

No. 701,578.

Patented June 3, 1902.

J. D. KNOWLTON.

MACHINE FOR CUTTING LOOPS OF PILE FABRIC.

(Application filed Apr. 25, 1898.)

(No Model.)

3 Sheets—Sheet 1.

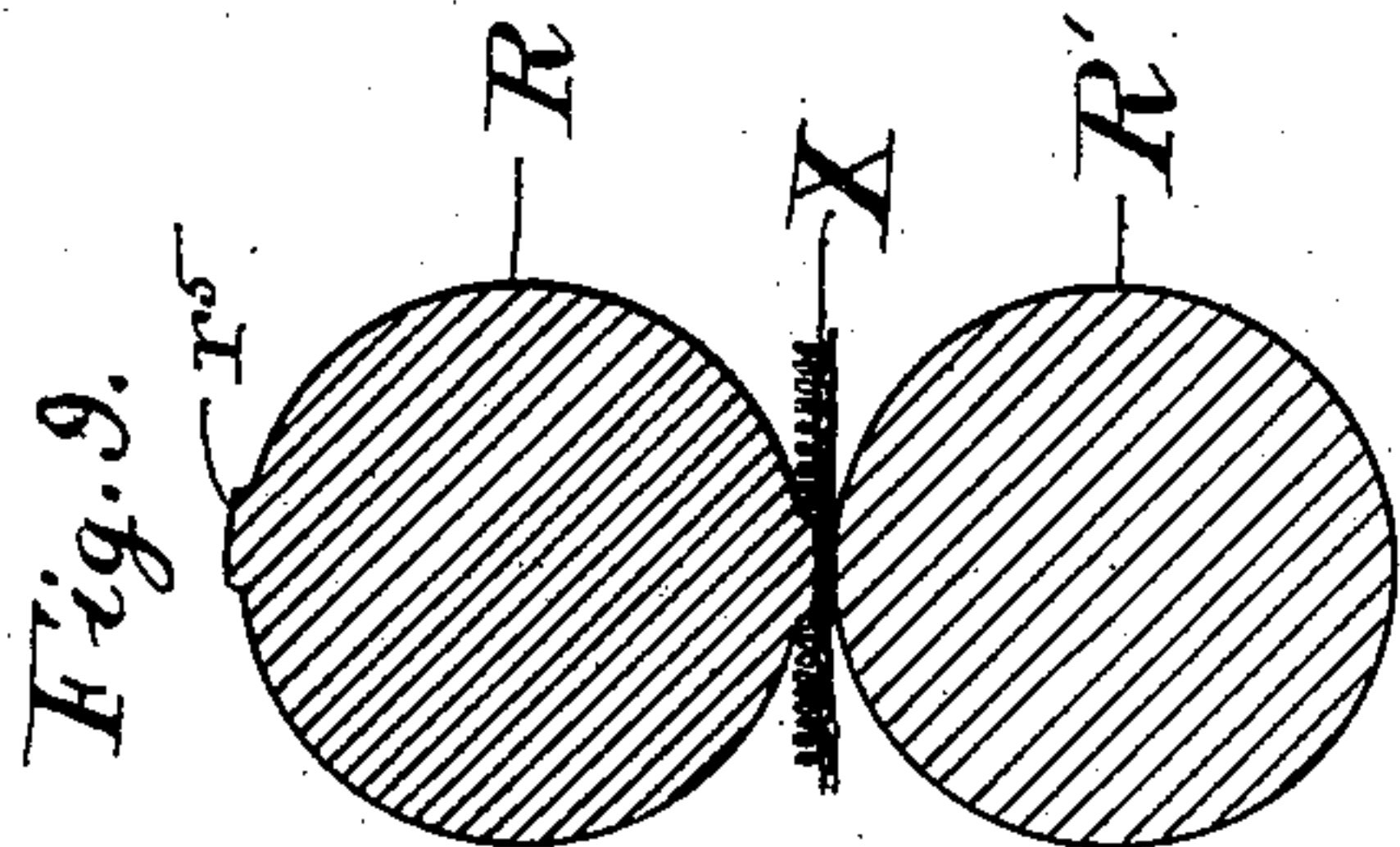
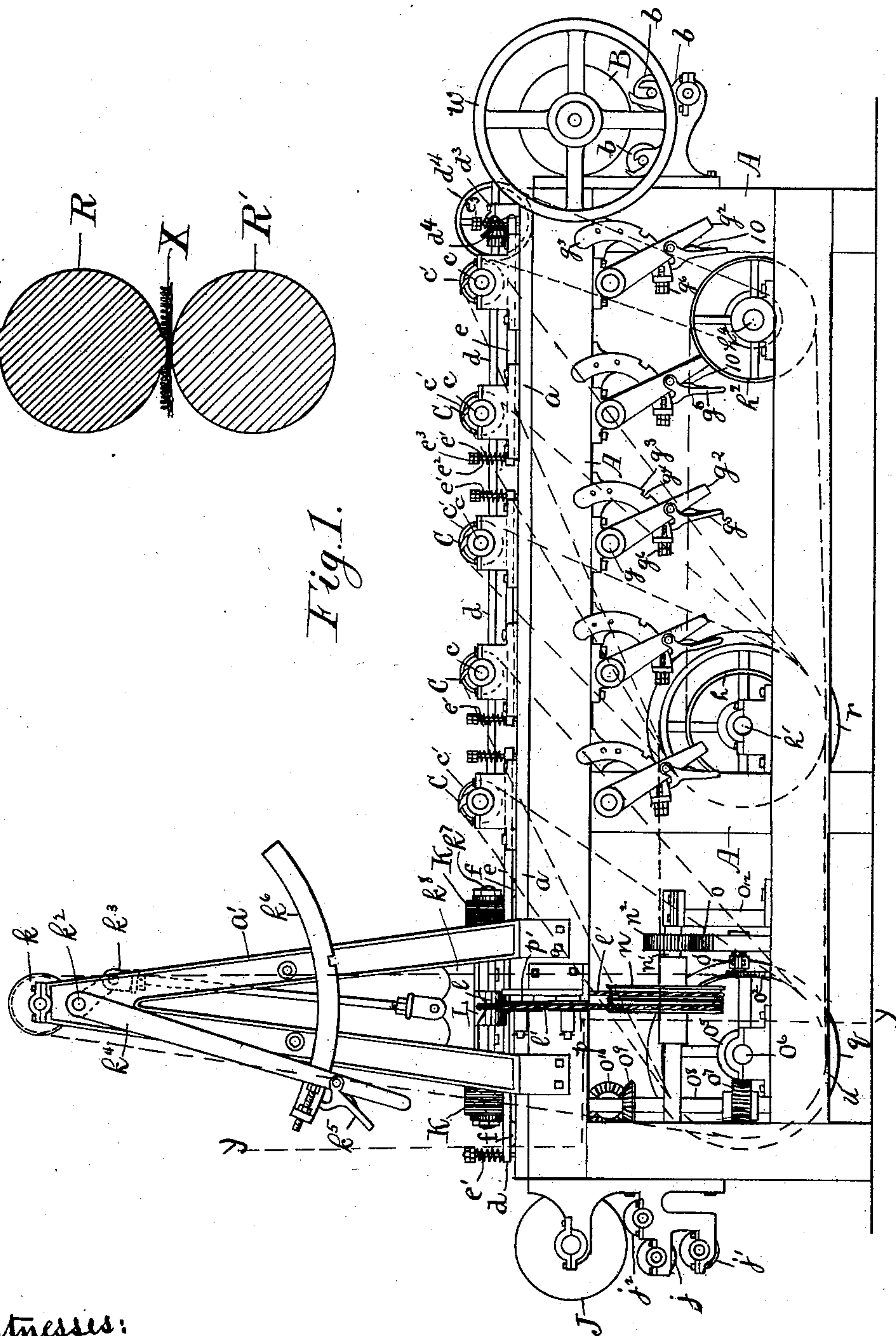


Fig. 1.



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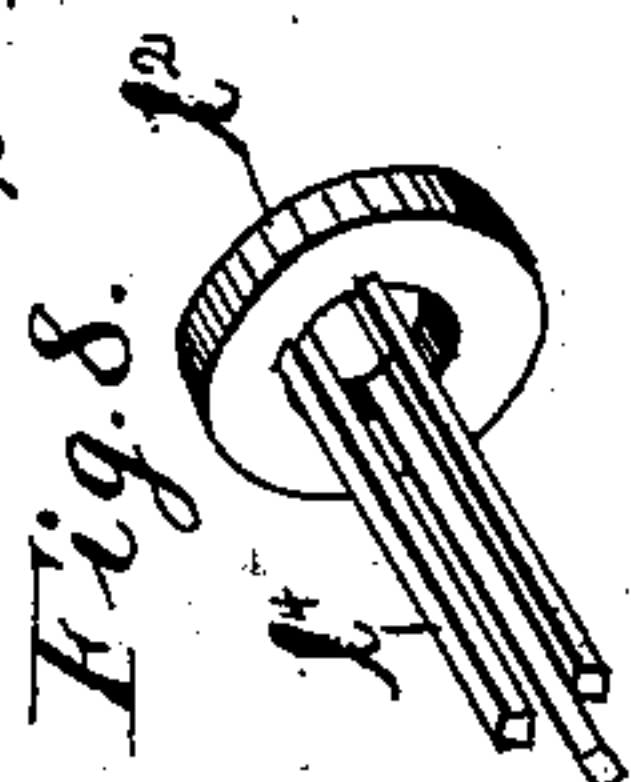
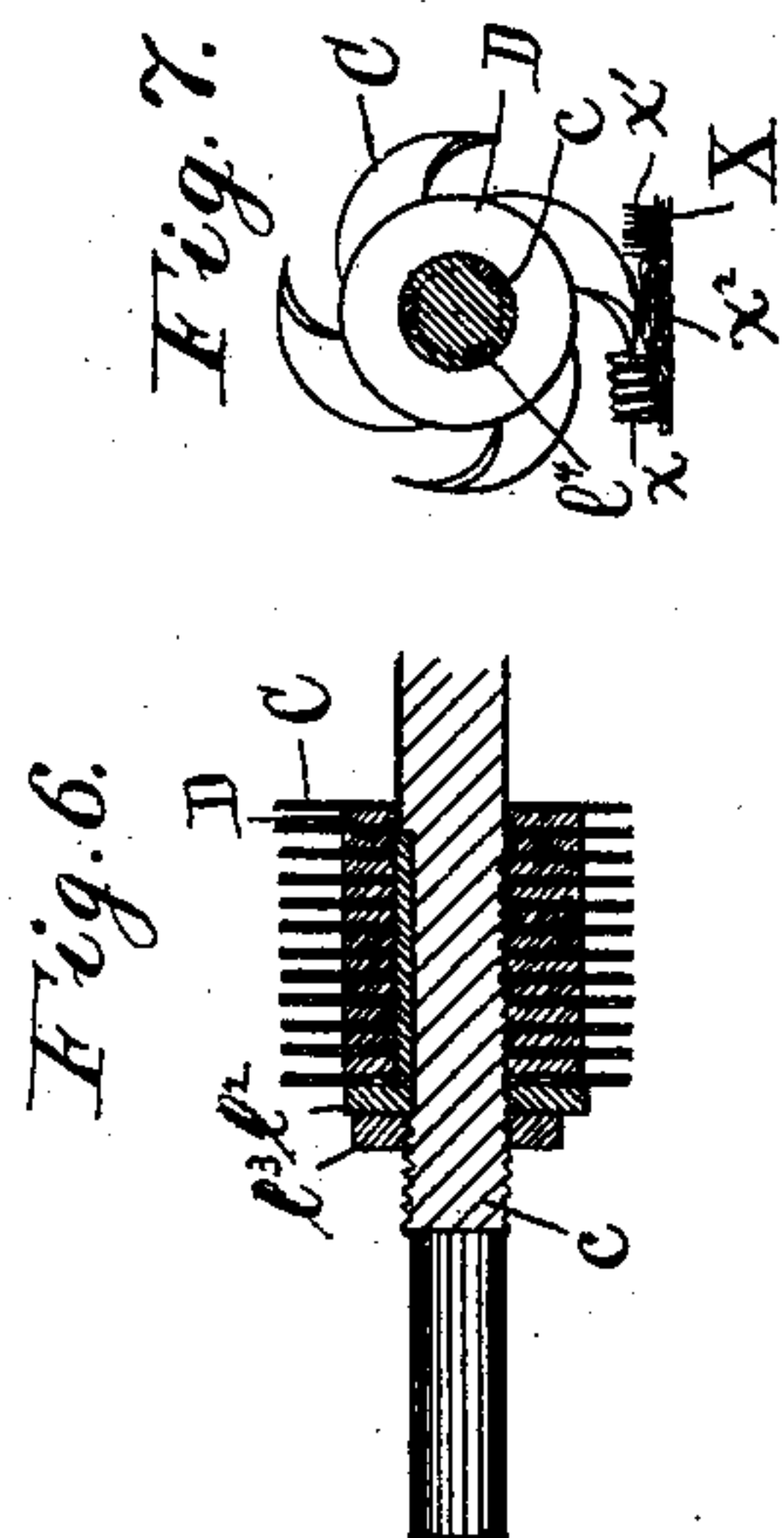
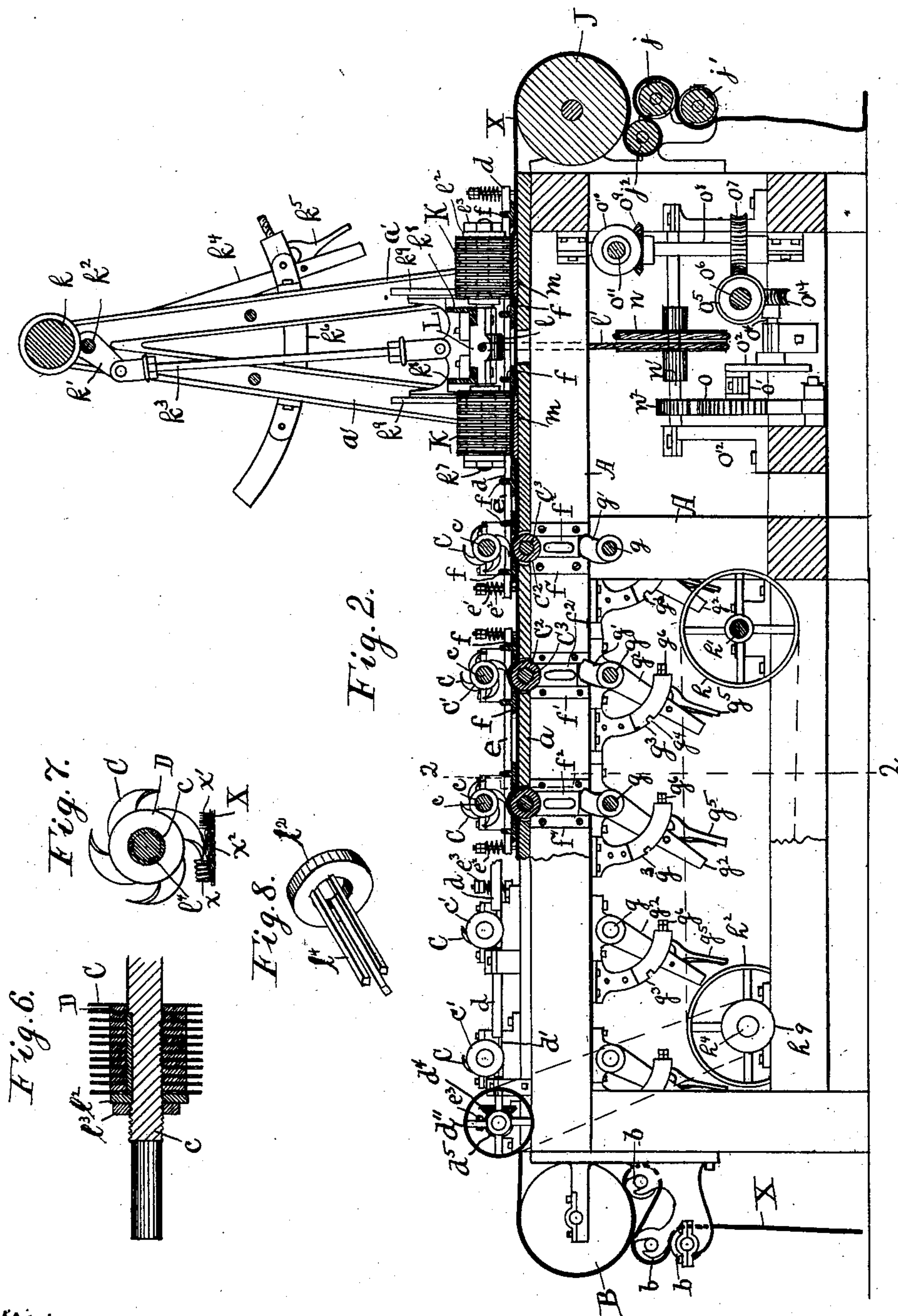
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3 Sheets—Sheet 2.



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3 Sheets—Sheet 3.

Fig. 3.

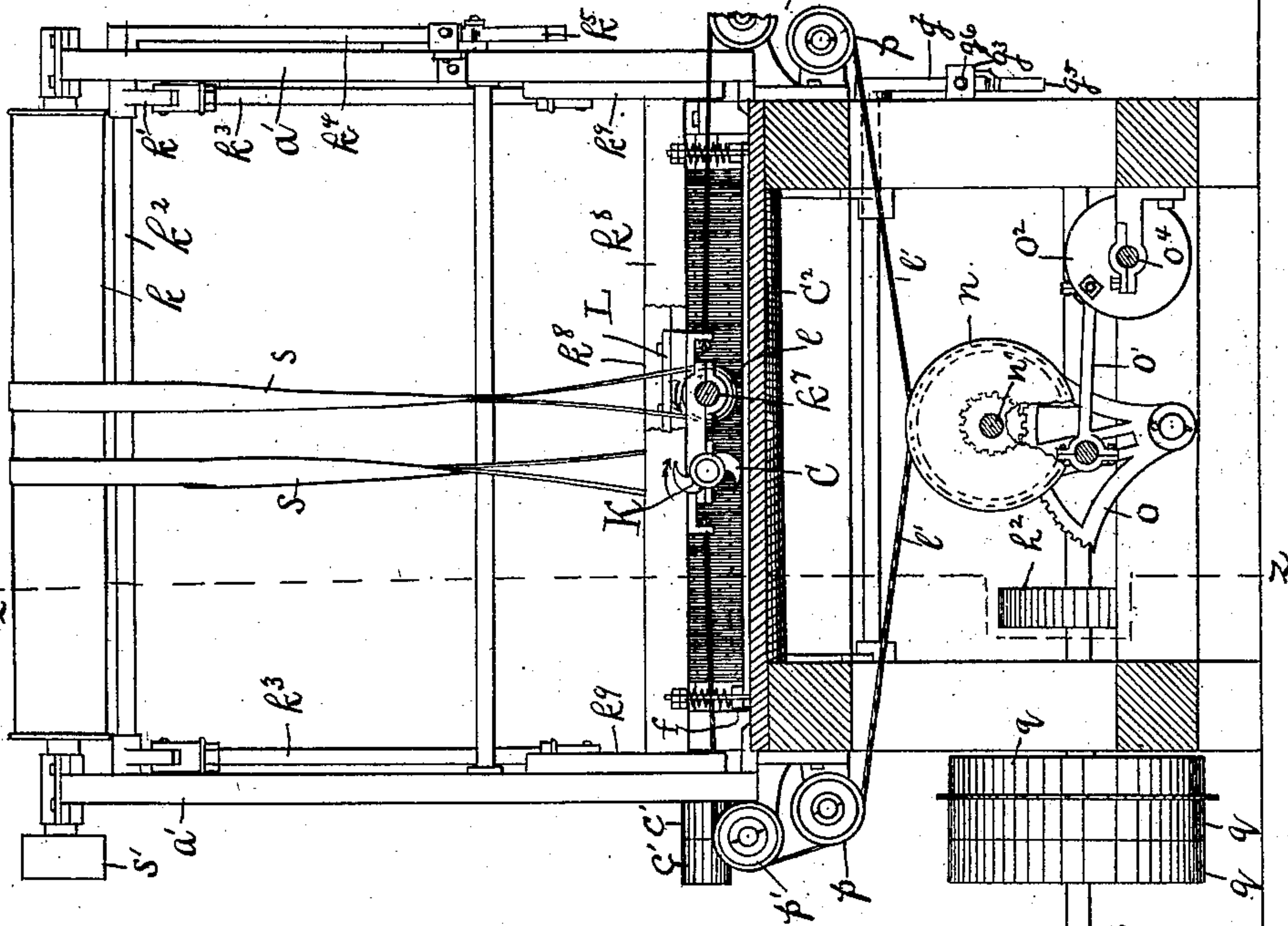


Fig. 5.

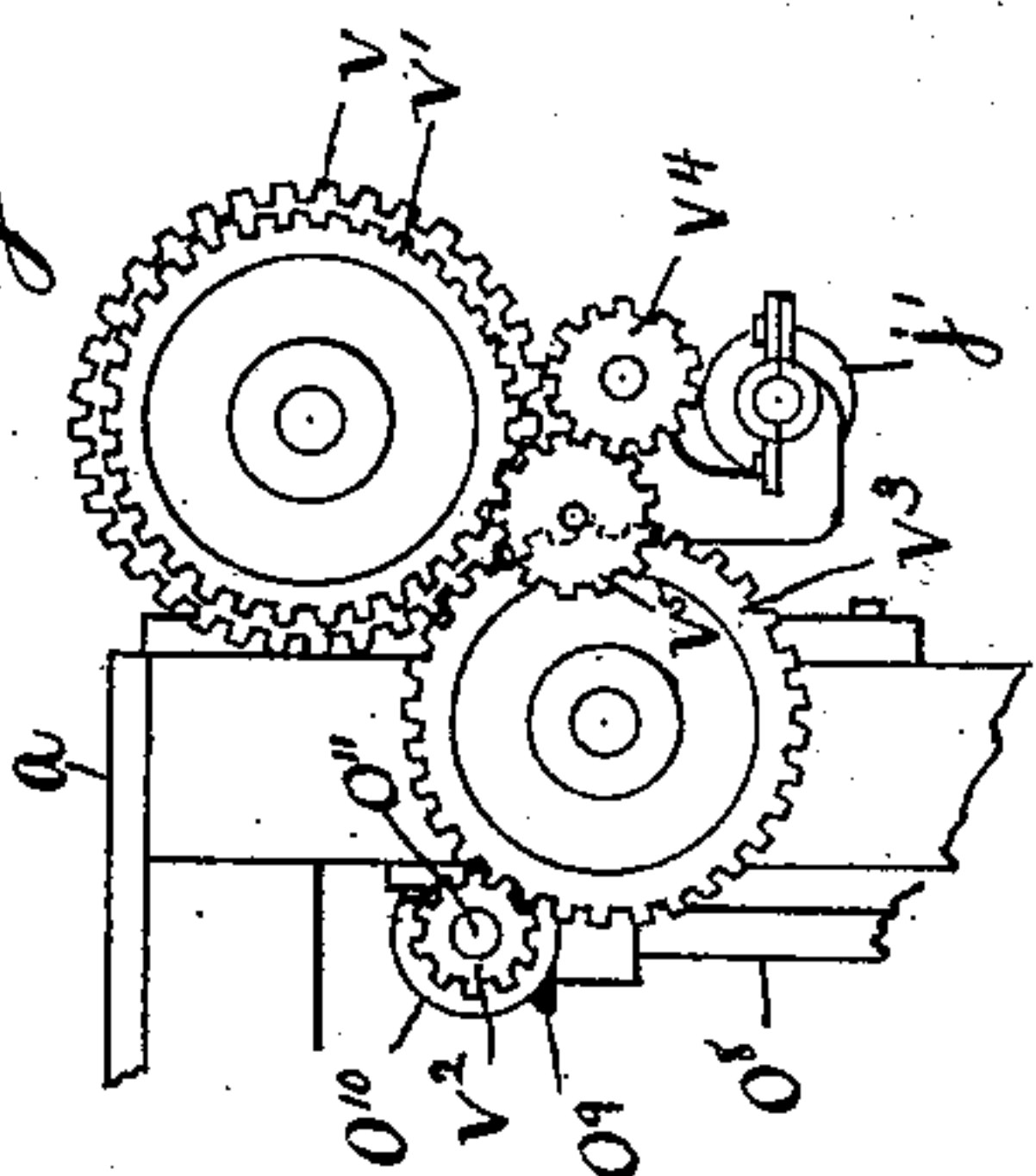
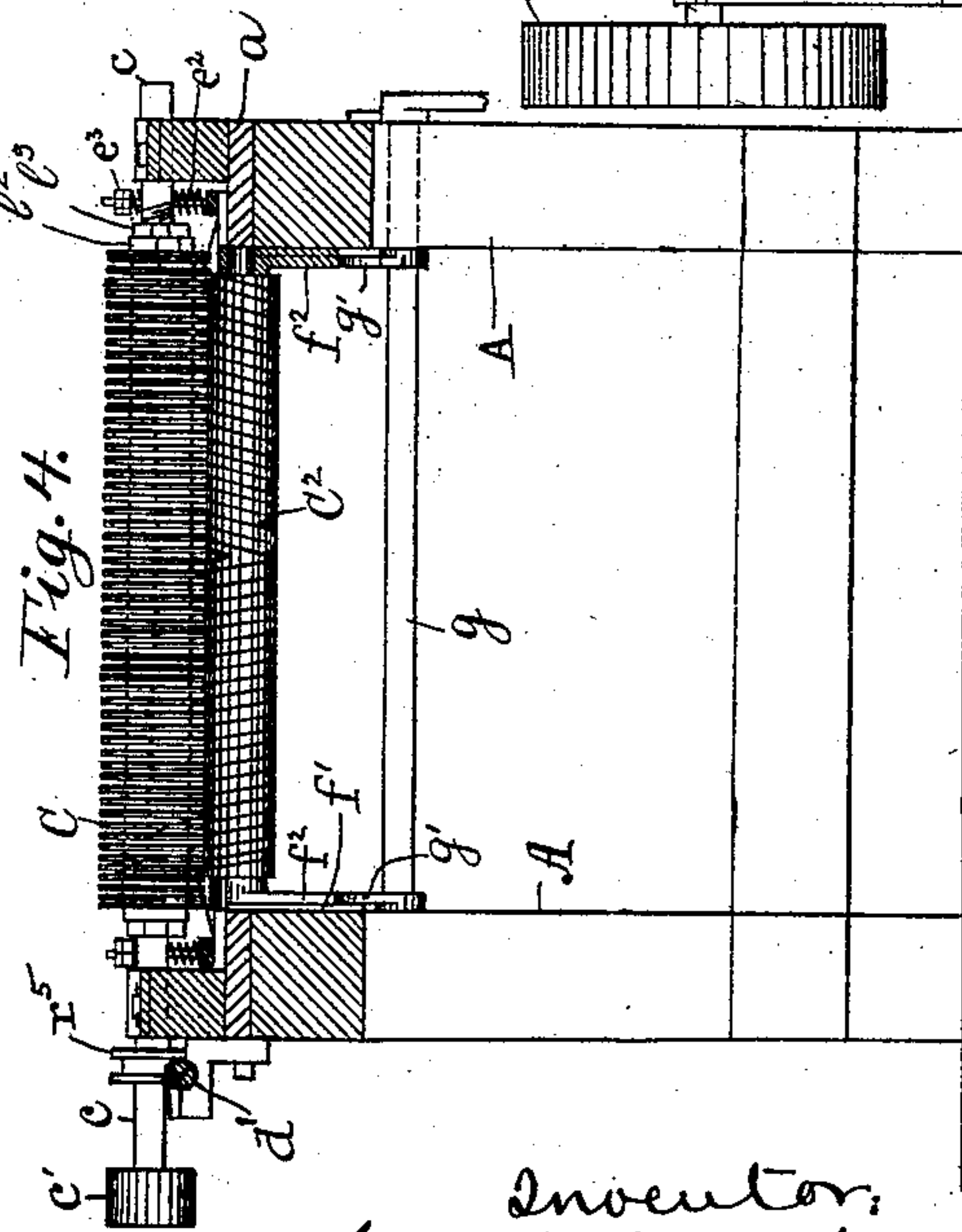


Fig. 4.



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UNITED STATES PATENT OFFICE.

JOHN D. KNOWLTON, OF WESTBROOK, MAINE, ASSIGNOR TO SANFORD MILLS, OF SANFORD, MAINE, A CORPORATION OF MAINE.

MACHINE FOR CUTTING LOOPS OF PILE FABRIC.

SPECIFICATION forming part of Letters Patent No. 701,578, dated June 3, 1902.

Application filed April 25, 1898. Serial No. 678,692. (No model.)

To all whom it may concern:

Be it known that I, JOHN D. KNOWLTON, a citizen of the United States of America, and a resident of Westbrook, Cumberland county, State of Maine, have invented certain new and useful Improvements in Machines for Cutting the Loops of Pile Fabric, of which the following is a specification.

This invention relates to an improved machine for cutting the loops of pile fabric.

I have herein illustrated my invention in a form adapted for cutting a pile fabric presenting figures or designs of uncut loops defined by contrast with the cut loops of the pile, or vice versa, which fabric in its most common form is known as "frise" or "frieze" plush. Hitherto frieze plush has been woven on Jacquard looms, the loops which were to be cut being cut by a sharpened pile-wire, as in the ordinary manner of weaving cut pile plush, the loops which were not to be cut being woven over plain pile-wires. The making of frieze plush on a Jacquard loom is expensive, owing to the slow speed at which the loom is necessarily run, and attempts have been made from time to time to cheapen the operation of making such plush by first weaving it as a plain looped fabric; secondly, depressing the loops which were to be left uncut to constitute the figure or design, and, thirdly, cutting the loops which were not depressed, and, fourthly, raising the depressed uncut loops.

My machine is adapted to cut pile fabric of various kinds in various conditions; but it is especially adapted for use in carrying out a process such as described in the patent to George B. Goodall, No. 605,710, dated June 14, 1898, wherein the frieze plush is made by weaving the fabric in the loop form, thoroughly sizing the loop fabric, drying the same, running it next through suitable embossing-rolls having figures in relief which act upon the sized loops and crush down or depress those which are not to be cut. Thereafter the fabric so treated is passed through my machine, and thereby all the stiffened standing loops are cut, after which the fabric is washed to remove the sizing, permitting the loops which were previously

crushed down to rise into their original position.

My machine contains, preferably, a gang of main rotating bladed cutters arranged in multiple series and preferably at right angles to the length of the fabric, the blades of the cutters catching into and cutting the loops of the standing pile as the fabric is fed through the machine beneath the cutters. My machine also contains other gangs of cross or traverse cutters, also preferably arranged in multiple series, the shafts carrying the gangs of traverse-cutters standing more or less in the direction of travel of the fabric through the machine, so that the bladed cutters carried thereby act across the fabric from one selvage toward the other and catch any loops which are not caught and cut by the main gangs of bladed cutters located substantially at right angles thereto. In my improved machine the shafts carrying the series or gangs of main rotating cutters for cutting the loops in the direction of the length of the fabric are also reciprocated transversely, so that each cutter has an extended or widened path or field of action, whereby each of said cutters acts to cut more loops than if it had imparted to it merely a movement of rotation.

In a machine using a multiple series or gangs of cutters the use of temple-rolls to support the back of the fabric opposite the line in which the gangs of cutters act adds very materially in reducing the friction and strain on the fabric as it is being fed through the machine compared with drawing the fabric over a series of stretcher-bars or stretcher-blades, as commonly practiced, and the herring-bone scoring of the said rolls (shown in Fig. 4) enables them to stretch the fabric in the direction of the width, thus performing the function of temples.

The features of the invention will be hereinafter more fully described, and set forth in the claims at the end of the specification.

Referring to the accompanying drawings, Figure 1 is a side elevation of my improved machine for cutting the loops of pile fabric. Fig. 2 is a partial longitudinal section of the machine, taken on the line $\bar{z} \bar{z}$ shown in Fig. 3. Fig. 3 is a cross-section of the machine,

taken on the line $y y$ shown in Fig. 1. Fig. 4 is a section of the machine, taken on the line 2 2 shown in Fig. 2. Fig. 5 shows the gears for operating the feed-rolls. Fig 6 is a partial longitudinal section of one of the shafts carrying the bladed cutters. Fig. 7 is a cross-section of the shaft c and its bladed cutters, the blades of the cutters being shown as about to act upon the stiffened standing loops of the fabric. Fig. 8 is a detail of the collar used for attaching the bladed cutters, and Fig. 9 is a sectional detail illustrating embossing-rolls which may be used for crushing or depressing certain loops of the pile fabric which are not to be cut.

As I have before stated, if the pile fabric X is to present a figured face consisting of contrasted lines or masses of cut and uncut loops then the loop-face may be suitably sized, dried, and passed between rollers $R R'$, one of said rollers having projecting from it in relief figures r^5 , which constitute patterns corresponding to the desired figure of uncut loops.

A represents a suitable framework to sustain the working parts to be described. The upper part of the frame sustains a bed a , shown as slotted transversely at intervals, said slots receiving in them rolls C^2 , shown as shells preferably corrugated or spirally grooved externally from the centers of their length outwardly toward their ends in herring-bone fashion, said shells being represented as mounted loosely upon suitable arbors C^3 , whereby said rolls act as temples and stretch and smooth the fabric from its center to its edges, so that all wrinkles are taken out of its surface. The surfaces of these rolls are made to protrude above the bed a , and said rolls act to bend upwardly the fabric X as it is being drawn through the machine by the feed-rolls $J j j' j^2$. These feed-rolls may be rotated positively in any usual or suitable manner, and they draw the fabric through the machine from between the friction-rolls $B b b b$.

The arbors C^3 , carrying the rolls C^2 , are mounted in vertically-moving bearings f^2 , adapted to be slid in suitable guides f' , the lower ends of said bearings resting, as herein shown, upon suitable cams g' , extending from shafts g , so that as said shafts are turned the cams acting on the bearings raise and lower them, together with the arbors and rolls, as desired, according to the work to be done. Each shaft g is shown as provided with an arm g^2 , which may be engaged and turned toward the right, Fig. 2, when it is desired to put said rolls C^2 in their elevated operative position, said rolls being projected more or less above the bed a , according to the position of an adjusting device g^6 , shown as a screw extending through a projection or lip at the end of a segmental plate g^3 , Fig. 2. Each of said arms is shown as provided with a latch or clamp g^5 , shown as a lever pivoted thereon and acted upon by a spring 10, said clamp acting against

the lower edge of the segmental plate and keeping the lever g^2 in its adjusted position, as shown in Fig. 2. If, however, it should be desired to depress the rolls C^2 to enable the fabric to be led through the machine or a seam to pass under the cutters, then the operator will disengage the latch g^5 and lever g^2 and turn the same to the left, Fig. 2, until the projection of the lever g^2 enters a notch g^4 in said segmental plate.

Upon the bed a I have mounted loosely a series of presser-plates f , which act upon the fabric at opposite sides of the rolls C^2 , and preferably the lower sides of said presser-plates will be ribbed diagonally to cooperate with the corrugated or scored surface of the rolls C^2 to keep the fabric stretched in the direction of its width, said plates and rolls thus together performing the function of a temple. These plates f rest on the fabric and hold it down in front of and behind the rolls C^2 , so that successive portions of the fabric, viewing the same transversely, having loops to be cut are lifted in transverse waves and presented above the general level of the fabric to be acted upon by the blades of the cutters. These plates are yieldingly pressed downwardly at their opposite ends by means of bars e , which slide on vertical stud-screws e^2 and are acted upon by spiral or other springs e' or equivalents, surrounding said stud-screws e^2 , which are provided with nuts e^3 , acting upon the upper ends of said springs, so that by adjusting said nuts the pressure of the plates f on the pile-face of the fabric may be adjusted as required by the work. The fabric the loops of which are to be cut passes under the presser-plates and over the rolls C^2 , thus presenting the standing loops in the desired proximity to the cutter-blades.

The framework at its top sustains a series of boxes which receive a multiple or series of shafts c , upon which are mounted a gang of bladed cutters, each cutter preferably having a plurality of blades and said blades being preferably hooked in shape, as shown in Fig. 7, the inner edge of each blade being sharpened, each blade having a point to readily enter the loops to be cut. The greater the number of gangs of cutters the faster the speed at which the fabric may be run through the machine and the more certain it is that all the standing loops will be cut. The bladed cutters are somewhat separated one from the other on their shafts by collars applied to the shafts, a collar preferably between each cutter, and each shaft has at its end a screw-thread (see Fig. 6) to receive the nut l^3 , and between said nut and the endmost cutter is a collar l^2 , having projecting bars l^4 , (see Fig. 8,) which enter longitudinal slots cut in the shaft, said bars extending substantially throughout the length of the screw-thread and filling said grooves to the outer edges of the screw-thread. By means of the collars l^2 the cutters and the collars D may be readily slipped on over the screw-thread at the end

of the arbor in successive bunches, and when the arbor is full the whole may be firmly clamped in place by turning up the nut l^3 . Sufficient pressure is put on the collars D and the cutters by means of the nut l^3 to prevent them from turning on the shaft. The shafts c have a rapid and limited longitudinal motion or transverse reciprocation in their bearings in order that each bladed cutter may be made to act over a wider space in the fabric during its longitudinal movement through the machine, the reciprocations of the shaft and cutters making it more certain that the blades, which are rotated rapidly, will catch into and cut substantially all the standing loops. Without this rapid longitudinal motion of the shaft the cutters will cut the loops in a straight line on the surface of the fabric and tend to form streaks in the finished fabric. This tendency is entirely avoided by the longitudinal motion of the shaft, and a smooth and even surface is produced. To reciprocate the shafts c longitudinally, each shaft is provided with a collar having an annular groove r^5 , (see Fig. 4,) which is entered by a cam or eccentric part d' , Fig. 2 and Fig. 4, of the cam-shaft d , extended longitudinally through the machine and having suitable bearings, said shaft d being substantially at right angles to the shafts c . The cam-shaft d derives its motion of rotation from a beveled pinion d^4 , mounted on one end of it, said beveled pinion being engaged and driven by a beveled gear d^5 , fast on a cross-shaft, having fast on it a pulley d'' , which is driven by a belt extending over a pulley h^9 on a counter-shaft h^4 , said counter-shaft having a second pulley h^2 . The pulley h^2 is driven by a belt (shown by dotted lines in Figs. 1 and 2) from a pulley h on a counter-shaft h' , provided with three larger driving-pulleys r , Fig. 1, which by suitable belts rotate the three arbors c , carrying the main bladed cutters C, said belts being extended over suitable pulleys c' on the shafts c . Power is applied to the counter-shaft h' by a suitable belt extending from a pulley u on the main driving-shaft O^6 , which is belted in practice to a similar pulley on the shaft h' , Fig. 1.

To insure the cutting of any standing loops which may have turned or twisted to such an extent that the open loops are not accessible to the blades of the series of cutters C, I have provided similar gangs of cutters K, and I shall hereinafter designate them as "cross" or "traverse" cutters. These gangs of traverse cutters are mounted on shafts k^7 , which occupy a position in the direction of movement of the material through the machine or a position angular with relation to the shaft c , carrying the gangs of bladed cutters C. The shafts k^7 , carrying these cross or traverse cutters K, have their bearings in a movable carriage L, supported on suitable horizontal guides k^8 , so that said carriage may be moved back and forth transversely with relation to the length of the fabric and in the path of

the fabric as the latter is being fed through the machine. These shafts k^7 may be driven by pulleys l , driven in turn by belts s from a long pulley k , having its bearings at the top of the uprights a' , erected on the frame A. The shaft having the long pulley k has a driving-pulley s' , which is driven by a belt from a main pulley q on the main driving-shaft O^6 .

Means have been provided for raising and lowering the cross or traverse cutters K to adapt them thereby to the length of the pile-loops and also for the purpose of allowing the machine to be started, for while the material is being drawn through the machine it is desirable to put the cross-cutters in such a position with relation to the pile that they shall not contact therewith. To effect this operation, I mount the horizontal guides k^8 in vertical guides k^9 , so that the movable carriage L may be raised and lowered by or through the pitmen k^3 , the lower ends of the pitmen being pivoted to the guides k^8 , while the upper ends are pivoted to the cranks k' , secured on shafts k^2 , one crank on each side of the machine. The shaft k^2 is operated by a lever k^4 , which may be secured in several different adjusted positions by a segment k^6 and a catch k^5 , which snaps into a notch in the segment. An adjusting-screw is provided by which the exact position of the lever and the cutter when down may be regulated.

As a means for reciprocating the carriage L and the cross or traverse cutters across the machine from side to side I have herein shown two cords or other flexible connection l' , one of which is secured to the carriage L at each end, said cords being extended over pulleys $p' p$, mounted at the outside of the machine, and connected to a reel n in the lower part of the machine, said reel being mounted on a shaft n' , journaled in an upright O^{12} . These cords are wound in opposite directions on the reel n , and means are provided for turning the reel first in one direction and then in the opposite direction, so that the said carriage L may be drawn back and forth. To turn the reel back and forth, as herein shown, I have employed a segment O, which engages a pinion n^2 on the shaft n' , and said segment is reciprocated by a pitman o' , connected with a crank-disk o^2 , fast on the shaft o^4 , which is operated by a worm-gear O^{14} , which engages a worm O^5 on the main shaft O^6 . (See Fig. 2.) The worm O^5 furnishes power to the feed-rolls through suitable gearing. As herein shown, the worm O^5 engages a worm-gear o^7 on a vertical shaft o^8 , said shaft having on its upper end a beveled gear o^9 , which engages a beveled gear o^{10} on a horizontal shaft o^{11} . (See Fig. 5.) A gear v^2 on said shaft o^{11} drives a train of gears $v^3 v v' v^5 v^4$, which operate the feed-rolls J, j , j' , and j^2 .

Beneath the multiple gangs of cross or traverse cutters K the fabric is drawn over suitable temple-plates m , which are flat and of the same width as the length of the gang of

cross-cutters, and suitable presser-plates *f*, similar to those hereinbefore described, bearing upon the fabric at the front and rear edges of the temple-plates, are located at the front of the cross or traverse cutters *K*. As already indicated, these cutters are rotated generally in a vertical plane at an angle to the direction of motion of the fabric through the machine and at an angle with relation to the axis of rotation of the main bladed cutters *C*, their function being to cut open the loops which remain uncut after passing the main gang of cutters *C* and which may have turned or twisted into a position which prevented their being cut by the cutters *C*.

I have herein shown gangs of main and traverse cutters in multiple series, and a greater or less number of gangs of cutters may be used. Within reasonable limits the greater the number of gangs the faster the speed at which the fabric may be fed through the machine and the greater the product.

In feeding the plush or other fabric through the machine one piece is sewed to another, and as the seams pass over the rolls *C*² said rolls will be lowered one at a time, so as not to disarrange the action of the cutters.

It is obvious, as hereinbefore stated, that the machine herein described may be employed to cut plain plush when woven originally in the loop form.

It will be understood that the angular positions of the shafts carrying the cross or traverse cutters may be varied more or less with relation to the shafts carrying the main bladed cutters without departing from my invention as long as the arbors carrying said cross-cutters move to and fro transversely with relation to the length of the fabric the loops of which are to be cut.

This invention is not intended to be limited to the particular means for operating the carriage containing the cross or traverse cutters nor to the particular means shown for imparting rotation to the shafts carrying said cross or traverse cutters.

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

1. In a machine for cutting the loops of a pile fabric, a framework, a bed over which the pile fabric is passed, and a rotary and reciprocating shaft having thereon a plurality of cutters or knives.

2. In a machine for cutting the loops of pile fabric, a framework, a bed over which the pile fabric is passed, a rotary and reciprocating shaft having thereon a plurality of cutters or knives, a rotatable roll beneath and parallel with said shaft of cutters or knives to support the fabric in position to be cut.

3. In a machine for cutting the loops of pile fabric, a rotating shaft having a gang of bladed cutters, means to reciprocate said shaft longitudinally, and means to support the back of the fabric at the line opposite where the

bladed cutters act to enter and cut the loops, substantially as described.

4. In a machine for cutting the loops of pile fabric, the following instrumentalities, viz., a rotating shaft having a gang of bladed cutters, means to reciprocate said shaft longitudinally during its rotation, means to sustain the fabric parallel with the axis of rotation of the rotating cutter-carrying shaft, and tension means acting upon the fabric to hold the same stretched over the support sustaining the fabric.

5. In a machine for cutting the loops of pile fabric, a gang of bladed cutters mounted upon a shaft extended across the line of travel of the fabric, means to rotate said shaft and its cutters, combined with a shaft having a gang of cross or traverse cutters, said shaft being arranged at an angle to the shaft carrying the gang of main cutters, and means to reciprocate the shaft carrying said cross-cutters to and fro across the fabric in the direction of its travel through the machine, substantially as described.

6. In a machine for cutting the loops of pile fabric, a carriage, a shaft mounted in said carriage, said shaft having one or more gangs of bladed cutters, means to rotate said shaft and to move said carriage transversely with relation to the direction of travel of the fabric through the machine, whereby said cross or traverse cutters are made to cut transversely across a field of loops of the fabric, substantially as described.

7. In a machine for cutting the loops of pile fabric, a gang of bladed cutters fixed upon a shaft extended across the line of travel of the fabric, a series of cross or traverse bladed cutters fixed upon a shaft more or less in line with the direction of travel of the fabric, and means to sustain the back of the fabric opposite the points where the said bladed cutters act to cut the loops thereof, means for reciprocating said cross or traverse cutters to and fro across the face of the fabric, and means for guiding and stretching the fabric being cut, substantially as described.

8. In a machine for cutting the loops of pile fabric, a gang of bladed cutters fixed upon a shaft extended across the line of motion of the fabric, a gang of cross or traverse bladed cutters fixed upon a shaft located more or less in line with the direction of travel of the fabric, means to sustain the back of the fabric opposite the points where the said bladed cutters act to cut the loops thereof, means for reciprocating said cross or traverse cutters to and fro across the face of the fabric, means for guiding and stretching the fabric being cut, and means for automatically feeding the fabric through the machine, substantially as described.

9. In a machine for cutting the loops of pile fabric, a gang of bladed cutters, and a shaft carrying them, said shaft being extended across the line of motion of the fabric, and a

gang of cross or traverse bladed cutters, and a shaft carrying them, said shaft occupying a position in the direction of the line of travel of the fabric through the machine, and means for moving both gangs of said cutters laterally with relation to the face of the fabric as the same is being fed beneath said cutters, substantially as described.

10. In a machine for cutting the loops of pile fabric, a shaft having a gang of bladed cutters, means to both rotate and reciprocate said shaft, means to sustain the back of the fabric in a line substantially parallel to the axis of rotation of the cutter-carrying shaft, tension devices for keeping the fabric stretched over the means for supporting the same during the time the loops are being cut, and means to change the relative positions vertically of the support for the back of the fabric and the gang of cutters, substantially as described.

11. In a machine for cutting the loops of pile fabric, means to support the fabric to be cut, a rotating shaft having a gang of bladed cutters thereon, a hub secured to the shaft carrying said cutters, said hub having an annular groove, and means operating with said groove to reciprocate automatically said shaft longitudinally in its journals, substantially as described.

12. In a machine for cutting the loops of pile fabric, a rotary shaft located in the line or direction of travel of the fabric, a gang of bladed cross or traverse cutters applied to said shaft, a carriage to support said shaft, guides to direct the movement of said carriage, and means for reciprocating said carriage on said guides across the machine, substantially as described.

13. In a machine for cutting the loops of pile fabric, a shaft located in the line or direction of travel of the fabric, a gang of bladed cross-cutters secured to said shaft, a carriage to support said shaft, guides to support said carriage, and direct its movements transversely with relation to the travel of the fabric through the machine, means to reciprocate said carriage in said guides, and means to raise and lower said guides, substantially as described.

14. In a machine for cutting the loops of pile fabric, a shaft located in the line or direction of travel of the fabric, a gang of bladed cutters mounted on said shaft, a carriage to support said shaft, transverse guides in which said carriage is mounted, means to move said carriage in said guides, temple-plates to support the fabric being acted upon by said gangs of cutters and presser-plates acting upon the face of the fabric in front of and behind said temple-plates, substantially as described.

15. In a machine for cutting the loops of pile fabric, a shaft, a carriage sustaining said shaft, a series of bladed cross-cutters mounted on said shaft, transverse guides in which said carriage is mounted, a cord or flexible connection secured to said carriage, a reel, and means to move it in one and then the opposite direction to wind and unwind said cord or flexible connection and thereby reciprocate said carriage to and fro in said guides, substantially as described.

16. In a machine for cutting the loops of pile fabric, a plurality of shafts, a movable carriage sustaining said shafts, gangs of bladed cutters mounted on said shafts, transverse guides in which said carriage is mounted, a flat temple-plate extended transversely with relation to the machine to support the back of the fabric, and a presser-plate acting upon the face of the fabric at opposite edges of said temple-plate, substantially as described.

17. In a machine for cutting the loops of pile fabric, a shaft having a series of bladed cutters, temple-rolls to support the back of said fabric opposite said cutters, presser-plates extended across the machine and acting upon the face of the fabric to hold the same down on said temple-rolls, and means for adjusting the effective pressure of said pressure-plates upon the fabric, substantially as described.

Signed by me at Portland, Maine, this 16th day of April, 1898.

JOHN D. KNOWLTON.

Witnesses:

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