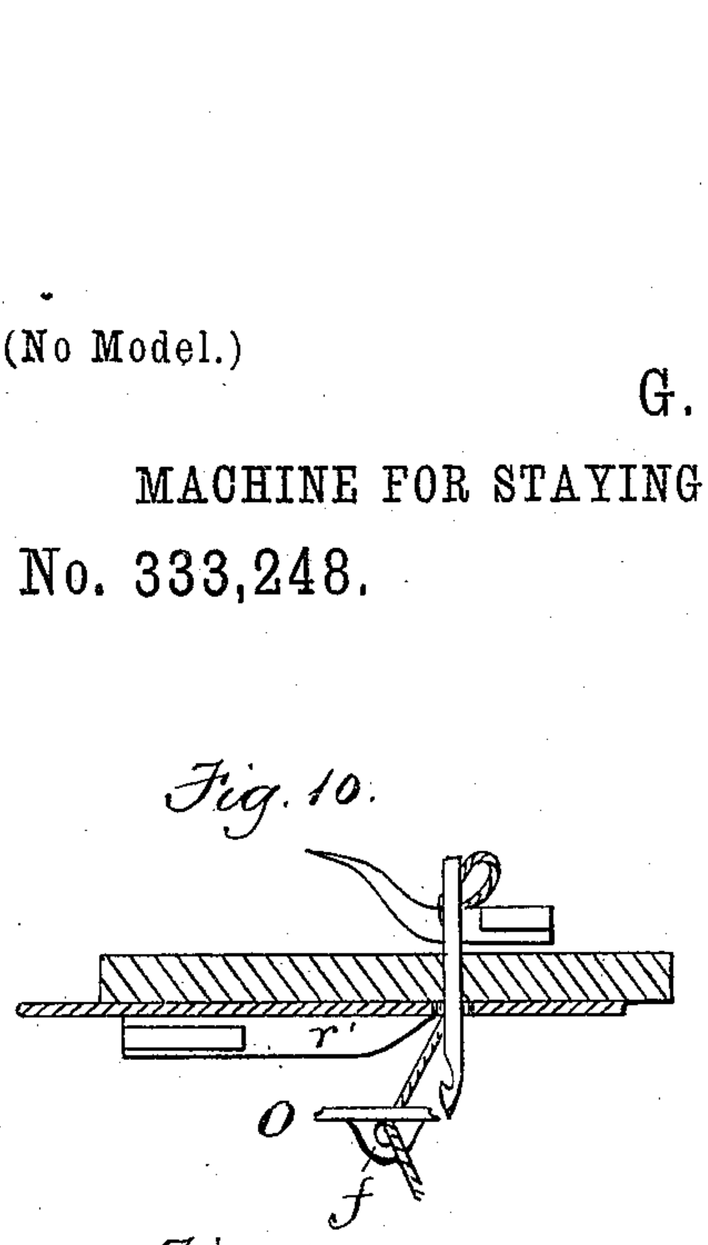


Fig. 10ª

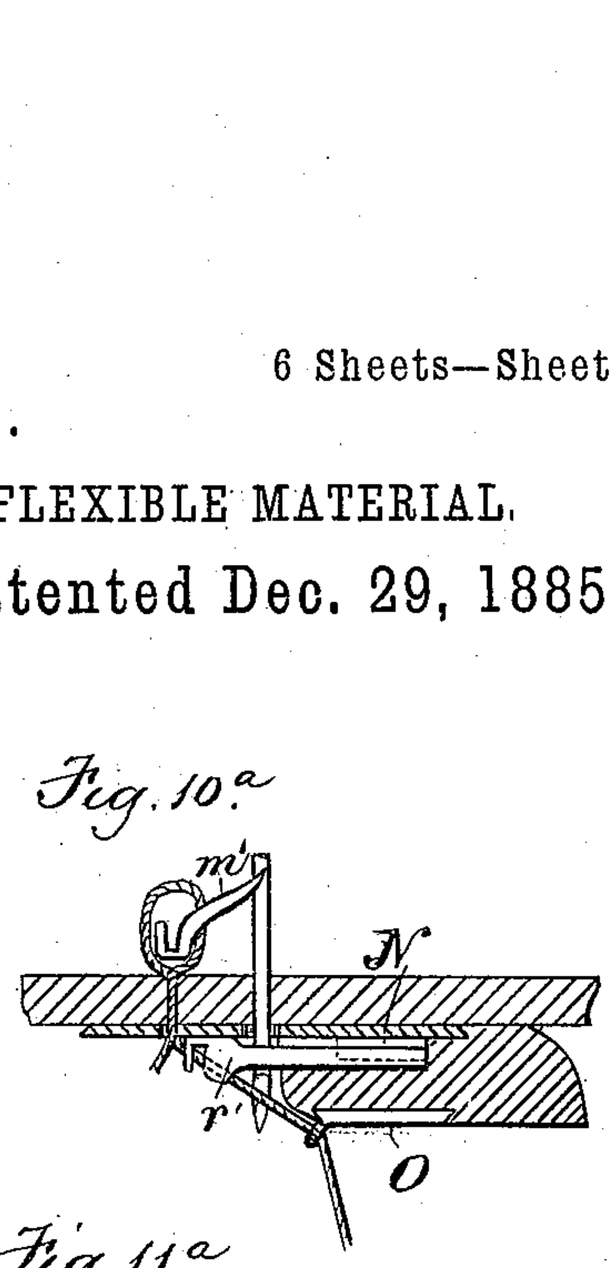


Fig. 11.

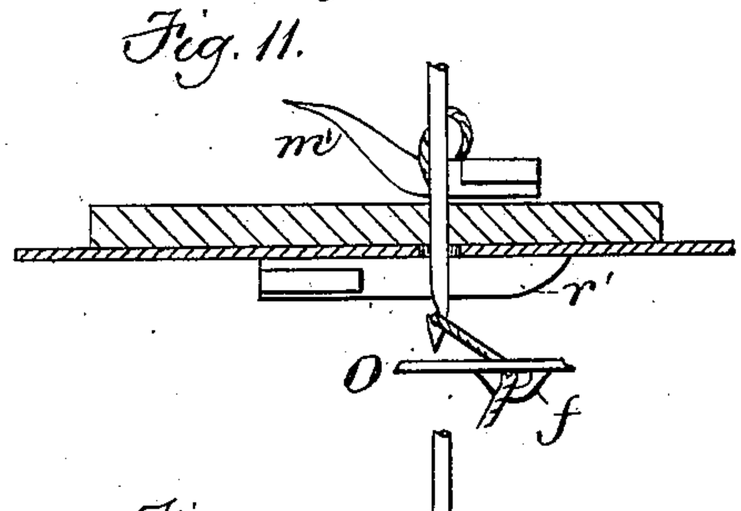


Fig. 11ª

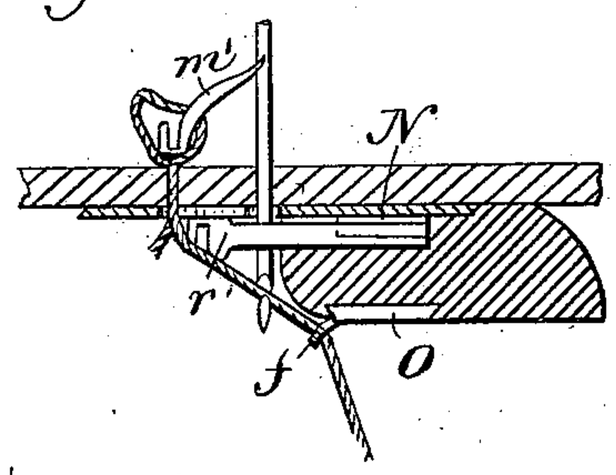


Fig. 12.

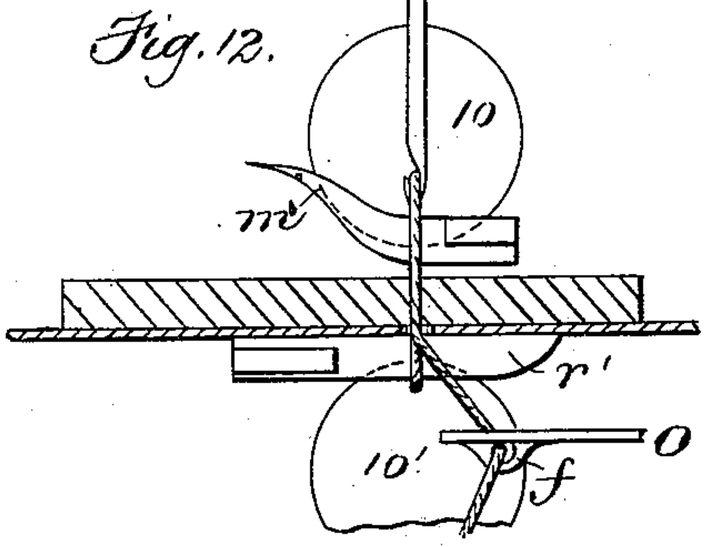


Fig. 12ª

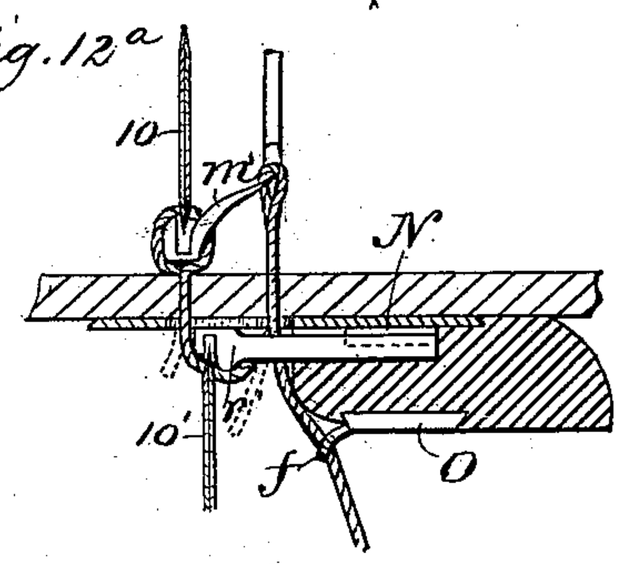


Fig. 13.

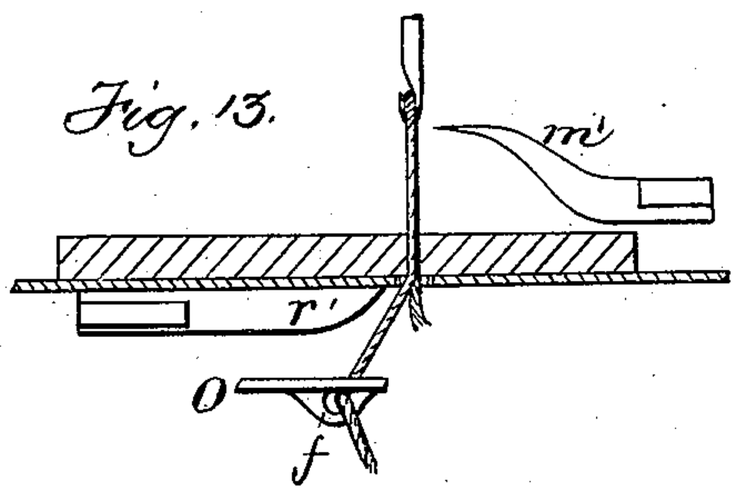
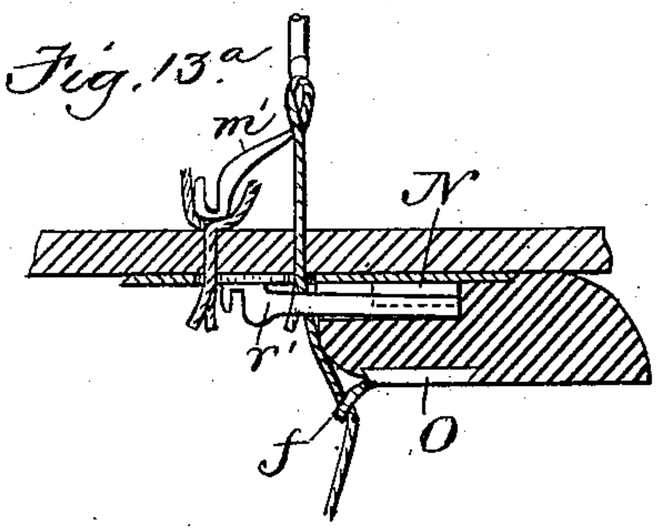


Fig. 13ª



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(No Model.) 6 Sheets—Sheet 6.

G. R. PEARE.

MACHINE FOR STAYING LAYERS OF FLEXIBLE MATERIAL.

No. 333,248. Patented Dec. 29, 1885.

Fig. 14.

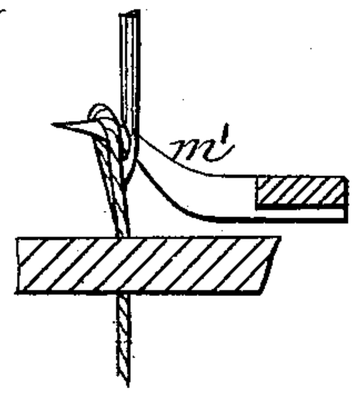


Fig. 14a

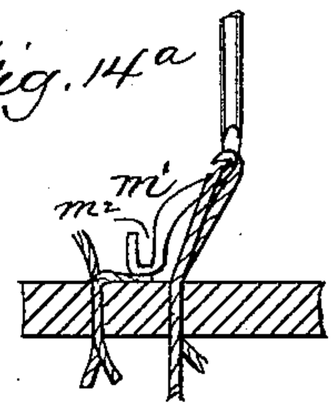


Fig. 15.

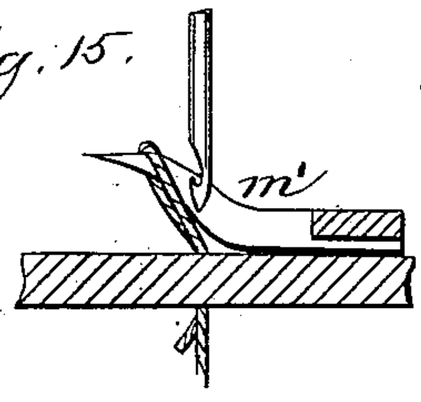


Fig. 15a

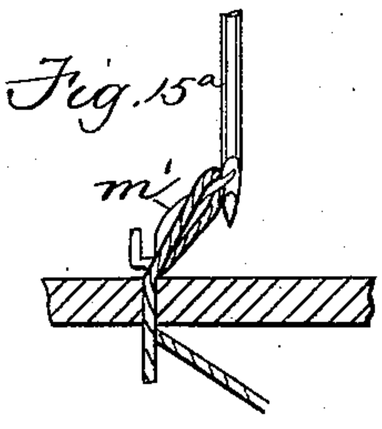


Fig. 16

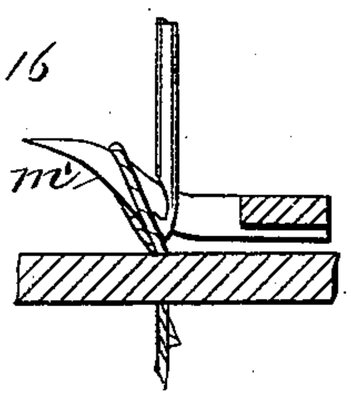


Fig. 16a

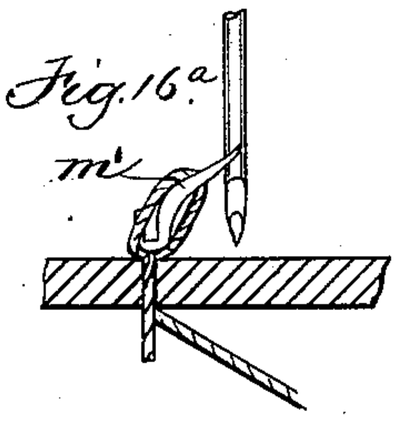


Fig. 17.

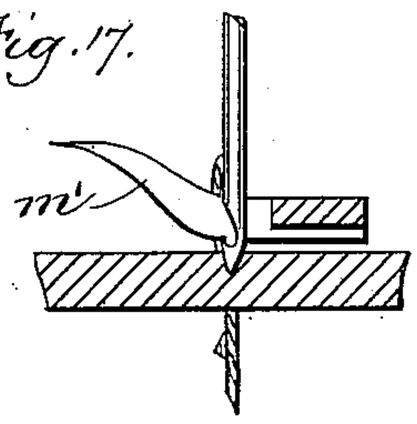


Fig. 17a

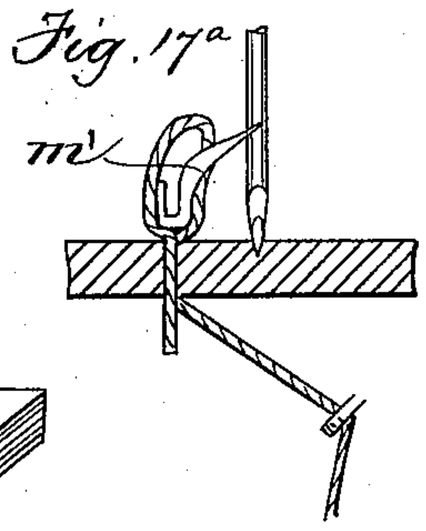
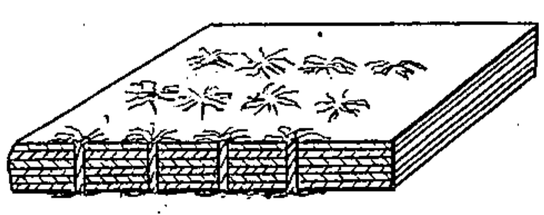


Fig. 18.



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UNITED STATES PATENT OFFICE.

GEORGE R. PEARE, OF LYNN, MASS., ASSIGNOR TO THE GUTTA PERCHA AND RUBBER MANUFACTURING COMPANY, OF NEW YORK, N. Y.

MACHINE FOR STAYING LAYERS OF FLEXIBLE MATERIAL.

SPECIFICATION forming part of Letters Patent No. 333,248, dated December 29, 1885.

Application filed May 18, 1885. Serial No. 165,919. (No model.)

To all whom it may concern:

Be it known that I, GEORGE R. PEARE, of Lynn, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Machines for Staying Layers of Flexible Material, of which the following is a specification.

This invention has for its object to provide a machine for forming flexible stays or lengths of cord or thread in superposed layers of unvulcanized rubber cloth intended for belting, the ends of said stays being laid upon the surfaces of the belting before vulcanization and secured to said surfaces by the vulcanizing process as described in Letters Patent to John Murphy, dated September 4, 1883, No. 284,221.

The invention consists, as a whole, in an organized machine comprising a series of needles adapted to perforate the work, (or layers of unvulcanized rubber cloth,) devices for presenting the cords or threads to the barbs of the needles below the work, a series of retainers below the work, which hold the threads away from the lower surface of the work between the loops last drawn up by the needles and the preceding loops, a series of take-off hooks above the work, which enter the loops drawn through the work by the needles and remove said loops from the needles and hold them after their removal, two series of cutters—one above and below the work—which sever the threads held by the retainers and the take-off hooks, thus converting the threads into independent stays with projecting ends, and feed mechanism whereby the work is moved forward while the needles are raised.

The invention also consists in detail in the improvements hereinafter specified relating to the feed mechanism, the cutters, and the loop-forming mechanism, all of which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a front elevation of my improved machine, the feed-rolls and a portion of the feed-shaft being shown in dotted lines. Fig. 2 represents a rear view of the same. Fig. 2^a represents a view of a part of the mechanism shown in Fig. 2. Fig. 3 represents a top view. Fig. 4 represents a plan view of the foot with the take-off hooks and their slide in place. Fig. 5 represents a plan view of the horn or work-support, showing the lower retaining-hooks. Fig. 6 represents a transverse section of the horn or work-support, showing the position of the needle at its lowest point of descent. Fig. 7 represents a perspective view of one of the lower retaining-hooks. Fig. 8 represents a perspective view of the take-off hook with a portion of the work, showing the position of the cord when it is ready to be cut. Fig. 9 represents a section on line *x x*, Fig. 1, through one of the upper cutters and the devices that support, rotate, and oscillate it. Figs. 10 to 17, inclusive, are elevations taken from the sides of the retaining and take-off hooks, showing their positions and those of the needle at different stages of the operation. Figs. 10^a to 17^a, inclusive, are corresponding elevations taken from the ends of said hooks. Fig. 18 represents a view of a piece of the work after the stays have been inserted and their ends flattened.

The same letters of reference indicate the same parts in all the figures.

In the drawings, I I I represent the needle-bars, three in number in this case, although the number may be varied as desired. Said bars are secured to a cross-head, J, which receives a vertical reciprocating motion from a cam-groove in the inner side of a disk, B, Fig. 2, through pitman I′, bell-crank lever H, connecting-rod D, and bell-crank lever C, the latter having a stud or roller which enters said cam-groove. The height to which the cross-head and needles are raised is determined by adjusting the point of connection of the rod D to the lever H by means of a segmental slot, G, in said lever. This does not change the limit of the descent of the cross-head and needles, however, because the slot G is so arranged that it is concentric with the pivot connecting the rod D with the lever C when the cross-head is at the lowest point in its movement, as shown in Fig. 2^a, so that no adjustment of the rod D in said slot will vary the extent to which the lever H is moved to depress the cross-head J, while an upward or downward

adjustment of the rod D in said slot will increase or diminish the extent of the upward movement of the cross-head, as the case may be, it being essential that the limit of their downward movement be fixed to enable the thread to be properly presented to the throats or barbs of the needles in looping.

The utility of the provision for adjusting the limit of the upward movement of the needles will be described hereinafter.

M represents the presser-foot, which is secured to the lower ends of vertical rods 2 2, fitted to slide in the head of the machine.

K represents a yoke having bosses *a a*, which receive and are secured to the rods 2 2 by set-screws 4 4. To said yoke are affixed studs *r r*, (see Figs. 1 and 9,) which constitute supporting-pivots for a series of swinging levers, which support and oscillate the upper cutters, 10 10 10. Each of said swinging levers is composed of two sections, *k m*, (see Fig. 9,) connected by a pin, *p*, and held in connection by a spring, *q*, interposed between a pin, *q'*, in the stud *r* and the section *m*, said spring enabling the section *m* to be separated from the section *k* for the purpose of sharpening the cutter which is attached to an arbor, 12, journaled in a bearing in the section *m*. The arbor of each cutter has a pinion, *n*, meshing with a pinion, *g*, mounted loosely on the stud *r*. A pinion, g^3, continuously rotated by a driving band or belt, *u*, passing over a pulley attached to it, meshes with the first and second pinions, *g*, and an idle-pinion, g^4, connects the second pinion with the third pinion, *g*. The pinions g^3 and g^4 are mounted on studs affixed to the yoke K.

The cutters 10 are simultaneously rotated by the means above described. A connecting-rod, *s*, is pivoted to the ends of the sections *k* and secured to a lever, *y*, which is pivoted to the frame of the machine, and provided with a stud entering a cam-groove, U, in a disk, U^2, on the shaft A. These devices oscillate the swinging levers supporting the cutters, and cause the latter to move forward and back while rotating, as hereinafter described.

d represents a slide fitted to move in guides on the presser-foot M, and carrying a series of take-off hooks, *m'*, (one for each needle,) which take the loops from the needles just as the latter commence their downward movement. Each hook has a main portion containing a slot, m^2, Fig. 8, and a pointed end offset from said main portion, and so arranged that in its forward movement it will pass immediately under the point of the raised needle, through the upper end of the loop held thereby, as indicated in Figs. 13 13^a, and, passing onward through the loop, will deflect the latter sidewise away from the needle onto the slotted body of the hook, as shown in Figs. 11 and 11^a. The take-off hooks are reciprocated by means of a connecting-rod, *c*, Fig. 2, attached to the slide *d*, a lever, *b*, pivoted to the frame of the machine and to the rod *c*, and a cam-groove in the disk B, receiving a stud or roller on the lever *b*. These devices give the take-off hooks first a slight forward movement to cause the offset points of the hooks to enter the loops and clear the needles, and then a further movement, as the needles descend, sufficient to carry the slotted bodies of the hooks into the loops. The loops are thus caused to loosely encircle the hooks, as shown in Figs. 11 and 11^a, until the operation of drawing up the next loops draws them tightly over the hooks, as shown in Figs. 12 and 12^a, and enables the swinging and rotating cutters, which move forward and enter the slots m^2, to sever said tightened loops, as shown in Figs. 12^a and 13^a.

Under the work-support or horn is a slide, O, carrying a series of thread-guiding eyes or loopers *f*, which press the cords or threads against the depressed needles.

Above the looper-slide O is a slide, N, fitted in a groove in the upper surface of the horn and carrying a series of retaining-hooks, *r'*, which hold the threads away from the under surface of the work at points between the loops last formed by the needles and the preceding loops, and have slots *m*, to receive the lower cutters. The slides O and N are rigidly connected, so as to move in unison by a stud, *i*, (seen in Fig. 2, and in dotted lines in Fig. 6,) said stud passing through a slot in the horn. A thin steel plate or cover, *s'*, removably inserted in the horn, covers the slide N and its retaining-hooks and protects them from dirt. The slides N O receive a reciprocating motion from a cam-groove in the disk U^2, a lever, *w*, having a stud projecting into said cam-groove, and a rod, *p*, connecting said lever with the slide O. The lever *w* is placed at one side of the frame of the machine and the rod *p* at the other side, the free end of the lever projecting through a slot in the frame, as shown in dotted lines in Fig. 2.

10' 10' 10' represent a series of rotary cutters located under the horn and mounted on swinging levers pivoted on fixed studs, said levers being provided with pinions *g* and *n*, which are driven by a continuously-rotated pinion, g^3, and a loose pinion, g^4, in the same manner that the upper cutters, 10, are driven and oscillated by a branch, *s'*, of the rod *s*. The two series of cutters are driven by a single belt, *u*, passing from the grooved periphery of the disk U^2 over the pulley on the upper pinion, g^3, and then back and over an idle-pulley, V, on the driving-shaft A, and from thence around the pulley on the lower pinion, g^3, and back to the disk U^2. The movements of the lower cutters are so timed that they swing into the slots in the retaining-fingers *r'*, as hereinafter described, just before the upper cutters swing into the slots in the take-off hooks. By making the swinging cutter-supporting levers in detachable sections *k m*, I am enabled to readily remove the sections *m* with the cutters to enable the latter to be sharpened.

To remove any cutter it is only necessary to remove the pinion *g* and the spring-holding pin *q'* from the stud *r*, when the section *m*, with

its cutter, may be removed. The springs *q* keep the sectional levers of the cutters in position to coincide with the slots in the take-off hooks and retaining-fingers, so that the cutters will not strike said parts. The work is fed intermittently by the feed drums or rolls T T, which are shown in dotted lines in Fig. 1 and in full lines in Figs. 2 and 3. The lower feed-roll is affixed to a shaft, Q, journaled in fixed bearings, and provided with a worm-gear, R, at one end, which meshes with a worm, S, fitted to slide on a spline on the driving-shaft A, the worm being compelled to rotate with said shaft, but free to slide lengthwise thereon. A collar, *e'*, affixed to the shaft A limits the movement of the worm in one direction.

a' b' are hardened steel toes, made fast the one to the fixed bearing on the shaft A and the other to the worm S. The rotation of the shaft A causes the worm S to revolve also, but as it is free to move endwise, as before stated, its engagement with the worm-gear R and the resistance to the free rotation of the feed-rolls, shaft Q, and worm-gear, caused by the engagement of the work with said feed-rolls, causes the worm to screw itself forward until its toe *a'* comes in contact with the fixed toe *b'*, causing the worm to slide quickly toward the collar *e'* and give the worm-gear R and shaft Q a partial rotation, the worm acting as a rack on the worm-gear as a pinion. The lower feed-roll is thus rotated a distance corresponding to the throw of the worm by its contact with the fixed toe *b'*. This feeding mechanism is simple and durable, and keeps the feed-rolls under positive control, so that it will not rotate accidentally.

The upper or pressure feed-roll is mounted loosely on a rod, the ends of which are flattened and fitted in slots in the ends of uprights L L, and held in place therein by pins. Said uprights are adapted to slide in ears on a head, W, affixed to the frame of the machine, and are pressed downwardly by springs 5 5. A shaft, 9, is journaled in the upper ends of the uprights L L, and has two cams, 8 8, affixed to it, one of said cams having a lever, *h*, whereby the shaft and cams can be turned to raise the uprights L L and the upper feed-roll. The head W is attached to the frame of the machine by a screw, *t*, passing through a vertical slot in the head, as shown in Fig. 1, said slot and screw enabling the head to be vertically adjusted, so as to adapt the upper feed-roll to the thickness of the work.

Operation: As the operation of each needle and the mechanism co-operating with it is like that of all the others, a description of the operation of one will be sufficient. When the needle is descending through the work, the thread held by the portion of it inserted in the work by the formation of the last loop is held by the looper away from the barbed side of the needle, as shown in Figs. 10 and 10ª, but after the completion of the downward movement of the needle the looper moves as indicated in Figs. 11 and 11ª, thus pressing the thread into the hook or barb. The lower loop retainer or hook moves with the looper, and interposes itself between the point where the last-inserted portion of the thread emerges from the work and the hook of the needle, the thread lying across the cutter-receiving slot in the loop-retainer. The needle now rises, drawing up the loop through the work, as shown in Figs. 12 and 12ª. Before the needle reaches the end of its upward movement the lower rotating cutter advances through the slot in the loop-retainer and severs the thread lying across said slot, as shown in Figs. 12 and 12ª. When the needle reaches the upper end of its movement, the take-off hook *m'* advances, enters the loop just at one side of the point of the needle, as shown in Fig. 13ª. At the same moment the needle begins to descend, as indicated in Fig. 14ª, thus releasing the loop and permitting the take-off hook to push it forward, as shown in Fig. 15. The work is fed forward while the take-off hook is entering the loop, as shown in Fig. 16ª. The take-off hook continues to move forward while the needle is descending, and by the time the needle has commenced to penetrate the work the slotted portion of the take-off hook is within the loop, as shown in Figs. 17 and 17ª, the loop being in a loose condition. The operation of drawing up the next loop tightens the loop around the take-off hook, as shown in Fig. 12ª, and immediately after the tightening of the loop the upper cutter advances through the slot m^2 of the take-off hook, as shown in Figs. 12 and 12ª, and severs the loop. The lower loop-retainer or hook, *r'*, presents its loop to the lower cutter a little before the take-off hook *m* presents its loop to the upper cutter, so that, although both cutters move simultaneously, the lower cutter acts before the loop is entirely drawn up by the needle, so that the longer of the two ends formed by the action of the lower cutter (said ends being shown in dotted lines in Fig. 12ª) is drawn upwardly by the needle, so that when the loop is entirely drawn up both ends are of the same length, as shown in Fig. 13ª. The operation is thus continued, the threads being severed between the loops below the work and in the loops above the work, so that a series of short lengths or stays of thread are formed, extending through the plies or layers of belting and projecting from both surfaces thereof. The projecting ends of the thread-stays are spread or flossed and flattened against the surfaces of the belting by the action of the feed-rolls, and are afterward permanently united to said surfaces by the means described in the above-mentioned Murphy patent. I do not limit myself, however, to the employment of cutters to sever the thread at both sides of the work, for, if desired, the lower cutters may be dispensed with, in which case the thread between the loops or stays drawn through the work will lie close against the under surface of the work.

The means described for adjusting the limit of the upward movement of the needles enables the points of the needles to conform, when at rest at the upper end of their movement, to the height of the take-off hooks *m'*, said hooks being supported by the presser-foot and standing at a height determined by the thickness of the work.

In my pending application, No. 165,920, filed concurrently with this application, I have shown a machine capable of forming and severing loops, for the purpose herein described, but by a different organization.

I claim—

1. In a machine for staying the layers of flexible material, the combination of work holding and feeding devices, loop-forming mechanism, substantially as described, a loop-retaining finger and mechanism to reciprocate it adapted to hold the thread away from the under surface of the work, and a movable cutter and mechanism to operate it, whereby the thread held away from the work by said finger is severed, as set forth.

2. In a machine for staying layers of flexible material, the combination of work holding and feeding devices, loop-forming mechanism, substantially as described, a take-off hook and mechanism to reciprocate it, whereby the loops drawn through the work are removed from the needle and held, and a movable cutter and mechanism to operate it, whereby the loop surrounding the take-off hook is severed, as set forth.

3. In a machine for staying layers of flexible material, the combination of work holding and feeding devices, loop-forming mechanism, substantially as described, movable cutters above and below the work, a retaining-finger below the work, and a take-off hook above the work, and mechanism, substantially as described, for operating said cutters, finger, and hook, as set forth.

4. The combination of the needle, the looper and lower retaining hook or finger connected to move in unison, and the cutter and its operating mechanism, whereby the thread is cut below the work, as set forth.

5. The combination of the needle, the looper, the take-off hook and its operating mechanism, and the upper cutter, whereby the loop is severed while on the take-off hook, as set forth.

6. The combination, with a thread-loop-holding hook, substantially as described, of a rotary or disk cutter, a pivoted lever or swing supporting said cutter, and mechanism, substantially as described, for oscillating the cutter and for continuously rotating it, as set forth.

7. The combination, with the presser-foot having the reciprocating take-off hooks, of the needles, their operating mechanism, and means, substantially as described, for adjusting the limit of the upward movement of the needles, as set forth.

8. In an organized machine for staying layers of flexible material, the combination of a series of reciprocating needles and operating mechanism therefor, a work-support, a series of loopers and retaining-hooks below the work-support, a presser-foot, a series of take-off hooks supported by the presser-foot, mechanism, substantially as described, for reciprocating said loopers, retaining-hooks, and take-off hooks, a series of pivoted swings or levers below the work-support, rotary cutters mounted on said levers, gearing, substantially as described, whereby said cutters are rotated in unison, a corresponding series of swinging levers, cutters, and gears, supported by a yoke which is movable with the presser-foot, and mechanism, substantially as described, for oscillating both series of levers and cutters, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 17th day of April, 1885.

GEORGE R. PEARE.

Witnesses:
C. F. BROWN,
A. L. WHITE.