(No Model.) 7 Sheets—Sheet 1.

A. EPPLER.

SEWING MACHINE.

No. 533,639. Patented Feb. 5, 1895.

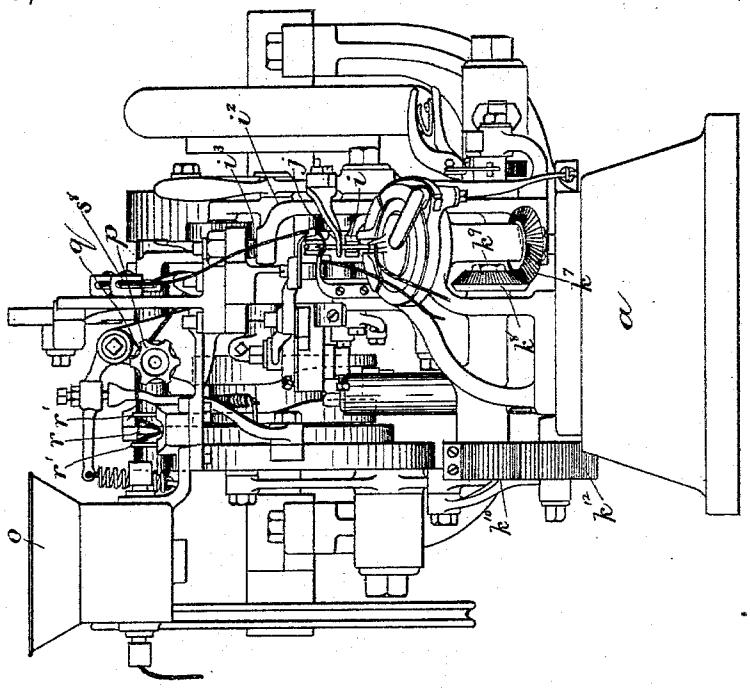

FIG-2-

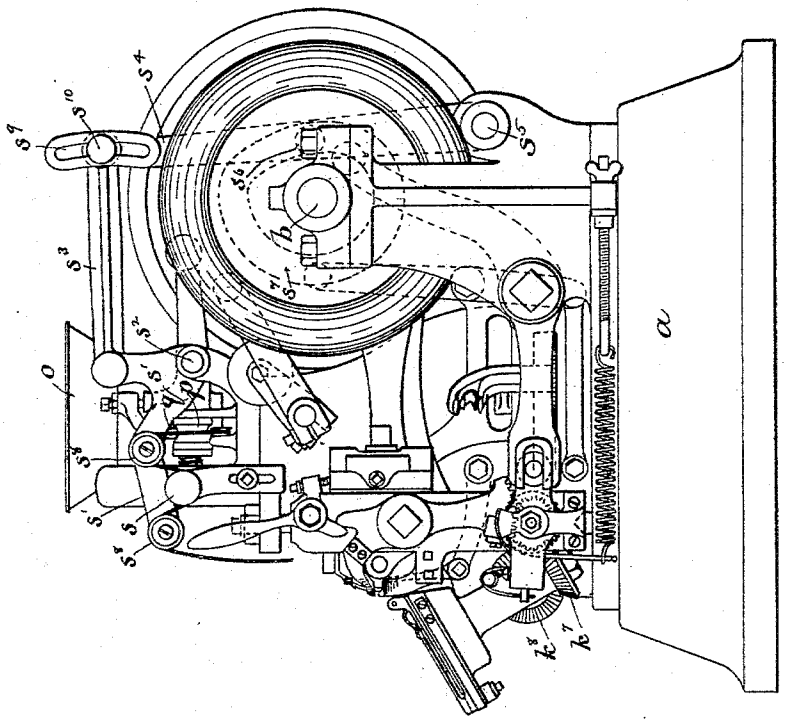

FIG-1-

WITNESSES
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A. D. Harrison.

INVENTOR
Andrew Eppler
by Wright Brown Quinby & Atty.

(No Model.)

7 Sheets—Sheet 2.

A. EPPLER.

SEWING MACHINE.

No. 533,639. Patented Feb. 5, 1895.

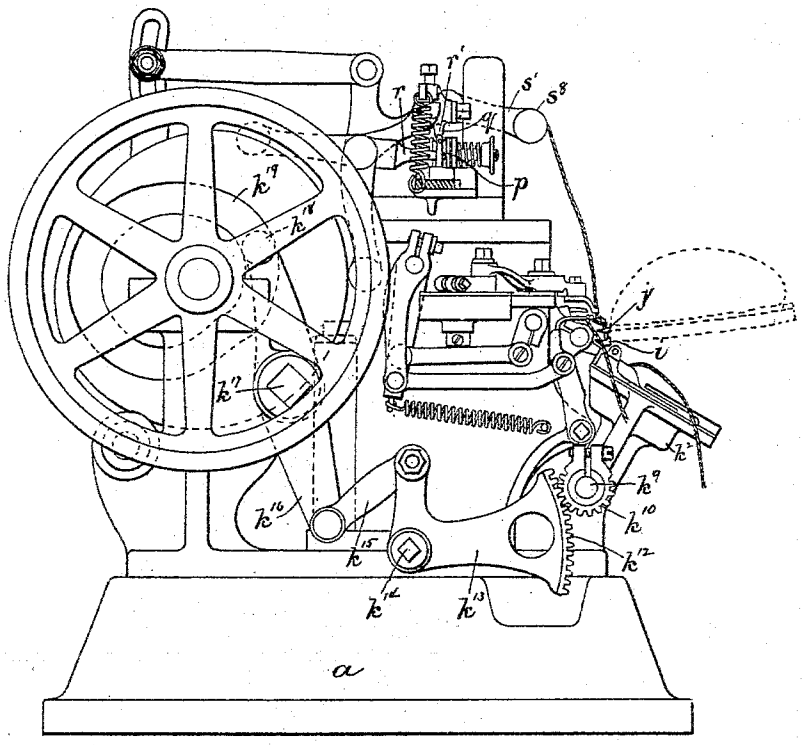


FIG. 3.

FIG. 4

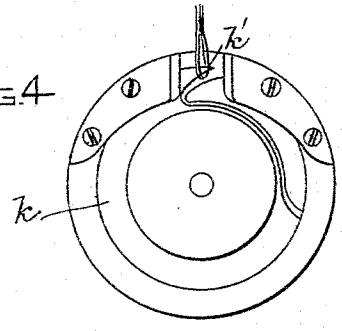
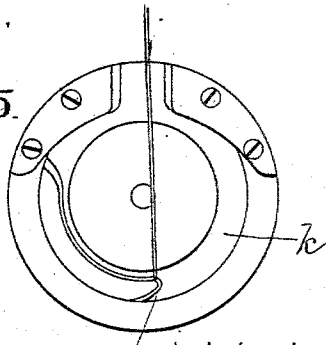


FIG. 5.



WITNESSES:

E. Batchelder

A. D. Harrison.

k' INVENTOR:

Andrew Eppler

by Wright Brown Crossley

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(No Model.) 7 Sheets—Sheet 3.

A. EPPLER.

SEWING MACHINE.

No. 533,639. Patented Feb. 5, 1895.

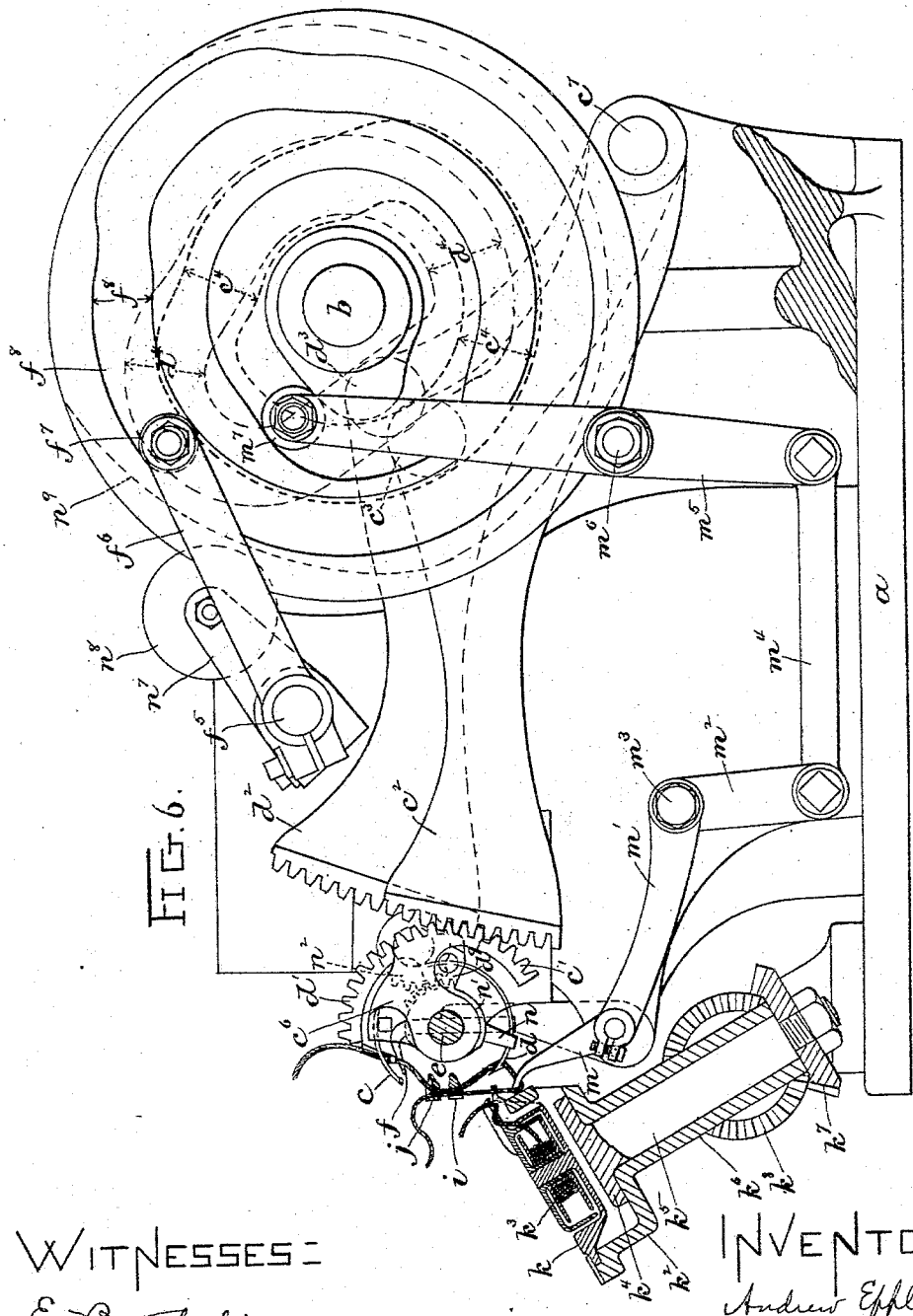

FIG. 6.

WITNESSES:
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(No Model.) 7 Sheets—Sheet 4.

A. EPPLER.

SEWING MACHINE.

No. 533,639. Patented Feb. 5, 1895.

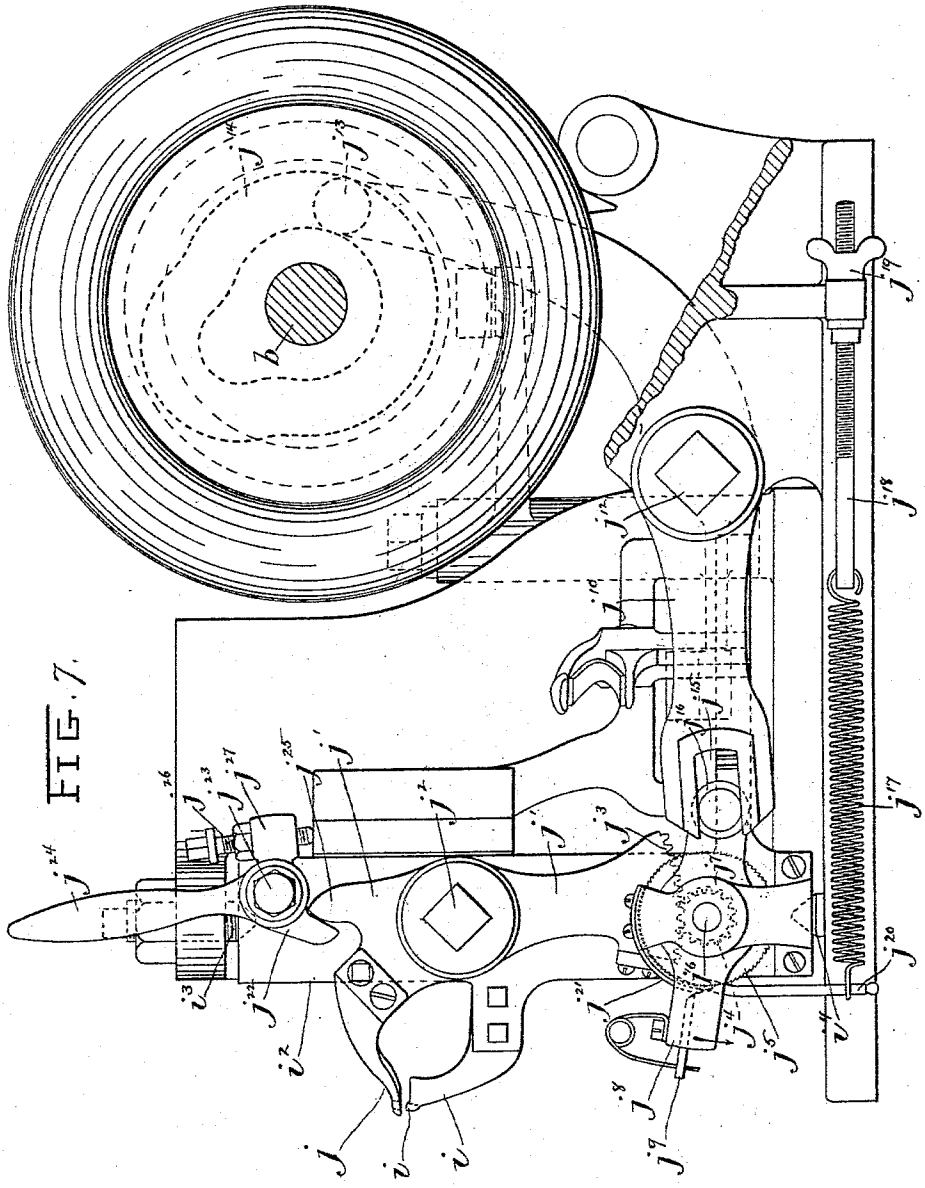

FIG. 7.

WITNESSES
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INVENTOR
Andrew Eppler
by Wright Brown Quinby
Attys.

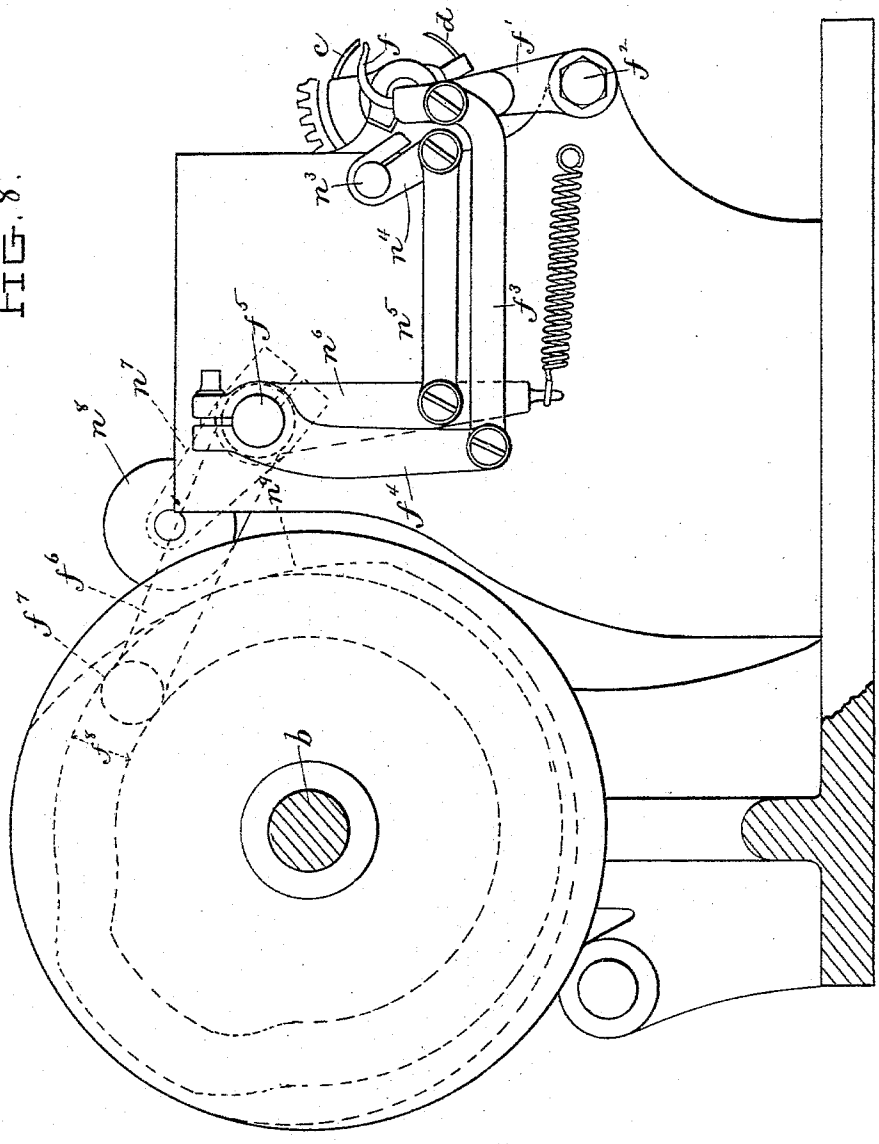
(No Model.) 7 Sheets—Sheet 5.

A. EPPLER.

SEWING MACHINE.

No. 533,639. Patented Feb. 5, 1895.

FIG. 8.



WITNESSES

E. Batchilder

A. D. Harrison.

INVENTOR

Andrew Eppler

by Wright Brown Quinby & Otty.

(No Model.) 7 Sheets—Sheet 6.

A. EPPLER.

SEWING MACHINE.

No. 533,639. Patented Feb. 5, 1895.

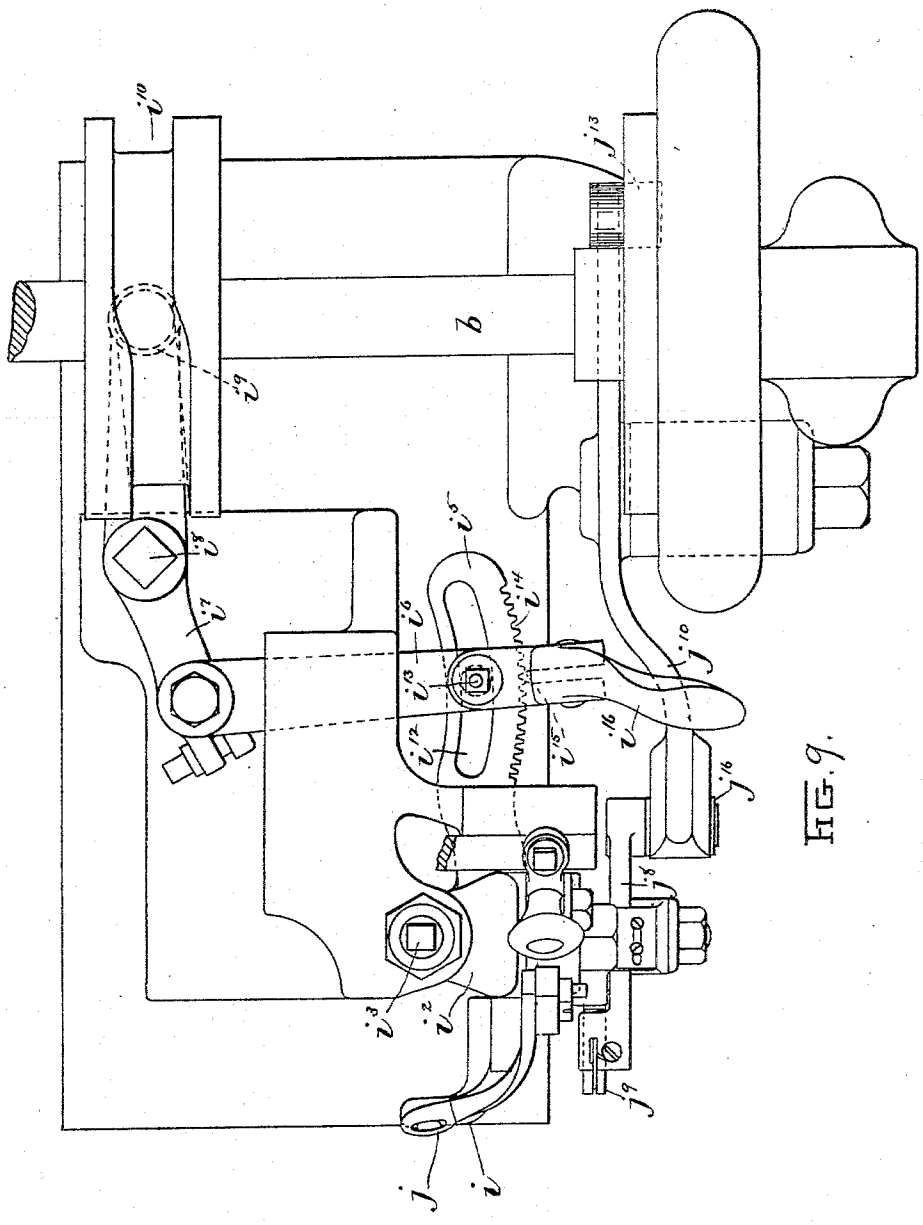


FIG. 9.

WITNESSES-
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INVENTOR-
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by Wright Brown Quinby & Atty

(No Model.) 7 Sheets—Sheet 7.

A. EPPLER.

SEWING MACHINE.

No. 533,639. Patented Feb. 5, 1895.

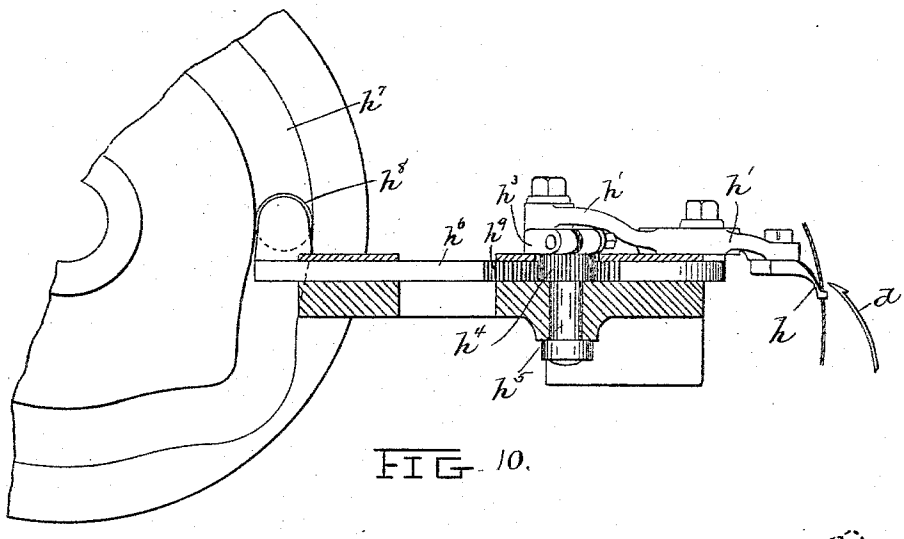

FIG. 10.

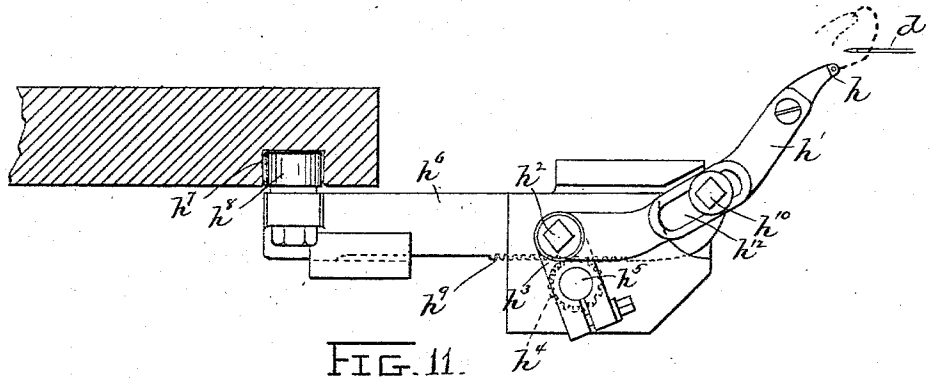

FIG. 11.

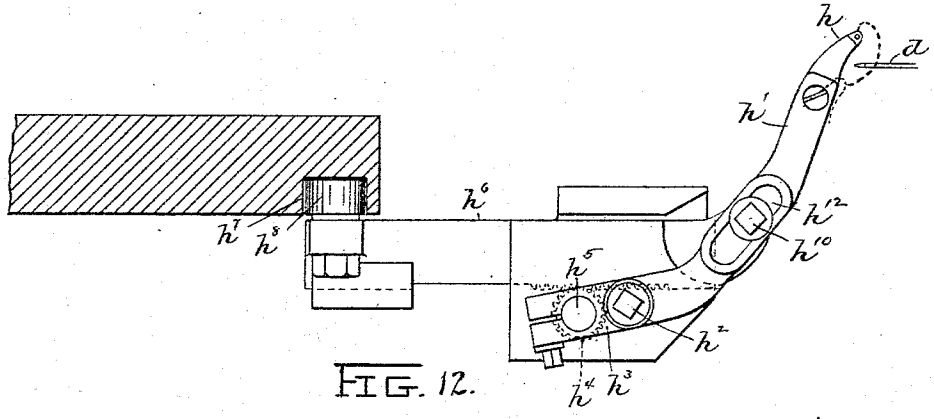

FIG. 12.

WITNESSES
E. Batchelder
A. D. Harrison

INVENTOR
Andrew Eppler
by Wright Brown Quinby & Otis
Attys.

UNITED STATES PATENT OFFICE.

ANDREW EPPLER, OF NEWTON, MASSACHUSETTS.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 533,639, dated February 5, 1895.

Application filed January 17, 1894. Serial No. 497,127. (No model.)

To all whom it may concern:

Be it known that I, ANDREW EPPLER, of Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

This invention has for its object to provide a simple and effective curved-needle double-thread sewing machine, adapted for stitching outer-soles to welts of welted boots and shoes, which shall operate to interlock the needle and shuttle threads at points close to the bottom surface of the outer-sole, and at a uniform distance from said bottom-surface, whether the thickness of the work be greater or less, without the employment of a special automatic thread-measuring device to proportion the amount of thread drawn from the wax-pot to the thickness of the work, the chief aim of my invention being to simplify the construction of a machine of this class by eliminating said automatic thread-measuring device therefrom, and to cause the shuttle and take-up and work support to accomplish all that has heretofore been accomplished by said device.

The invention consists, first, in a sewing machine comprising in its construction a feeding channel-guide which in the present machine also forms the work-support and is in effect the work-supporting channel-guide, an oscillating shuttle located at one side of said work-support and arranged so that, in engaging the shuttle-thread with the needle-loop, it will pull said loop below the bottom-surface of the outer-sole and thus draw thread from the thread-supply, (which in the machine shown is the slack thread provided by the pull-off arm (*r*), which at each operation furnishes thread to make a stitch through the thickest goods to be sewed) for the next stitch, and a take-up adapted to take up the thread pulled down by the shuttle and thus set the stitch, the two threads being interlocked at a uniform point with relation to the bottom of the outer-sole without regard to the thickness of the work, because the thread that is taken up to set each stitch was previously pulled down to an exact and unvarying distance below the bottom of the outer-sole.

The invention also consists in certain improvements relating to various parts of the stitch-forming mechanism, all of which I will now proceed to describe and claim.

Of the accompanying drawings, forming part of this specification: Figure 1 represents a side elevation of a machine embodying my improvements. Fig. 2 represents a front elevation of the same. Fig. 3 represents an elevation of the opposite side from that shown in Fig. 1. Figs. 4 and 5 represent top views of the shuttle, showing its thread-pulling action. Fig. 6 represents a partial side-elevation and partial section, showing portions of the machine. Fig. 7 represents an enlarged side elevation of the machine, taken from the side shown in Fig. 1, parts being broken away. Fig. 8 represents a partial side view and partial sectional view, showing portions of the machine, from the side viewed in Fig. 3. Fig. 9 represents a plan view of parts of the machine. Fig. 10 represents a side view of the looper and its actuating mechanism. Figs. 11 and 12 represent top views of the looper and its operating mechanism.

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

In the drawings: *a* represents the supporting-frame or bed of the machine, having bearings for the driving-shaft *b*, which is provided with a series of operating cams, and disks containing cam-grooves, all hereinafter specifically referred to, said cams and cam-grooves giving motion to the various parts of the machine hereinafter described.

c represents the awl, which is of curved form and oscillates in a curved path. Said awl is attached to an arm c^6, which is mounted to oscillate on a fixed stud *e*, and is provided with a gear-segment c'. Oscillating motion is imparted to the awl by means of said segment; a lever c^3, having a gear-segment meshing with the segment c', and pivoted at c^7 to a fixed support; a trundle-roll c^3 on said lever; and a cam-groove c^4, receiving said trundle-roll.

d represents the curved needle, which is attached to an arm d^9, which is also mounted to oscillate upon the stud *e*, and is provided with a gear-segment d', meshing with a similar segment on a lever d^3, which is pivoted at c^7, and is provided with a trundle-roll d^3 entering a cam-groove d^4. The awl-arm c^6 and

needle-arm d^9 are formed and arranged so that the awl and needle occupy the same plane, neither having any lateral movement, so that, when they are oscillated, the awl follows the needle and vice versa.

f represents an oscillating thread-finger, which co-operates with the looper hereinafter described in engaging the needle-thread g with the needle. Said finger is attached to a lever f', which is pivoted at f^2 to a fixed support, and is connected by a rod f^3 with an arm f^4 attached to a rock-shaft f^5, the latter having an arm f^6, on which is a trundle-roll f^7, entering a cam-groove f^8.

h represents the looper, which is affixed to a lever h', one end of which is connected to a wrist-pin h^2, on a crank h^3, affixed to a pinion h^4, which is mounted on a stud h^5 journaled in a fixed bearing. h^6 represents a slide, which is reciprocated in a fixed guide by the action of a cam-groove h^7, and a trundle-roll h^8 on the slide h^6, the latter having rack-teeth h^9, meshing with the pinion h^4. The slide h^6 also has a stud h^{10}, which enters an oblique slot h^{12} in the looper-lever h'. The reciprocating motion of the slide h^6 causes it to act on the looper through the pinion h^4, crank h^3, stud h^{10} and oblique slot h^{12}, in such manner as to give a compound movement to the looper, as illustrated in Figs. 11 and 12.

i represents a work-supporting channel-guide, which is preferably formed with a protuberance i' adapted to enter the channel in the under surface of the outer-sole of a welted shoe, said support being arranged to hold the work in the path of the awl and needle. The work-support is affixed to a head or holder i^2, which is mounted to oscillate on vertical studs i^3 i^4 affixed to the supporting-frame. Hence the work-support has a back and forth motion across the path of the needle, whereby it in connection with the presser-foot also carried by the head i^2 is enabled to feed the work.

The mechanism for giving the described motion to the work-support is best shown in Fig. 9, and comprises an arm i^5 affixed to the head i^2, and a rod i^6 connecting said arm with a lever i^7, which is pivoted at i^8 and has a trundle-roll i^9 entering a cam-groove i^{10}. The arm i^5 is adjustably connected with the connecting-rod i^6, by means of a segmental slot i^{12} in said arm, a bolt i^{13} on the rod i adapted to slide in said slot, rack-teeth i^{14} on the arm i^5, and a latch or dog i^{15} affixed to a handle i^{16}, which is pivoted to the connecting-rod i^6 and is adapted to engage the teeth i^{14}. By changing the point of connection of the rod i^6 with the arm i^5, the length of the feed-movement may be increased or diminished.

j represents a presser-foot, which is attached to a lever j', pivoted at j^2 to the head or holder i^2, and arranged so that the presser-foot has an up and down motion toward and away from the work-support, so that the foot is adapted to alternately grasp and release the work, the foot moving back and forth with the work-support and having an independent up and down motion.

The mechanism for giving the presser-foot its up and down motion, as here shown, is as follows: On the lever j' is formed a rack-segment j^3, meshing with a pinion j^4, which is attached rigidly to a ratchet-wheel j^5, affixed to a rock-shaft j^6, which is journaled in a fixed bracket j^7. j^8 represents a lever, mounted to oscillate on the rock-shaft j^6, and provided with a spring dog j^9, which normally engages the ratchet j^5. The lever j^8 is oscillated by means of a lever j^{10}, which is pivoted at j^{12}, and has a roll j^{13} at one end, engaging a cam-groove j^{14}; and a slot j^{15} at the other end, receiving a pivoted block j^{16} on the lever j^8. A spring j^{17}, connected at one end by a rod j^{18} and nut j^{19} with a fixed support on the frame, and at the other end with an arm j^{20} affixed to the lever j', normally holds the presser-foot yieldingly down upon the work interposed between it and the work-support. When the lever j^8 is moved in the direction indicated by the arrow in Fig. 7, the dog j^9, acting on the ratchet j^5, pinion j^4 and lever j, raises the presser-foot to a height above the work determined by a fixed shield j^{21}, which is arranged to hold the dog out of engagement with the ratchet until the dog passes below said shield. The described mechanism is timed so that the presser-foot is held down by the spring during the work-feeding movement of the work-support, and raised during the backward movement. A lever j^{22}, pivoted at j^{23}, is provided to enable the operator to raise the presser-foot, said lever having a handle j^{24}, and bearing on a projection j^{25} on the lever j'. The extent of the downward movement of the presser-foot toward the work-support may be regulated by means of a set-screw j^{26}, in an arm j^{27}, affixed to the lever j^{22}, said screw being adjustable vertically in said arm, and bearing at its lower end on a fixed support on the frame of the machine.

k represents the shuttle, which is provided with a beak k', adapted to enter the needle-loop at a point below the work-support. Said shuttle is mounted to oscillate in a fixed casing or holder k^2, and the path of its movement is such relatively to the work-support that the shuttle, in moving from the position shown in Fig. 4 to that shown in Fig. 5, considerably elongates the needle-loop by pulling downwardly on the same and drawing thread from the supply-end to a given point below the work-support and the surface of the work resting thereon. The advantage of this arrangement is that the shuttle pulls from the supply-end enough thread for the succeeding stitch, said thread being disposed below the under surface of the sole, so that, when the surplus thread is taken up to set the stitch, the needle and shuttle threads will be interlocked at a fixed and uniform point in relation to the bottom-surface of the sole, without regard to the thickness of the work through which the thread passes, so that, whether the work be

thicker or thinner, the thread will be interlocked at an unvarying point with relation to the bottom-surface of the sole, the varying amount of thread needed for the varying thickness of the goods being taken from the slack thread above the goods. I am therefore enabled to eliminate from the machine any special automatic thread-measuring mechanism to compensate for variations in the thickness of the work. The shuttle is provided with a suitable bobbin k^3, and is engaged with a suitable driver, the general construction of the shuttle, bobbin and carrier being well known and forming no part of my invention.

The shuttle-carrier is affixed to a shaft k^5, which is journaled in a fixed bearing k^6, and has at its lower end a bevel-gear k^7, meshing with a bevel-gear k^8, affixed to a shaft k^9, which is provided at one end with a split gear-segment k^{10}, adjustably mounted on said shaft and meshing with a gear-segment k^{12}, affixed to a lever k^{13}, which is pivoted at k^{14}, and connected by a rod k^{15} with a lever k^{16}, pivoted at k^{17}, and provided with a trundle-roll k^{18}, running in a cam-groove k^{19}, the described mechanism imparting an oscillating motion to the shuttle. The adjustable gear-segment k^{10} enables the position of the shuttle to be adjusted, as will be readily seen.

m represents a loop-dividing finger, which is affixed to one arm of a bell-crank lever m' m^2, which is pivoted to the frame of the machine at m^3, and is connected by a rod m^4 to a lever m^5, which is pivoted to the frame of the machine at m^6, and has a trundle-roll m^7, entering a cam-groove m^8. The finger m is formed to enter the needle-loop at a point below the work-support, and to hold the same open, as shown in Fig. 6, while the shuttle-beak k' enters said loop.

n represents the needle-guide, which is affixed to a segmental gear n', mounted to oscillate on the awl and needle supporting stud e. Said segment n' is oscillated to give the needle-guide the usual motions, by a suitable series of devices, receiving motion from one of the cams on the driving-shaft; but, as the needle-guide-operating mechanism involves nothing new, and as its operation is well-known, I do not deem it essential to describe the said operating mechanism.

o represents the wax-pot, which may be of any suitable construction.

p represents the tension-wheel, around which the thread passes on its way from the wax-pot to the stitch-forming mechanism.

q represents a thread-locking arm, which is adapted to be alternately pressed against the convolutions of thread on the tension-wheel to lock the same, and raised from said wheel to release the thread, said locking-device being constructed and operated substantially as shown in Letters Patent of the United States, No. 421,889, granted February 25, 1890, to Ezra P. Arnold, to which reference may be made for a fuller description.

r represents a thread-pulling arm, which is adapted to oscillate vertically between guides r' r' (Fig. 2), between which the thread passes from the wax-pot to the tension-wheel. Suitable mechanism is employed to oscillate the said arm, and thus cause it, when moving downwardly, to pull a supply of thread from the wax-pot more than will be required for the next stitch, this motion taking place when the thread is locked by the locking-device q. The arm r is raised when the thread is being pulled down by the shuttle, so that it offers no resistance to the pulling out of the thread previously drawn by it from the wax-pot. There being nothing new in this thread-pulling arm, I do not describe in detail the mechanism for operating it.

The take-up mechanism shown in Fig. 1 comprises a loose pulley s, mounted on a fixed bearing, a lever s', pivoted at s^2, and connected by a rod s^3 with a lever s^4, which is pivoted at s^5, and has a trundle-roll s^6, which enters a cam-groove s^7. The lever s' has loose pulleys s^8 s^8 at opposite sides of the pulley s, the thread passing over the pulleys s^8 and under the pulley s, as shown in Fig. 1. The vertical oscillating movements of the lever s' cause the pulleys s^8 s^8 to co-operate with the pulley s in taking up the thread, in a manner which will be readily understood. The extent of the take-up motion may be regulated by means of a slot s^9 in the lever s^4, and a stud s^{10}, adjustable in said slot and connecting the rod s^3 with the lever s^4.

The described mechanism is timed to operate as follows: The awl first advances and penetrates the material supported on the work-support i, the presser j rising while the awl is in the material. While the presser is raised, the work-support and presser receive their backward movement, preparatory to the next feeding-movement. The presser then descends upon the work, and the thread-finger f moves back, taking a sufficient quantity of thread from the supply-end to enable the needle to go through the material without causing the thread to slip or reeve in the hook of the needle. The awl then retreats, and the needle advances, following as closely as possible behind the point of the awl. The looper then presents the slackened thread to the eye of the needle, and the needle is retracted, drawing a loop through the work. The loop-dividing finger m then enters the loop, and presents it to the beak of the shuttle. The shuttle then moves from the position shown in Fig. 4 to that shown in Fig. 5, exerting a pulling strain on the thread, which pulls from the supply-end a sufficient quantity of thread to complete the stitch. The thread-finger f and loop-dividing finger m return to their starting positions while the shuttle is acting. After the shuttle has released the elongated loop, the take-up acts to draw said loop upwardly and interlock it with the shuttle-thread near the bottom surface of the work. While the take-up is acting, the presser-bar is held down upon the

work with a sufficiently strong pressure to resist the pull of the take-up on the thread. While the needle and awl are retracted and the presser-foot is depressed, the work-support and presser are moved forward to feed the work, after which the presser is raised and the work-support and presser again move backward.

As already stated, the arrangement of the shuttle relatively to the work-support, which has no vertical movement (and by "vertical" I mean in the direction of movement of the needle), enables the shuttle to elongate or pull down the needle-loop to a point at an unvarying distance from the bottom-surface of the work, so that the subsequent action of the take-up causes the locking or setting of each stitch at a uniform relation to the bottom-surface of the sole, without regard to the thickness of the work, this uniform relation being caused by the action of the work-support, shuttle, and take-up, without any automatic special thread-measuring mechanism to compensate for variations of thickness of the work.

From the foregoing it will be seen that the amount of thread drawn off is varied automatically according to the thickness of the work and the length of the stitch which are made the gage by which the required amount of thread is measured. The thread is always drawn to a uniform distance from the bottom surface of the work, and as the stitches are interlocked at or near that surface, the action of the take-up forms every stitch at a uniform point with relation to the bottom surface of the work, a result that is very desirable in stitching outer soles to welted boots and shoes.

I claim—

1. In a sewing machine the combination with a work-support having an upwardly pointing channel-guide, of a shuttle and a curved needle located below the work-support and a take-up above said work support, substantially as and for the purpose set forth.

2. In a machine for sewing shoes, in combination, a work-supporting channel-guide fixed against movement in the direction of movement of the needle but capable of movement in a direction at right angles thereto, a clamping part connected to said guide, means for giving said guide a feeding movement, a rotary shuttle and a curved needle, both located on the same side of said guide, substantially as and for the purpose described.

3. In a machine for sewing shoes, in combination, a work-supporting channel-guide provided with a clamping part fixed against movement in the direction of movement of the needle but capable of movement in a plane at right angles thereto, means for giving said guide a feeding movement, a shuttle and a needle on the same side of said guide, an awl on the opposite side of said guide arranged to hold the work stationary while the clamping part shifts to its initial position preparatory to feeding the work, substantially as and for the purpose described.

4. In a machine for sewing shoes, in combination, a work-support fixed against movement in the direction of movement of the needle but capable of movement in a direction at right angles thereto, a clamping part connected to said work-support, means for giving said work-support a feeding movement, a needle and a shuttle on the same side of said support, and an awl on the opposite side of said support arranged to hold the work while the clamping part shifts to its initial position preparatory to feeding the work, substantially as and for the purpose described.

5. In a sewing machine for stitching outer soles to welts of welted boots or shoes, the combination with a work-support having a projecting channel-guide of a shuttle and a curved needle, said shuttle and needle being located on the same side of said work-support, said channel-guide projection pointing away from said shuttle and needle whereby the shoe may be placed in position for stitching with the tread of the shoe toward the shuttle and needle and whereby the thickness of the work and the length of the stitch are made the gage by which the required amount of thread is measured, and whereby the stitch is set at a uniform distance with respect to the base line, substantially as and for the purpose set forth.

6. In a sewing machine, the combination of a curved oscillating needle, a work-support arranged to hold the work in the path of the needle and having a work-feeding movement, said support having no movement in the direction of the movement of the needle, a shuttle at one side of the work-support arranged to pull the needle thread a uniform distance from said support, a take-up at the opposite side of the work-support, and a presser which co-operates with the work-support in feeding the work, and holds the work against the action of the take-up.

7. In a sewing machine, in combination, a work-feeding mechanism including a clamping part, a curved oscillating awl and a curved oscillating needle, the awl being adapted to hold the work while the clamping part takes its initial position preparatory to advancing the work, substantially as and for the purpose described.

8. In a sewing machine, the combination of a curved oscillating needle and work-holding and feeding mechanism comprising a work-support having a work-feeding movement across the path of the needle, and a presser-foot which moves with said work-support in feeding the work and has an independent work-grasping and releasing movement, and a curved oscillating awl adapted to hold the work while the work-holding and feeding mechanism takes its initial position preparatory to advancing the work, substantially as and for the purpose described.

9. In a sewing machine, the combination of

a curved oscillating needle, a movable head or holder, a work-support affixed thereto, said head and support having a back and forth work-feeding movement across the path of the needle but no movement in the direction of movement of the needle, a presser-foot pivotally connected with said head and having a work-grasping and an automatic work releasing movement governed by the thickness of the material, said foot being adapted to cooperate with the work-support in feeding the work.

10. In a sewing machine, the combination of a curved oscillating needle and a curved oscillating awl, both oscillating independently in the same plane without lateral movement, a head or holder mounted to oscillate on pivots, mechanism for oscillating said head, a work-support affixed to the head and moved across the path of the needle by the movements of the head, a presser-foot pivotally connected to said head and arranged to co-operate with the work-support, and mechanism for vertically oscillating the said presser-foot.

11. The combination of the looper arm having a slot, the slide movable in fixed guides and provided with a pin or stud entering said slot and also provided with a rack, means for reciprocating said slide, a pinion journaled in a fixed bearing and meshing with said rack, and a crank affixed to said pinion and having a wrist-pin engaged with the looper arm, as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 6th day of January, A. D. 1894.

ANDREW EPPLER.

Witnesses:
C. F. BROWN,
A. D. HARRISON.