

(No Model.)

7 Sheets—Sheet 1.

J. E. BERTRAND.
SOLE SEWING MACHINE.

No. 409,161.

Patented Aug. 20, 1889.

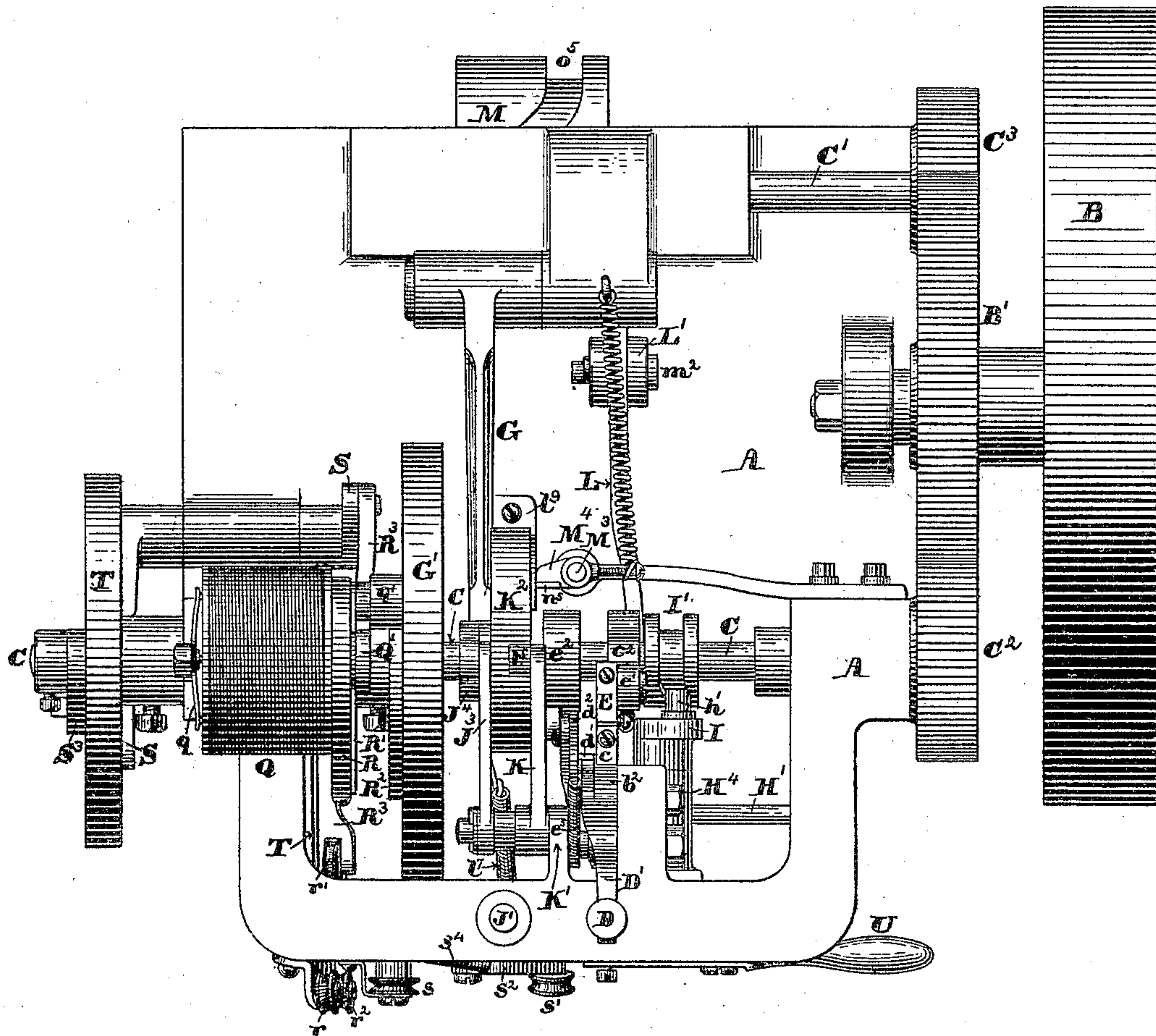


Fig. 1.

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J. D. Field

Inventor:
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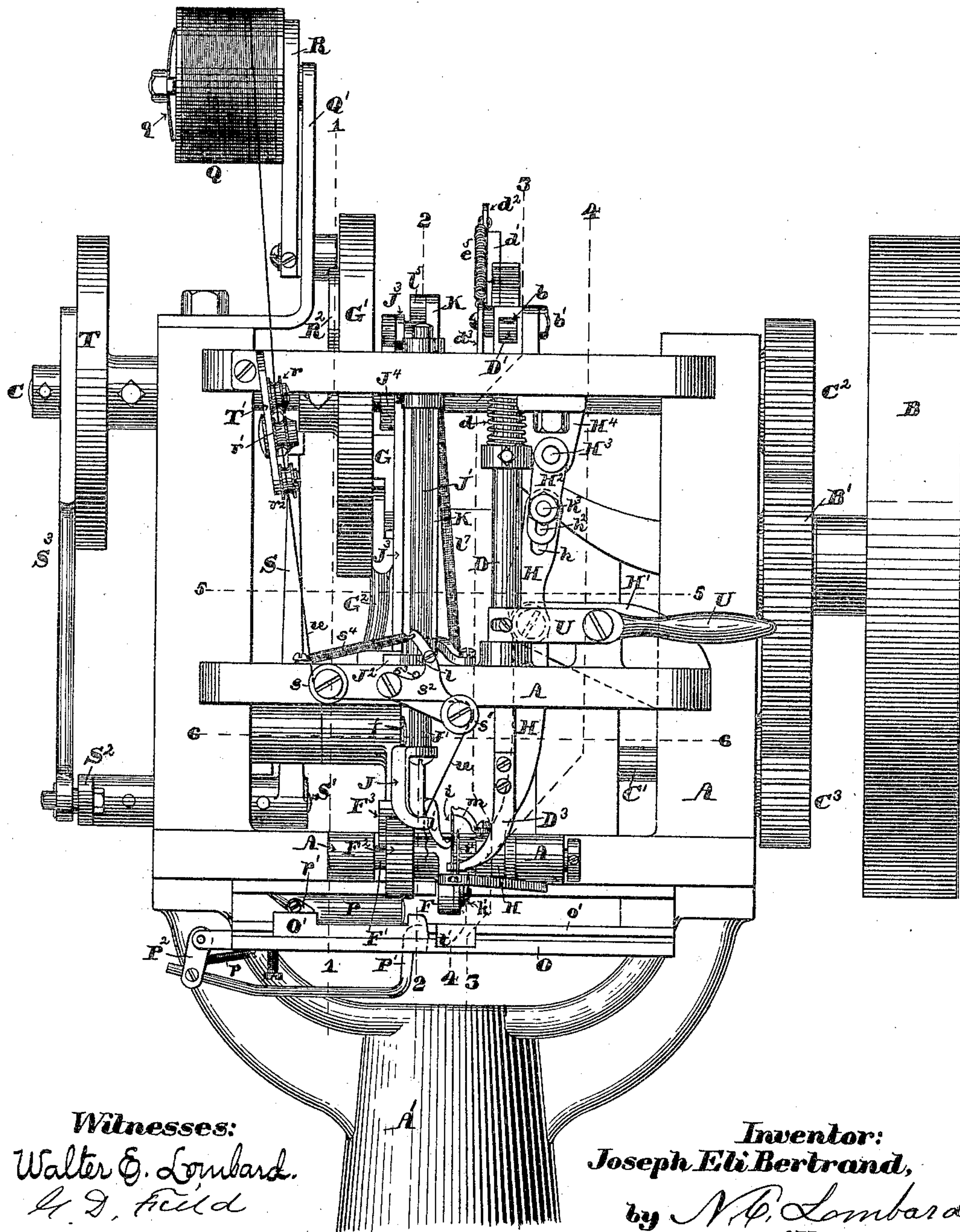
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J. E. BERTRAND.
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No. 409,161.

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Witnesses:
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Fig. 2.

(No Model.)

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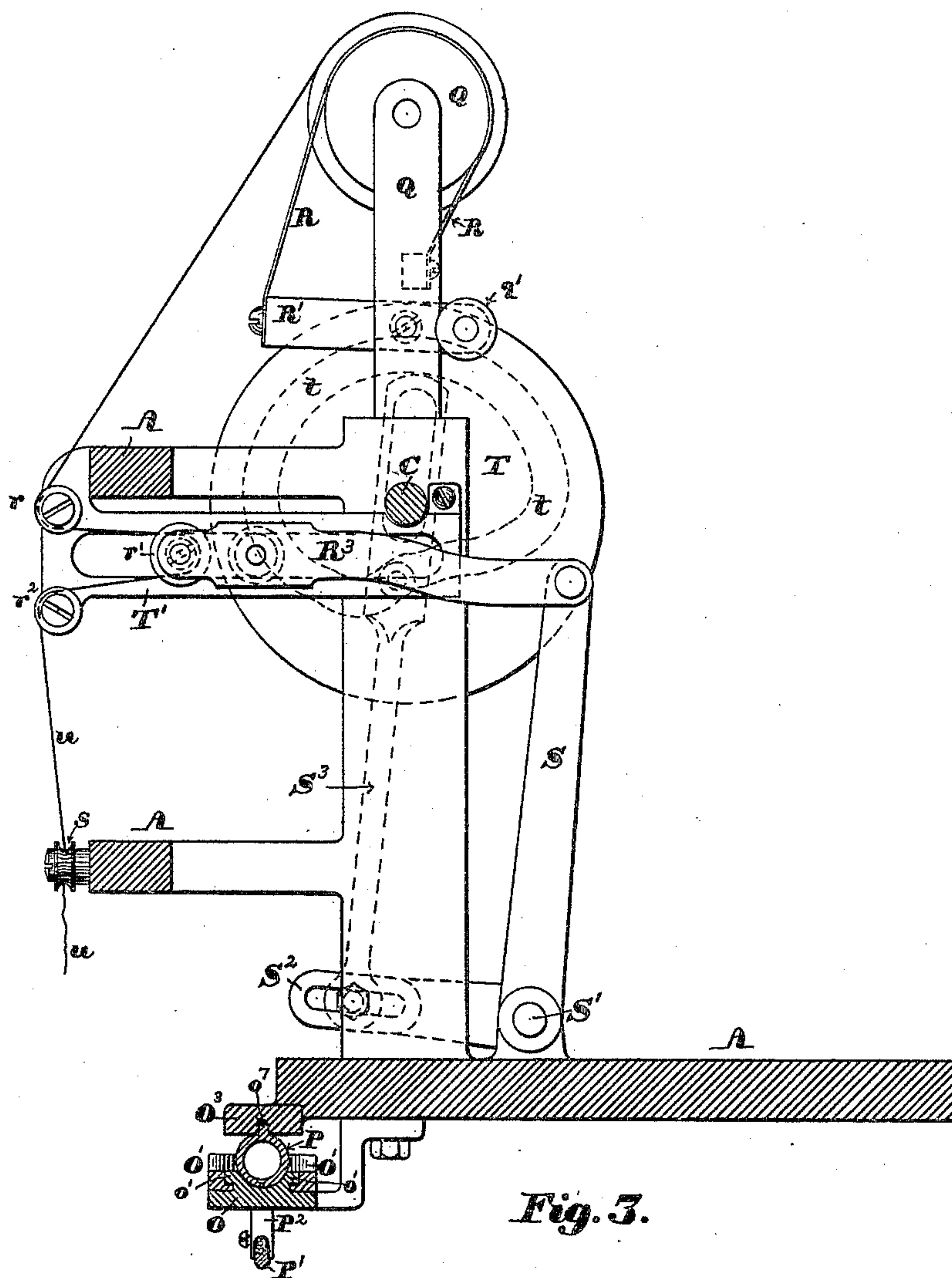


Fig. 3.

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(No Model.)

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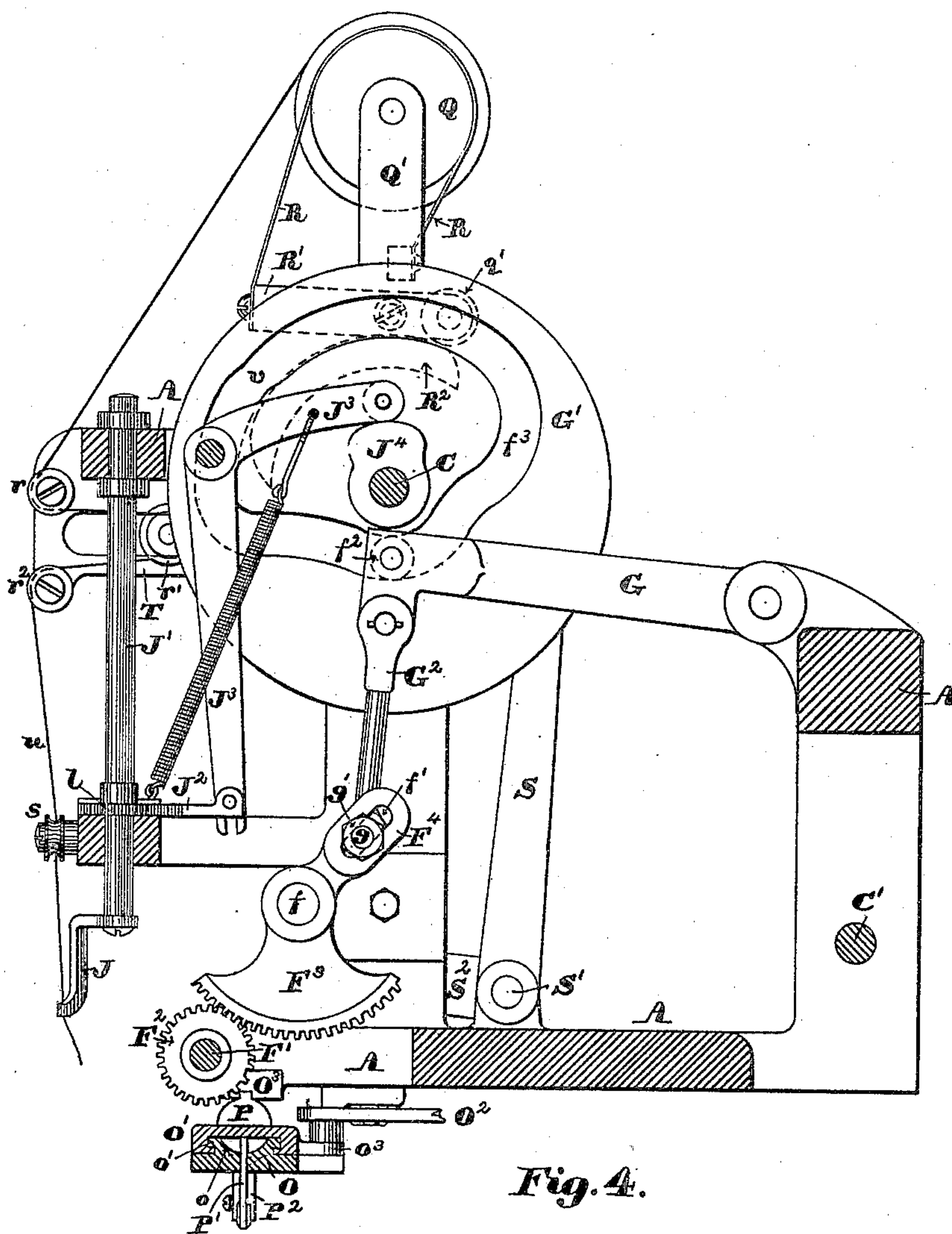


Fig. 4.

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(No Model.)

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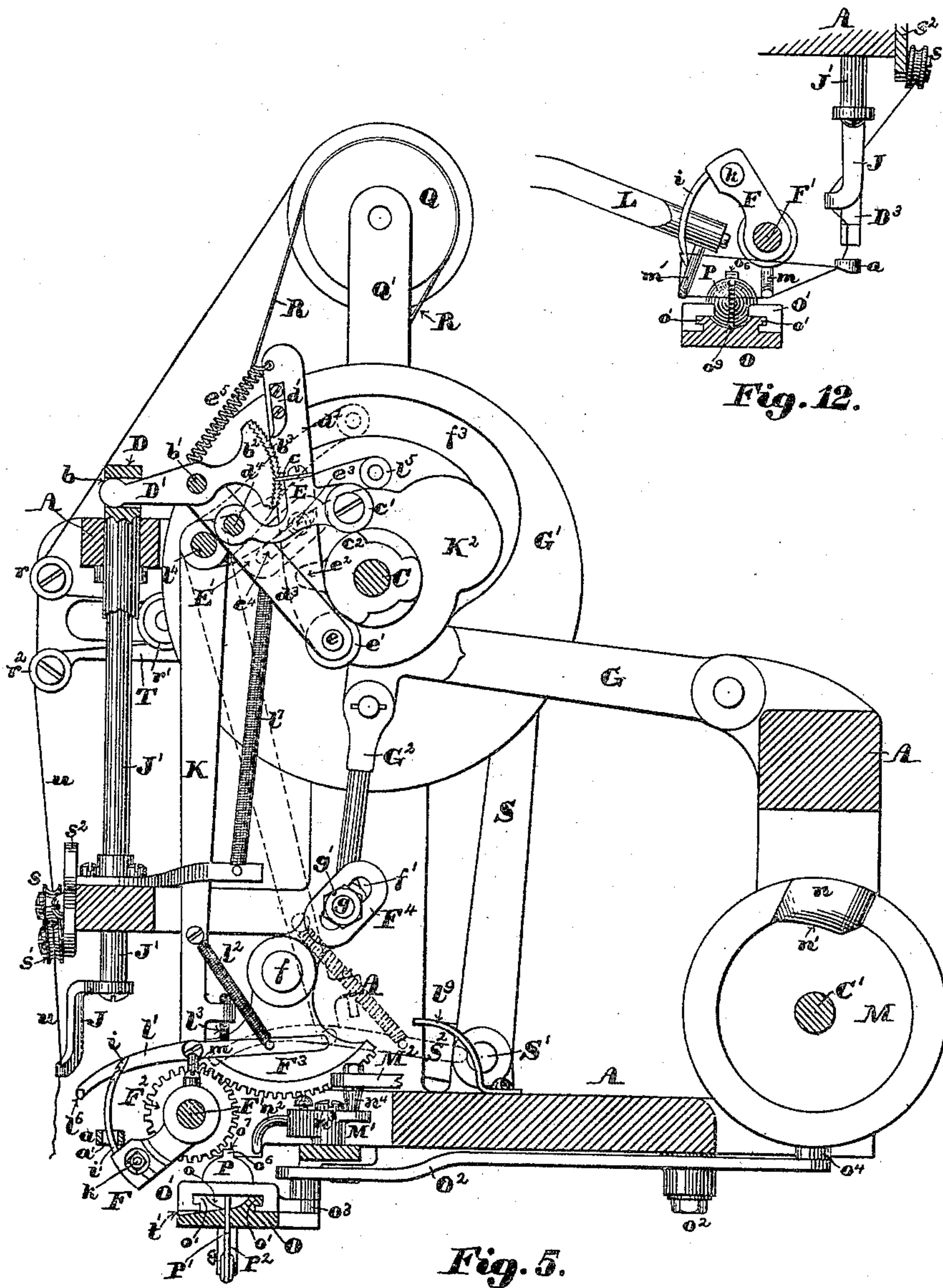


Fig. 5.

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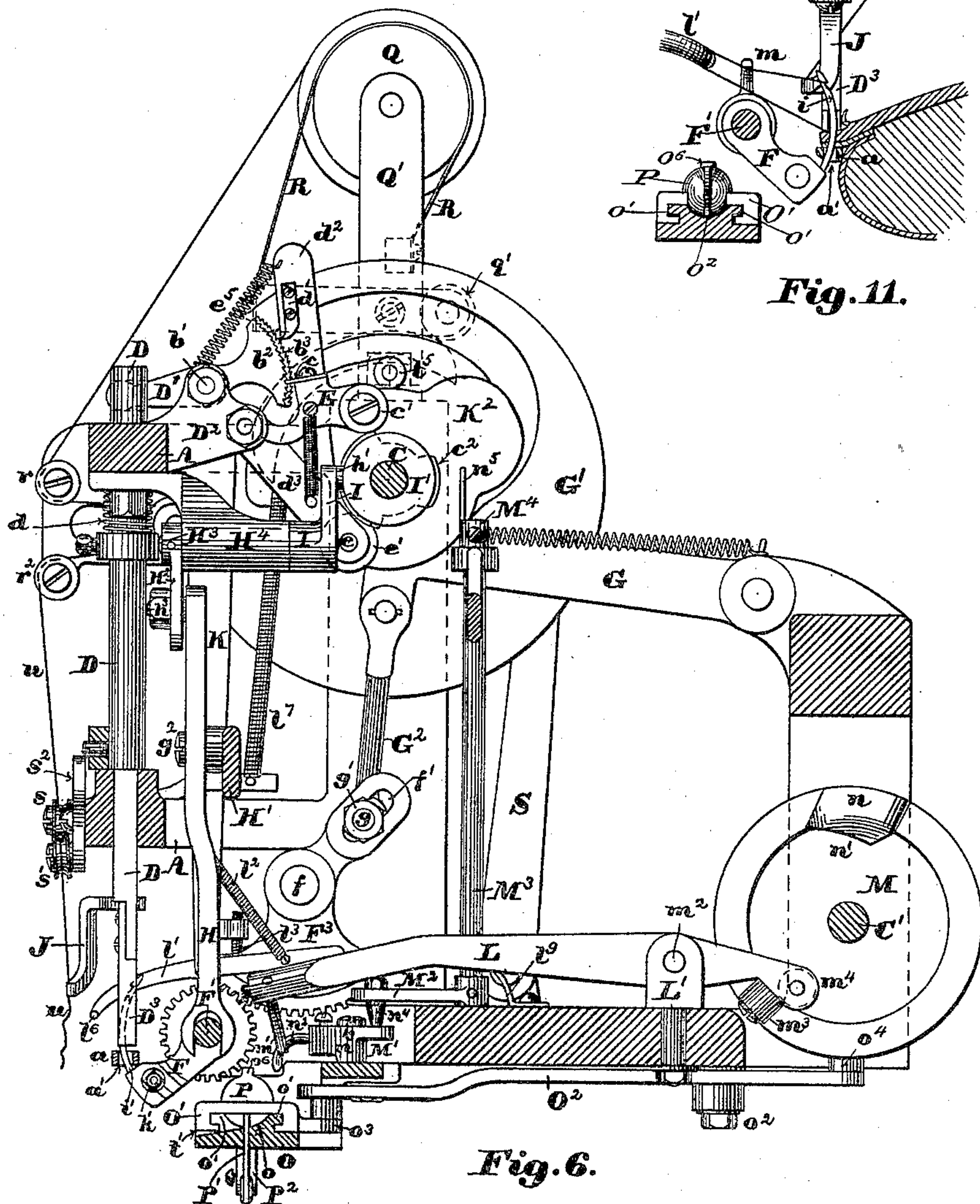


Fig. 6.

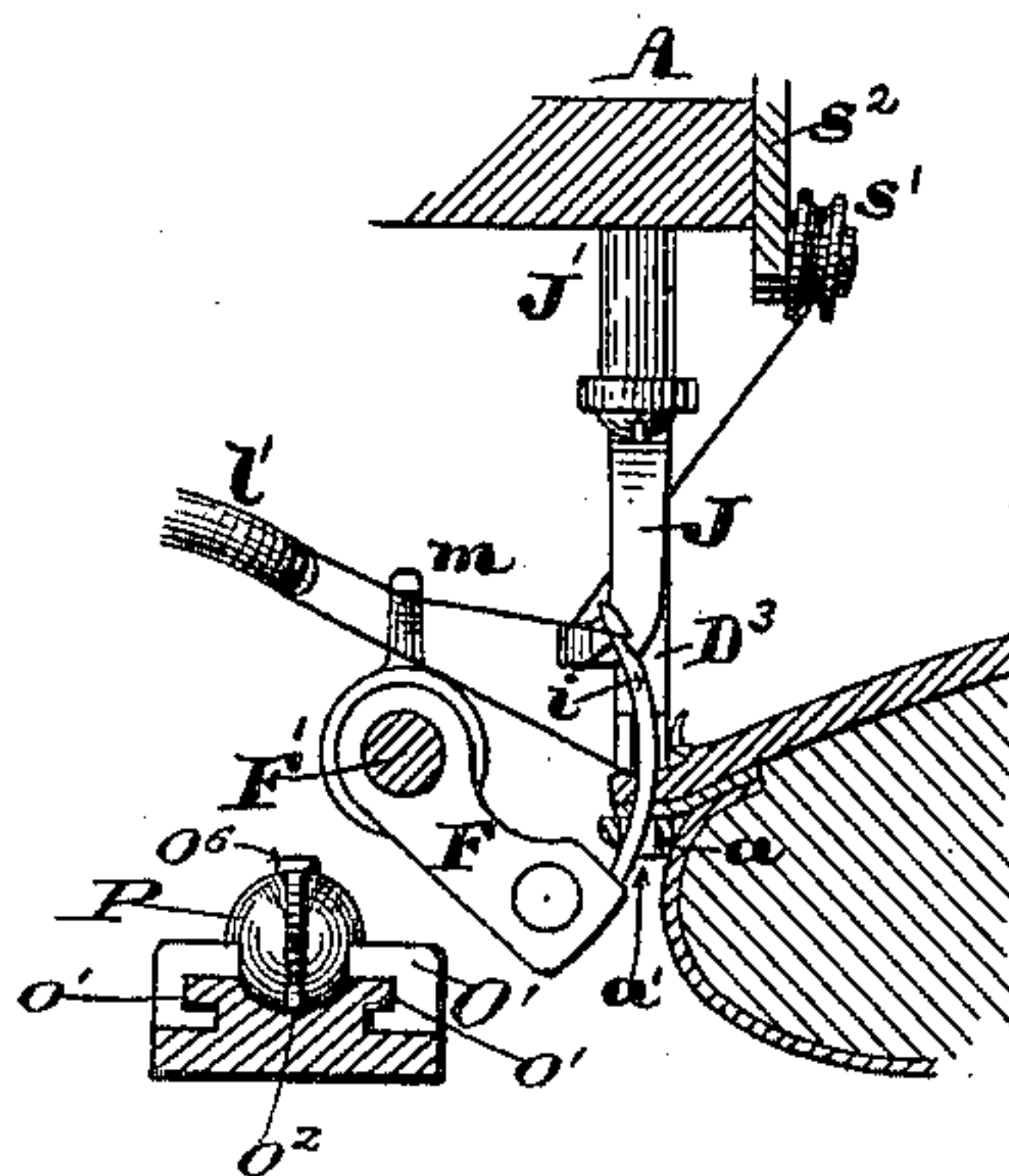


Fig. 11.

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7 Sheets—Sheet 7.

No. 409,161.

Patented Aug. 20, 1889.

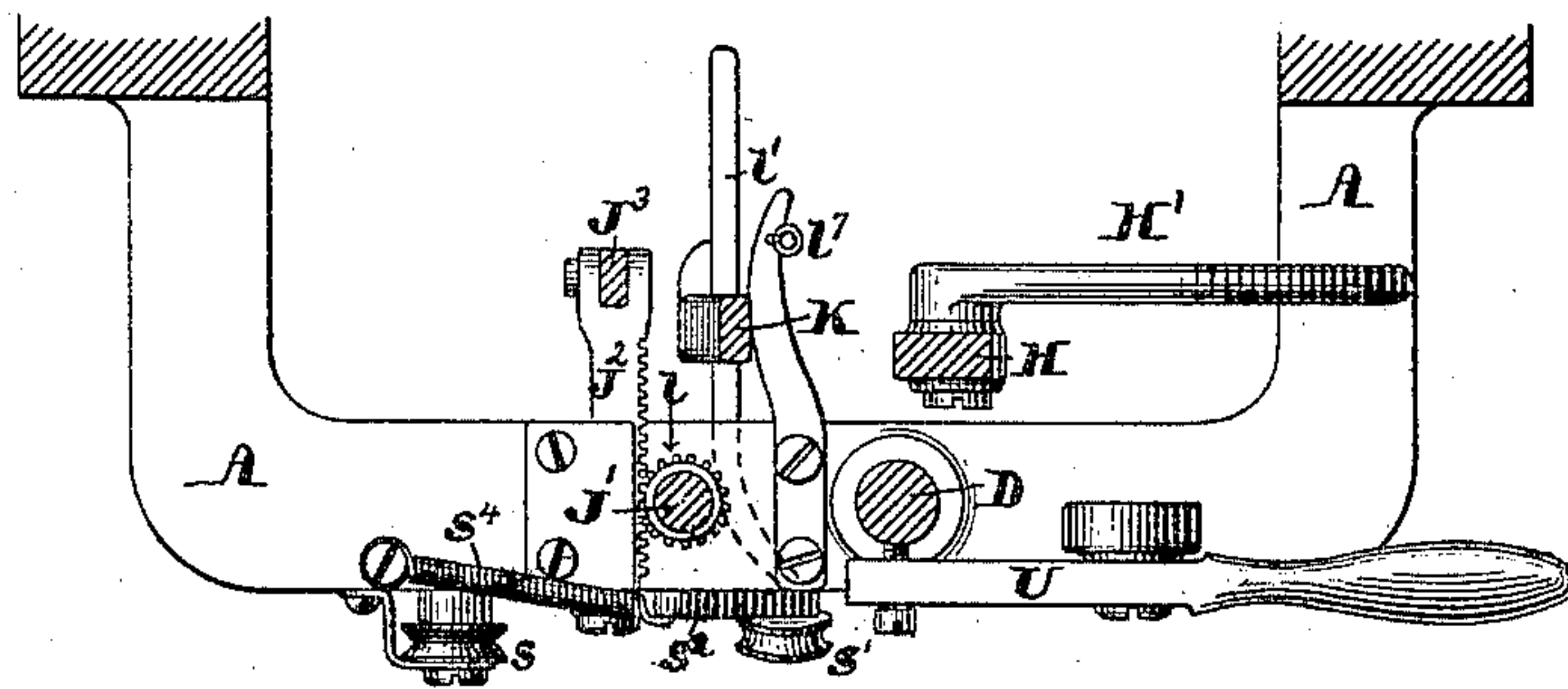


Fig. 7.

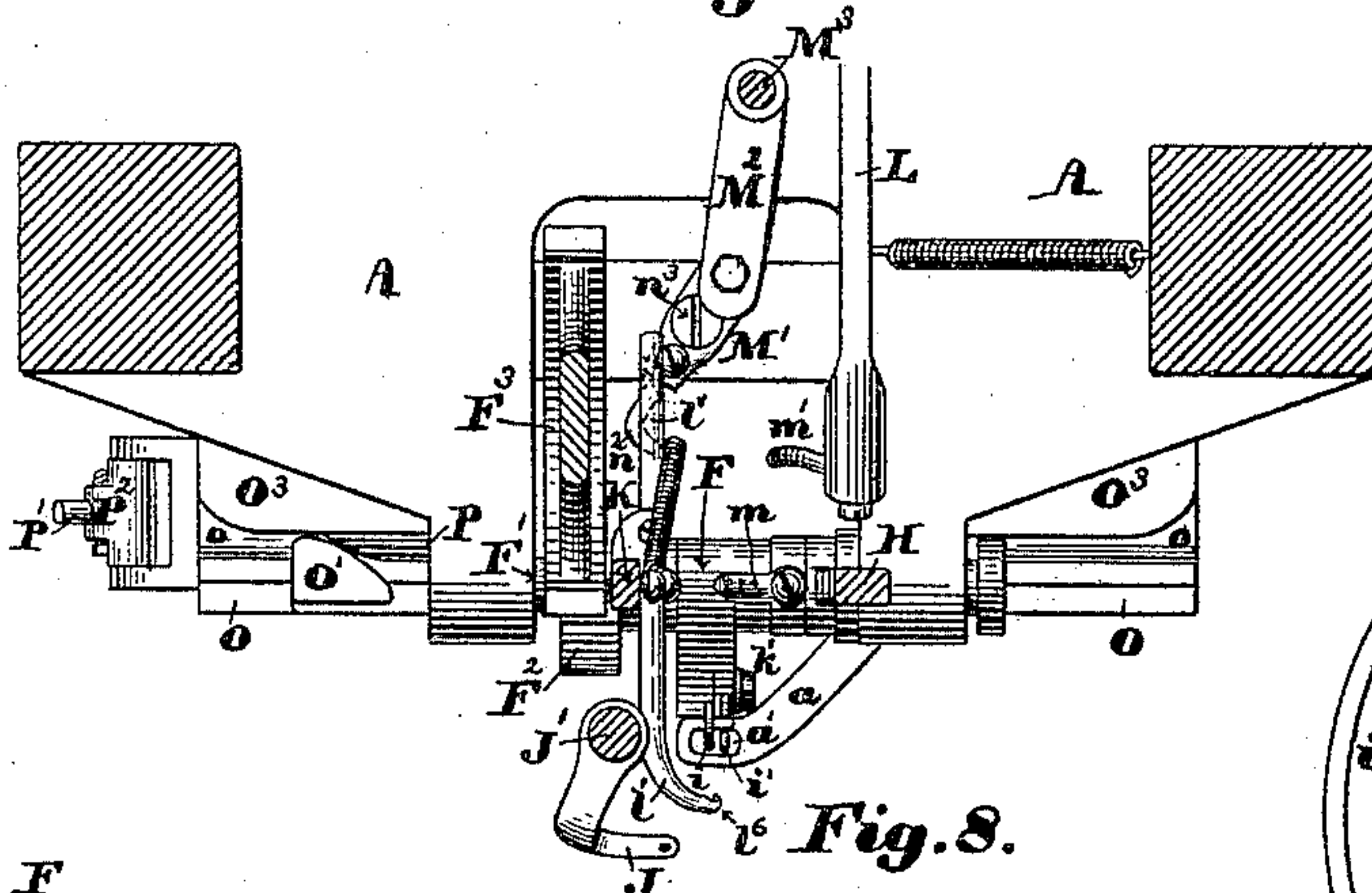


Fig. 8.

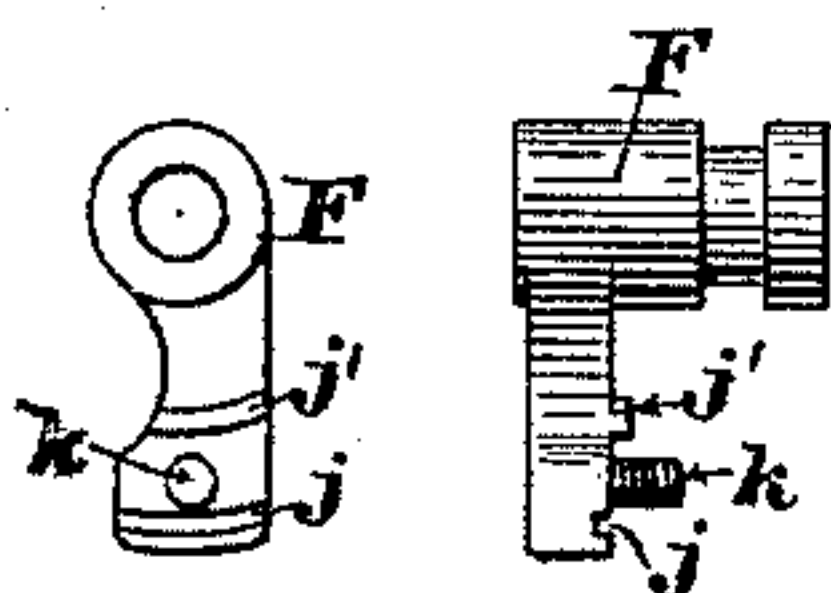


Fig. 13. Fig. 14.

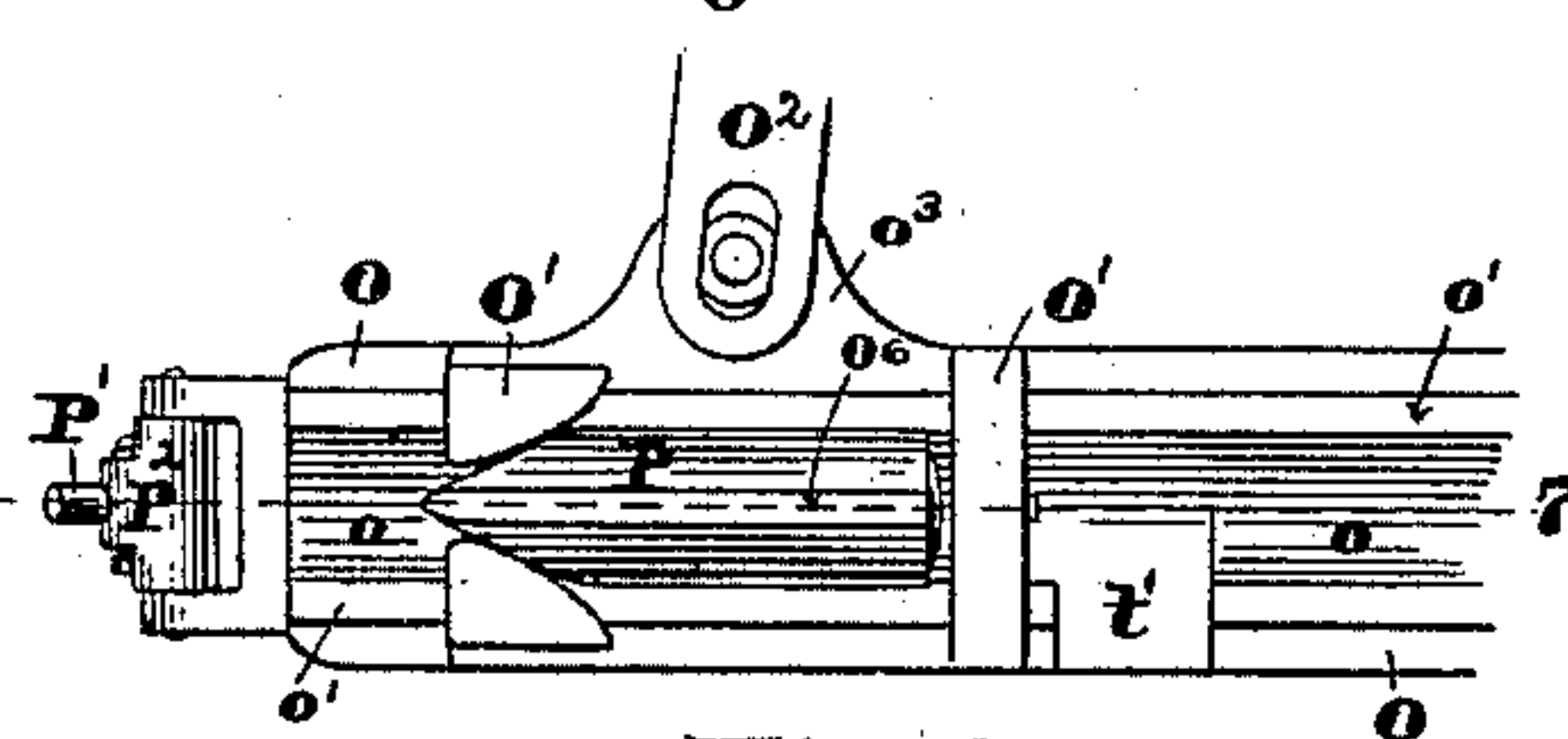


Fig. 9.

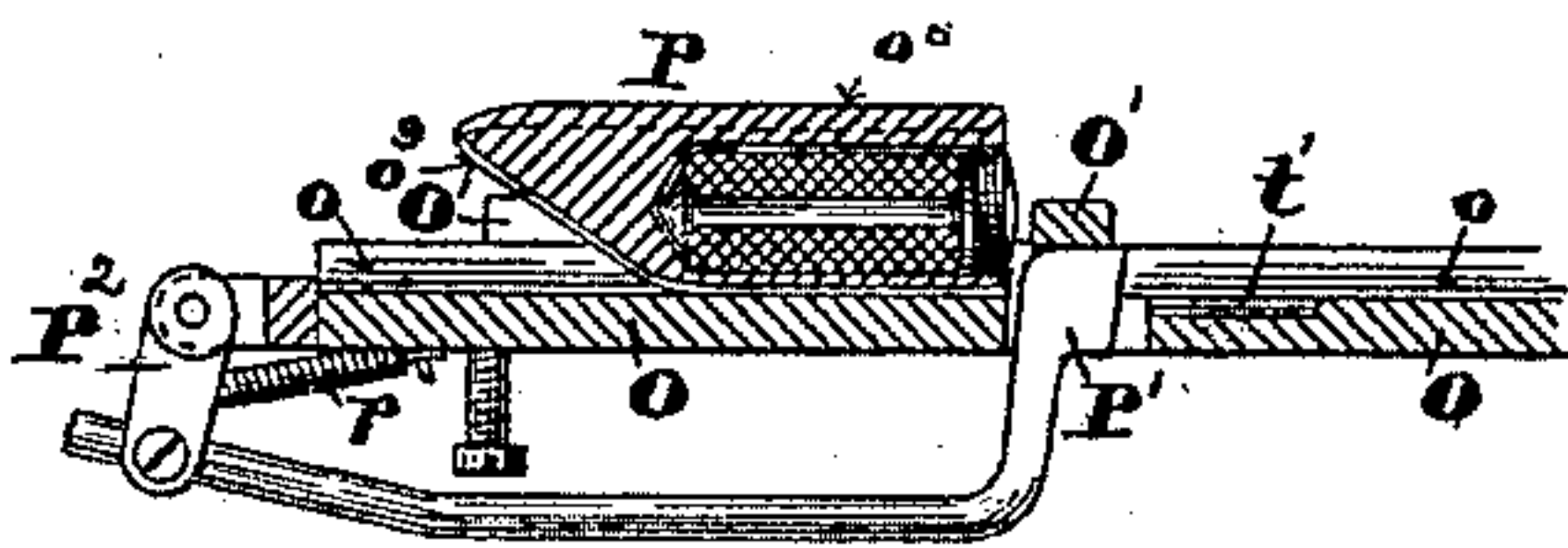


Fig. 10.

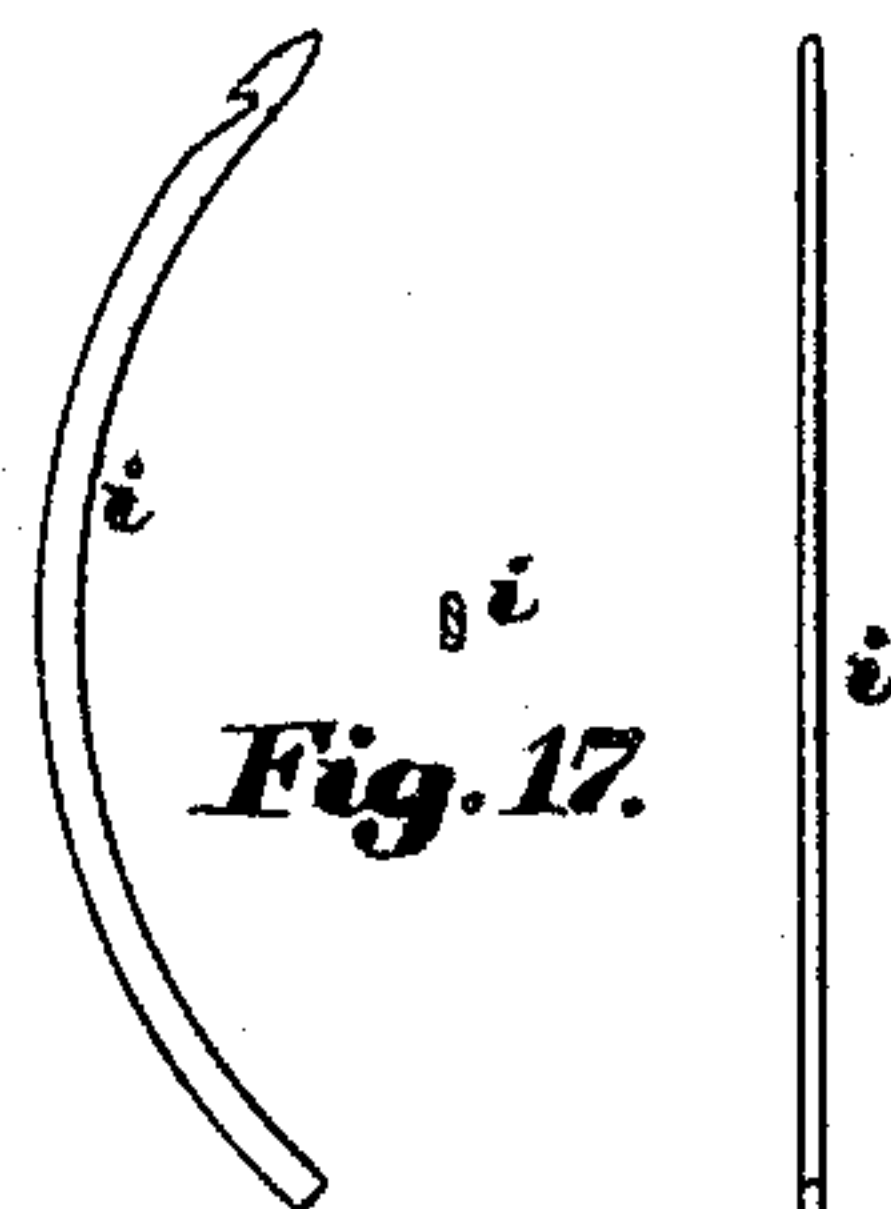


Fig. 17.

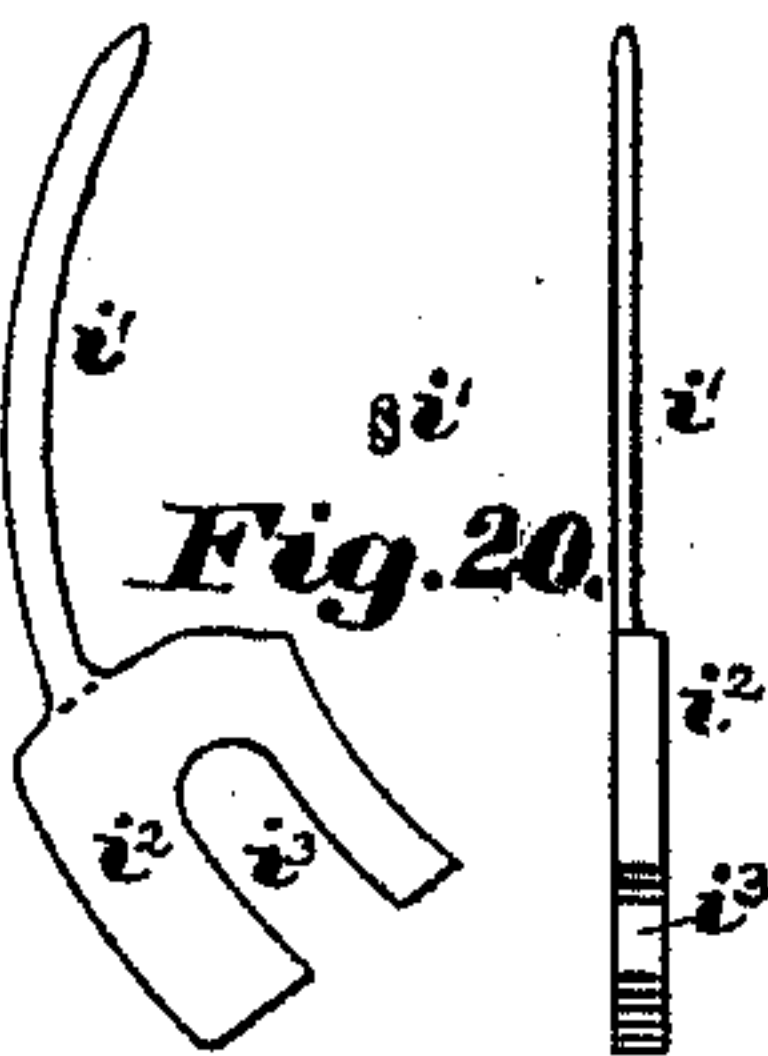


Fig. 20

Fig. 18. Fig. 19.

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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. 409,161, dated August 20, 1889.

Application filed September 17, 1888. Serial No. 285,575. (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.

This invention relates to machines for uniting the soles of boots and shoes to their uppers, and has for its object to provide a novel and efficient mechanism by the use of which a lock-stitch may be formed and the outer sole be stitched to the welt at the shank as well as at the ball and around the toe, regardless of the width of the last, and without removing the last from the boot or shoe.

My invention consists in certain novel features of construction, arrangement, and combination of parts which will be best understood by reference to the description of the drawings and to the claims to be hereinafter given.

Figure 1 of the drawings is a plan of so much of my improved sole-sewing machine as is necessary to illustrate my invention. Fig. 2 is a front elevation of the same. Fig. 3 is a vertical section on line 1 1 on Fig. 2, looking toward the left. Fig. 4 is a vertical section on line 2 2 on Fig. 2, also looking toward the left. Fig. 5 is a vertical section on line 3 3 on Fig. 2, also looking toward the left. Fig. 6 is a vertical section on line 4 4 on Fig. 2, looking in the same direction as in the case of the other vertical sections. Fig. 7 is a partial horizontal section on line 5 5 on Fig. 2. Fig. 8 is a partial horizontal section on line 6 6 on Fig. 2. Fig. 9 is a plan of the shuttle, shuttle-carrier, and a portion of the shuttle-race; and Fig. 10 is a longitudinal section through the shuttle and shuttle-race on line 7 7 on Fig. 9. Fig. 11 is a diagram illustrating the formation of the loop above the work. Fig. 12 is a diagram illustrating the formation of the loop below the work. Figs. 13, 14, 15, 16, 17, 18, 19, and 20 are detail views of the needle-carrier, needle, and awl, to be hereinafter referred to.

In the drawings, A is the frame of the head of the machine, which is firmly secured to the

stand or column A', a portion of which is shown in elevation in Fig. 2.

B is the driving-pulley and balance-wheel, having secured upon its hub the spur gear-wheel B' and mounted so as to revolve freely on the fixed stud set in an upright of the frame A.

C and C' are cam-shafts mounted in bearings in the frame A and having secured upon their outer ends the pinions C² and C³, respectively, which pinions engage with the gear-wheel B' upon opposite sides thereof, so as to be revolved thereby when the pulley B is revolved. A work-supporting arm *a* is secured by one end to the under side of the frame A and projects obliquely therefrom and has formed in its outer end a slot *a'*, through which the needle and awl pass to enter the work resting thereon.

D is the presser-foot rod, mounted in bearings in the frame A and projecting above its upper bearing, and having in its upper end the lateral opening *b* to receive the front end of the locking-lever D', which is pivoted at *b'* to the stand D² and has formed upon its rear end a segmental ratchet *b*², the teeth of which are arranged with their shoulders downward, and with which the pawl *c*, mounted upon the lever E, engages to lock said presser-bar in position with the presser-foot in firm contact with the work and prevent it being raised or moved upward by the passage of the needle and awl through said work.

The pawl-lever E is pivoted to the stand D², and carries at its free end the truck *c'*, which is acted upon by the cam *c*², mounted upon and revoluble with the shaft C, as shown in Figs. 1 and 2, said cam *c*² being so formed and timed as to cause the pawl *c* to engage with a tooth of the ratchet *b*² and lock the presser-foot rod while the needle and awl are passing through the work.

The presser-foot rod D is forced downward or toward the work by the spring *d*, and has secured to its lower end the presser-foot D³ to rest upon the upper surface of the work and grip it between it and the work-supporting arm *a*, as shown in Fig. 11.

A second segmental ratchet *b*³ is firmly secured to the side of the ratchet *b*², the teeth

of which have their shoulders or working-faces turned upward, or in the reverse direction to the teeth of the ratchet b^2 , and are engaged by the pawl d' , secured to the side of the arm d^2 , which in turn is pivoted to the free end of the lever d^3 , mounted upon a fulcrum-pin set in the stand D^2 at d^4 , as shown in Fig. 5. The free end of the lever d^3 has set therein a stud e , upon which is mounted the truck e' , upon which the cam e^2 acts to raise the presser-foot from the work at the proper time to permit the work to be fed by the lateral movement of the needle and awl. The arm d^2 has set therein a stud e^3 , which projects into the cam-slot e^4 , formed in the fixed plate E' , said slot and stud co-operating with the vibratory motions of the lever d^3 and arm d^2 to control the disengagement of the pawl d' from the teeth of the ratchet b^3 against the tension of the spring e^5 and permit said engagement at the proper time.

F is the needle-carrier, firmly secured upon the shaft F' , mounted in bearings in the front edge of the lower plate of the frame A in such a manner as to be revoluble and movable endwise therein.

The shaft F' has firmly secured thereon the pinion F^2 , with which the teeth of the segment F^3 engage to impart to said shaft and needle-carrying arm an oscillating or reciprocating rotary motion about the axis of said shaft. The segment F^3 is mounted upon the stud f , set in the frame A , or a stand secured thereto, and is provided with the arm F^4 , in which is formed a longitudinal slot f' , as shown in Fig. 5.

G is a lever pivoted to an ear or stand on the rear bar of the frame A and carrying at its free end a truck f^2 , (shown in dotted lines in Fig. 4,) which fits into and is acted upon by the path f^3 of the cam G' to vibrate said lever.

G^2 is a link pivoted at its upper end to the free or movable end of the lever G and adjustably connected at its lower end by means of the stud g and nut g' to the arm F^4 of the segment F^3 , thereby rendering it practical to vary the length of arc through which the needle-carrier oscillates, all as shown in Figs. 4, 5, and 6.

The hub of the needle-carrier, or a separate hub or collar secured on the shaft F' , is provided with an annular groove, with which the forked lower end of the lever H engages. The lever H is pivoted at g^2 to the stand H' and has formed in its upper end a longitudinal slot h , and is connected to the lower end of the lever H^2 , mounted upon a rocker-shaft H^3 , mounted in the stand H^4 , and having secured upon its rear end the lever I , which carries at its free or movable end a truck h' , which fits into and is acted upon by the path of the cylinder-cam I' , as shown in Figs. 1 and 6, the lever H^2 being provided with the longitudinal slot h^2 and connected to the lever H by means of the stud h^3 , adjustably secured to the lever H^2 in its slot h^2 and projecting into

the slot h of the lever H , as shown in said Fig. 6 and in Fig. 2.

The needle i and awl i' , which are curved to arcs of circles of equal radius and concentric with the axis of the shaft F' , are arranged side by side and parallel to each other and a distance apart equal to the desired length of stitch to be formed.

The needle and awl carrier F has formed in its free end a curved groove j , concentric with the axis of movement of said carrier and of a depth nearly equal to the thickness of the shank of the needle i , which is fitted thereto, and is also provided with a curved shoulder j' , to serve as a guide for the awl-shank, and has set therein the threaded stud k , provided with the nut k' , (see Fig. 8,) by means of which the needle and awl are firmly clamped in position.

The construction of the needle and awl carrier is clearly shown in Figs. 13 and 14, and the needle is shown in detail in Figs. 15, 16, and 17 and the awl in Figs. 18, 19, and 20.

The awl i' has formed upon its shank or butt-end a broad plate i^2 , having an open slot i^3 formed therein to enable said awl to be placed in position and removed without removing the nut k' , by which said plate is pressed hard against the shank of the needle i to clamp the same, the inner edge of said awl-plate i^2 and the sides of the slot i^3 being curved concentric to the axis of motion of said awl and needle, as shown.

The awl i' is made somewhat shorter than the needle i , so that the needle will enter a previously-formed perforation in the shoe sole and welt or other goods being sewed before the awl is brought in contact with the under side of the work to puncture a new hole therein.

The awl shank or haft is made thicker than the body of the awl, said increase in thickness being in each case equal to the required distance between the needle and awl to give the proper length of stitch, from which it is obvious that a series of awls having shanks of different thicknesses will be required to adapt the machine to form stitches of different lengths, said awls being used interchangeably, according to the kind of work required.

The needle i is a barbed needle, and the needle and awl are arranged to pierce the sole and welt of a boot or shoe from the under side thereof, the needle entering the last puncture made by the awl and the awl forming a new puncture at each upward movement of said needle and awl, and the work is fed forward by the lateral movement of the needle and awl, which takes place while they are in the work, the stud h^3 being so adjusted in the slots h and h^2 of the levers H and H^2 , respectively, as to cause a lateral movement of said needle and awl just equal to the distance between the center of the needle and the center of the awl.

J is the thread guide or carrier, mounted

upon the lower end of the vertical rod J' , fitted to bearings in the frame A and having secured thereon just above its lower bearing the spur-pinion l , with which the teeth of the sliding rack J^2 engage to impart thereto an oscillating motion about its axis to carry the thread into engagement with the barb of the needle, said rack being reciprocated by the elbow-lever J^3 and the cam J^4 , firmly secured upon the shaft C.

A looper-finger l' is pivoted to the lower end of the elbow-lever K and held in its normal position relative thereto by the spring l^2 and the adjustable screw-stop l^3 , as shown in Fig. 5, until in its backward movement its rear end comes in contact with the fixed curved plate or cam l^4 , when its rear end is somewhat depressed from the position it would otherwise assume, so as to maintain the front or hook end of said looper at about the same height when in its rearmost position as when in its most forward position, as shown in dotted lines in Fig. 5.

The lever K is pivoted at l^4 , Fig. 5, to the ear K' , projecting from the upper front bar of the frame A, (see Fig. 1,) and carries at the free end of its upper arm a truck l^5 , upon which the cam K^2 on the shaft C acts to vibrate said lever and move the looper-finger l' toward the rear of the machine, carrying with it a bight of the thread in engagement with the hook l^6 , formed upon its front end, thereby forming a loop in the thread above the work, said loop extending from the work to the hook l^6 of the looper-finger l' when in its most rearward position, and thence to the barb of the needle, as shown in Fig. 11. The truck l^5 is kept in contact with the cam K^2 by the tension of the spring l^7 , which might be dispensed with by substituting a path-cam for the face-cam K^2 , if desired.

When the needle descends to draw the thread through the work from its upper side, the looper-finger has returned to the position shown in Figs. 5, 6, and 8 of the drawings and released the thread from its hook, and the surplus thread which constituted the loop just described is drawn through the work and carried to the rear by the barb of the needle to form the loop proper below the work, and through which the shuttle with its bobbin or coil of thread is to pass without any slip of the thread on the barb of the needle. When the needle moves to the rear to form a loop below the work, the loop-spreading finger m , mounted upon the hub of the needle and awl carrier and rotating therewith, comes in contact with the lower strand of the loop and depresses it at one side of the shuttle, while it is depressed upon the opposite side of the shuttle and disengaged from the barb of the needle by the finger m' , set in the front end of the lever L , pivoted at m^2 to the swiveling stud L' and carrying at its free ends trucks m^3 and m^4 , arranged with their axes at right angles to each other to be acted upon by the cam-surfaces n and n' on the cylinder-cam

M, all as shown in Figs. 1, 6, and 8, the truck m^4 being only shown in dotted lines in Figs. 1 and 6. When the loop is disengaged from the barb of the needle, it is received by the loop-retaining and releasing finger n^2 , set in the front end of the short lever M' , mounted upon a vertical axis at n^3 and connected at its rear end by the stud n^4 to the free end of the lever M^2 , secured to the upright shaft M^3 , upon the upper end of which is secured the arm M^4 , provided with the finger n^5 , with which the cam c^2 engages to impart to said shaft an oscillating motion and vibrate the loop-retainer.

O is the shuttle-race, secured to the under side of the lower plate of the frame A, and having formed in its upper side a longitudinal groove o , in the form of a segment of a hollow cylinder and extending at right angles to the planes of movement of the needle and awl.

O' is the shuttle-carrier, fitted to suitable longitudinal guides or lips $o' o'$, so as to be movable longitudinally of said raceway by the vibrations of the lever O^2 , pivoted at o^2 to the under side of the lower plate of the frame A, and connected at its front end to an ear o^3 on the shuttle-carrier, and carrying at its rear end a truck o^4 , which fits into and is acted upon by the path o^5 of the cam-cylinder M upon the shaft C', as shown in Figs. 5, 6, and 9.

P is the shuttle, the main body of which is cylindrical in cross-section and hollow, and having one end made conical, with the apex of the cone nearly in line with the upper side of the cylinder, as shown in Figs. 9 and 10.

The shuttle P has formed upon its upper side the longitudinal lip or rib o^6 , which fits into the groove o^7 , formed in the under sides of the plates O^3 , secured to the under side of the lower plate of the frame A, as shown in Figs. 4, 5, and 6. The shuttle P also has formed in its underside a longitudinal groove o^8 , into which the upper edge of the thread-holding finger P' enters as the shuttle passes over it from right to left, thereby preventing the thread of the loop through which the shuttle is passing being carried forward or toward the left end of the shuttle-race by said shuttle.

The thread-holding finger P' is secured in the free end of the lever P^2 , pivoted to the left-hand end of the shuttle-race O, and has its free end forced upward through a slot in the shuttle-race by the spring p , so as to be in a position to prevent a lateral movement of the loop of thread while the shuttle is passing through the same.

The shuttle-thread is arranged in a cylindrical coil within the cylindrical portion of the shuttle P and is drawn from the interior of said coil through an opening in the side of the conical portion of said shuttle and beneath the tension-spring p' , as shown in Fig. 2.

Q is the thread-spool, mounted upon a stud set in the upright Q' , and provided with a

hub to receive the brake-strap R for the purpose of locking said spool to prevent rotation thereof at the time that the slack of the thread is being drawn up after the loop has
 5 been cast off from the barb of the needle and the lock of the stitch is being drawn into the center of the sole or other work being sewed. The spool Q is pressed against the shoulder of its supporting-stud by the multiple-leaved
 10 spring q in a well-known manner.

One end of the brake-strap R is secured to the upright Q' or other fixed portion of the machine and the other end thereof is secured to one end of the lever R' , pivoted to the up-
 15 right Q' and carrying at its other end the truck q' , with which the cam-plate R^2 , secured to the side of the cam G' , opposite its path f^3 , engages to draw said strap hard upon the hub of the thread-spool and lock it against
 20 any possible rotation thereof while the thread is being drawn up, all as shown in Figs. 2 and 4. The thread from the spool Q is carried partially around and in front of the thread-guiding-sheave r , partially around and in the
 25 rear of the sheave r' , and in front of the sheave r^2 , and thence under the sheave s and over the sheave s' and through the eye of the thread-guide J. The sheaves r , r^2 , and s are mounted upon fixed studs, the sheave r'
 30 is mounted upon a reciprocating bar or plate R^3 , and the sheave s' is mounted upon the free end of the arm s^2 , which is held in its normal position in contact with the stop-pin s^3 by the spring s^4 , except when the ten-
 35 sion of said spring is overcome by the strain on the thread when the needle is drawing the thread through the work or the sheave r' is being moved to the rear to take the slack and draw the stitch tight.

The sheave-carrying plate or bar R^3 is connected at its rear end with the upper end of the lever S, mounted upon the rocker-shaft S' , which has secured to its opposite end the
 40 slotted arm S^2 , to which is adjustably connected the lower end of the link or rod S^3 , the upper end of which is slotted to embrace the shaft C and carries a truck which fits into and is acted upon by the path t of the
 45 cam T to impart to said bar or plate R^3 an intermittent reciprocation, said bar being fitted to slide on the slotted plate T' , which carries at its front end the sheaves r and r' ,
 50 as shown in Fig. 3.

It will be observed, on reference to Figs. 17
 55 and 20, that the needle and awl are made with flat sides or elliptical in cross-section, and that they are arranged with their longest diameters at right angles to the line of movement of the material being sewed, which is a
 60 great advantage, particularly when short stitches are required, as it is obvious that more stitches can be formed in a given space with a flat needle and awl than with a round needle and awl and leave the work in equally
 65 as good condition.

A portion of the shuttle-guiding groove in the raceway O near the middle of its length

is cut away upon its front side to permit the passage of the awl and needle and their carrier, all as shown at t' , Figs. 2, 5, 6, 9, and 10. 70

U is a hand-lever by which the presser-foot may be raised to permit the insertion or removal of the work when the pawl c is disengaged from the teeth of the ratchet b^2 .

The operation of my invention is as follows: The edge of a boot or shoe sole and welt or other piece of work to be sewed being inserted between the work-support a and the presser-foot D^3 , and power being applied to the driving-pulley B to revolve the same, 80 the needle and awl are forced through the work to the extreme of their upward movement. The shuttle moves toward the right and the looper l' moves toward the rear, its hook l^6 engaging the thread u between the eye of 85 the thread-carrier J and the work and drawing a loop of thread to the rear at the same time that the thread-carrier carries the thread into engagement with the barb of the needle, when the needle and awl are moved to the 90 left to feed the work a distance equal to the desired length of stitch, the presser-foot being raised by the pawl d' . The needle and awl descend, the needle drawing a loop of the thread through the work without any slip of 95 the thread across the barb of the needle, the looper l^6 having released the loop carried back by it just as the needle is to descend. The needle and awl continue their rearward movement until said movement is completed, dur- 100 ing which time the loop-spreaders m and m' have pressed the lower thread of said loop downward, the latter acting in conjunction with a slight forward movement of the needle i , caused by the throw v in the path f^3 of 105 the cam G (see Fig. 4) discharging the loop from the barb of the needle, and at the same time said loop is received by the loop retainer and releaser. While the loop is opened, as shown in Fig. 12, the shuttle P is moved from 110 the right to the left, passing through the loop, the lower thread of which is prevented from being carried forward with the shuttle by coming in contact with the end of the finger P' , the upper edge of which projects into the 115 groove o^9 in the under side of the shuttle, as before described. Just as the shuttle has completed its movement toward the left and the loop has been discharged from the barb of the needle the take-up sheave r' and its 120 carrying-bar commence to move toward the rear to draw up the slack of the thread, the loop-releaser n^2 being moved to the left to withdraw it from the loop and permit the slack to be drawn up. When the take-up 125 sheave has accomplished about half of its rearward movement, the cam R^2 comes in contact with the truck q' to depress the front end of the lever R' and cause the brake-strap R to be forced hard upon the hub or flange 130 of the spool Q and lock said spool, so that no thread can be drawn therefrom during the latter part of the rearward motion of the take-up sheave r' , thus insuring the stitch

being drawn tight and the lock of the stitch being drawn into the middle of the work. These several operations are repeated at each complete oscillation of the needle and awl-carrier, the needle at each upward motion entering a previously-formed puncture in the work, and the awl at the same time forming a new puncture at a distance equal to the required length of stitch from the puncture made by the last previous upward movement of said awl.

The needle, awl, and shuttle and shuttle-race herein described form the subject-matter of three other applications, numbered, respectively, 298,040, 298,039, and 298,038, and therefore are not claimed herein.

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

1. In a lock-stitch sewing-machine, the combination of the oscillating needle and awl-carrier *F*, provided with the groove *j* and shoulder *j'*, the needle *i*, fitted to said groove *j*, the awl *i'*, provided with a plate-like shank *i''*, having a thickness equal to the aggregate thickness of the body of said awl and the distance required between said awl and needle and provided with the slot *i'''*, the threaded stud *k*, and the nut *k'*.

2. In a lock-stitch sewing-machine, the combination of a fixed work-support, a presser-foot, a spring for pressing said foot upon the work, an oscillating curved awl and a barbed needle arranged side by side and parallel with each other and to enter the work from the side opposite to said presser-foot, the lever *D'*, connected at one end to the upper end of the presser-foot rod and provided at its other end with two sets of ratchet-teeth *b''* and *b'''*, with the shoulders of their teeth opposed to each other or facing in opposite directions, the lever *E*, pawl *c*, and cam *c''*, for locking said presser-foot, and the lever *d''*, arm *d'''*, pawl *d''''*, and the cam *e''*, for lifting said presser-foot above the work when the work is to be fed.

3. In a lock-stitch sewing-machine, the combination, with a circularly-curved barbed needle and a thread guide or carrier for carrying the thread into engagement with the barb of the needle after it has pierced the work, of the arm *l'*, provided with the hook *l''*, the elbow-lever *K*, the revolving cam *K''*, the spring *l''*, and the curved cam-plate *l'''*, all constructed, arranged, and operating substantially as and for the purposes described.

4. In a lock-stitch sewing-machine, the combination of the shaft *F'*, the carrier-arm *F*, the curved needle *i* and awl *i'*, secured to said carrier side by side and arranged to be forced through the work from the same side, a pinion secured upon said shaft, a toothed segment engaging with said pinion and provided with a slotted arm, the link *G''*, the lever *G*, truck *f''*, and cam *G'*, for oscillating said shaft and carrier, the levers *H*, *H''*, and *I*, the rocker-shaft *H''*, and cam *I*, for imparting to said shaft an intermittent reciprocatory motion, substantially as described.

5. In a lock-stitch sewing-machine, the combination of a shaft constructed and arranged to oscillate about its axis and to be moved endwise in its bearings, a carrier-arm secured upon said shaft, a barbed needle and an awl, both secured to said carrier-arm side by side, parallel with each other, and bent to a curve concentric with the axis of said shaft, the gear-wheel *F''*, segment *F'''*, arm *F''''*, the lever *G*, the cam *G'*, the rod *G''*, the levers *H*, *H''*, and *I*, the rocker-shaft *H''*, and the cam *I'*, all constructed and arranged substantially as described.

6. In a lock-stitch sewing-machine, the combination of an oscillating circularly-curved barbed needle and a circularly-curved awl arranged side by side in the same carrier-arm, parallel to each other, and to pierce the work from the same side, the loop-spreading finger *m*, mounted upon and revoluble with the hub of the needle and awl carrier, the lever *L*, provided with the loop-opening finger *m'* and pivoted in the swiveling stand *L'*, the cams for imparting to said lever *L* both vertical and horizontal vibratory motions, the pivoted lever *M'*, provided with the loop receiving and releasing finger *n''*, the rocker-shaft *M''*, the levers *M''* and *M''''*, and the cam *e''*, all constructed, arranged, and operating substantially as and for the purposes described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 8th day of September, A. D. 1888.

JOSEPH ELI BERTRAND.

Witnesses:

N. C. LOMBARD,

WALTER E. LOMBARD.