(No Model.)

7 Sheets—Sheet 1.

A. M. LESLIE.

SEWING MACHINE.

No. 444,759. Patented Jan. 13, 1891.

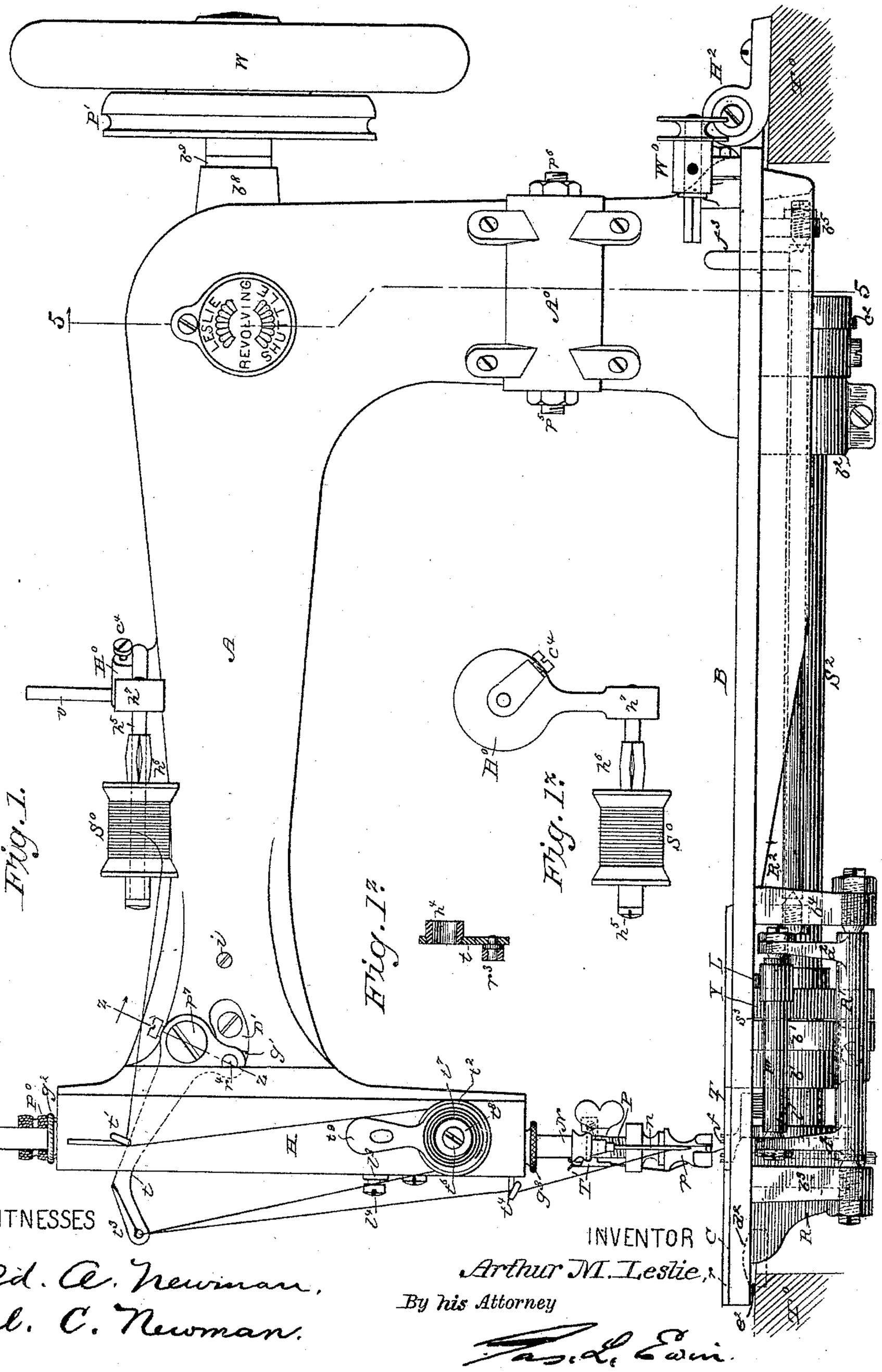

Fig. 1.

Fig. 1a

Fig. 1b

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SEWING MACHINE.

No. 444,759. Patented Jan. 13, 1891.

Fig. 2.

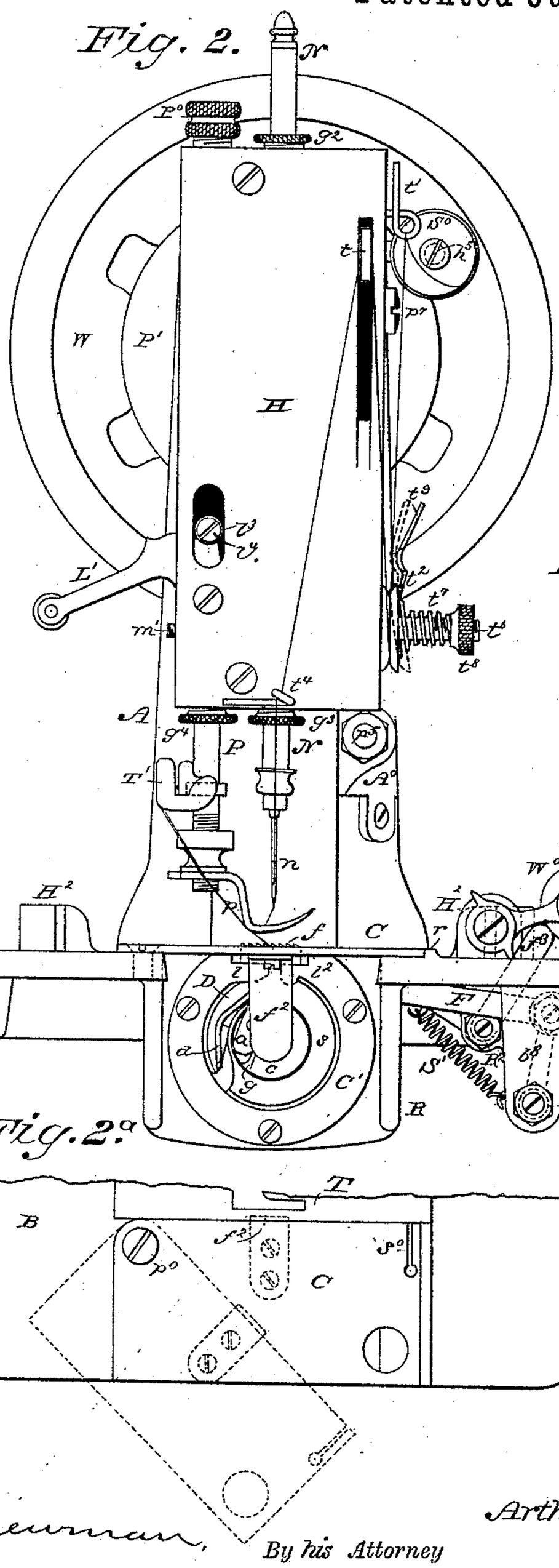

Fig. 2d

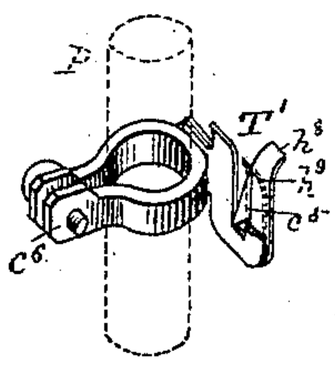

Fig. 2c

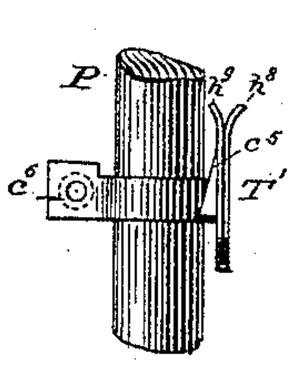

Fig. 2b

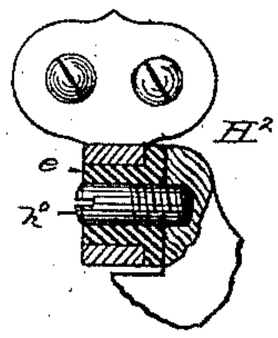

Fig. 2a

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SEWING MACHINE.

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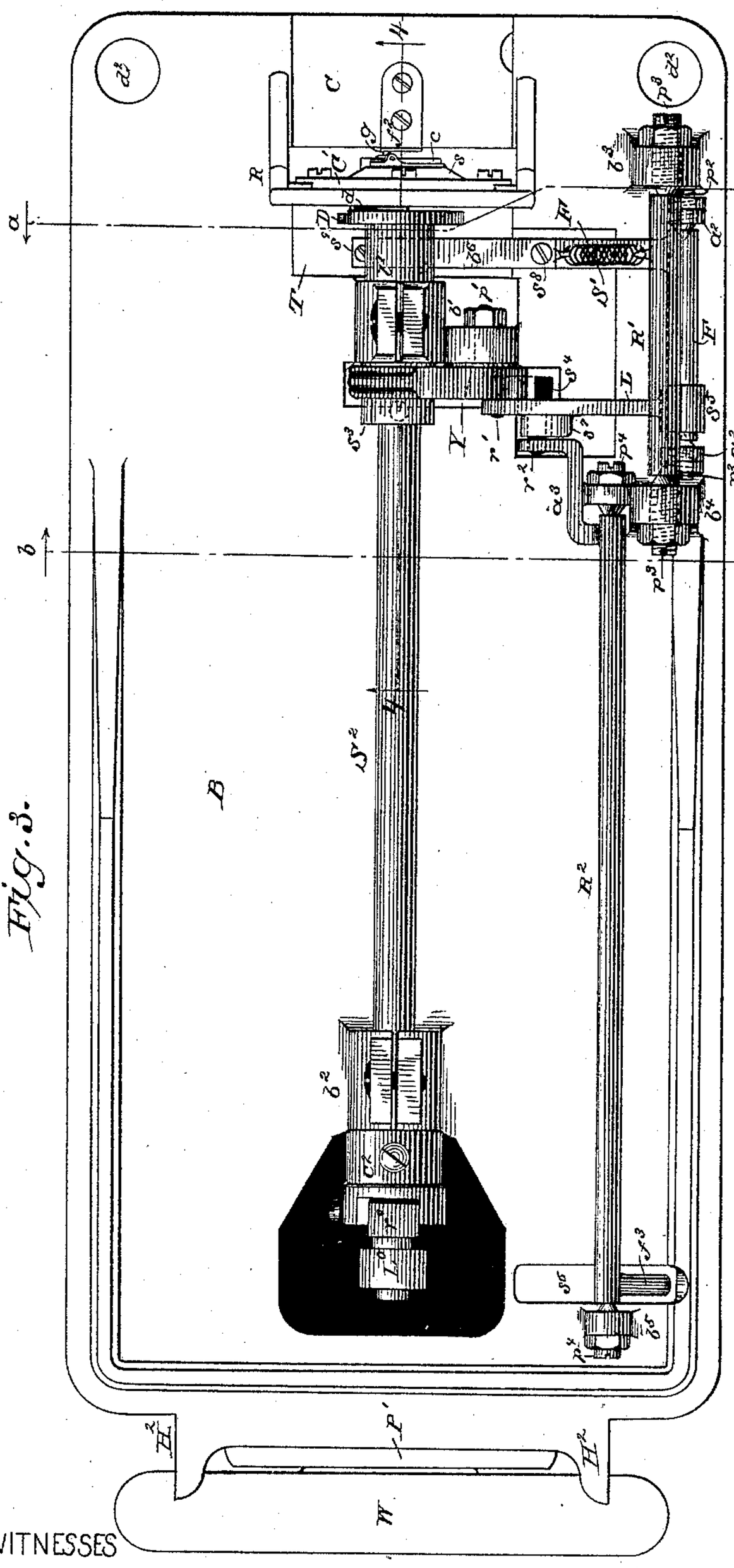

Fig. 3.

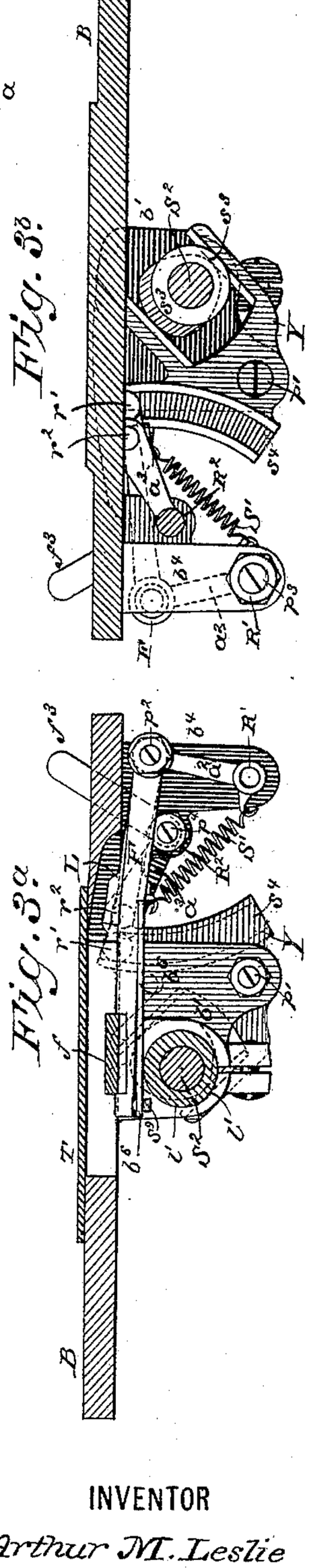

Fig. 3b.

Fig. 3a.

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A. M. LESLIE.

SEWING MACHINE.

No. 444,759. Patented Jan. 13, 1891.

Fig. 4.

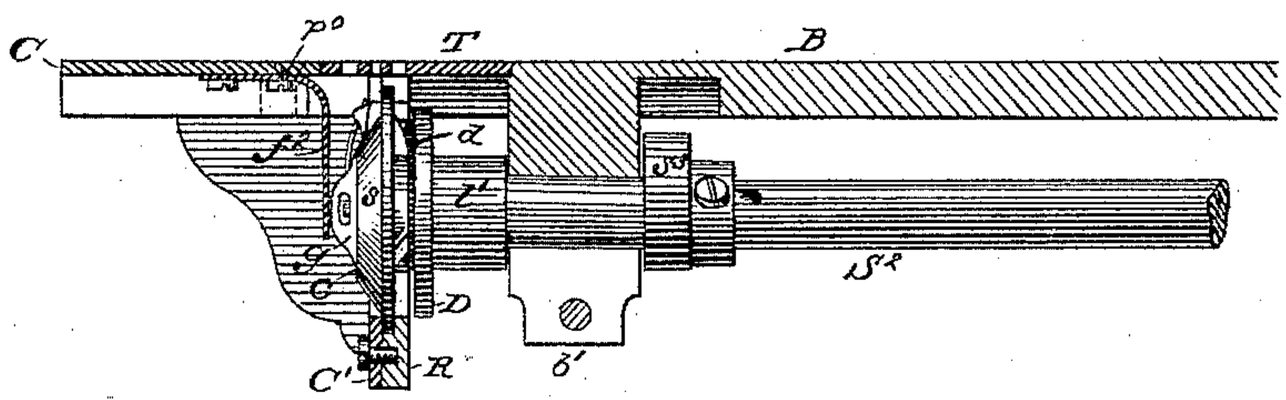


Fig. 4a

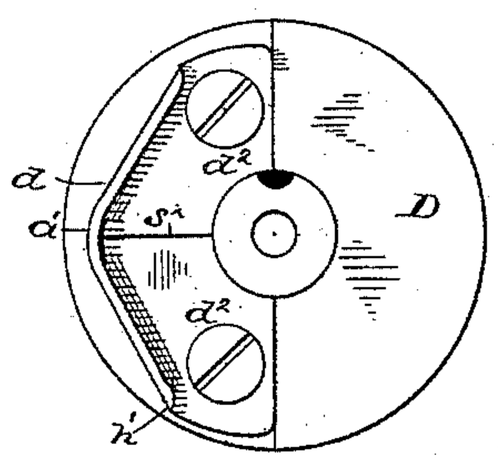


Fig. 4d

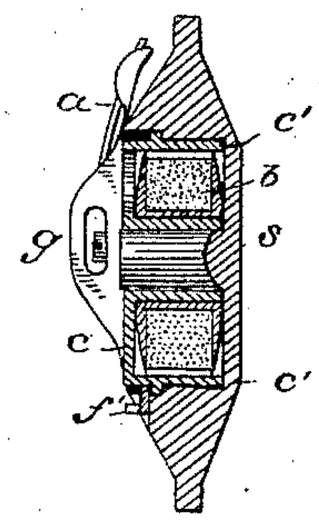


Fig. 4c

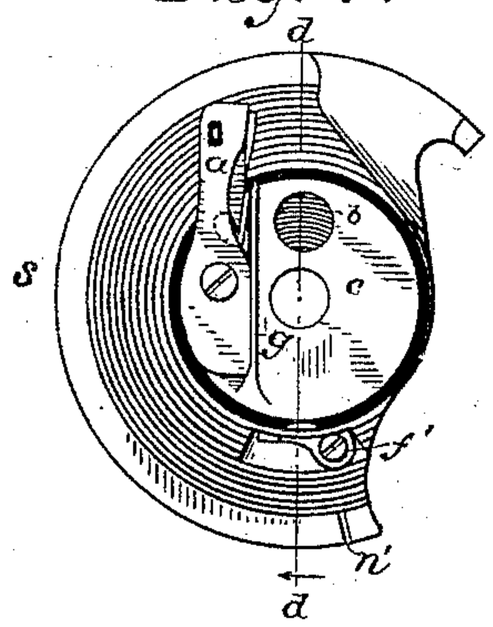


Fig. 4b

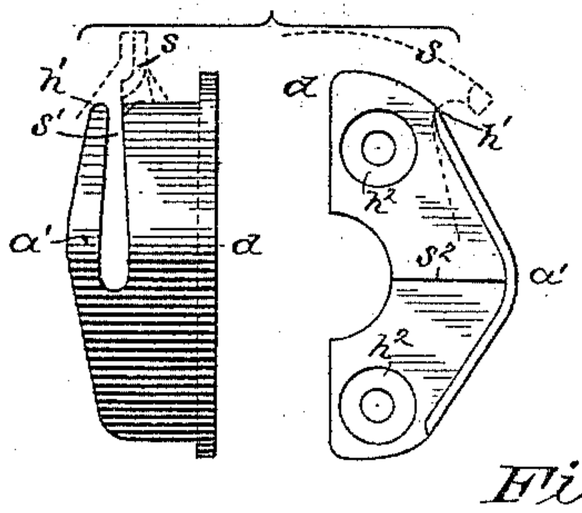


Fig. 4e

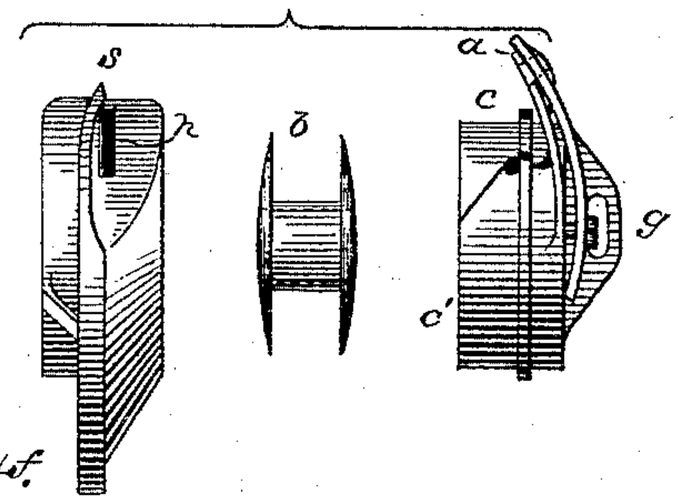
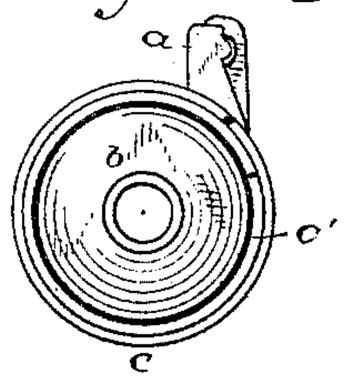


Fig. 4f.



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A. M. LESLIE.

SEWING MACHINE.

No. 444,759. Patented Jan. 13, 1891.

Fig. 5a.

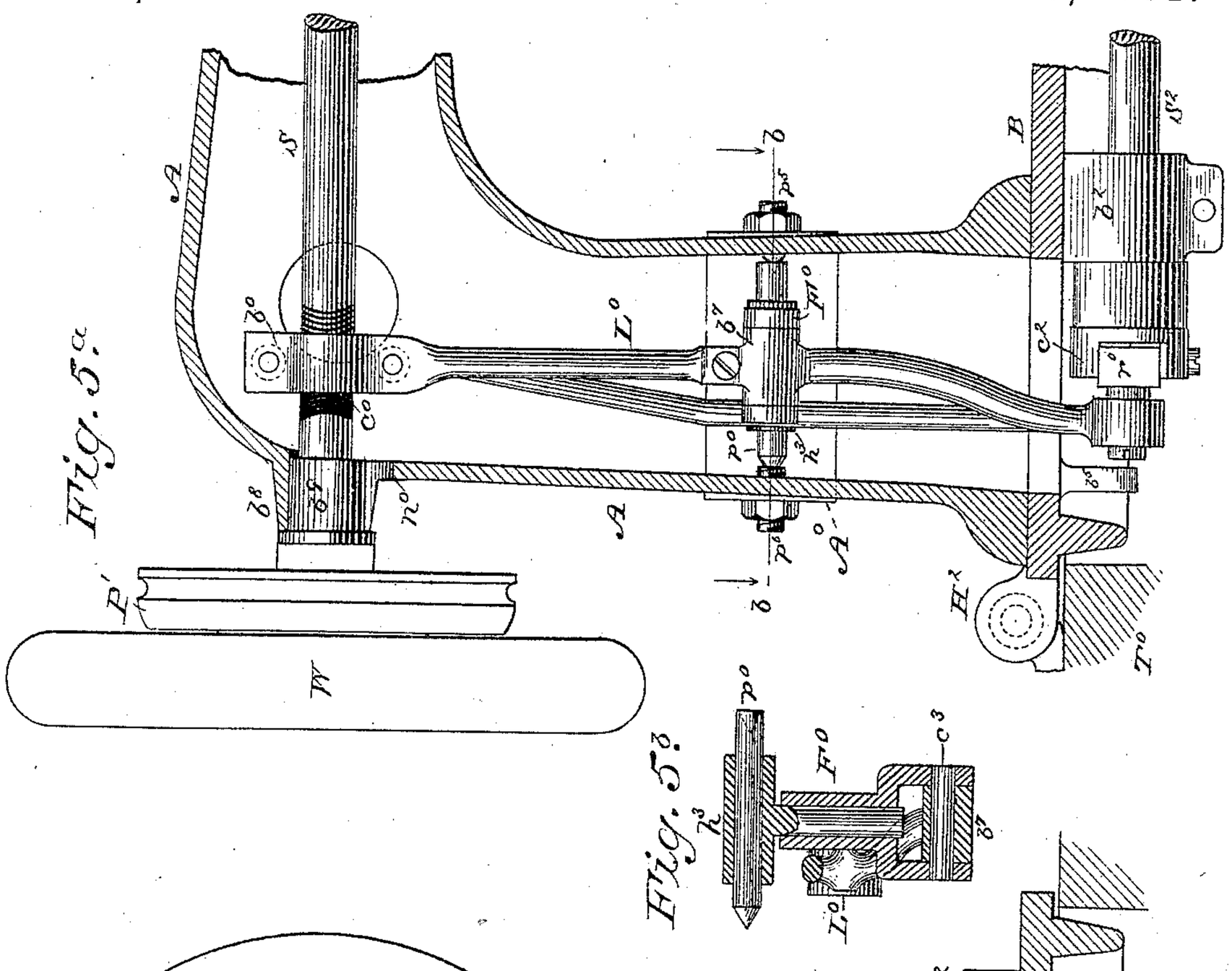
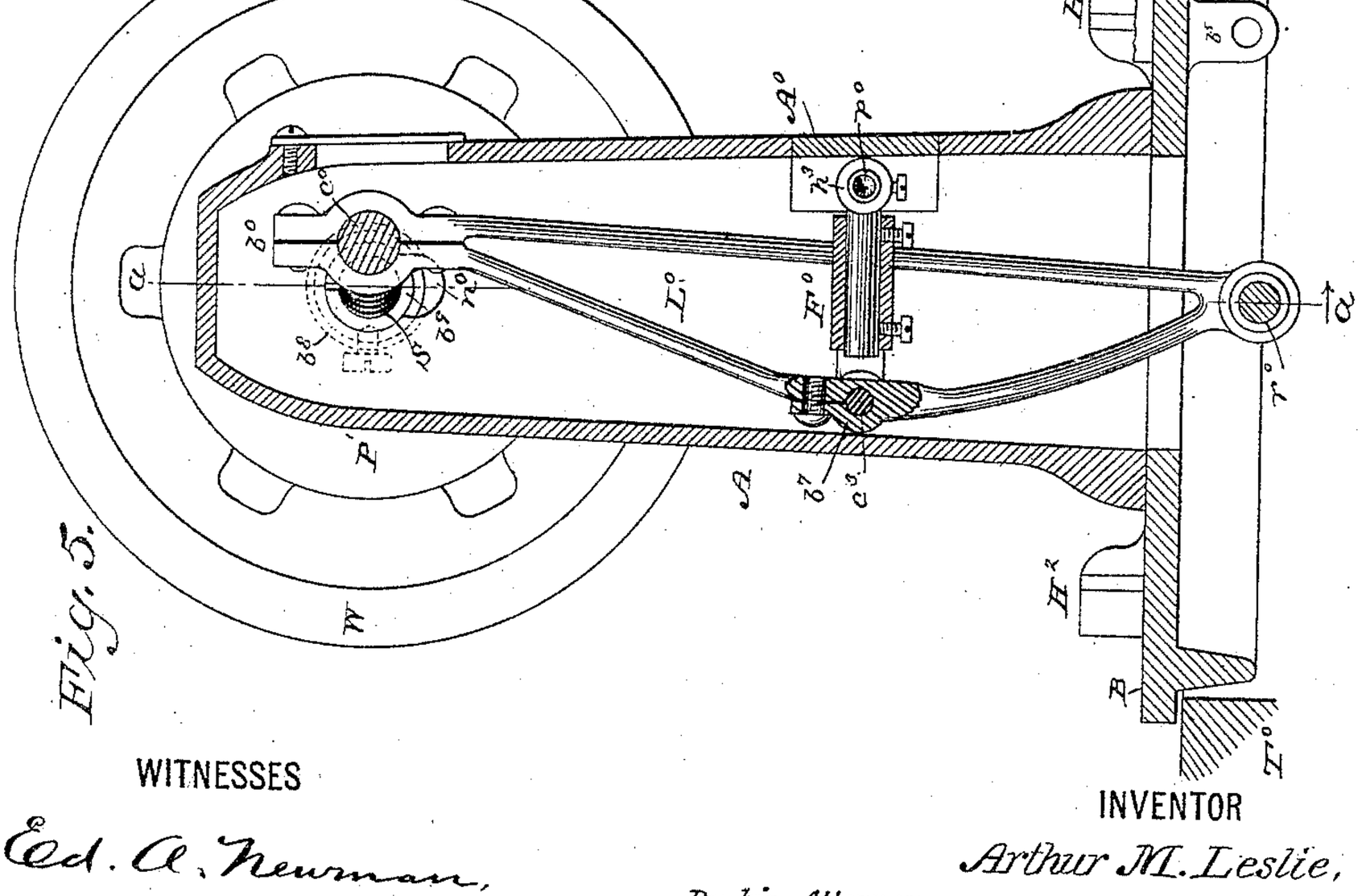


Fig. 5b.

Fig. 5.



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A. M. LESLIE.

SEWING MACHINE.

No. 444,759. Patented Jan. 13, 1891.

Fig. 6.

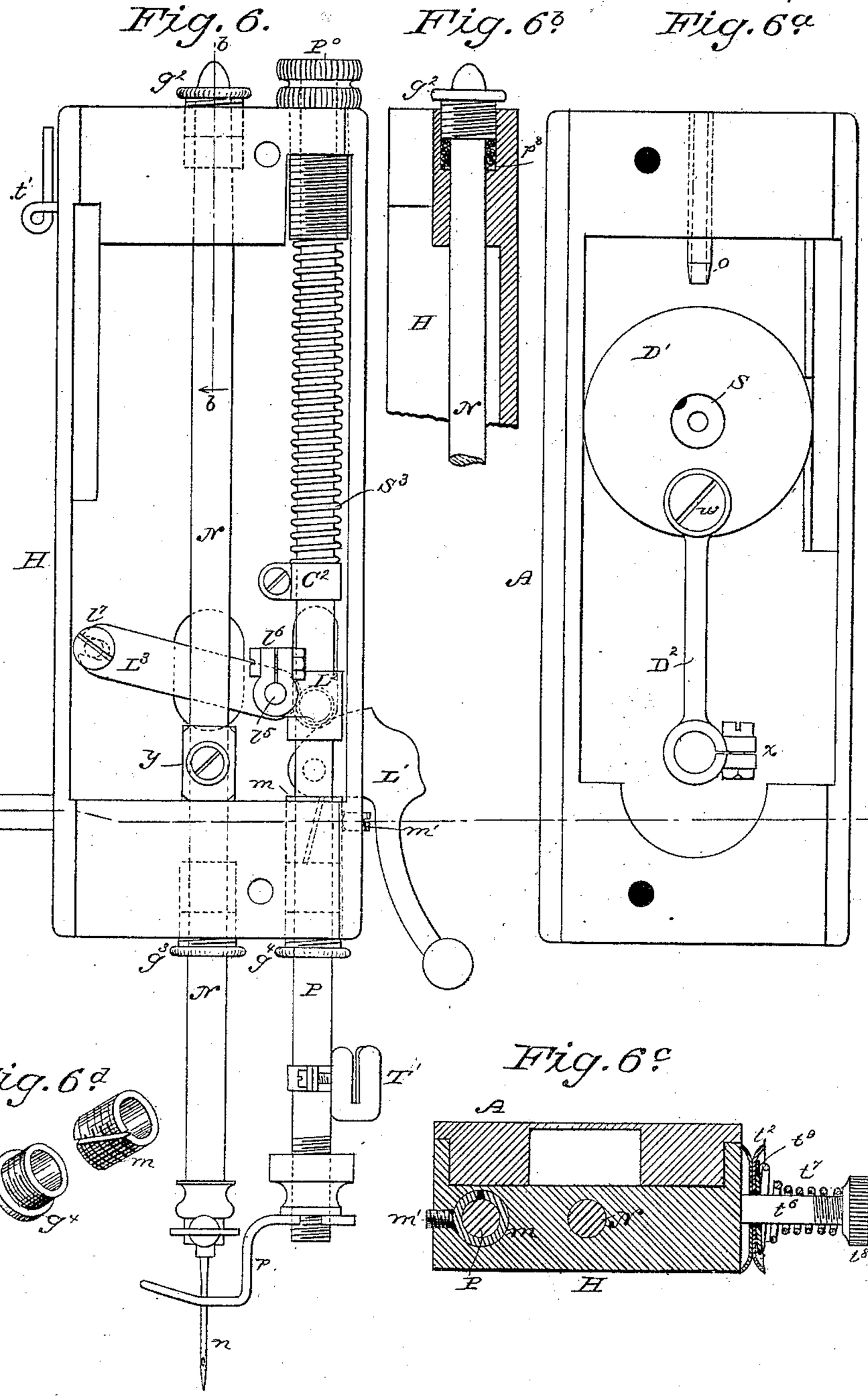

Fig. 6ª

Fig. 6ª

Fig. 6ª

Fig. 6ᶜ

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A. M. LESLIE.

SEWING MACHINE.

No. 444,759. Patented Jan. 13, 1891.

Fig. 7.

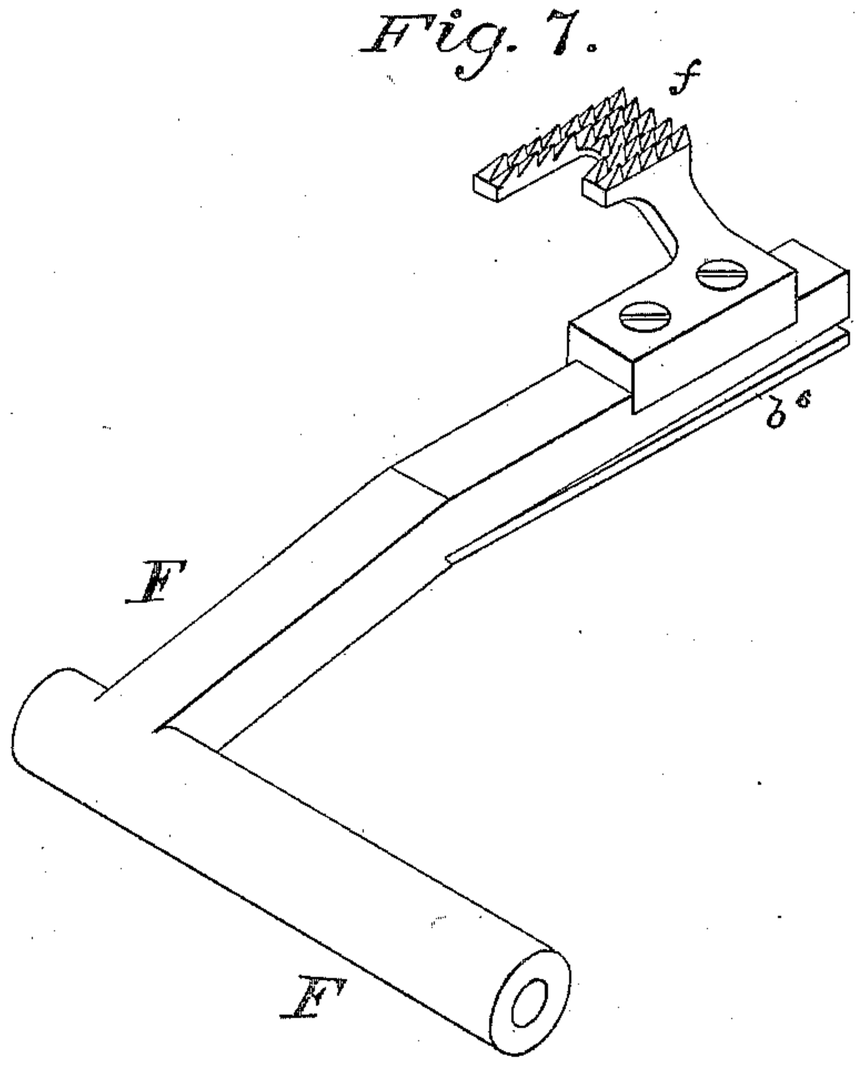
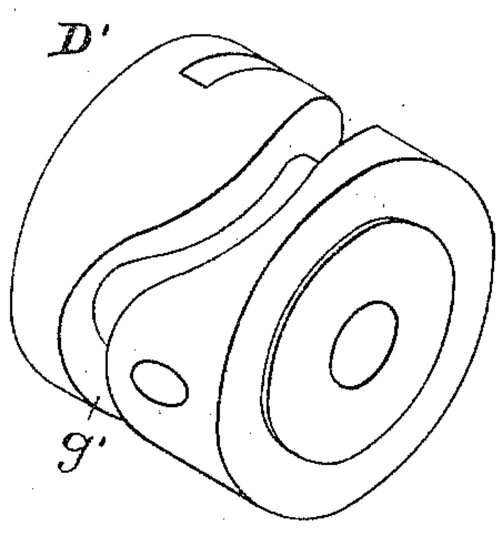


Fig. 7ª.



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E. L. Ewin.

UNITED STATES PATENT OFFICE.

ARTHUR M. LESLIE, OF CHICAGO, ILLINOIS.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 444,759, dated January 13, 1891.

Application filed January 13, 1885. Renewed July 11, 1890. Serial No. 358,418. (No model.)

To all whom it may concern:

Be it known that I, ARTHUR M. LESLIE, a citizen of the United States, residing at Chicago, in the State of Illinois, (formerly of Cleveland, in the State of Ohio,) have invented a new and useful Improvement in Rotary-Shuttle Sewing-Machines, of which the following is a specification.

This invention is additional to the improvements in sewing-machines described and claimed in my specifications forming part of United States Letter Patent No. 241,553, dated May 17, 1881, and No. 261,363, dated July 18, 1882; and it consists in an improved rotary-shuttle sewing-machine embodying several novel parts and combinations of parts, as hereinafter set forth.

The general object of my present invention is to produce a rotary-shuttle sewing-machine with link-motions, a positive feed, and a positive take-up, and adapted by these means and accessories thereof to sew perfectly at high speeds and to be manipulated with quickness and facility.

The special objects of the respective parts or features of the machine, hereinafter set forth and claimed, are as follows, to wit: first, to facilitate inserting and removing the bobbin-case of the rotary shuttle, including provision for keeping the same in position while the machine is working; secondly, to more effectively guard the shuttle-thread against entanglement, and at the same time to facilitate threading the bobbin-case and its tension-arm; thirdly, to more effectively conduct the under thread from the bobbin to the extremity of the arm of the bobbin-case by easily-threaded guides; fourthly, to adapt the shuttle to remove from the shuttle-race groove any particles of thread or lint which may find access thereto; fifthly, to adapt the shuttle-driver to be made of a peculiar effective shape of bent steel; sixthly, to adapt the same to guide or control the needle as to its path in sewing work that throws the needle to one side or the other, so that when the shuttle-point reaches the needle the latter shall always be straight and in the right position for the shuttle to catch the needle-loop; seventhly, to transmit motion from the shaft of the rotary shuttle to the feed-dog, so that the forward and backward motions of the latter shall both be "positive" and transmitted by "frictionless" and quiet link-motion mechanism working on adjustable cone-pivots; eighthly, to regulate the length of stitch by adjusting said transmitting mechanism; ninthly, to regulate the projection of the feed-dog so operated in a simple and effective way; tenthly, to afford a solid and durable bearing for the pulley end of said driving-shaft and at the same time facilitate its insertion and withdrawal; eleventhly, to provide for quickly relieving the upper thread from tension at will, so that the work may be drawn out without breaking the thread, and, twelfthly, to supplement the guides of the presser-bar by an adjustable link-motion device within the head to keep the presser-foot from shaking in case of wear.

Seven sheets of drawings accompany this specification as part thereof.

Figure 1 of the drawings is an elevation of my improved rotary or "revolving" shuttle sewing-machine, showing its front. Fig. 1^x is a top view of its spool-holder. Fig. 1^z is a sectional view of the take-up arm. Fig. 2 is an end elevation of the machine, showing the face of its head and a face view of the shuttle. Fig. 2^a is a top view of the shuttle end of the bed-plate. Fig. 2^b is a sectional top view of one of the cushioned hinges, and Fig. 2^c is an edge view of the thread cutter and holder on a larger scale. Fig. 2^d is a perspective view of the thread cutter and holder on said larger scale. Fig. 3 is an inverted plan view of the machine, showing the feed mechanism and other parts below the bed-plate; and Figs. 3^a and 3^b represent partial cross-sections on the lines *a a* and *b b*, Fig. 3, respectively, showing views of the feed mechanism from opposite planes of vision. Fig. 4 represents a vertical section on the line 4 4, Fig. 3, showing an edge view of the shuttle within its race. Fig. 4^a is a face view of the shuttle-driven-disk with the shuttle-driver thereon. Fig. 4^b is an edge view and face view of the shuttle-carrier detached. Fig. 4^c is a face view of the shuttle with the bobbin and bobbin-case therein. Fig. 4^d is a section on the line *d d*, Fig. 4^c. Fig. 4^e is an edge view of the shuttle, bobbin, and bobbin-case separated; and Fig. 4^f is a back view of the bobbin-case with the bobbin within it, Figs. 4^a to

4f, inclusive, being drawn to twice the scale of Fig. 4. Fig. 5 represents a cross-section of the machine in the broken plane indicated at 5 5, Fig. 1, showing a sectional elevation of the parts within the standard. Fig. 5a represents a rear view, partly in section, on the line *a a*, Fig. 5; and Fig. 5b represents a partial cross-section on the line *b b*, Fig. 5a. Fig. 6 represents a large-scale interior view of the face-piece of the head of the machine, showing the parts within it. Fig. 6a is a face view of the back part of the head, showing the parts within it as exposed by removing said face-piece. Fig. 6b is a partial vertical section on the line *b b*, Fig. 6. Fig. 6c is a cross-section of the lower part of the head on the line *c c*, Figs. 6 and 6a, and Fig. 6d is a perspective view of parts of the lower presser-bar guide. Fig. 7 is a perspective view of the feed-bar and feed-dog, and Fig. 7a is a perspective view of the combined needle-driver "disk" and take-up cam on said larger scale.

Like letters of reference indicate corresponding parts in the several figures.

This improved machine has in common with the one shown and described in my last previous patent aforesaid (No. 261,363, dated July 18, 1882) a hollow arm A and a flat bed-plate B, rigidly united with each other, a horizontal driving-shaft S, mainly within said arm, and a parallel rotary shaft S^2, driven in an opposite direction by the former, beneath said bed-plate, a cylindrical needle-bar N, carrying a short straight needle *n* and driven by the upper shaft S, a cylindrical presser-bar P, carrying the presser-foot *p* and mounted, together with said needle-bar, in the face-piece H of the hollow "head" formed at the extremity of said arm, a rotary shuttle *s*, driven by the under shaft S^2 and provided with a disk-bobbin *b* and a non-rotary bobbin-case *c*, a vibrating take-up arm *t* and a four-motion feed-dog *f*, driven, respectively, by said upper shaft and said under shaft, and other minor details which will be apparent.

C, Figs. 1, 2, 2a, 3, and 4 represent a "cloth-plate" at the shuttle end of the machine, attached to said bed-plate B by a vertical pivot-screw p° at one inner corner, and having as its fastening device a spring-slit s° at its other inner corner, where it fits into a re-entrant angle formed by the front edge of the customary screw-attached throat-plate T, and a rib *r* left on the bed-plate in milling the seats for said plates C and T. This cloth-plate is thus adapted to be swung horizontally clear of the opening in the bed-plate which it bridges, and back again into place to facilitate opening and closing the latter in removing and replacing the bobbin-case *c* and bobbin *b*. To secure these latter within the shuttle *s* when said cloth-plate is fastened, should the operator neglect to do so by means of the bobbin-latch or bobbin-case fastening *f'* of the shuttle and to release them "automatically," said cloth plate is provided on its under side with a spring-finger f^2, rigidly attached at its upper end to the plate and projecting downward, so as to be about a sixty-fourth of an inch from the inner position of the outer extremity of the under tension-guard *g* when the cloth-plate is fastened. When the cloth-plate is swung outward, as indicated by dotted lines in Fig. 2a, as said finger f^2 moves therewith the bobbin-case and bobbin are released by it without attention.

The bobbin-case *c*, Figs. 2, 4, 4c, 4d, 4e, and 4f, has at the left of said guard *g*, as viewed in Figs. 2 and 4e, an arm *a*, which coacts with lips $l\ l^2$ on the cap C' of the shuttle-race R, to render the bobbin-case non-rotary, as aforesaid, while it is kept in effective position by said lips and forms, primarily, a thread-guide and tension device for the under thread, as in my said previous machine. It is now wholly composed of two simple parts with the tension-screw by which they are united. To keep the under thread from "slopping" over the bobbin *b* within the bobbin-case *c*, and thus becoming entangled, the bobbin-case is constructed with a cylindrical portion *c'*, adapted to completely envelop the edges of the bobbin, as seen in Fig. 4d, while at the same time threading the bobbin-case and tension-arm is facilitated. This is best seen by reference to Figs. 4c and 4e. An oblique slit admits the thread to a smooth radial hole, from which a straight open groove extends to a recess behind that edge of the arm *a* which is next to said guard *g*. The upper end of said guard projects so as to stop the thread as drawn toward it in the threading operation, and by continuing a revolving movement of the hand the thread is next engaged with a downwardly-projecting hook on the back part of said arm *a*, which directs it into a guide-hole in said back part, (seen in dotted lines in Fig. 4e,) and from this it passes longitudinally under the front part or spring of the arm and between two projections at the extremity of said back part, one of which projects through a hole in said spring, while the other masks this one and aids in drawing the thread under the spring.

The shuttle *s*, Figs. 2, 3, 4, 4c, 4d, and 4e, is constructed with a radial hole *h*, Fig. 4e, in its peripheral portion elongated in the direction of motion from immediately behind its point to admit the point of the needle *n* in the downstroke of the latter, so as to preclude dulling contact of the needle with the shuttle. The shuttle is also constructed with a radial slit or notch *n'* in its marginal guide-flange to engage with and carry out of the shuttle-race any bit of thread which may be carried into it.

The shuttle-driver *d*, Figs. 2, 3, 4, 4a, and 4b, (shown detached in the figure last named,) is constructed with great lightness and strength of bent steel, its flat back, by which it is attached to the shuttle-driver disk D, having the contraction joint or slit s^2 and a pair of countersunk screw-holes h^2 to receive the attaching-screws, (seen in Fig. 4a,) while the effective portion of the driver perpendicular to

said back at one edge is jointless, and has a double inclined peripheral side and a needle-admitting slot s', Fig. 4^b, which extends from in front of its apex a' to its hind end h' and tapers in width from its front end to its outlet. The path of the latter coincides in plane with the correct path of the needle n relatively to the point of the shuttle s, which point within the shuttle-race projects behind said apex a' of the driver and behind or to the right of said slot s', as indicated by dotted outlines of the shuttle-point added to Fig. 4^b. The wider front end of said slot s' admits the point of the needle through it to be deflected to the right or to the left, and the sides of the slot restore the needle to the correct plane before it is reached by the shuttle-point, which would otherwise strike it and break the needle or miss the needle-loop, which would result in "skipped stitches." The hub of said shuttle-driving disk D forms, as heretofore, the lifting-cam l' of the feed mechanism, Figs. 1, 2, 3, 3^a 3^b, 4, and 7, and a stroke-cam s^3, separated from the former by that one of the hanger-bearings b' b^2 of the under shaft S^2 at its shuttle end, completes the furniture of the shaft. A rocking yoke Y embraces said stroke-cam, having its pivot p' at its lower end and in front of the plane of the shaft S^2, but close thereto, said pivot being supported by an extension of said hanger-bearing b'. Said yoke has in one side a sector slot or groove s^4 extending upward from a point in front of its pivot, which receives and coacts with a laterally-projecting roller-stud r' at the inner end of a link L, the outer end of which forms a horizontal sleeve s^5, which embraces loosely the cylindrical longitudinal member of an L-shaped feed-bar F, (shown detached in Fig. 7,) and the other member of the latter projects rearwardly above said lifting-cam l' and carries the feed-dog f, as best seen in Fig. 3^a. Said feed-bar F is mounted on cone-pivots p^2 between a pair of arms a^2, which project from a rock-shaft R', and this in turn is mounted on cone-pivots p^3 between a pair of hanger-bearings b^3 b^4, which depend from the bed-plate, and a spiral spring S' is stretched between a pair of hooks on said rock-shaft and feed-bar to hold the latter down upon the lifting-cam l', so as to steady its movement. The length of stroke imparted to the feed-dog f is varied for a longer or shorter stitch by shifting said roller-stud r' in said sector groove or slot s^4, so that it shall be farther from or closer to the yoke-pivot p', (see Fig. 3^b,) and this is accomplished from above the bed-plate by means of a longitudinal rock-shaft R^2, hung beneath the same between said hanger b^4 and a hanger b^5 on cone-pivots p^4, screwed through said hangers, said rock-shaft R^2 having a finger-lever f^3, which projects upward through a slot s^6 in the bed-plate convenient to the right hand of the operator, while at that end of the rock-shaft adjacent to said hanger b^4 it carries an arm a^3, having a laterally-projecting roller-stud r^2 at its upper extremity, which works in a straight groove s^7 in an enlargement of said link L, and transmits motion to the latter when said finger-lever f^3 is moved, so that by shifting the latter backward the feed-stroke and length of stitch are shortened, and vice versa. In the drawings the feed mechanism is shown as set for the greatest length of stitch. Said rock-shaft R^2 may be adapted to remain in any position to which it may be turned by said finger-lever f^3 by tightening its cone-pivots p^4 sufficiently or by other means, such as are commonly used, for example. It will be observed that all the movements of this "link-motion" feed mechanism are positive and provided for by "cone-pivots" or pivot-screws having conical bearing-points, which are adjustable to take up wear, so as to render the motion steady and noiseless. The head of the cone-pivot p' forms its bearing-point, and the points proper of the remainder of said cone-pivots form their bearing-points, the parts which receive them being correspondingly drilled, and each is provided with a jam-nut to lock it as adjusted.

To regulate the projection of the feed-dog f, a steel bar b^6, Figs. 3 and 3^a, is interposed between the feed-bar F and lifting-cam l', being attached at one end to the back of said feed-bar by a countersunk screw s^8, and at its other end provided with a vertical adjusting-screw s^9, tapped in the steel bar and bearing against the flattened back of the feed-bar, so as to elevate the latter and therewith the feed-dog, more or less, as required.

For rotating the under shaft S^2, as aforesaid, from the driving-shaft S, an improved lever-pitman mechanism is employed, as illustrated by Figs. 1, 3, 5, 5^a, and 5^b, particularly the three figures last named. Said driving-shaft is a crank-shaft, and the wrist of its crank c°, being in line vertically with the "standard" of the arm A, is embraced by a split bearing b° at the upper end of a skeleton lever-pitman L°, which extends downward within said standard and carries at its lower end the screw-pivot of a roller-stud r°, the rectangular roller-slide of which works in the slot or groove of a crank-arm c^2, fast on the corresponding end of said under shaft. At mid-length said lever-pitman is provided with a fulcrum, which at once secures the adjustable link-motion quality arrived at throughout my improved machine, and preserves the varying lever action of the lever-pitman, set forth with its effects in my specification forming part of said patent No. 241,553, dated May 17, 1881. The rear of two members which constitute the body of the lever-pitman L° has a split bearing b^7, which embraces a horizontal cross-pin c^3 in the bifurcated rear end of a radius-bar or rocking fulcrum F°, and a horizontal sleeve h^3 at the front end of said rocking fulcrum embraces and is screw-fastened to a steel pivot-pin p°, mounted on cone-pivots p^5 p^6 at the front of the standard. As

shown in the drawings, a screw-attached piece A°, covering an opening in the standard of the arm A, supports said screw-pivots p^5 p^6. In practice the arm-casting may accommodate them without any such attachment. The rocking fulcrum F° is preferably made in two T-shaped parts, the stem of one embracing that of the other and screw-fastened thereon, as seen in Figs. 5 and 5^b, to render it adjustable in length for regulating the motion.

The driving-shaft S carries at its protruding end, which is at the right hand of the operator, the customary fast band-wheel W and loose driving-pulley P′, with clutch connections. To afford a solid and durable bearing for this pulley end of said shaft S and at the same time admit the same freely and provide for its withdrawal conveniently, notwithstanding its crank c°, the arm-casting is simply provided with a suitably-projecting boss b^8, Figs. 1, 5, and 5^a, bored larger than the diameter of the shaft, and a notch n°, of sufficient depth and diameter to clear said crank c°, cut in the bottom of said bore, and a flanged and split bushing b^9 is fitted to said bore, and when the shaft is in place is turned so as to bridge said notch with its solid side, and tightened by a set-screw inserted through the back of said boss, as seen in dotted lines in Fig. 5. A similar split bushing is held within the inner shaft-bearing by a screw i, Fig. 1.

W°, Figs. 1 and 2, represents an ordinary bobbin-winder mounted on the bed-plate B in position to coact with the belt or band which drives said pulley P′.

To provide for turning up the machine or head as mounted upon the table-top T° of its stand, so as to expose the parts below the bed-plate B without unbelting the driving-pulley P′, and at the same time to isolate the machine from the stand and floor in an effective way, the bed-plate B is made square-ended, as shown in Fig. 3, and is hinged to said table-top at the pulley end of the machine by a pair of cushioned hinges H^2, Figs. 1, 2, 2^b, 3, 5, and 5^a, one of them shown in detail in said Fig. 2^b. Each hinge is composed of a lug on the bed-plate B, (shown at H^2 in said Fig. 3,) and a part which is attached by screws to the table-top. The part last named is bored large and provided with a flanged elastic bushing e, having its flange between the parts of the hinge, and a stud-screw h°, projecting through said bushing from the lug on the bed-plate and adapted to turn freely in said bushing, completes the hinge. The other end of the bed-plate is supported by a pair of elastic cushions e^2, Fig. 1, seated in depressions in the table-top T° and coacting with conveniently-located surfaces d^2, Fig. 3, on the bottom of the bed-plate B. These surfaces may be formed by depressions, as shown, or by short "legs" or studs. For driving the needle n and take-up arm t from said driving-shaft S, with better provision for resisting and taking up wear, said shaft S is provided at the needle end of the machine with a combined disk and cam D′, Figs. 1, 6^a, and 7^a, the disk end of which is flush with the extremity of the shaft and with the inner wall of said head-recess covered by the face-piece H, and is connected by an adjustable wrist-pin screw w with the upper end of a driving-link D^2, the lower end of which forms a split bearing x to embrace a roller-stud y' Fig. 6, with which the cylindrical needle-bar N is provided near the bottom of said head-recess. An oil-tube o, Fig. 6^a, depending within said head-recess, provides for readily lubricating said driving-link from the top of the head. The cam end of said disk and cam D′ is cylindrical and of large diameter, and is provided with a radial hole, through which its fastening-screw is inserted, as seen in Fig. 1, into the shaft-groove, (seen in Fig. 6^a,) and is provided with a circumferential cam-groove g', Figs. 1 and 7^a, adapted in an ordinary way to operate said take-up arm properly, said take-up arm being provided with a roller-stud r^3, fitted to said groove. The take-up arm is adapted to be stamped from plate-steel, and at the same time is provided with an extended bearing on the outer end of its pivot-screw p^7 by means of a combined bushing and hub h^4, Fig. 1^z, made fast within the bore of the arm.

The face-plate H, Figs. 1, 2, 6, 6^b, and 6^c, is bored at its upper and lower ends to form the vertical guides for the needle-bar N, in the manner represented in Figs. 6 and 6^b, with substantial bearings of the solid metal, and beyond these large bores provided with coils of packing material p^8, Fig. 6^b, and screw-glands g^2 g^3, so that the needle-bar may be kept well lubricated and at the same time be kept tight and the escape of oil downward to the cloth be prevented.

For supplying the upper thread to the needle n I provide an improved holder for the commercial spool S°, Figs. 1, 1^x, and 2, as shown in these figures. The essential parts of this holder are a horizontal spindle h^5, substantially parallel to the horizontal portion of the arm A, having a head at its needle end and provided with an outwardly-sprung split sleeve h^6, loose upon said spindle, and as large as or a little larger than the head of the spindle over which the spool S° is passed to apply it to said sleeve, upon which it fits tightly. The upper thread draws freely at the highest speeds from the spool so held, as it is is not necessary that the spool should rotate. From around the smooth head of the spool, directed toward the needle end of the machine, the thread passes through a guide t' between a pair of tension-disks t^2, through the eye t^3 of the take-up arm t and another guide t^4 to the eye of the needle n, as indicated in Figs. 1 and 2. Said holder-spindle h^5 is screwed into a hub h^7 at one extremity of a casting H°, the other end of which forms a horizontal disk provided with a vertical bore fitted to the customary vertical spindle v, and is provided with a radial clamping-

screw c^4, by which it is held in position. Said tension-disks t^2, Figs. 1, 2, and 6^c, are mounted upon a split and screw-threaded spindle t^6, Fig. 6, together with a tension-spring t^7 and a milled nut t^8, and a finger-lever t^9, interposed at its lower end between said outer disk and spring, forms an efficient tension-relief. The tension-disks are of the customary concavo-convex shape, the convex face of the outer disk bearing against the convex face of the other disk, hereinafter termed the "inner" disk, as seen in Figs. 2 and 6^c, and both disks and the superposed finger-lever t^9 are loosely fitted to the spindle t^6, as indicated in Fig. 6^c, while the spring rests upon the lever both above and below the spindle. Consequently, if the upper end of the lever be pressed toward the head H, the nearest point of the convex face of the inner disk will form a fulcrum upon which the outer disk and the finger-lever will turn together, as indicated by dotted lines in Fig. 2, and thus free the upper thread or "relieve the tension" to the required extent.

For cutting the threads at the ends of seams by a part of the machine itself, and by the same means holding the ends which connect, respectively, with the bobbin b and spool S°, so that neither of them can be drawn down into the shuttle-race R when the machine is again started, I attach a peculiarly-constructed thread cutter and holder T′, Figs. 1, 2, 2^c, 2^d, and 6, to the presser-bar P at a convenient point, the same having a pair of upwardly-projecting holding-fingers h^8 h^9, Fig. 2^c, at its rear edge, and a cutting-blade c^5 integral with the inner or front edge of said finger h^8, said parts being united with a split collar c^6, which embraces the presser-bar.

When the operator desires to end a seam, the machine is stopped with the take-up arm t at its highest point, as shown in Figs. 1 and 2. The presser-foot p is then lifted from the work by means of the lifter L′, Fig. 2, and the right thumb is pressed on the projecting end of the tension-relief lever t^9. The thread can now be readily drawn by the left hand, both from the shuttle-bobbin b and the upper thread-spool S° without breaking either thread. The thread is drawn first backward and then upward to the thread cutter and holder and between its holding-fingers h^8 h^9 around its cutting-blade c^5 and out at the left. A slight downward pull now severs the thread on the edge of the cutting-blade, and those ends belonging to the machine are held at their extremities between said holding-fingers, and also beneath the presser-foot when the latter is again lowered, so that they shall not be carried down into the shuttle-race.

The lifter-stud l^3, Figs. 1 and 2, with which the lifter L′ engages, is formed on a sleeve L^2, Fig. 6, which embraces the presser-bar P within the head, and is clamped thereon in proper position by a screw l^4, Figs. 1 and 2, working within said stud, which is tubular, in customary manner. To steady the presser-bar as against lateral movement of the presser-foot, or to keep the presser-bar from turning, a link L^3, Fig. 6, is introduced into the head-recess, the same being provided with a horizontal stud-pin l^5, perpendicular to its rear end, and said sleeve L^2 is provided with a split bearing l^6 to work upon said stud-pin, while the front end of the link is "slotted" or notched and coacts with a screw l^7, which passes through the notch of the link into the front of the face-piece H and is tightened more or less, as may be required, to take up wear at this point.

To resist wear and keep the presser-bar from shaking in operation, its lower bearing in said face-piece H, as illustrated in Figs. 6, 6^c, and 6^d, is bored large and packed and provided with a screw-gland g^4 like those of the needle-bar, and is, moreover, provided with a split metallic bushing m, tightened by a set-screw m'. The upper end of the presser-bar is guided by the customary hollow pressure-regulating screw P°, Figs. 1, 2, and 6, beneath which, as shown in Fig. 6, is a spiral presser-spring S^3, which acts on a split collar C^2, clamped in proper position on the presser-bar.

Details not herein specified are or may be of the description set forth for corresponding parts in my previous patents aforesaid or of any approved description.

Having thus described my said improvement in rotary-shuttle sewing-machines, I claim as my invention and desire to patent under this specification—

1. In a rotary-shuttle sewing-machine, a cloth-plate attached by a pivotal screw so as to swing horizontally, and having an elastic slitted corner portion forming a fastening means, in combination with a bed-plate having a reentrant angle to coact with said corner, and a spring-finger depending from the under side of said cloth-plate to retain the bobbin-case in the shuttle, substantially as set forth.

2. In combination with a rotary shuttle and its disk-bobbin, a non-rotary bobbin-case having a cylindrical body which completely envelops the edges of the bobbin and provided with a threading-slit in its edge at the back of the case extending to a point midway between the disks of the bobbin, a peripheral groove leading therefrom to the face of the case, and a tension-guard and an upwardly-projecting arm attached to the face of the case, the arm comprising two parts, one of which is a longitudinal spring, together with a tension-screw uniting them, and one of said parts having a hook or threading-finger masked by said tension-guard and a guide hole or slot into which the under thread is directed by said finger, substantially as set forth.

3. In combination with a rotary shuttle and its disk-bobbin, a non-rotary bobbin-case having a cylindrical body which envelops the edges of the bobbin and provided with a threading-slit in its edge at the back of the case extending to a point midway between

the disks of the bobbin, a peripheral groove leading therefrom to the face of the case, and a tension-guard and an upwardly-projecting arm attached to the face of the case, the arm comprising two parts, one of which is a longitudinal spring, together with a tension-screw uniting them, and one of said parts having a thread-guide at the upper end of the arm, and one of them having a hook or threading-finger and a guide-hole at the perimeter of the body of the case, into which the under thread is directed by said finger, substantially as set forth.

4. In a rotary-shuttle sewing-machine, the combination, with an annular shuttle-race, of a rotary shuttle having a marginal guide-flange provided with a radial slit or notch to carry out of the shuttle-race particles of thread or lint, substantially as set forth.

5. In combination with the shuttle-driver disk of a rotary-shuttle sewing-machine, a shuttle-driver having a shuttle-engaging portion at right angles to said disk inclined in opposite directions and provided with a tapering needle-admitting slot having its widest portion at the apex so formed, substantially as set forth.

6. In a rotary-shuttle sewing-machine, a bent-steel shuttle-driver having a flat back portion provided with a contracting slit and a shuttle-engaging portion at one edge thereof inclined in opposite directions and provided with a needle-admitting slot, substantially as set forth.

7. The combination, substantially as herein specified, of the rotary-shuttle driver-shaft provided with a stroke-cam and a lifting-cam, a rocking yoke embracing said stroke-cam and pivoted close thereto, a rock-shaft having a pair of arms, between which the longitudinal member of an L-shaped feed-bar is pivoted, a link connecting said longitudinal member with said rocking yoke, and a feed-dog carried by the other member of the feed-bar, for the object stated.

8. The combination, substantially as herein specified, of a link-motion feed mechanism having a rocking yoke embracing the stroke-cam, pivoted close thereto, connected by a link with the feed-bar, and having a sector groove or slot to coact with a roller-stud on said link as their coupling, a rock-shaft extending to a conveniently-located slot in the bed-plate and provided thereat with a finger-lever, and an arm projecting from said rock-shaft and suitably coupled with said link for adjusting said coupling of the latter with said rocking yoke to regulate the length of stitch, in the manner set forth.

9. In a link-motion feed mechanism having a horizontally-arranged L-shaped feed-bar pivoted at the extremities of its longitudinal member and carrying the feed-dog on its other member, a steel bar interposed between said other member of the feed-bar and the lifting-cam, and a vertical screw for adjusting said steel bar, substantially as herein specified, for regulating the projection of the feed-dog, in the manner set forth.

10. In combination with the crank-shaft within the arm of the machine, an arm-casting bored large and notched at the bearing for the pulley end of said shaft, and a flanged bushing-sleeve fastened within the bearing-bore to form a closed bearing and cut off communication with the notch, substantially as herein specified, for the object stated.

11. The combination, in the upper tension device, of a spindle, a pair of disks mounted thereon having convex faces opposed to each other, a spiral spring which normally keeps the disks in contact, and a tension-relief lever interposed at one end between the outer disk and the spring and having in common with said outer disk a hole occupied by said spindle and loosely fitted thereto, so that said lever and outer disk are free to turn together upon the convex face of the inner disk as upon a hinge, substantially as set forth.

12. In combination with the presser-bar guided within the head of the machine at top and bottom of the latter, an intermediate link-guide having an adjustable split connection with the lifter-sleeve and a screw-pivot at its opposite end, substantially as herein specified, for the objects stated.

ARTHUR M. LESLIE.

Witnesses:
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