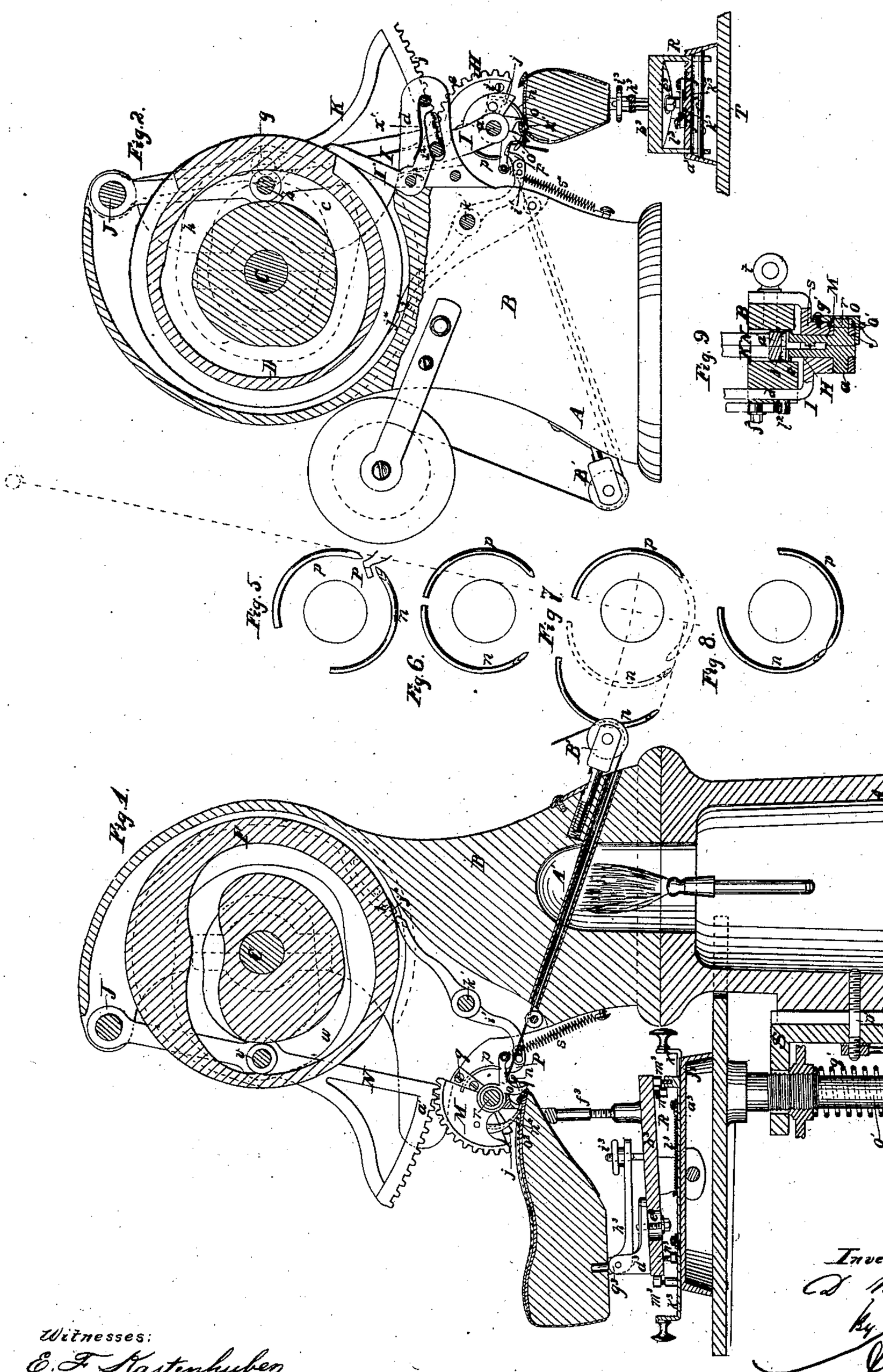
2 Sheets—Sheet 1.

D. MILLS.

SEWING MACHINE.

No. 93,731. Patented Aug. 17, 1869.



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2 Sheets—Sheet 2.

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SEWING MACHINE.

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Fig. 4.

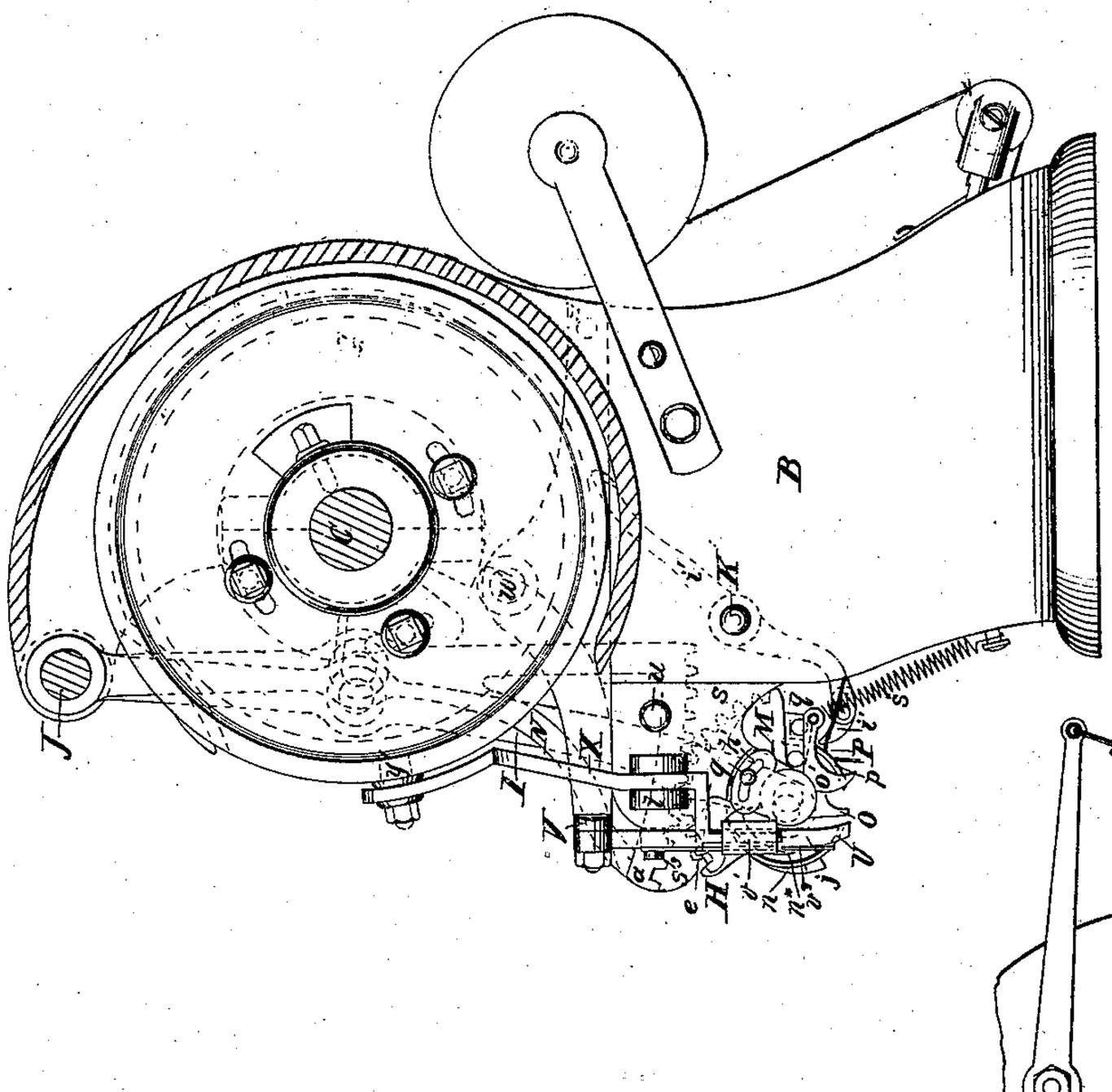
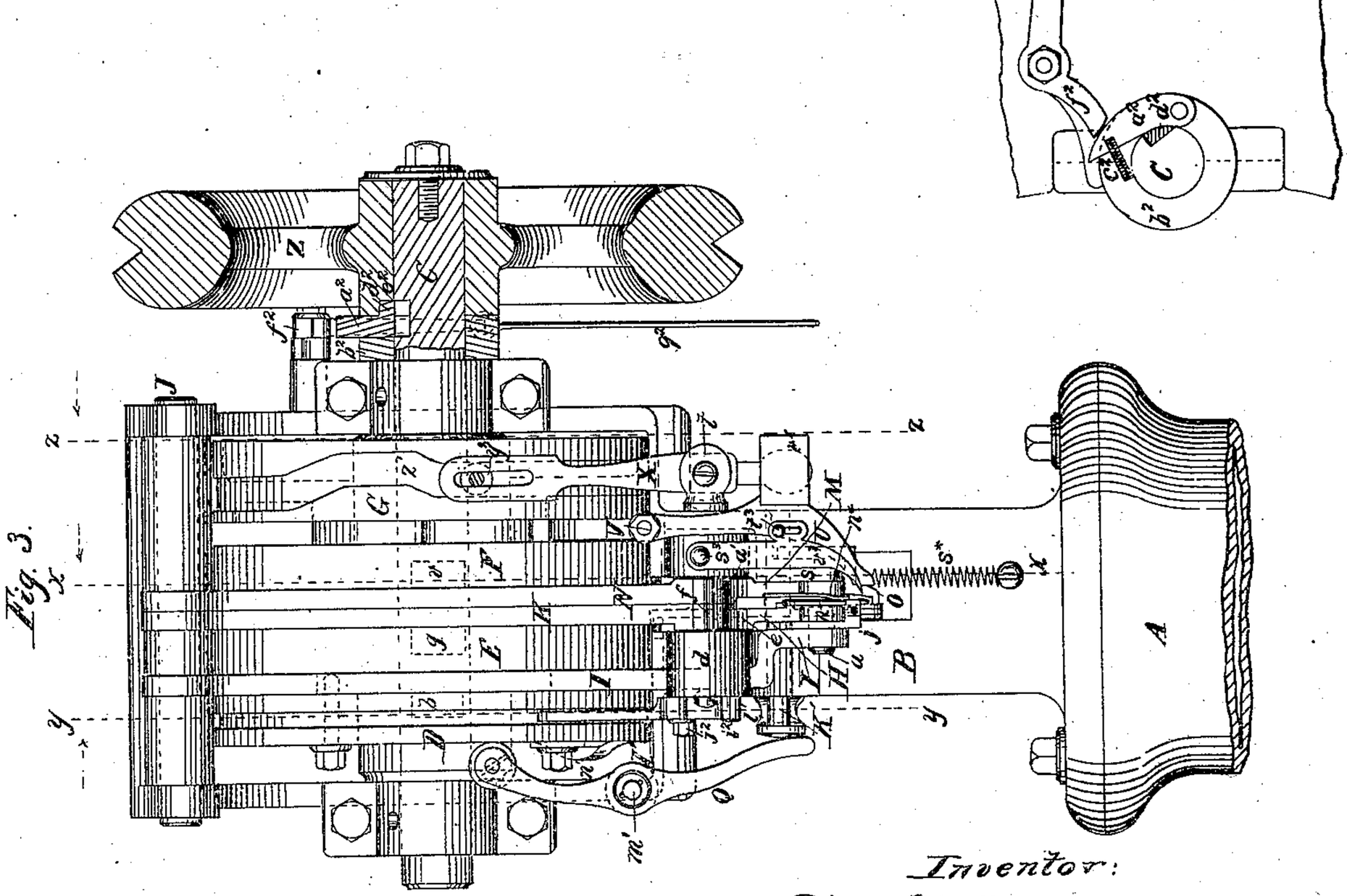


Fig. 3.



Witnesses:
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UNITED STATES PATENT OFFICE.

DANIEL MILLS, OF NEW YORK, ASSIGNOR TO CHARLES GOODYEAR, JR., OF NEW ROCHELLE, NEW YORK.

IMPROVEMENT IN SEWING-MACHINE.

Specification forming part of Letters Patent No. **93,731**, dated August 17, 1869; antedated February 17, 1869.

To all whom it may concern:

Be it known that I, DANIEL MILLS, of the city, county, and State of New York, have invented a new and useful Improvement in Sewing Machines; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing forming part of this specification, in which drawing—

Figure 1 represents a vertical section of this invention taken in the plane indicated by the line *x x*, Fig. 3, and looking in the direction of the arrow opposite to that line. Fig. 2 is a similar section of the same, the plane of section being indicated by the line *y y*, Fig. 3, and looking in the direction of the arrow opposite to that line. Fig. 3 is a front elevation, partly in section. Fig. 4 is a vertical section of the same, the line *z z*, Fig. 3, indicating the plane of section, and looking in the direction of the arrow opposite to that line. Figs. 5, 6, 7, and 8, are diagrams, showing different positions of the needle and awl. Fig. 9 is a detached vertical section of the needle and awl stock taken in the plane indicated by the *x' x'*, Fig. 2. Fig. 10 is a detached sectional view of the stop-motion.

Similar letters indicate corresponding parts.

This invention relates to certain improvements in sewing-machines of that class which is intended particularly for the manufacture of boots and shoes, and is adapted not only to the manufacture of turned work, but also to the sewing on of welts and soles, the operation of sewing being effected by the combined action of a barbed or crochet-needle and awl, both oscillating within a circle of comparatively small diameter. These improvements consist in the arrangement of an independently-oscillating needle-stock, and an independently-oscillating awl-stock, in combination with one or more cam-disks mounted on one and the same shaft, in such a manner that the motion of each of said parts can be regulated independently of the other, allowing either of them to "dwell" or remain stationary at certain stages of the motion, according to the nature of the work, and that the herein-described operation of the sewing-mechanism can be insured; also, in the arrangement of an oscillating lever, forming the bearing for the pivot of the needle-stock, in combination with a lever-segment and toothed quadrant on said needle-stock, in such a manner that by the action of the oscillating lever a motion away from the stationary axis of the awl-stock is imparted to the needle-stock and needle without throwing the toothed quadrant out of gear with the lever-segment; also, in the arrangement of a locking-lever, in combination with the oscillating lever which carries the needle-stock, in such a manner that said oscillating lever is firmly retained in position while the needle passes through the work; further, in the arrangement of a thread-carrier which receives a vibrating and transversely-sliding motion, in such a manner that, by said thread-carrier, the thread is looped round the barb of the needle without fail, and with perfect regularity; also, in the arrangement of a guard or barb-coverer, attached to the awl-stock, and operating, in combination with the oscillating needle, in such a manner that it covers the barb at the proper intervals, and thereby prevents said barb from catching in the loop previously deposited on the work; further, in the arrangement of a loop-check or retractor, in combination with the oscillating barbed needle, in such a manner that each loop is released from the barb of the needle without fail, and that the needle is prevented from carrying any of the formed loops back into the work; also, in the arrangement of a rising and falling lever, and of a transversely-oscillating lever, in combination with the feeder, in such a manner that a sure and reliable feed-motion is imparted to the work to be sewed; further, in the arrangement of a yielding edge-gage acting on the outer edge of the work, in combination with a rigid gage acting on the face or channel of the work where the needle passes in, in such a manner that, by the combined action of the two gages, the work is always presented to the needle in the proper position; also, in the arrangement of a stop-motion, in combination with the driving-shaft and with the sewing-mechanism, in such a manner that the machine will always be stopped when the needle and the awl are out of the work, and thereby the removal and introduction of the work are materially

facilitated; further, in the arrangement of a tube, situated in the lower part of the frame, and exposed to the action of a flame, for the purpose of heating the wax thread as the same passes to the sewing mechanism.

A represents a column made of cast-iron, or other suitable material, of convenient height for the operator. On the top of this column is secured the frame B, which forms the bearings for the working parts of the sewing mechanism. C is the driving-shaft, on which are mounted four disks, D E F G, the disks E and F being secured directly to the shaft, while the disks D and G are fastened to the disks E and F by set-screws or other means, in such a manner that the various disks can be adjusted in relation to each other, as may be required. The disk D is provided with three cams, one on the outside face, controlling one of the motions of the thread-carrier, another on the periphery giving motion to the lever I* of the locking apparatus, and the third on its inside face, which gives motion to the oscillating lever I. The disk E, which may be termed the main disk, is provided with two cam-grooves, one of which controls the motions of the needle, while the other controls one of the motions of the thread-carrier. The disk F controls the motion of the awl and the needle-guard, while the disk G governs the motions of the feeder. The needle-stock H (Fig. 2) consists of a quadrant, from the center of which projects a pivot, *a*, which has its bearing in a lever, I, (see Fig. 9,) and this pivot is by preference made solid with the needle-stock, so that these two parts are not liable to become disconnected. The lever I is suspended from a rod, J, which extends across the upper portion of the frame B, (see Fig. 3,) and to the side of said lever is attached a roller-stud, *b*, which works into a cam-groove, *c*, in the disk D, best seen in Fig. 2. This cam-groove is so shaped that by its action the lever I, together with the needle-stock, is made to swing out, at certain intervals, away from the stationary pivot of the awl-stock M, and said lever is guided in its oscillating motion by a slotted arm, *d*, of the frame through which the same passes, and which is secured to the frame B in close proximity to the needle-stock. When the lever I is at the inner end of its stroke, it is locked by a pin, i^2, projecting therefrom, and catching in a notch in the lever I*, which swings on a stud, j^2, secured in the arm *d*, and which, at the proper moment, is pressed down upon the pin i^2 by a cam on the periphery of the disk D.

The quadrant H, which forms the principal portion of the needle-stock, is provided with cogs *e* on its circumference, and these cogs gear in corresponding cogs *f* on the edge of a lever-segment, K, which is also suspended from the rod J, but is situated on the opposite side of the disk E, as shown in Figs. 2 and 3. From the side of the lever-segment projects a roller-stud, *g*, into a cam-groove, *h*, in the side of the disk E, as shown in dotted lines in Fig. 2. This cam-groove is so shaped and situated, in relation to the cam-groove *c*, that the lever-segment K moves, while the lever I remains stationary.

The object of this arrangement is to produce the required motion of the needle, as will be hereinafter more fully explained.

The needle *n* is a hook or crochet needle, curved to form a segment of a circle described from the center of motion of the needle-stock. It is secured to the needle stock or quadrant H by a clamp, *i*, or by any other suitable means, and it is strengthened in its position by a shield, *j*, which is firmly secured to the lever I, and which occupies a position in proximity to the work when the point of the needle begins to enter the same, and supports the needle while drawing out the loop.

The awl *p* is secured by a clamp to the awl-stock M, which is constructed similarly to the needle-stock, consisting in a quadrant, from which extends a pivot, *r*, which has its bearing in a bracket, *s*, best seen in Figs. 3 and 9. This bracket is firmly secured to the main frame B by screw *u*, (see Fig. 4,) and said awl-stock receives an oscillating motion only, its center of motion being stationary. The oscillating motion of the awl-stock is produced by a lever-segment, N, which is suspended from the rod J, and provided with a roller-stud, *v*, that works in a cam-groove, *w*, in the disk F. Cogs a^1, on the edge of this lever-segment, gear into corresponding cogs on the periphery of the quadrant M.

O O′ are the two gages, the channel or fixed gage O being intended to bear on the bottom of the groove or channel of the work, where the needle enters, while the edge or spring gage O′ bears on the outer edge of the work. These gages are supported by the tubular bearing of the pivot of the awl-stock, the edge-gage O′ being slipped loosely on said bearing, and subjected to the action of a spring, S*, which forces the same against the work, and allows it to follow the sinuosities of said work, by yielding concentrically with the awl. The channel-gage O is placed over the end of said tubular bearing, and it is secured to the bracket *s* by means of a screw, *g′*, set in a slot, h^1, (see Fig. 4,) so that it can be adjusted according to the nature of the work to be sewed. When the screw *g′* is drawn up tight, the channel-gage O is rendered rigid, and by the action of the spring S* on the edge-gage O′ the edge of the channel is held in close contact with the channel-gage, and in the proper position for the action of the awl and needle. The thread is looped round the barb of the needle *n* by the thread-carrier P, which projects from a lever, i^1, that is firmly secured to a rod, k^1. The inner end of said lever is provided with a laterally-projecting lip, which catches against a projection, j^*, on the circumference of the disk E, and is thrown by this projection into a cam-groove, j^1, in said disk, which cam-groove is so shaped that it first depresses the thread-carrier below

the point of the needle, then causes it to rise to a level with said point, and finally raises it above the point of the needle to the position shown in Fig. 1. The object of this motion will be presently explained.

The rod k^1, which forms the fulcrum of the lever i^1, has its bearing in the main frame B, and it is so arranged that it can assume a sliding motion in the direction of its length. The end of said rod extends beyond the frame B, and it is subjected to the action of a spring, C, which holds said projecting end in contact with a lever, Q. This lever has (see Fig. 3) its fulcrum on a pivot, m^1, secured in the main frame B, and its upper end (which may be provided with a friction-roller) bears against the side of the disk D. From this side rises a cam, n^1, and as the disk revolves the lever Q receives an oscillating motion, whereby the rod k^1 is caused to slide in its bearing, and a traversing motion is imparted to the thread-carrier P. This motion takes place when the needle has passed clear through the work, and while the thread-carrier occupies the highest position. Immediately thereafter the tail-end of the lever i^1 enters the cam-groove j^1, the thread-carrier is depressed, and the rod k^1 returns to its original position, and then the thread-carrier rises to a level with the point of the needle, thus carrying the thread round the point of the needle, and depositing it in the barb thereof. In this position (that is to say, level with the point of the needle,) the thread-carrier remains stationary, while the needle recedes, for if the thread-carrier were allowed to rise at once above the point of the needle the thread would be liable to break. As the needle recedes it carries the loop deposited in its barb back with it through the work, and then the thread-carrier rises and reassumes its original position, as shown in Fig. 1.

The stitch is produced as follows: After the work has been adjusted in the proper relation to the sewing mechanism, the awl descends to the position shown in dotted lines in Fig. 7, and opens a hole in the work to receive the needle. Then the awl recedes a short distance, to the position shown in Fig. 8, and the needle moves into the position shown in said figure. From this position the needle follows the awl, point to point, until through the work; then the awl gains on the needle, thereby opening a path to the thread-carrier, as seen in Fig. 5. At this point the motion of the thread-carrier takes place, as previously described, and after the thread has been looped round the needle the needle recedes, drawing the loop through the work, while the awl drops to the position shown in Fig. 6 to make room for the needle-shank, and when the needle has reached the position shown in Fig. 6, the needle-stock is carried out by the action of the lever I, while the cam in the disk E, by its shape, effects a receding motion, sufficiently to prevent the needle-stock from rotating, and the needle is brought into the position shown in full lines in Fig. 7, the awl, in the mean time, remaining stationary in the position shown in Figs. 6 and 7. At this time the feed begins, and as the feed takes place the needle changes its position from that shown in full lines in Fig. 7 to that shown in dotted lines, and by these means the feed takes place with a slack thread. When the needle has reached the position shown in dotted lines in Fig. 7, the lever I is arrested in its back movement, and it remains stationary until the awl has passed clear through the work and assumed the position shown in dotted lines in Fig. 7. If said lever should not be arrested in this position, the point of the awl would strike the point of the needle, and the working-parts of the machine would become injured. Then the awl commences to recede, and is overtaken by the needle, as shown in Fig. 8. By the outward motion of the needle, the previous stitch is drawn tight, and as the needle descends it passes through the loop previously carried up, and leaves this loop on the work, and by drawing the subsequent loop through the same a chain-stitch is formed, each stitch being drawn tight by the outward-swinging motion of the needle, as previously stated.

The work is placed on a last, which is secured to a last-holder, R, of novel construction. It consists of a bed-plate, a^3, (see Figs. 1 and 2,) to which is connected the tilting-plate b^3, which has its fulcrum on a pin, c^3, passing through the bed-plate a^3. From this tilting-plate rises a lug, d^3, which is adjustable by means of a set-screw, e^3, toward and from the supporting-standard f^3. The lug d^3 forms the bearing for the fulcrum-pin g^3 of an elbow-lever, h^3, one arm of which is cylindrical, and extends up into a hole in the last, while its other arm is acted on by the set-screw i^3. If the last is placed on the pin of the lever h^3, the toe-part thereof can be firmly depressed upon the supporting-standard f^3 by means of the set-screw i^3, and the last is rigidly held down on the last-holder. By moving the lug d^3 toward or from the standard f^3 the last-holder is adjusted for smaller or larger lasts. In the bed-plate a^3 are two grooves, j^3, which form the guides for two bolts or latches, k^3, projecting from said bed-plate in opposite directions, as shown in Fig. 1. Each of these latches is provided with a spring, l^3, for the purpose hereinafter shown. In each of the latches is secured a stop, m^3, which is made adjustable by a screw-thread, and in the bottom or under surface of the tilting-plate are secured two set-screws, n^3, in such a position that the stops m^3, when actuated by the springs l^3, will strike the same if the tilting-plate be brought in the proper position. If the tilting-plate be brought in the position shown in Fig. 1, the stop m^3 at one end passes under said plate until it strikes the corresponding set-screw n^3, and the set-screw n^3 at the opposite end is so adjusted

that it strikes the upper surface of the bed-plate, and by these means the tilting-plate is firmly retained in position, thereby enabling the operator to turn the work without difficulty while sewing round the toe-part of the shoe. After the work has been turned, the last-holder is fed along automatically by the action of the machine, and when the part o^3 of the shoe arrives under the sewing mechanism, it is necessary that the heel-part thereof should be gradualy elevated. This purpose is effected by touching the latch at the heel-part, so as to release the toe-end of the tilting-plate from the stop m^3. As soon as this stop is forced out far enough, the last begins to tilt automatically, by the action of the feeder, and the heel-part of the tilting-plate is gradually raised high enough to allow the stop m^3 to pass under it, and thereby the last is held firmly in position until the sewing is completed.

It will be readily understood that the operator has nothing to do but to touch the spring-latches at the proper intervals, and then to turn the last-holder, while sewing round the toe-part of the sole, all the remaining motions of said last-holder being produced automatically by the action of the machine.

By adjusting the stops m^3 and set-screws n^3, the throw of the tilting-plate can be regulated to suit lasts of different sizes and shapes.

The last-holder R is supported by a table, T, which is provided with a table, T, which is provided with a leg, o^1, that slides up and down in a vertical direction, being guided in a bracket, S, which is secured to the column A by a set-screw, p^1, and which can be adjusted up and down on said column, if desired. A spring, q', which is wound round the leg of the table, has a tendency to force said table up, so that the work placed thereon is pressed with a yielding power against the gage O. From the bottom end of the leg o^1 extends a chain, r^1, which is intended to connect with a treadle in the bottom of the column A, so that the operator, by stepping on the treadle, is enabled to depress the table, and to relieve the work from the gage. The feed-motion of the work is effected by the feeder U, which is pivoted to the end of a lever, V. (See Fig. 4.) This lever has its fulcrum on a pivot, t', and it is provided with a roller-stud, u', which works in a cam-groove in the side of the disk G. From the rear edge of the feeder U projects a lug, v', with a slot which receives the end of the lever X, said end being rounded, so that it may oscillate therein. This lever has its fulcrum in the bifurcated head of the screw t, and its end is armed with a roller-stud, y', which works in a cam-groove, z', in the periphery of the disk G. (See Fig. 3.) By the action of the lever V, the feeder is raised from and depressed on the work, and at the moment when it is depressed it receives an oscillating motion imparted to it by the lever X, and the work is fed along the required distance. The feed-motion is adjusted by shifting the roller-stud y' in the slotted end of the lever X, the feed being increased if said roller-stud is brought closer to the fulcrum of the lever, and decreased if the roller-stud is moved away from the fulcrum. In front of the feeder U is situated the loop-retractor r^3, which is suspended from a pivot, s^3, fastened in the main frame B of the machine, and which connects with the feeder by a pivot, t^3, passing through a slot in the retractor. The object of this retractor is to catch in and retain the loop as the needle moves forward, so as to prevent the needle from carrying the loop back again into the work. In order to enable the retractor to perform this function a vibrating motion must be given to it so as to enable its point to catch in the loop at the proper intervals, and then to pass out of the way of the needle. This motion is imparted to it by the action of the feeder with which it connects by the pivot t^3, as previously stated, and the cam-groove z', which imparts motion to the feeder, is so shaped that said feeder will stop about midway in its backward motion, giving time to the retractor to perform its function, before it (the feeder) moves clear back. The correct action of the sewing mechanism is further insured by the barb-coverer n^*, which is attached to the oscillating awl-stock, and which serves to cover the barb of the needle, as the same retreats from the work, and carries a new loop through the loop previously formed. If the barb-coverer is not used, the barb of the needle is liable to catch in the loop previously deposited on the work, and the correct operation of the sewing mechanism is disturbed.

It remains to describe the stop-motion, and the means for heating the thread used in this machine. The stop-motion consists of a dog, a^2, which is hinged to the collar b^2 on the driving-shaft, and which is subjected to the action of a spring, c^2, that has a tendency to force the same out, away from the center of the shaft. From said dog projects a bit, d^2; and if the dog is depressed against the action of its spring this bit lodges in a cavity in the shaft C, but if the dog is left free to follow the action of its spring the bit d^2 catches in a cavity, e^2, in the band-wheel Z, (see Fig. 3,) and thereby said band-wheel is thrown into gear with the shaft C, and the shaft is compelled to move with the wheel. If the dog is pressed in, the band-wheel becomes uncoupled from the shaft, and the motion of the shaft stops. The dog is acted on by a lever, f^2, which is hinged to the main frame B, and which connects by a rod, g^2, with a treadle secured to the lower part of the column A. A spring, which acts on the treadle, or directly on the lever f^2, forces the point of said lever down upon the dog a^2, so that the band-wheel Z becomes uncoupled. The point of the dog a^2, however, even if pressed clear down as far as it will go, projects above the periphery of the collar b^2, so that the same, on striking the end of the lever f^2, will form a positive stop for

the shaft C; and said dog is so situated, in relation to the sewing mechanism, that when the lever f^2 is left free it will stop the shaft C, when the needle and the awl are out of the work.

In order to set the machine going, the operator places his foot on the stop-motion treadle, thereby raising the working end of the lever f^2, and allowing the bit of the dog a^2 to engage with the band-wheel Z; and if he wishes to stop the machine, he releases the stop-motion treadle, and the band becomes uncoupled as soon as the shaft C has turned far enough to bring the dog in contact with the lever f^2. By these means, the machine is positively stopped without making another stitch, leaving the needle and awl out of the work, so that the operator is enabled to remove his work, and put in new work, without trouble.

The thread used in this machine is of that kind commonly known by the term "wax thread," and in order to make it pliable, particularly in the cold season, it has to be heated. This purpose is effected by passing the thread through a tube, A′, in the frame B, said tube being exposed to the flame of a lamp or to a gas-flame, which is kept burning in the interior of the column A, and which strikes the tube as the same passes through a cavity in the frame B. (See Fig. 1.)

A spring-roller, B′, secured in the frame B, serves to keep the thread taut, as the same passes from the spool to the thread-carrier.

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

1. The combination of an awl-stock and a needle-stock, mounted independently of each other, the one in stationary, the other in movable, bearings, both being operated independently of each other by one or more cam-disks, mounted on one and the same shaft, substantially as herein shown and described.

2. The needle and awl-stocks, having motions imparted to them in the manner and by the means herein described—that is to say, through the intermediary of segmented cog-gears on both said stocks, and upon levers actuated by cam-disks—as herein shown and set forth.

3. In combination with a lever forming the bearing for the pivot of the needle-stock, and effecting its back-and-forth movement, the lever actuating the rotary movement of the needle-stock, when both levers oscillate upon one and the same axis, substantially as set forth.

4. In combination with the needle-stock, having a compound rotary movement, as described, the locking-lever, and its actuating-cam disk, so arranged, in relation to the lever forming the bearing of the needle-stock, as to hold the said needle-stock stationary while the stitch is being made, substantially as herein shown and set forth.

5. The combination of the thread-carrier or looper, with mechanism, substantially as herein described, to impart to it the movement in relation to those of the needle, as herein shown and specified.

6. The thread-carrier or looper, mounted upon a transversely-sliding rod, which forms its pivot, in combination with cams, or their equivalents, for effecting the compound vibratory movement, substantially as herein shown and described.

7. The combination, with the rotary needle and awl, of a guard or barb-cover, when the same is mounted in and partakes of the movement of the awl-stock, to operate in connection with the needle, substantially as herein shown and described.

8. In combination with the rotary barbed needle, the loop-check or retractor, operating substantially as herein described.

9. The combination, with the sewing mechanism, substantially as herein described, of two gages, one to guide the work by the channel cut into it, the other to press against or hold the work to the former gage, substantially as set forth.

10. The arrangement of two gages, substantially as herein described, in such manner, that while the one is stationary or fixed, the other shall yield to the sinuosities of the work, as set forth.

11. The spring-gage, mounted upon the axis of the awl, so that it shall yield concentrically with the awl, substantially as set forth.

12. The combination of a stop mechanism with the driving-shaft and sewing mechanism, under the arrangement, substantially as herein shown and described, so that the machine can be stopped only when the needle and awl are out of the work, and thus allow of the ready removal and introduction of the work.

13. The feed-dog, mounted upon an up-and-down vibratory lever, in combination with a laterally-vibrating lever of the first order, and the means herein described, or the equivalent thereof, for adjusting the length of said lever, whereby an adjustable four-motion top-feed is obtained, substantially as and for the purposes set forth.

14. A last-holder, composed of a tilting-plate, combined with spring-latches and adjustable stops, in such manner, that by releasing said latches at proper intervals, the work is adjusted by the action of the feed-dog, and the last-holder becomes locked at the proper time for the turning of the work.

15. The arrangement of the stationary tube located in, and passing through, the lower part of the main supporting-frame, and exposed to the action of a flame within the cavity in the interior of said frame or standard, for the purpose of heating the waxed thread as it passes to the sewing mechanism, as set forth.

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