

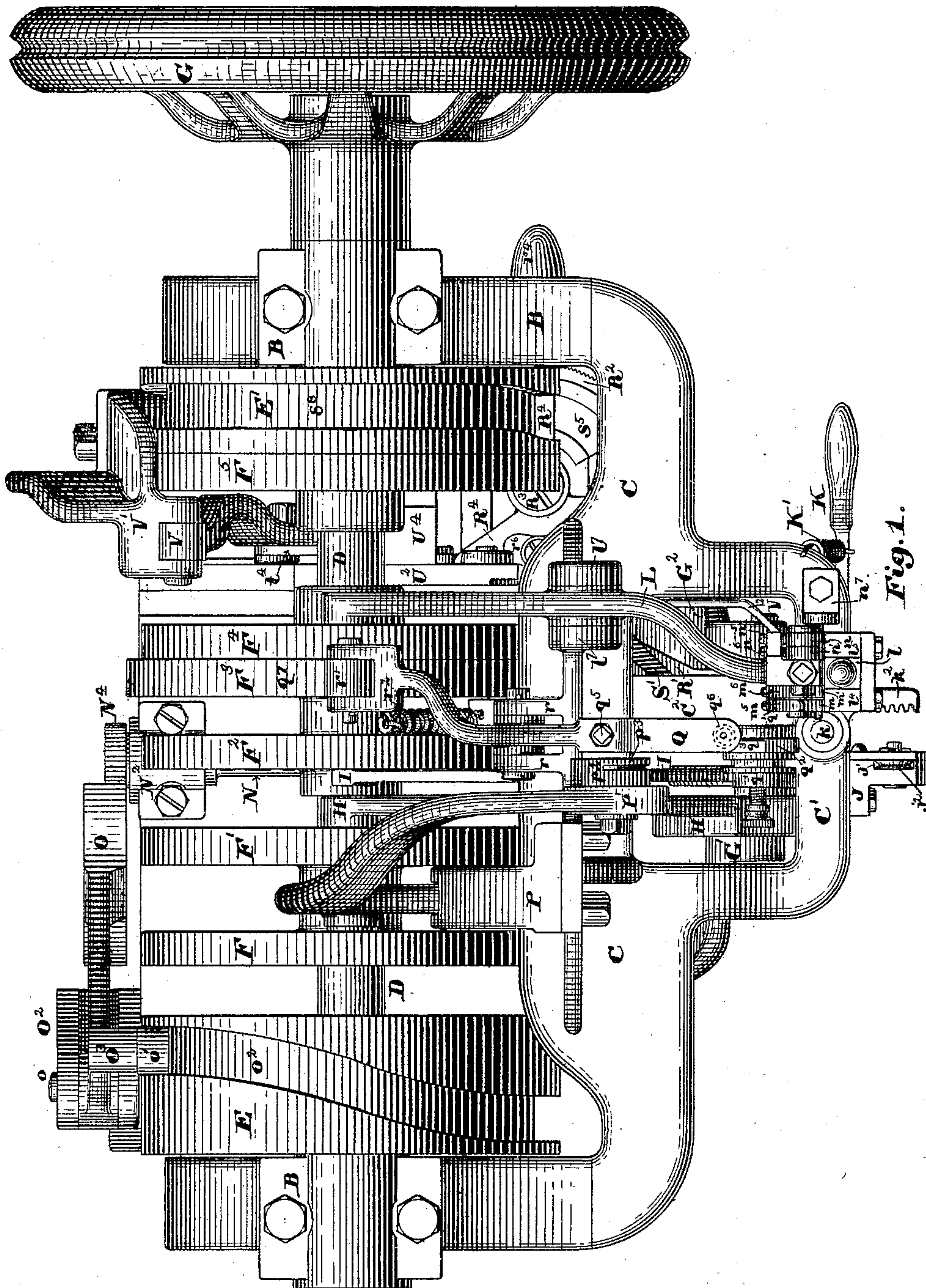
(No Model.)

6 Sheets—Sheet 1.

J. E. BERTRAND.  
SOLE SEWING MACHINE.

No. 432,011.

Patented July 15, 1890.



**Witnesses:**  
Walter E. Lombard.  
Henry H. Kendall.

**Inventor:**  
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Attorney.



(No Model.)

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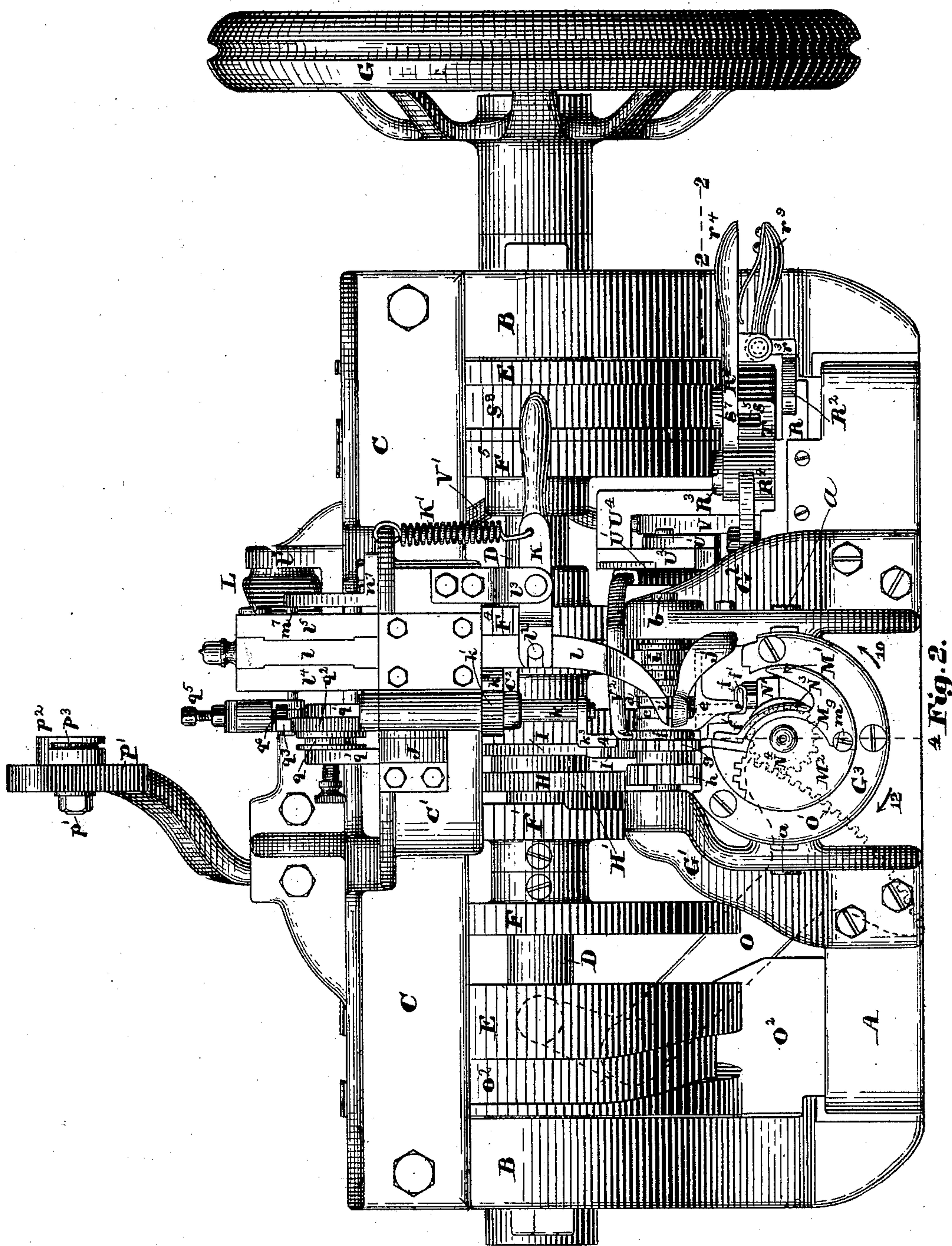


Fig. 2.

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(No Model.)

6 Sheets—Sheet 3.

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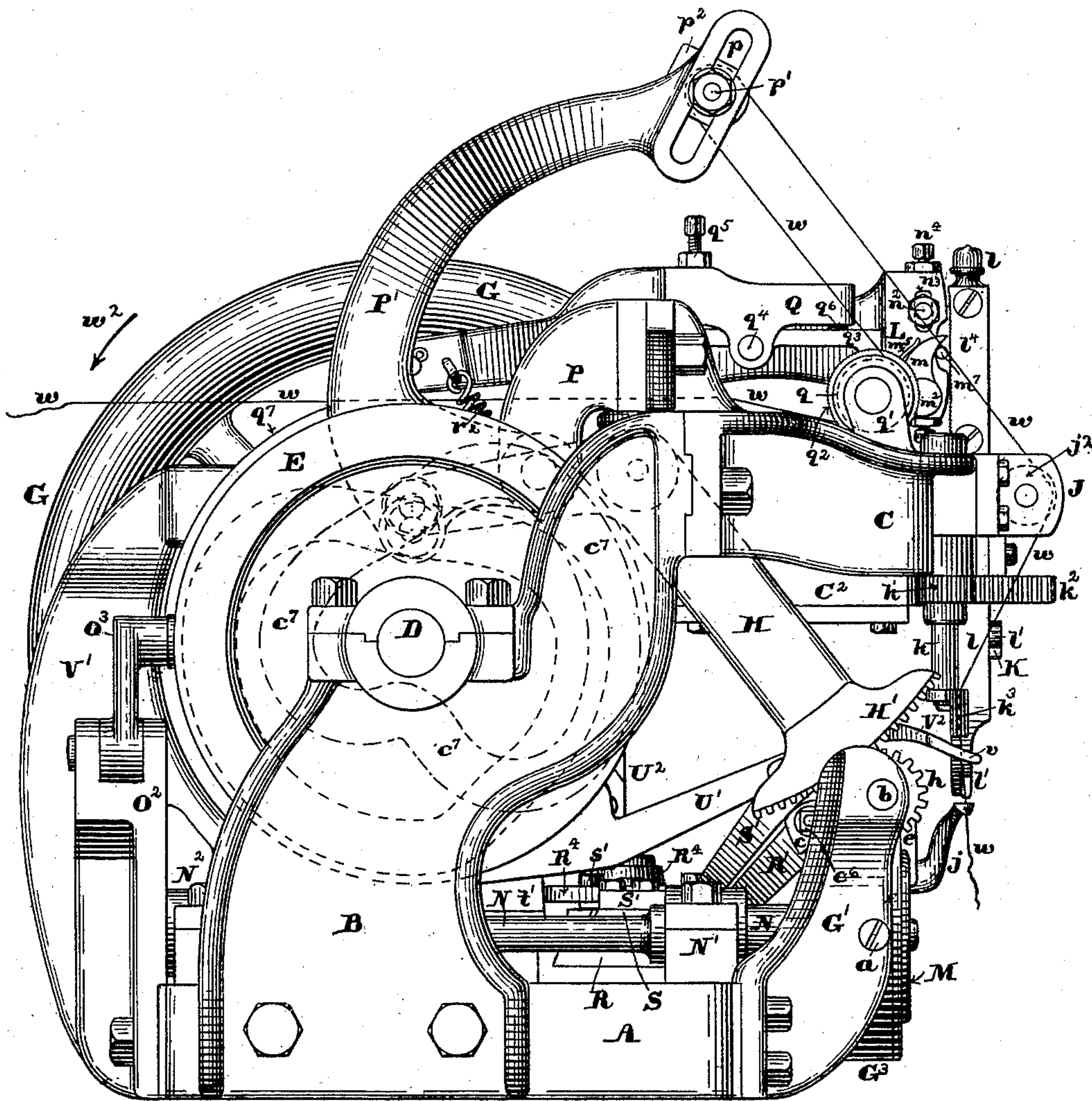


Fig. 3.

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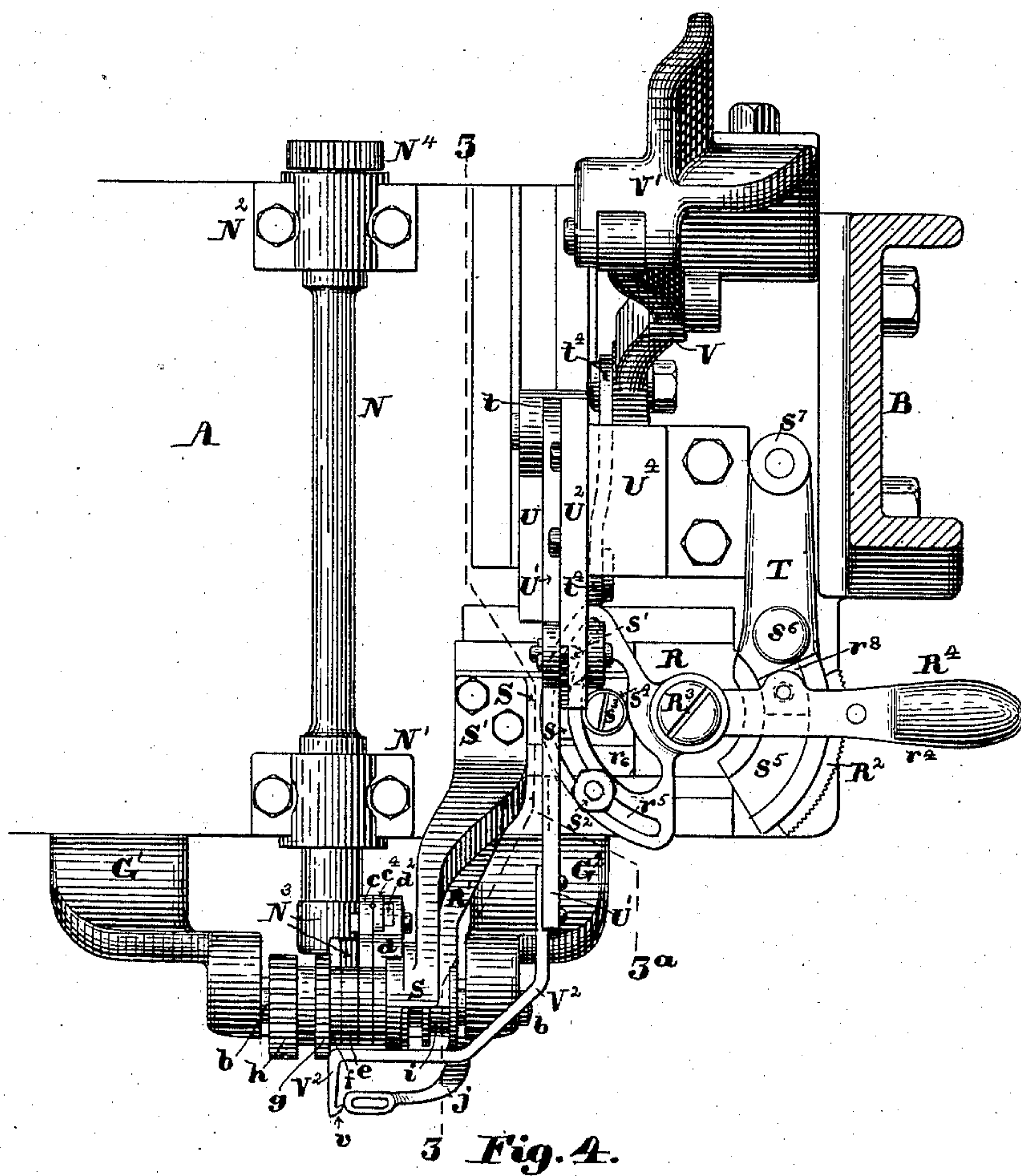
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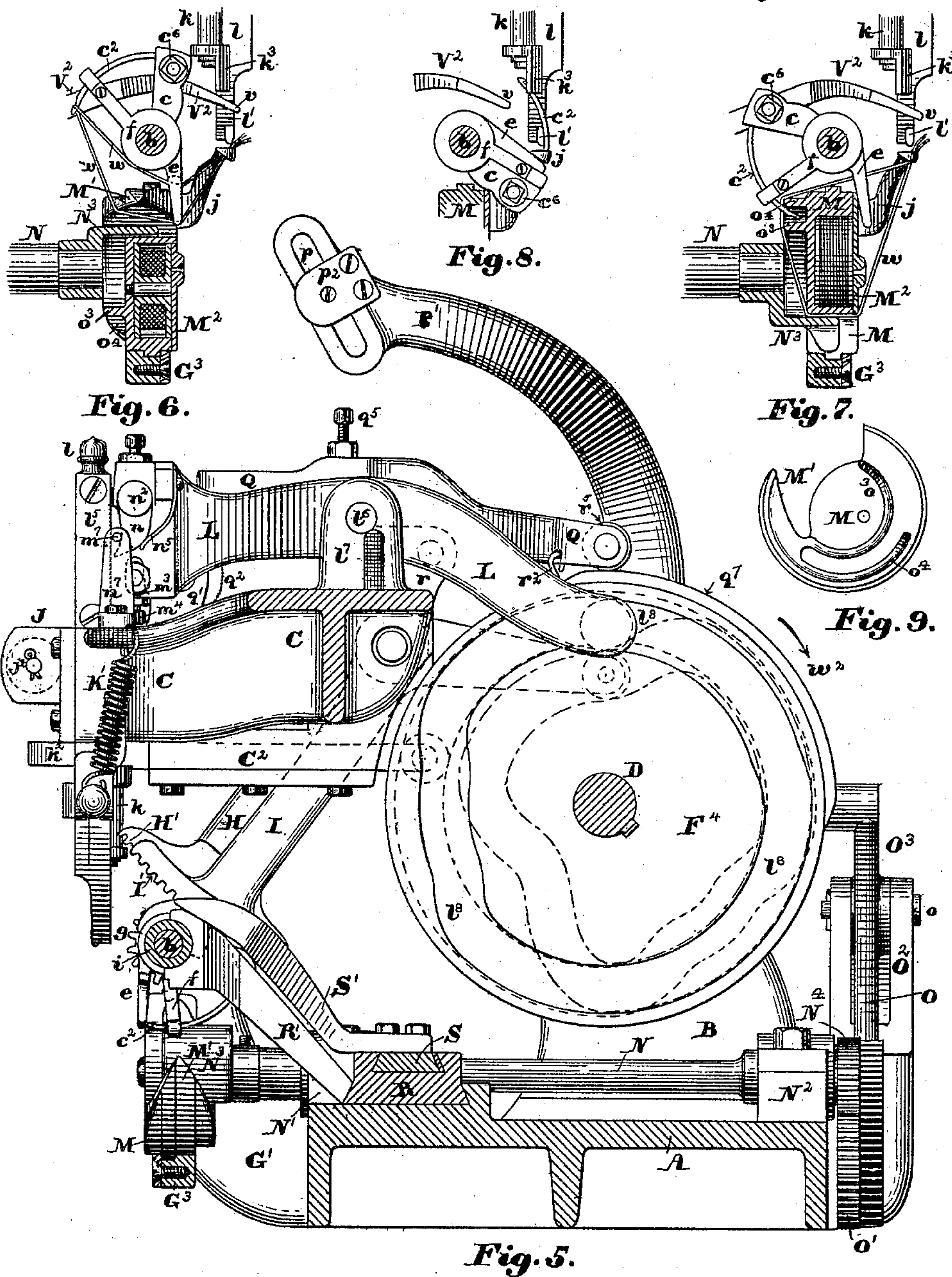
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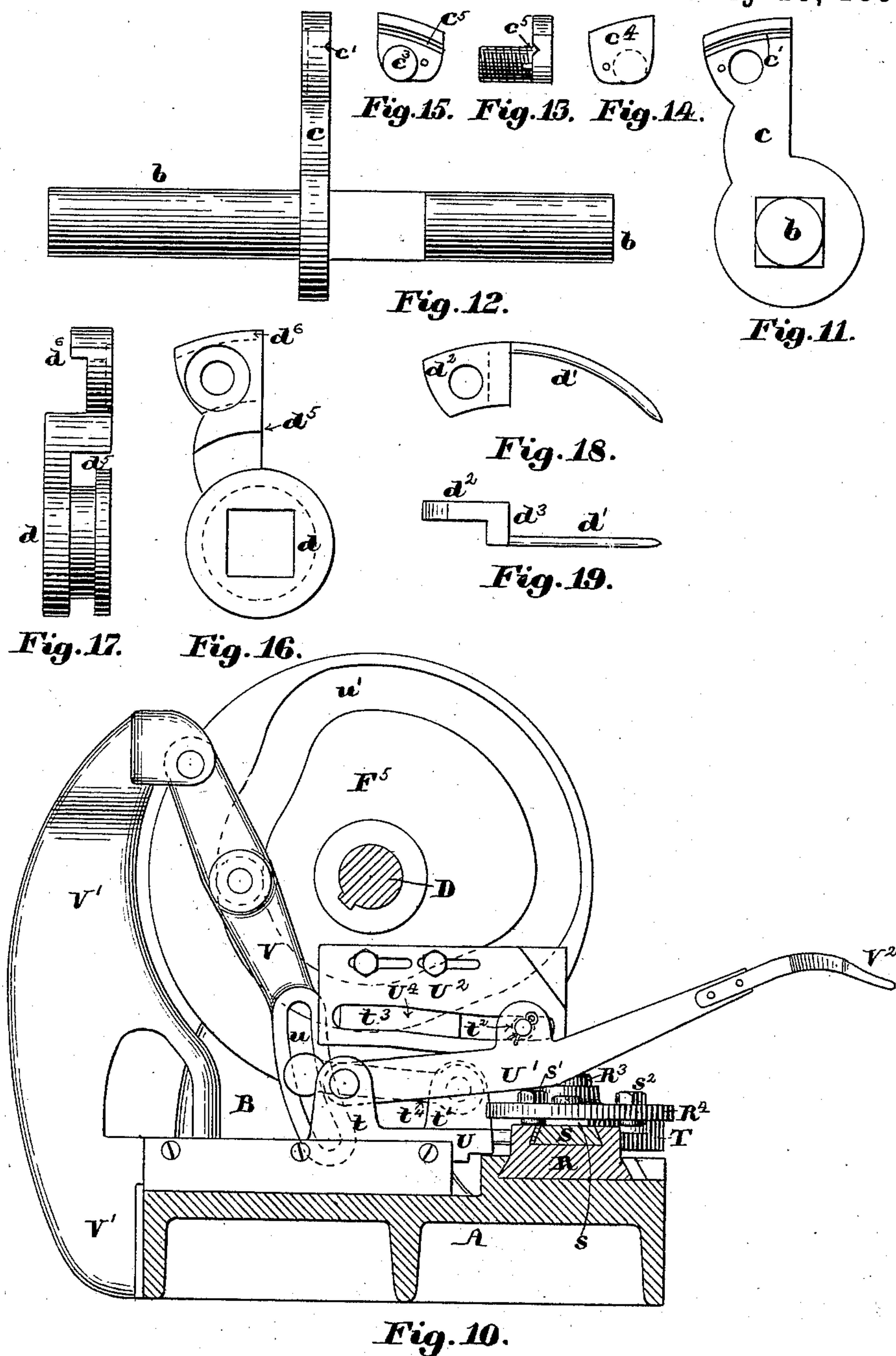
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# UNITED STATES PATENT OFFICE.

JOSEPH ELI BERTRAND, OF BOSTON, ASSIGNOR OF ONE-HALF TO MELLEN BRAY, OF NEWTON, MASSACHUSETTS.

## SOLE-SEWING MACHINE.

SPECIFICATION forming part of Letters Patent No. 432,011, dated July 15, 1890.

Application filed January 18, 1890. Serial No. 337,290. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPH ELI BERTRAND, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Sole-Sewing Machines, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to sole-sewing machines, is an improvement upon the inventions described in the Letters Patent No. 409,161, granted to me August 20, 1889, and in another application of mine filed July 29, 1889, Serial No. 319,015; and it consists in certain novel features of construction, arrangement, and combination of parts, which will be readily understood by reference to the description of the drawings and to the claims hereinafter given, and in which my invention is clearly pointed out.

Figure 1 of the drawings is a plan of a machine embodying my invention. Fig. 2 is a front elevation of the same. Fig. 3 is an end elevation. Fig. 4 is a horizontal section through the right-hand shaft-supporting frame on line 2 2 on Fig. 2, and showing a portion of the bed and the needle and awl carrying arms, their operating-shaft, the awl and feed adjusting mechanism, and the mechanism for forming the loop above the work in plan. Fig. 5 is a vertical section on line 3 3, looking toward the left of Fig. 4. Fig. 6 is a vertical section through the shuttle, its race and carrier, and the needle and awl carrying shaft on line 4 4 on Fig. 2, and showing the needle, its carrying-arm, the needle-guide, and the loop-spreader in elevation in the positions they assume when the needle is at the extreme of its rearward movement. Fig. 7 is a similar view, with the several parts in the positions they assume when the needle is in its intermediate standstill position. Fig. 8 is a similar view showing the needle in its position of rest after having pierced the work and when the shuttle is making its backward movement. Fig. 9 is a rear elevation of the shuttle removed from its race. Fig. 10 is a section of a portion of the machine on line 3 3<sup>a</sup> on Fig. 4, looking toward the right. Fig. 11 is an end elevation of the needle radius-

arm and its shaft. Fig. 12 is a side elevation of the same. Fig. 13 is a side elevation of the needle-clamping bolt. Fig. 14 is an elevation at the head end. Fig. 15 is an elevation looking at the opposite end. Fig. 16 is a side elevation of the awl-carrying radius-arm. Fig. 17 is an edge view of the same. Fig. 18 is a side elevation of the awl. Fig. 19 is an edge view of the same.

In the drawings, A is the bed of the machine, constructed and arranged so that it may be supported at the desired height upon a column or upon a bench, and upon which are supported all of the working parts of the machine.

B B are two end frames bolted to opposite ends of the bed A, and project upward therefrom and are connected together at their upper ends by the tie-girt C, as shown.

D is the cam-shaft mounted in bearings formed in the frames B B and having mounted thereon, between said bearings, the cylinder-cams E and E' and the cam-disks F, F', F<sup>2</sup>, F<sup>3</sup>, F<sup>4</sup>, and F<sup>5</sup> and outside of the right-hand frame B the driving-wheel G.

To the front edge of the bed A are bolted the stands G' and G<sup>2</sup>, which serve as supports for the shuttle race or bearing G<sup>3</sup>, which consists of a segment of a ring open both in front and rear, and is secured to said stands by the screws *a a*, said stands having formed in their upper ends suitable bearings, in which is mounted the needle and awl carrying shaft *b*, upon which are mounted the needle-carrying radius-arm *c*, the awl-carrying radius-arm *d*, the loop-spreader *e*, the needle and awl stay or guide arm *f*, with the pinion *g* attached thereto, the pinion *h* for rotating said shaft, and the grooved collar *i* to serve in connection with a suitable arm engaging therewith to impart an endwise reciprocation to said shaft for feeding the shoe or other article being sewed.

The needle-carrying radius-arm *c*, the pinion *h*, and the collar *i* are firmly attached to the shaft *b*, so as to move therewith, whether it is moved around its axis or in the direction of its length, while the needle and awl guide *f* and the loop-spreader *e* are so mounted on said shaft as to be freely oscillated about the



same and at the same time movable in the direction of the length of said shaft in unison therewith, and the awl-carrying radius-arm  $d$  is so fitted to said shaft as to be compelled to oscillate therewith, while it is free to be moved on said shaft in the direction of its length. To this end, that portion of the shaft on which the awl-carrying radius-arm is mounted is made square and the hub of said arm has a square hole to fit upon said square section of the shaft; but, if preferred, the shaft may be made round throughout, and said arm be fitted thereto by means of a spline and keyway. The needle-arm  $c$  is preferably made in one piece with the shaft  $b$ .

An oscillating motion is imparted to the shaft  $b$ , the needle-arm  $c$ , and the awl-arm  $d$  by means of the lever  $H$ , provided at one end with the toothed segment  $H'$ , and the cam  $F'$ , the path  $c^7$  of which acts upon a roll or stud carried by the other arm of said lever. The needle and awl guide or stay  $f$  has an independent oscillating motion imparted thereto by means of the lever  $I$ , having formed on one arm the toothed segment  $I'$ , which engages with the pinion  $g$ , and the cam  $F^2$ , the path of which acts upon a roll or stud set in the other arm of said lever, as shown. The needle-arm  $c$  has formed therein, near its free end, a segmental groove  $c'$  to receive the shank or butt of the needle  $c^2$ , which is clamped thereto by the bolt  $c^3$ , provided with the large head  $c^4$ , having on its inner side a corresponding groove  $c^5$  to receive the other side of the needle-shank, and the nut  $c^6$ , all as shown in Figs. 7, 11, 12, 13, 14, and 15. The awl  $d'$  is formed in one piece with the block-like haft  $d^2$ , formed with the offset  $d^3$ , and is secured to the awl-carrying radius-arm by means of a screw-bolt, said arm being provided with the offset  $d^5$  and the lip  $d^6$ , which form a recess or groove to receive said block or haft, as shown in Figs. 16, 17, 18, and 19. By this construction of the awl and needle carrying arms and the awl-haft the awl may be adjusted into almost close contact with the needle, or to a distance therefrom equal to the length of the longest-desired stitch.

The needle and awl guide or stay  $f$  has formed in its free end a slot  $f'$  of sufficient length in the direction of the length of the needle-carrying shaft to permit both the needle and awl to pass through the same when the awl is adjusted to its greatest distance from the needle. The stand  $G^2$  has bolted thereto the work-supporting arm  $j$ , which has formed in its free end a vertical slot for the passage of the needle and awl corresponding in length to the slot in the needle and awl guide. The tie-girt  $C$  is formed with a forward extension  $C'$ , in which is formed the bearings for the thread-carrier rod  $k$  and the presser-foot bar  $l$ , and has secured to its front side the stand  $J$ , having formed therein the vertical slot  $j'$ , in which is mounted the thread-guiding sheave  $j^2$ , as shown in Fig. 1. The rod  $k$  has mounted thereon, just below

its bearing in the front bar  $c'$  of the tie-girt  $C$ , the pinion  $k'$ , with which the teeth of the rack-bar  $k^2$  engage to impart to said bar and the thread-carrier  $k^3$ , secured to the lower end of said bar  $k$ , an oscillating motion about the axis of the rod  $k$ , whereby said thread-carrier will carry the thread which is passed through the eye in its free end into engagement with the barb of the needle, substantially as described in my before-cited pending application. The rack-bar  $k^2$  is mounted in a bearing  $C^2$ , connecting the front and rear bars of the tie-girt  $C$ , and has mounted on a stud, set in its rear end, a roll, (not shown,) upon which a cam-path, formed in the side of the cam-disk  $F^3$ , operates to impart to said rack an endwise reciprocation in a well-known manner. The bar  $l$  has secured to its lower end the presser-foot  $l'$ , and has set therein, below its bearing in the bar  $C'$  of the tie-girt  $C$ , the pin  $l^2$ , with which the forked end of the lever  $K$ , fulcrumed in the lower end of the pendent stand  $l^3$ , engages, so that by pressing upon the handle end of the lever  $K$  with sufficient force to overcome the tension of the spring  $K'$  said rod and presser-foot may be raised from the work when not locked. The tension of the spring  $K'$  tends to force the presser-foot downward upon the work in an obvious manner.

So far the presser-foot and its operation are old; but the mechanism for automatically raising, lowering, and locking the same, while operating upon somewhat the same principle as that shown in my before-cited pending application, is an improvement thereon, in that the ratchets are secured directly to the presser-foot bar, thus doing away with the possibility of lost motion between the presser-bar and the point where the lock is applied, as must be the case when the locking is done at a distance from the presser-bar and joints in the mechanism intervening between said lock and bar. In the present case I secure to opposite sides of the presser-bar  $l$  two steel bars  $l^4$  and  $l^5$ , and in their rear faces I form ratchet-teeth, with their pawl-engaging shoulders turned in opposite directions, said shoulders on bar  $l^4$  facing downward and those on bar  $l^5$  facing upward, as shown in Figs. 3 and 5, respectively.

$L$  is a lever fulcrumed on a pin  $l^6$ , set in ears  $l^7$   $l^7$ , projecting upward from the tie-girt  $C$  and carrying at its rear end a roll or stud, with which the cam-path  $l^8$ , formed in the side of the cam-disk  $F^4$ , engages and operates to impart to said lever  $L$  a vibratory motion about its fulcrum. The front end of the lever  $L$  is expanded to a greater width, and has pivoted thereto, upon its left side, two pawls  $m$  and  $m'$ , of slightly-different lengths, with their free ends upward, the same being mounted upon a common fulcrum-pin  $m^2$ , set in a slot  $m^3$ , formed in the lower part of the expanded end of said lever and adjustable therein by means of the set-screw  $m^4$ , as shown in Fig. 5. Two similar pawls  $n$  and  $n'$  are mounted on the pin  $n^2$ , set in the slot  $n^3$ ,



formed in the upper part of the expanded front end of said lever L and adjustable therein by the set-screw  $n^4$ , said pawls  $n$  and  $n'$  being on the right side of the lever L and have their free ends downward, and the pawls  $m, m', n$ , and  $n'$  are pressed toward the ratchet-bars  $l^4$  and  $l^5$  by the springs  $m^5, m^6, n^5$ , and  $n^6$ , respectively.

Between the ratchet-bars  $l^4, l^5$  and the front end of the lever L is the horizontal pin  $m^7$ , set in the upper end of the stand  $n^7$ , and so located as to height as to be equidistant from the pivot-pins of the two pairs of pawls when the front end of the lever L is in the center of its vibratory motion, and serves to throw said pawls out of engagement with their ratchet-bar at the proper time. It will be seen that the cam acts directly upon one end of the lever, and the pawls pivoted to the opposite end thereof act directly upon the presser-foot bar without the intervention of other parts or joints, which by looseness of fits, caused by wear or otherwise, would cause more or less lost motion, tending to partially destroy the effectiveness of the locking device. When the rear end of the lever L is depressed by the cam-path  $l^8$ , one or the other of the pawls  $m, m'$  will, during the latter part of its upward movement, engage a tooth on the bar  $l^4$  and raise the presser-foot from the work, in which position it is held until the work is fed to the position for forming a new stitch, the pawls  $n$  and  $n'$  being held away from the ratchet-bar  $l^5$  by the pin  $m^7$ , and when the rear end of said lever is raised by the cam-path  $l^8$  the presser-foot is forced downward by the spring  $K'$ , the pawls  $m$  and  $m'$  are forced away from the ratchet-bar  $l^4$  by the pin  $m^7$ , and one or the other of the pawls  $n$  will engage at the end of their downward movement with a tooth of the ratchet-bar  $l^5$  to lock the presser-foot against upward movement while the needle and awl are passing upward through the material being sewed.

M is the shuttle of the revolving hook-pattern, mounted in the shuttle-race  $G^3$  and having a portion of its periphery cut away to form the hook  $M'$  and a circular recess in its front side to receive a bobbin or spool of thread, said recess being closed by the hinged cover  $M^2$ , secured in a closed position by the screw-head  $m^9$ , one side of which is cut away to permit the opening of said cover, substantially as in my before-cited pending application.

N is the shuttle-operating shaft mounted in bearings  $N'$  and  $N^2$  on the bed A, and has secured to its front end a hub, from the front end of which projects the curved lip  $N^3$ , which engages the shuttle M within the cut through its periphery, so as to cause said shuttle to partake of the oscillating motions imparted to said shaft.

So far the construction of the shuttle and the means of connecting it to the operating-shaft are the same, as shown and described in my before-cited prior application; but in

that case the shuttle had an intermittent motion about its axis always in the same direction, while in my present invention the shuttle has imparted to it an oscillating motion about its axis, to accomplish which the shaft N has secured on its rear end the pinion  $N^4$ , with which the teeth of the segment  $O'$  on the free end of the long arm of the lever O engages, as shown in Figs. 1, 2, 3, and 5. The lever O is fulcrumed on the pin  $o$ , set in the stand  $O^2$ , secured to the rear edge of the bed A, and the short arm  $O^3$  of said lever carries at its upper end an anti-friction roll  $o'$ , which fits into and is acted upon by the path  $o^2$  of the cylinder-cam E, as shown in Figs. 1, 3, and 5. The rear face of the shuttle M has formed thereon two rearwardly-projecting ribs  $o^3$  and  $o^4$ , curved concentric to the axis of revolution of said shuttle and parallel to each other from a point at the root of the hook  $M'$  to the end of rib  $o^4$ , said ribs being at such a distance from the axis of the shuttle that when the shuttle has moved about its axis in the direction indicated by the arrow 10 on Fig. 2 a distance sufficient to pass the hook M fairly into the loop of thread the space between said ribs will be directly in the path of reciprocation of the needle, and they serve, in combination with a short forward movement of the needle at the right time, as a means of casting off the loop of thread from the barb of the needle, thus dispensing entirely with an independent cast-off device.

P is a stand bolted to the tie-girt C and depending therefrom between the cam-disks F and  $F'$ , and has pivoted to its lower end the take-up lever  $P'$ , which has mounted on a stud set therein a roll which is acted upon by the path in the cam-disk F to impart a vibratory motion to said lever for the purpose of taking up the slack in the thread and drawing up the loop after the shuttle has passed through the same. The front end of the lever  $P'$  has formed therein a slot  $p$ , in which is adjustably secured the bolt  $p'$ , which secures in position on said lever the block  $p^2$ , which carries in a slot formed therein the thread-guiding sheave  $p^3$ , as shown in Figs. 1, 2, 3, and 5.

Q is a thread-tension wheel mounted upon a pin set in the ears  $q' q'$ , and has formed thereon or secured thereto the ratchet-wheel  $q^2$ , with which the pawl  $q^3$ , carried by the lever Q, engages to lock said wheel, the lever Q being vibrated about its fulcrum-pin in the ears  $r r$  by the face-cam  $q^7$ , as shown. This tension-wheel and its locking mechanism form the subject-matter of another application of mine filed March 5, 1890, Serial No. 342,685, and therefore is not claimed in this, and need not be further described here. The bed A has formed on its upper surface, at its right-hand front corner, a dovetailed groove, the sides of which are parallel with the front edge of said bed and with the shaft D, in which is fitted, so as to be movable endwise therein, the plate R,



in the upper face of which is formed another dovetailed groove, extending about one-half the length of said plate R, in which is fitted, so as to be movable endwise therein, the smaller plate S. The plate R, has formed thereon or secured thereto the forked shipper-arm R', the forked end of which engages with the groove in the collar *i* as a means of imparting an endwise movement to the shaft *b* for the purpose of feeding the work when the awl and needle are within the work. The plate S has secured thereto and movable therewith the shipper-arm S', the forked end of which engages with the groove in the hub of the awl-carrying radius-arm *d*, and serves to adjust said awl toward or from the needle, according as a short or long stitch is desired. The right-hand end of the plate R has secured thereto the segmental locking-ratchet R<sup>2</sup>, the curve of which is concentric with the center of the stud R<sup>3</sup>, set in said plate R, and upon which is fulcrumed the adjusting hand-lever R<sup>4</sup>, the handle end of which is provided with the spring-actuated dog or pawl *r*<sup>3</sup>, which engages with the teeth of the segment R<sup>2</sup> to lock said hand-lever in the position to which it is adjusted. The hand-lever R<sup>4</sup> has formed therein, at the side of its hub opposite to the handle *r*<sup>4</sup>, two segmental slots *r*<sup>5</sup> and *r*<sup>6</sup>, eccentric to the axis of motion of said lever, as shown in Fig. 4. The plate S has formed upon its upper side the block or lug *s*, which serves as a stop to limit the movements of said lever R<sup>4</sup> by contact therewith of one or the other of two stop-pins *s*<sup>1</sup> and *s*<sup>2</sup>, adjustably secured in the slot *r*<sup>5</sup>, as shown. The plate S also has set in its upper side a stud *s*<sup>3</sup>, upon which is mounted a roll *s*<sup>4</sup>, which fits into and is acted upon by the eccentric slot *r*<sup>6</sup> to cause an endwise movement of the plate S, and through it and the forked arm S' to move the awl toward or from the needle, according to the length of stitch it is desired to make.

It is obvious that when the length of the stitch is changed the feed of the material must be varied accordingly, and as the feeding of the material is accomplished by moving the needle and awl and their carrying-shaft in the direction of the length of said shaft while the needle and awl are in the work I have conceived the idea of so connecting the awl-adjusting and feed-adjusting mechanisms that both adjustments may be made by one operation and while the sewing is being performed. To accomplish this, I mount on a stud, set in the under side of the lever R<sup>4</sup>, upon the side of its fulcrum opposite to the slots *r*<sup>5</sup> and *r*<sup>6</sup>, a segmental block *r*<sup>8</sup> or a roll, which fits into a curved slot *s*<sup>5</sup>, formed in the upper side of the front end of the lever T, fulcrumed on the stud *s*<sup>6</sup>, set in the bed A, and carrying at its rear end a roll or stud *s*<sup>7</sup>, which fits into and is acted upon by the path *s*<sup>8</sup> of the cylinder-cam E' to impart to said lever T a vibratory motion at the proper time about its fulcrum-pin, and said

lever, acting upon the truck or roll *s*<sup>7</sup>, moves the lever R<sup>4</sup>, the plate R, the forked arm R', the shaft *b*, the radius-arms *c* and *d*, and the needle and awl secured to said arms in a direction parallel to the axis of the driving-shaft D. The length of the reciprocating motions imparted to said parts depends, of course, upon the throw of the cam-path *s*<sup>8</sup> and the proportions of the two arms of the lever T, and it therefore follows that if the length of the front arm of said lever T is varied the length of the feed will be likewise varied. It will be seen upon examination that the slot *r*<sup>6</sup> is so arranged relatively to the axis of motion of the lever R<sup>4</sup> that a movement of the handle end of said lever toward the front of the machine will cause the awl to be moved toward the right or farther away from the needle, and at the same time the block or roll *r*<sup>8</sup> is moved farther away from the fulcrum of the lever T, thereby practically lengthening the front arm of said lever, so that the length of the reciprocation imparted to the needle and awl carrying shaft in the direction of its length is increased just in proportion to the increased distance between the needle and awl.

When the lever R<sup>4</sup> is to be adjusted, the operator raises the handle *r*<sup>9</sup> of the dog *r*<sup>3</sup> to disengage it from the teeth of the segment R<sup>2</sup>, when said lever may be moved about its axis in either direction till the stop-pin *s*<sup>1</sup> or *s*<sup>2</sup> comes in contact with the block or lug *s*, when he releases the dog which engages with the teeth of the segment R<sup>2</sup> and locks said lever against accidental displacement.

The bed A has formed on its upper surface, in the rear of the feed and awl adjusting lever, a dovetailed groove extending at right angles to the front and rear edges of said bed in which is mounted, so as to be movable endwise therein, the bar or plate U, having formed upon its upper side the two upwardly-projecting ears *t* and *t'*, to the former of which is pivoted the lever U', which carries at or near the middle of its length a roll or stud *t*<sup>2</sup>, (shown in dotted lines in Fig. 10,) which fits into and reciprocates in the cam-slot *t*<sup>3</sup>, formed in the plate U<sup>2</sup>, adjustably secured to the stand U<sup>4</sup>, as shown in Fig. 10. The ear *t'* has pivoted thereto one end of the link *t*<sup>4</sup>, the opposite end of which is adjustably pivoted to the lower end of the lever V, which is provided with the slot *u* for the purpose, is pivoted at its upper end to the stand V', and carries between its two ends a roll or stud, (shown in dotted lines in Fig. 10,) which fits into and is acted upon by the cam-path *u*<sup>1</sup> of the cam-disk E<sup>5</sup>, to impart to said plate U and the lever U' a reciprocating motion toward and from the front of the machine, during which the front end of said lever has imparted thereto, by the action of the cam-slot *t*<sup>3</sup> upon the stud or roll *t*<sup>2</sup>, a short rise and fall, all as shown in Fig. 10. To the front end of the lever U' is secured the rear end of the bent looper-finger V<sup>2</sup>, having formed on its



front end the thread-engaging hook  $v$ , as shown in Figs. 4 and 10.

In the drawings, the several parts of the machine are represented in Figs. 1, 2, 3, 4, 5, and 6 in the positions which they occupy when the needle has drawn out the loop below the work to its extremelength and the needle has moved forward to its intermediate standstill position and the shuttle has completed its passage through the loop of thread drawn out by the needle and the take-up has nearly completed the drawing up of the loop to complete the stitch. The needle-thread  $w$ , which is drawn from the bobbin or spool, (not shown,) is passed around the polygonal tension-sheave  $q$ , over the sheave  $p^3$ , carried by the take-up lever  $P'$ , thence in front of the sheave  $j^2$ , mounted in the stand  $J$ , secured to the front of the tie-girt, thence through the eye in the thread-carrier arm  $k^3$ , and then through the work or the eye or slot in the work-supporting arm  $j$ .

In sewing shoes the operation is as follows: The shoe is presented to the machine with the sole uppermost and the welt resting upon the work-supporting arm  $j$ , with the front of said arm in close contact with the upper, as described in my before-cited prior patent, when, if the cam-shaft be revolved in the direction indicated by the arrow  $w^2$  on Figs. 3 and 6, the needle and awl complete their forward and upward movement, passing through the work, where they remain in a state of rest, while the looper finger-hook  $v$  seizes the thread just below the thread-carrier arm  $k^3$  and recedes toward the rear of the machine, and the thread-carrier is partially rotated about the needle to lay the thread into the barb of the needle, during which latter movement the shaft  $b$ , with the awl and needle, is moved toward the left of the machine a distance equal to length of the stitch to be formed, carrying with it the work being sewed, and at the same time the shuttle is being rotated backward or in the direction indicated by the arrow 12 on Fig. 2, passing in the rear of the needle and awl carrying arms  $c$  and  $d$ , as shown in Fig. 8. When the shuttle  $M'$  has completed its backward revolution, so that its hook-point is at the right of the paths of the needle and awl, the needle and awl are moved downward, backward, and upward, drawing the loop of thread, formed above the work by the looper-finger  $V^2 v$ , through the work and forming the loop below the work, one strand of which is laid into the notch or groove in the free end of the loop-spreader  $e$ , which moves about the axis of the shaft  $b$  with the needle-carrier until its horizontal arm  $e'$  comes in contact with the stop-shoulder  $e^2$  on the lower arm of the fork of the arm  $R'$ , where it remains in a state of rest until the shuttle commences to rotate in the direction of the arrow 10, and the hook  $M$  of said shuttle passes above the lower strand of said loop. When said loop-spreader is moved toward the front by said shuttle, the needle

and awl are moved downward and forward again until the barb of the needle is between the ribs  $o^3$  and  $o^4$  on the back of the shuttle, the edges of which, coming in contact with the thread of the loop on each side of the needle, forces it out of the barb of the needle, and the shuttle continues its forward motion until it has passed through the loop, when the locking-pawl engages with the ratchet of the tension-wheel  $q$  to lock it against rotation, and the take-up lever is operated to draw up the loop and complete the stitch. The presser-foot is automatically lifted by the lever  $L$  and pawl  $m$  or  $m'$  while the feed of the work takes place, and is firmly locked against any upward movement by said lever and a pawl  $n$  or  $n'$  while the needle and awl are passing upward through the work, there being a portion of the time of the revolution of the cam-shaft during which neither of the pawls  $m$ ,  $m'$ ,  $n$ , or  $n'$  are in engagement with the ratchet-bars  $l^4$  or  $l^5$ , so that the presser-foot is free to be raised by the hand-lever  $K$  against the tension of the spring  $K'$  for the purpose of inserting the work beneath or removing it from the presser-foot.

The operation of the mechanism for adjusting the feed and the distance of the awl from the needle has already been sufficiently explained. The path  $c^7$  of the cam-disk  $F'$  (shown in dotted lines in Fig. 3,) is so formed as to impart three distinct movements to the shaft  $b$  and the needle and awl and their carrying-arms with a period of rest between them, as follows, viz: Starting from the extreme backward and upward positions of said parts, as shown in Fig. 6, the needle and awl are moved toward the front until they assume the position shown in Fig. 7, where they remain in a state of rest until the shuttle has completed its forward movement and passed entirely through loop of the thread, when the needle and awl are again moved in the same direction until they have passed upward through the work and assumed the position shown in Fig. 8, where they remain until the work is fed, the loop drawn out above the work, and the thread carried into the barb of the needle, and the shuttle completes its backward movement about its axis, when said awl and needle are moved backward about the axis of the shaft  $b$  to the starting position, as shown in Fig. 6. By this arrangement and mode of operating the needle and awl, and imparting thereto a reciprocating motion about their axis of motion to the extent of about three-fourths of a revolution or from the position shown in Fig. 6 to the position shown in Fig. 8, I am enabled to draw out the full length of loop of thread required for the passage of the shuttle in its forward movement by the needle without the aid of other devices, and also to give the forward movement to the shuttle while the needle and awl are in their rearmost position or moving from said position to their intermediate position shown in Fig. 7, and the backward motion to said shut-



tle while the needle and awl and their carrying-arms are in the positions shown in Fig. 8, the result of which is that I can run the machine much faster and with greater ease than if the forward and backward movements of the oscillating shuttle had to be completed while the needle and awl were at one extreme of their movement. This I consider a very important feature of my invention.

Another important feature is the construction and arrangement of the needle and awl carrying arms and the means of operating the same, whereby I am enabled to adjust the awl to a greater or less distance from the needle without removing the awl from its holder and without stopping the sewing.

Another great advantage is obtained by giving to the needle two forward movements with a standstill or period of rest between said two movements, in combination with the rotary shuttle, having formed on its back face two parallel ribs arranged concentric to the axis of revolution of said shuttle and at such a distance therefrom that when the needle is in its intermediate standstill position its point and barb are between said ribs, whereby the shuttle operates to cast off the thread from the barb of the needle, thus dispensing entirely with an independent cast-off and the mechanism for operating the same.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a sewing-machine, the combination of a rocker-shaft, two independent radius-arms arranged side by side upon said shaft and adjustable toward and from each other, a curved needle carried by one of said arms, a curved awl carried by the other of said arms and movable in unison with said shaft about its axis and in the direction of its length, and means having provision for adjusting said radius-arms toward and from each other.

2. In a sewing-machine, the combination of a needle and awl operating shaft mounted in bearings so as to be revoluble and movable endwise therein, two radius-arms arranged side by side on said shaft, one being fixed thereon and the other movable in the direction of the length of said shaft, and both revoluble therewith, a curved needle mounted in the free end of said fixed arm, a curved awl mounted in the free end of the other arm in a position by the side of and parallel to said needle, a forked shipper-arm constructed and arranged to engage with the hub of the awl-carrying radius-arm, and a hand-lever constructed and arranged to move said shipper-arm and the awl-carrying radius-arm in the direction of the length of the needle and awl operating shaft to vary the distance between the needle and awl.

3. The combination, in a sewing-machine, of a needle and awl operating shaft mounted in bearing so as to be revoluble and movable endwise therein, two radius-arms arranged side by side on said shaft, one being fixed thereon and the other movable lengthwise of

said shaft and provided with a peripheral groove in its hub and both revoluble with said shaft, a curved needle mounted in the free end of said fixed arm, a curved awl mounted in the free end of the movable arm in a position by the side of and parallel to said needles, a grooved collar fixed on said shaft, a sliding plate, a shipper-arm carried by said plate and engaging with the grooved collar on said shaft, a second sliding plate mounted on the first-mentioned plate, a forked shipper-arm carried by said second plate and engaging with the groove in the hub of the awl radius-arm, a hand-lever mounted upon a fulcrum-pin set in the first-mentioned sliding plate constructed and arranged to act upon the second sliding plate to impart endwise motion thereto by a movement of said hand-lever about its fulcrum, a lever fulcrumed upon a pin set in a fixed portion of the machine and provided in one arm with a curved groove to engage with a block or roll on the handle-arm of said hand-lever, and a cam constructed and arranged to act upon the other end of said lever to vibrate the same, substantially as and for the purposes described.

4. The combination, in a sewing-machine, of the shaft *b*, mounted so as to be movable endwise and about its axis, the arm *c*, fixed thereon, the arm *d*, mounted on said shaft and revoluble therewith and movable lengthwise thereof, the curved needle carried by the arm *c*, the curved awl carried by the arm *d*, the plate *R*, provided with the segmental ratchet *R*<sup>2</sup>, the plate *S*, provided with the lugs and the roll *s*<sup>4</sup>, the shipper-arms *R*<sup>1</sup> and *S*<sup>1</sup>, the hand-lever *R*<sup>4</sup>, fulcrumed upon the plate *R* and provided upon one side of said fulcrum with the slots *r*<sup>5</sup> and *r*<sup>6</sup> and upon the other side of said fulcrum with the block or roll *r*<sup>8</sup>, the dog or pawl *r*<sup>3</sup>, the lever *T*, provided with a curved groove to receive the roll *r*<sup>8</sup> and at its opposite end with the roll or stud *s*<sup>7</sup>, and the cylinder-cam *E*<sup>1</sup>, all constructed, arranged, and adapted to operate substantially as described.

5. The combination, in a sewing-machine, of a curved needle mounted in the free end of a radius-arm carried by an oscillating shaft, a pinion on said shaft, a lever having formed on one arm a segment of a gear to engage said pinion, a cam to act upon the opposite end of said lever, constructed and operating to impart to said needle a forward movement in two steps, with a rest between, and a backward movement in a single step, and a rotary shuttle arranged to move in a plane at right angles to the plane in which the needle reciprocates, with its hook in position to intersect the path of the needle, and provided on its rear face with two segmental ribs concentric with the axis of said shuttle and at such distances therefrom that the point and barb of the needle when in its intermediate standstill position will be between said ribs, as set forth, and said ribs



will have cast the thread off from the barb of the needle.

6. The combination, in a sewing-machine, of a curved needle mounted in the free end of a radius-arm carried by an oscillating shaft, a pinion on said shaft, a lever having on the free end of one arm a toothed segment to engage said pinion, a cam to act upon said lever constructed and operating to impart to said needle a forward movement in two steps, with a period of rest between said steps, and a backward movement in a single step, with a period of rest between the forward and backward movement, a reciprocating rotary shuttle, a shuttle-operating shaft having mounted thereon a pinion, a lever having a toothed segment on the free end of one arm thereof to engage said pinion, and a cam to act upon said lever, constructed and operating to impart to said shuttle a complete revolution in a forward direction and a corresponding backward movement, with a standstill at the end of each movement, said movements being so timed that the forward movement of the shuttle takes place while it is at or in the rear of its intermediate standstill position, and the backward movement of the shuttle takes place while the needle is in a state of rest at the extreme of its forward and upward movement.

7. The combination, with the shaft *b*, the needle-arm *c*, fixed thereon, the needle *c*<sup>2</sup>, and the bolt *c*<sup>3</sup>, provided with the clamping-head *c*<sup>4</sup>, of the awl-arm *d*, movable lengthwise on said shaft and provided with the offset *d*<sup>5</sup> and the lip *d*<sup>6</sup>, and the awl *d*<sup>7</sup>, formed in one piece with the block-like haft *d*<sup>2</sup>, provided with the offset *d*<sup>3</sup>, and secured to the awl-arm by a screw-bolt, whereby said awl is adapted to be adjusted into close proximity to or away from said needle.

8. In combination with the presser-foot bar, two ratchet-bars secured thereto upon opposite sides thereof, with the pawl-engaging shoulders on one facing downward and on the other upward, a lever carrying on its front end a pawl or pawls arranged to engage at the proper times with the teeth of each of said ratchet-bars, a cam to act upon the rear end of said lever and impart thereto a vibratory motion, and a guard-pin constructed and arranged to retract said pawls from engagement with said ratchet-bars during a portion of the time of each revolution of the cam-shaft.

9. The combination of the needle carrying and operating shaft, a radius-arm fixed thereon, a second radius-arm mounted upon and revoluble with and movable endwise of said shaft, a curved needle mounted in the free end of said fixed arm, a curved awl mounted in the free end of said movable arm in a position by the side of and parallel with said needle, a forked shipper constructed and arranged to engage with the hub of the awl radius-arm, a pivoted hand-lever engaging with said shipper to impart motion thereto, a pawl or dog mounted upon the handle end of said hand-lever, and a ratchet constructed and arranged to be engaged by said pawl or dog to lock said hand-lever, and through it the awl, against accidental displacement.

10. In combination with the needle carrying and operating shaft and a revolving shuttle, the stands *G'* *G*<sup>2</sup>, detachably secured to the front of the bed by suitable bolts, and having formed in their upper ends bearings for said shaft and in their inner sides with bearing-surfaces to fit the shuttle-raceway, the raceway *G*<sup>3</sup>, made in the form of a segment of a ring and fitted between and supported by said stands, and the screws *aa*, for securing said raceway to said stands.

11. In combination with the needle carrying and operating shaft of a sewing-machine and a revolving shuttle, the stands *G'* and *G*<sup>2</sup>, detachably secured to the front of the bed of the machine by suitable bolts, and having formed in their upper ends bearings for said shaft, bearing-surfaces upon their inner sides to receive the shuttle-raceway, and one of said stands being provided with a bearing to receive the work-support, the shuttle-raceway *G*<sup>3</sup>, made in the form of a segment of a ring and fitted between and supported by said stands, the screws *aa*, for securing said raceway to said stands, and the work-support *j*, detachably secured by a bolt or screw to one of said stands, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 13th day of January, A. D. 1890.

JOSEPH ELI BERTRAND.

Witnesses:

N. C. LOMBARD,  
WALTER E. LOMBARD.