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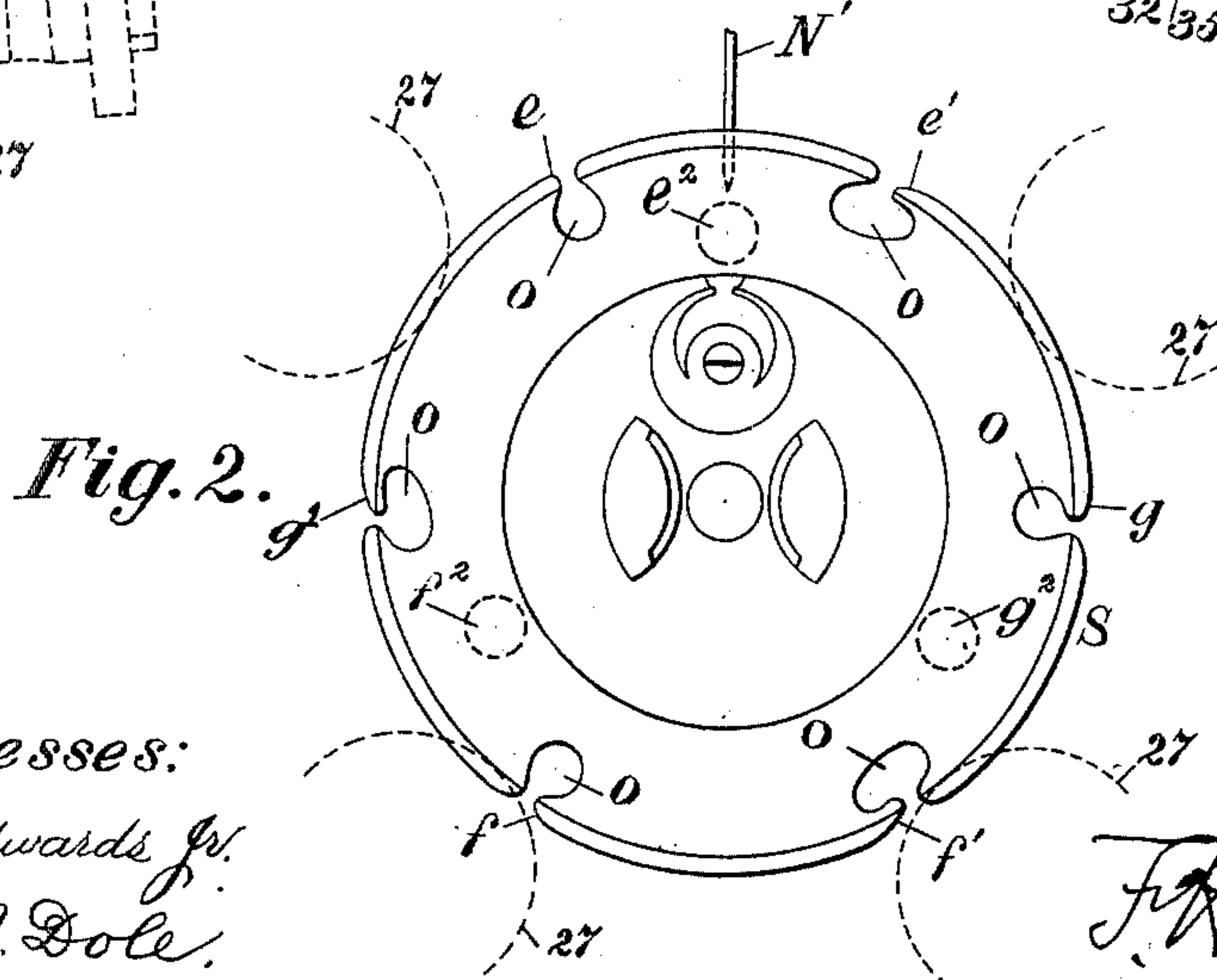
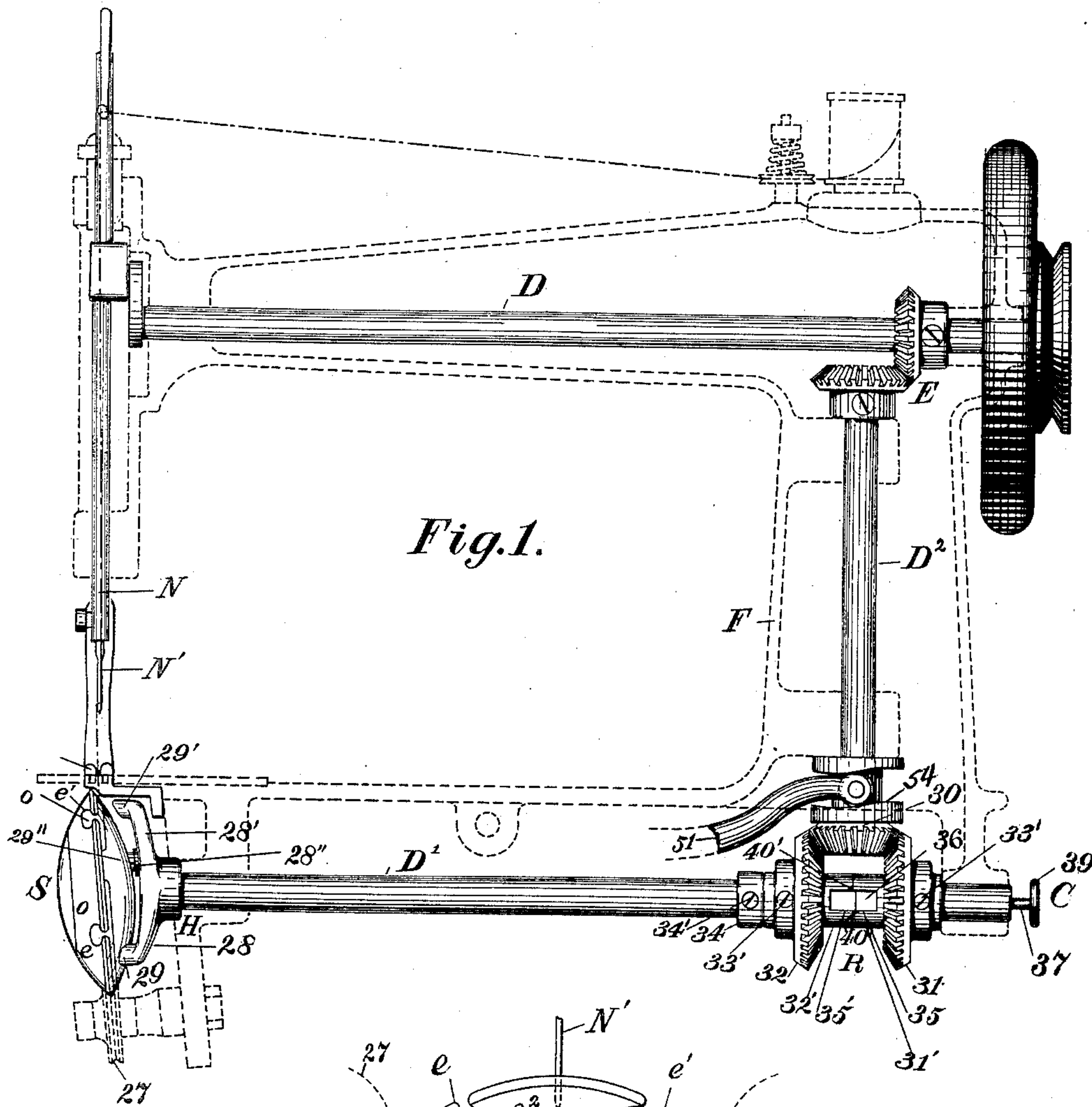
Patented July 30, 1901.

F. H. RICHARDS.
SEWING MACHINE.

(Application filed Jan. 26, 1895.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
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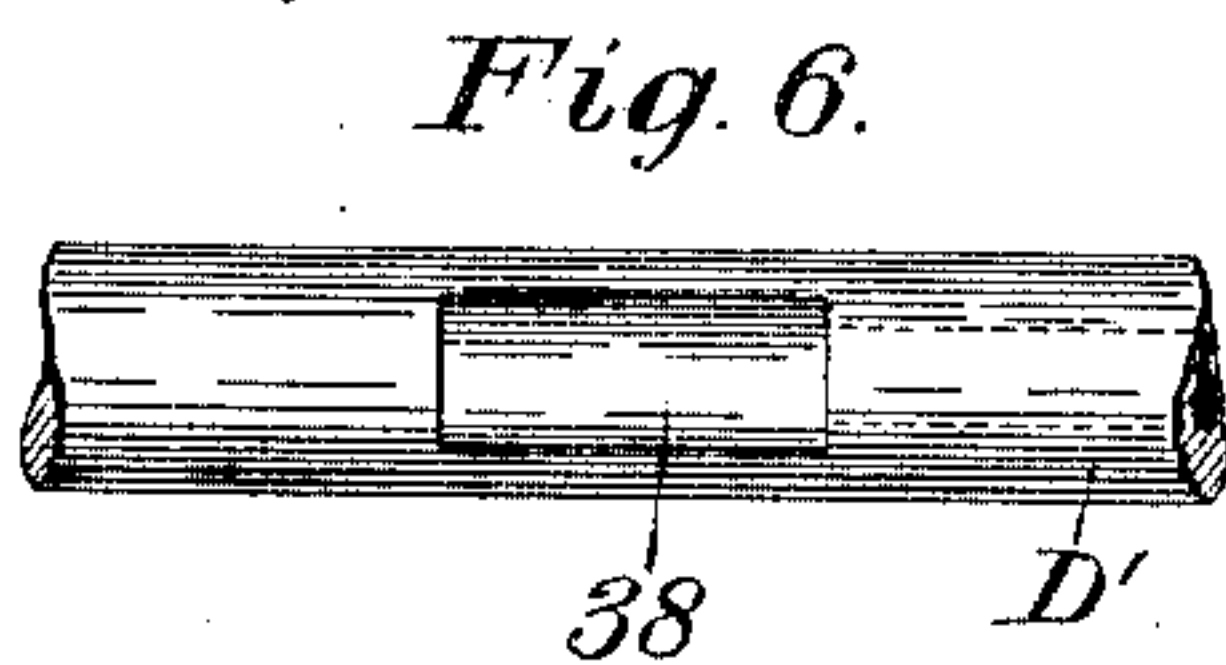
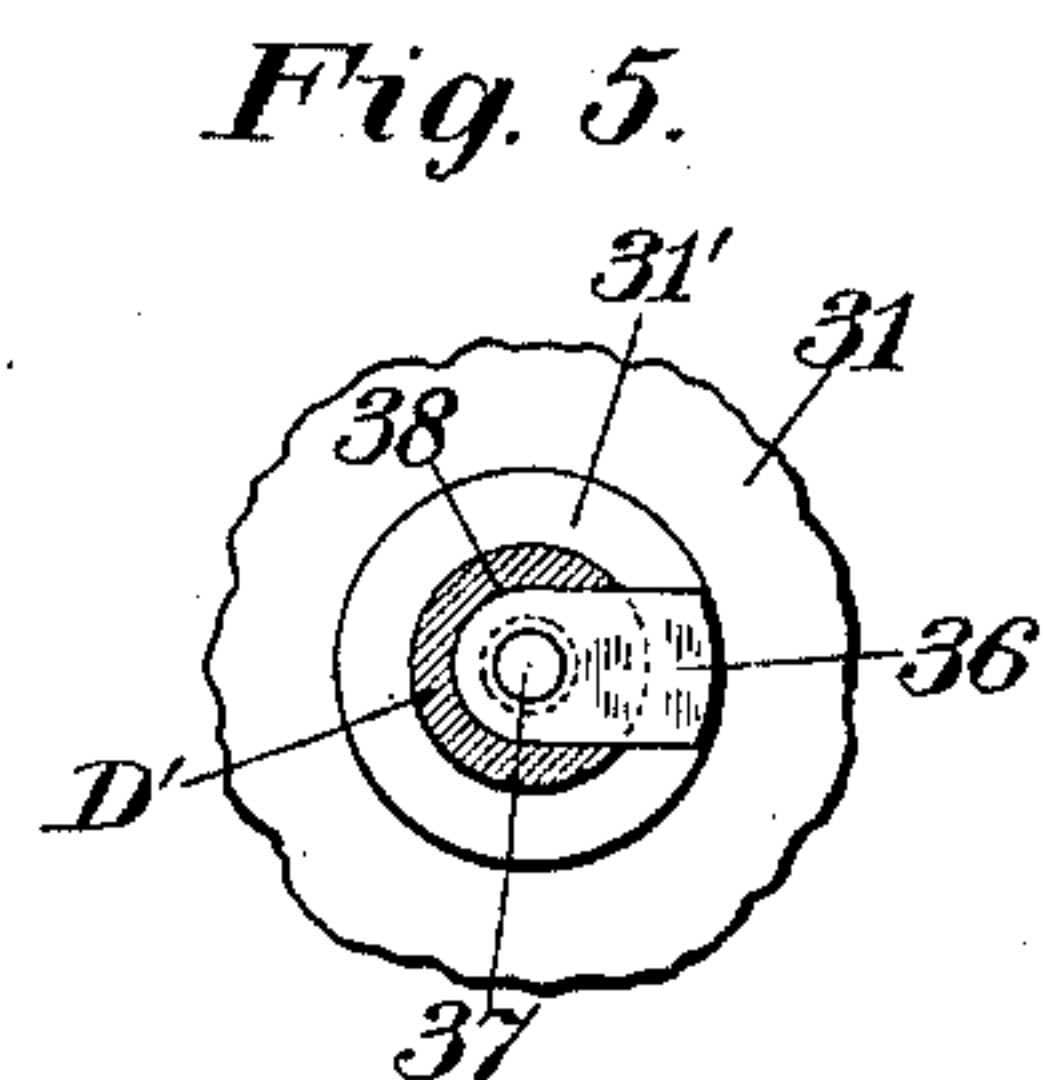
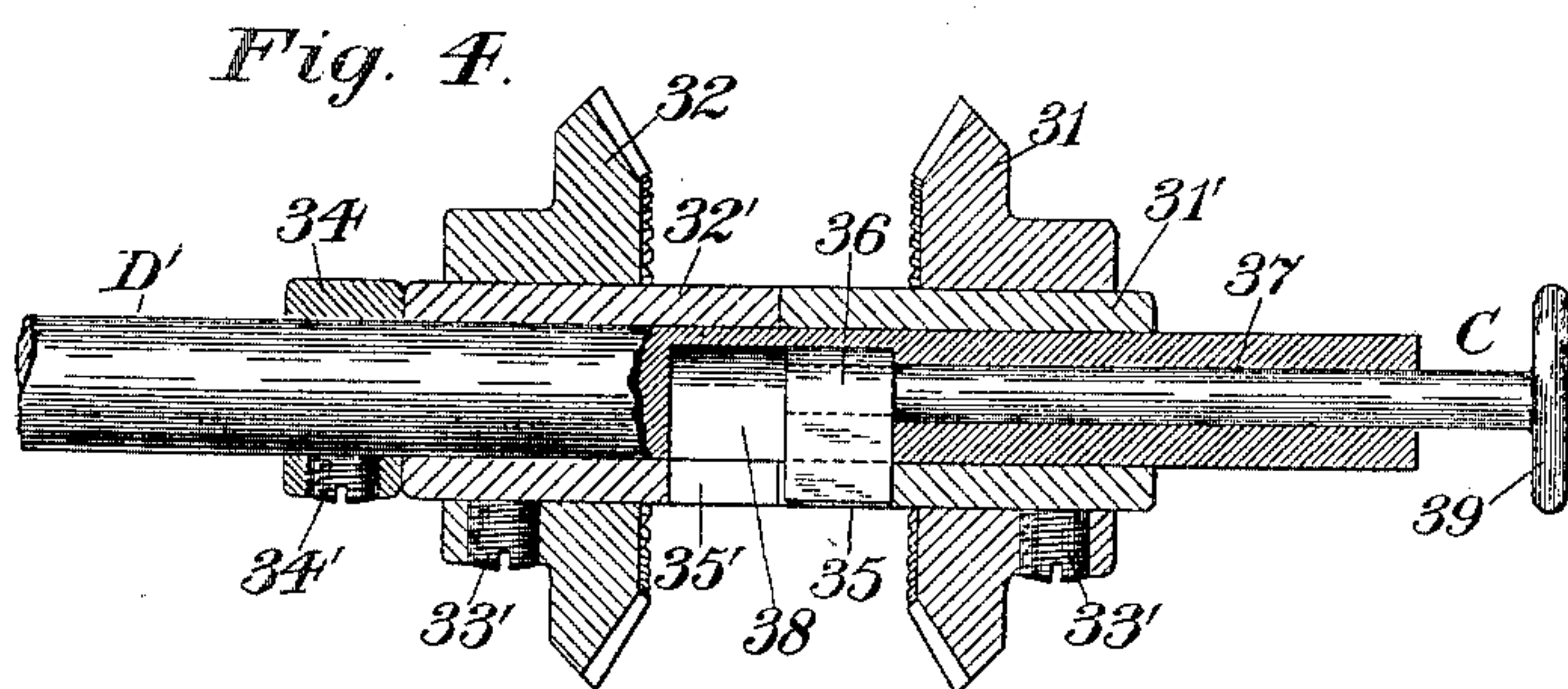
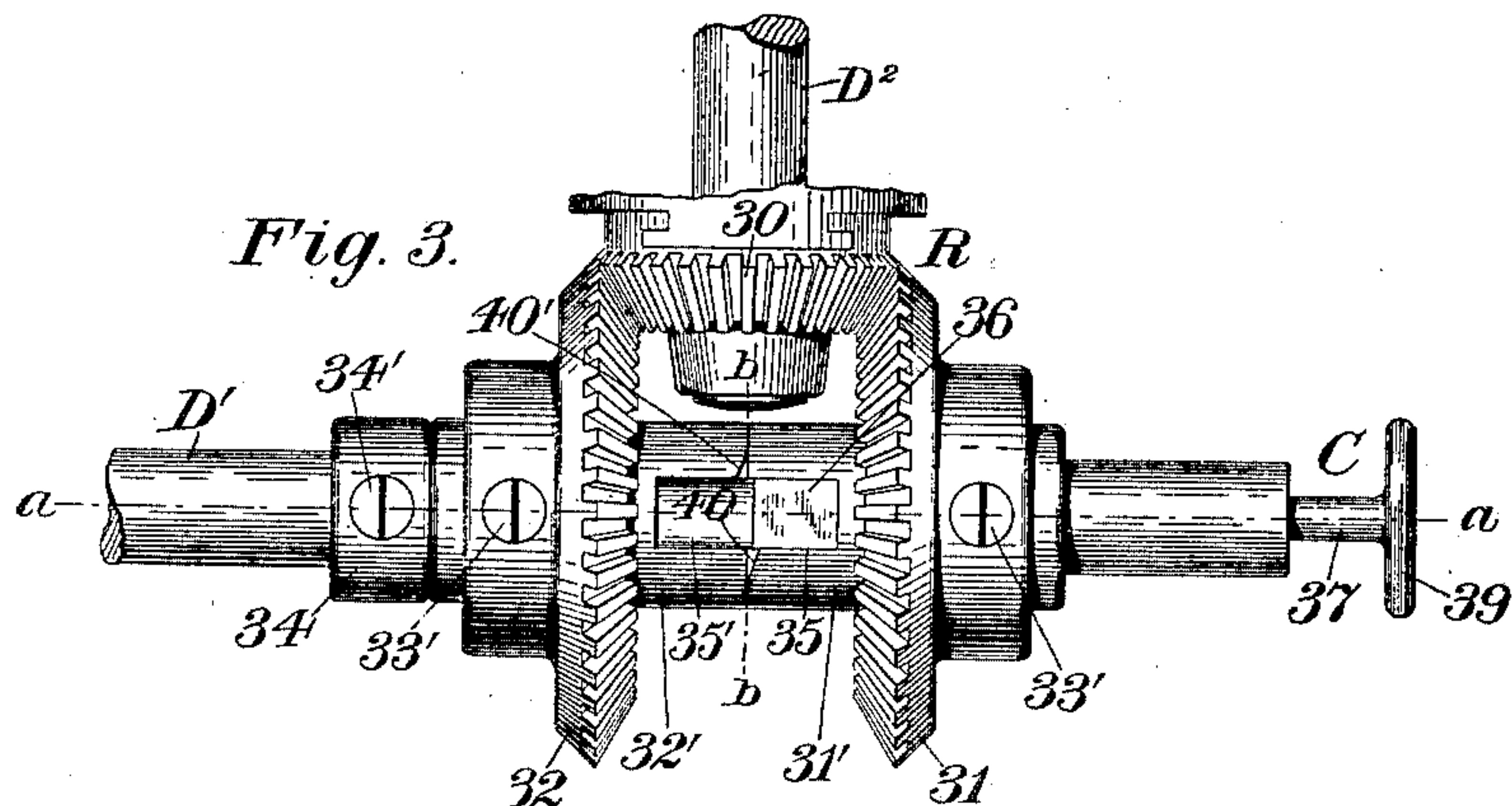
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(No Model.)

2 Sheets—Sheet 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT, ASSIGNOR TO JEREMIAH EVARTS TRACY, OF PLAINFIELD, NEW JERSEY.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 679,511, dated July 30, 1901.

Application filed January 26, 1895. Serial No. 536,338. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

This invention relates to sewing-machines of the class known as "combination lock-stitch and chain-stitch" machines, or sewing-machines in which a vertically-reciprocating needle-bar and a movable shuttle or looper are employed for making the stitch and in which the loop of the needle-thread may be engaged by the looper to inclose a second or lower thread to form a lock-stitch, or in which one loop of the needle-thread may be carried by the looper through a preceding loop to form a chain-stitch.

An object of the present invention is to provide, in connection with a sewing-machine having a movable looper or shuttle provided with loop-takers for forming different kinds of stitches, improved means whereby a change in the character of the stitch may be effected.

A further object of my present invention is to furnish, in connection with a sewing-machine having a revolvably-reversible looper or shuttle, an improved actuator embodying reversing mechanism in position and adapted for changing the direction of rotation of the shuttle and its actuator without changing the direction of movement of the other parts of the machine, to thereby effect a change in the character of the stitch.

Another object of my invention is to provide, in connection with a sewing-machine of the class specified having a vertically-reciprocating needle, a reversibly-revoluble looper having two sets or two series of oppositely-disposed peripheral loop-takers, shown as hooks, the hooks on one set alternating with those of the other set, and the hooks of one set being adapted to engage the loops of the needle-thread when the looper is rotated in one direction to form one kind of stitch and the hooks of the other set being adapted to engage the loops of the needle-thread when the looper is rotated in the opposite direction to form another kind of stitch, and to combine with said looper locking and reversing

mechanism adapted for effecting a change in the direction of rotation of the shuttle at that point in the rotation thereof which corresponds with a neutral position of the needle relatively to two opposing hooks of the looper, one hook of each set of hooks, and adapted for locking said looper against a change in the direction of rotation thereof until the needle occupies a neutral position between two opposing hooks.

Another object of the invention is to so construct said reversing mechanism and to so organize the same relatively to the shuttle or looper as positively to insure the accurate positioning of one or the other of the hooks of said shuttle relatively to the needle-bar and needle when the reversing mechanism is shifted to rotate the shuttle in one or the other direction, as desired to form a lock-stitch, and to accomplish this without the necessity of adjusting or resetting the parts after they are assembled and before and after the shifting of the reversing mechanism takes place, and also to provide means for preventing any misadjustment of the shuttle and its operating-hooks relatively to the needle-bar when a change in the direction of rotation of the said shuttle is made by the shifting of the reversing mechanism.

Another object of my invention is to so construct and organize the reversing mechanism and shuttle-actuator that the reversing mechanism cannot be operated to effect a change in the direction of rotation of the shuttle until the necessary set of hooks of the shuttle is in proper operative position relatively to the needle-bar.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation of a portion of the operative mechanism of a sewing-machine of the class specified embodying my present improvements, the framework of the machine being shown in dotted lines, as if in vertical section. Fig. 2 is an elevation of a reversible shuttle detached, which shuttle is shown having two sets or two series of oppositely-disposed peripheral loop-engaging hooks, the hooks of one set alternating with those of the other set and being adapted the hooks of one set for engaging the loops of the needle-thread when the

shuttle is rotated in one direction to form a lock-stitch and the hooks of the other set for engaging the loops of the needle-thread when the shuttle is rotated in the opposite direction to form a chain-stitch, the supporting-rolls for said shuttle being shown in dotted lines in said figure in their proper positions. A portion of the lower end of the needle is also shown in this figure to illustrate the operative relation between the shuttle and the needle. Fig. 3 is a side elevation, on an enlarged scale, of the shuttle-reversing mechanism detached, a portion only of the shuttle-driving mechanism being shown. Fig. 4 is a horizontal section of said reversing mechanism, taken in dotted line *a a*, Fig. 3, as seen from the upper side in said figure. Fig. 5 is a vertical cross-section taken in dotted line *b b*, Fig. 3, and looking toward the right hand in said figure, a portion only of one of the gears of the reversing mechanism being shown; and Fig. 6 is a side elevation of a portion of the looper or shuttle-actuating shaft, showing the clutch-pin slideway therein.

Similar characters represent like parts in all the figures of the drawings.

In the drawings only so much of a sewing-machine is shown as is deemed necessary clearly to illustrate the application and the mode of operation of my present improvements.

Briefly stated, the sewing-machine shown in the drawings comprises a suitable framework, (shown in dotted lines, Fig. 1, and designated in a general way by *F*;) a reciprocating needle-bar *N*, carrying an eye-pointed needle *N'* at the lower end thereof; a needle-bar-actuating shaft *D*, journaled in suitable bearings in the framework and operatively connected with the needle-bar; a revolvably-reversible shuttle or looper *S*, preferably supported at an inclination to the path of movement of and below the needle-bar by means of track-rolls 27, which are peripherally disposed relatively to the looper and are carried by suitable studs connected with a bracket which constitutes a part of the framework of the machine, as shown in dotted lines in Fig. 1 of the drawings; a horizontally-disposed looper-actuating shaft *D'*, the axis of which is shown inclined relatively to the axis of the looper; a driver *H*, carried by the shaft *D'*, in position and adapted for engaging and rotating the shuttle; an intermediate or vertical shaft *D²*, connecting the needle-bar-actuating shaft *D* and the looper-actuating shaft *D'*; a feed-lever 51, a portion only of which is shown; a cam 54, carried by the intermediate shaft *D²* and in engagement with the feed-lever 51; a train of gears directly connecting the intermediate shaft *D²* and the needle-bar-actuating shaft *D*, and a reversing driving mechanism (designated in a general way by *R*) connecting the intermediate shaft *D²* and looper-actuating shaft *D'* and constructed and adapted, as will be hereinafter more fully described, for effecting a re-

versal in the direction of movement of the looper without effecting a change in the direction of movement of the intermediate shaft *D²* or needle-bar-actuating shaft *D*.

Inasmuch as the feed mechanism does not in itself constitute an essential part of my present invention and as any suitable or well-known feed mechanism may be employed in connection therewith, I have only shown in the drawings so much of the feed mechanism—to wit, a portion of the feed-lever, the feed-lever-actuating cam, and the vertical shaft, which actuates the cam—as is necessary to an understanding of the general operation of the machine.

It is desired to state in the above connection that a sewing-machine embodying my improvements will of course be provided with suitable tension devices and other accessories to render the same operative for sewing.

The intermediate shaft *D²* constitutes not only the driver for the reversing mechanism, but also constitutes the feed-lever-actuating shaft, said shaft *D²* carrying the cam 54, with which the feed-lever 51 is operatively connected and by which said feed-lever is oscillated.

The shuttle or looper *S* is of a well-known convex discoidal form and has two sets of peripheral loop-engaging hooks, (shown, preferably, consisting of three hooks in each set,) the hooks of one set being oppositely disposed relatively to and alternating with the hooks of the other set. The hooks of one set are designated by *e*, *f*, and *g*, respectively, and are adapted for engaging the loops of the needle-thread when the shuttle or looper is rotated in one direction to form a lock-stitch and will be termed herein the "lock-stitch" hooks, and the hooks of the other set are designated by *e'*, *f'*, and *g'*, respectively, and are adapted for engaging the loops of the needle-thread when the shuttle or looper is rotated in the opposite direction to form a chain-stitch and will be hereinafter termed the "chain-stitch" hooks. Each loop-engaging hook is formed by a wall of a loop-receiving opening *O*, formed transversely in the periphery of the shuttle, as will be understood by reference to Fig. 2 of the drawings, and each hook is of course provided with a beak to take the loop from the needle and a heel to let it off. This looper or shuttle is also shown as having driver-sockets (designated by *e²*, *f²*, and *g²*) formed in one side thereof and adapted to be engaged by successive driver-pins upon the revolvable driver *H*, as will be hereinafter more fully described.

Each driver is, as shown in Fig. 2, located substantially midway between a lock-stitch hook and a chain-stitch hook or between one hook of one set and the next adjacent oppositely-disposed hook of the other set of hooks, so that during the rotation of the looper in either direction said driver-socket will have an advanced relation to the operating-hook

of the set of hooks or the hook which is to engage the loop of the needle-thread. I desire to state that in this connection it is therefore distinctly to be understood that the invention is not limited to the specific looper or shuttle described, as it comprehends any looper or shuttle provided with a plurality of loop-takers, one loop-taker coöperating with the needle mechanism to form a lock-stitch when the looper is shifted and another loop-taker coöperating with said needle mechanism to form a chain-stitch or a lock chain-stitch when the looper is again shifted.

The driver H in the form shown has three radially-disposed arms 28, 28', and 28'', each having at the free end thereof an outwardly-projecting driving-pin, the pins of the three arms being adapted to engage in the corresponding driver-sockets in the shuttle or looper S and serving to rotate the same continuously, as will be readily understood by reference to Figs. 1 and 2 of the drawings, the driver-pins of the successive arms 28, 28', and 28'' being respectively designated by 29, 29', and 29''. It will of course be understood that any desired number of driver-pins may be employed, in which case the looper will have a corresponding number of driver-sockets formed therein.

As will be seen by reference to Fig. 1 of the drawings, the path described by the ends of the driver-pins of the driver H is at an inclination to the path of movement of the loopers, the degree of inclination of said looper relatively to the driver-pins being in practice small for the purpose of promoting the duration of engagement of the successive driver-pins with the shuttle or looper and also for the purpose of reducing to a very large extent the rolling action of the driver-pins in their respective driver-sockets.

As a means for changing the direction of rotation of the looper without changing the direction of movement of the intermediate or needle-bar-actuating shaft D² to thereby render said looper operative for forming a lock-stitch or a chain-stitch, as desired, and in the construction shown as a means for maintaining an operative relation between one set of loop-engaging hooks of said looper and the reciprocating needle when the looper is rotated in one direction, and for maintaining an operative relation between another set of hooks and the needle when the looper is rotated in the opposite direction, I have provided, in connection with the looper-actuating shaft or driver, and preferably intermediate to said driver and said intermediate shaft D², a reversing driving mechanism, (designated in a general way by R,) which in the form shown comprises a bevel-gear 30, fixed upon the lower end of the intermediate or feed-actuating shaft D², two oppositely-disposed bevel-gears 31 and 32, revolvably mounted upon the looper-actuating shaft D' and preferably in constant mesh, respectively, with opposite sides of the bevel-gear 30 and

adapted one of said gears for rotating the looper-actuating shaft in one direction and the other of said gears for rotating said shaft in the opposite direction, and a shifting means (shown as a clutch device and designated in a general way by C) carried preferably by the looper-actuating shaft and in position and adapted for effecting a fixed connection between the looper-actuating shaft and one or the other of the bevel-gears 31 or 32, as desired.

In the form of reversing mechanism shown and described the bevel-gears 31 and 32, which mesh with the gear 30 upon the vertical shaft D² and which constitute the reversing members or gears for effecting the requisite change in the direction of rotation of the looper or shuttle actuating shaft, are for convenience of adjustment shown separately mounted upon sleeves 31' and 32', respectively, and are adjustably secured to said sleeves, preferably by means of set-screws 33'. These sleeves 31' and 32' may be held against longitudinal movement after adjustment upon the shaft D' by any suitable means—as, for instance, a collar 34, adjustably fixed to said shaft by a set-screw 34', as clearly shown in Figs. 1, 3, and 4 of the drawings. These sleeves are notched or slotted longitudinally at adjacent ends thereof, as shown at 35 and 35', to form clutch-pin sockets adapted for registering one with the other and for receiving a clutch pin or key 36 on a clutch-rod 37, carried by and rotating with the shuttle-actuating shaft D'. In the present instance said clutch-pin 36 is shown shiftably supported in a recess or guideway 38, formed longitudinally in the periphery of the shaft D in such a manner that the outer end of said pin projects somewhat beyond the periphery of said shaft, as shown most clearly in Fig. 4 of the drawings, and the clutch rod or stem 37 is shown extended through an axial bore in said shaft into the recess 38 and is secured at its inner end to the clutch-pin 36, preferably in the manner shown in Fig. 4 of the drawings, said clutch-rod being preferably provided with a knob 39 at the outer end thereof, which constitutes a convenient means for shifting said rod to throw the clutch-pin 36 into or out of engagement with the sleeve of one or the other of the reversing-gears 31 or 32.

For the purpose of facilitating the shifting of the clutch pin or key 36 from the clutch-pin socket in the sleeve of one of the reversing members or gears into the clutch-pin socket of the sleeve of the other reversing member or gear, said clutch-pin sockets are preferably relieved at opposite sides, respectively, as shown at 40 and 40', so that when the operator takes hold of the knob 39 (which knob is connected by means of a stem or rod 37 to the clutch-pin 36, as hereinbefore described) and shifts the clutch-pin or crowds the same against the end of the opposite sleeve (the sleeves abutting against each

other, as shown in the drawings) said clutch-pin will upon coming to said relieved portion pass partly out of one sleeve and engage against the side wall of the socket of the other sleeve, thereby positively positioning the two sleeves relatively to each other with their clutch-pin sockets in registration, and thus permitting the operator to complete the shifting movement of the clutch.

10 In the organization shown and described the oppositely-revoluble members 31 and 32 and the clutch C practically constitute a combined looper or shuttle reversing and locking device, said device being adapted for reversing the movement of the looper or shuttle and also for locking said shuttle against a reverse movement thereof until the proper hook of the same comes to a precise position relatively to and in coöperative relation with the needle—that is to say, a change in the movement of the looper or shuttle cannot be effected until a coöperative relation is established between one hook and the needle—as, for instance, when the needle arrives at a neutral position relatively to two opposing hooks. By this means the needle is positively maintained during the reversing operation in such relation with two different hooks that it will properly coöperate without further adjustment with either hook irrespective of the direction of rotation of said looper or shuttle.

25 In assembling the parts of the machine to bring the looper or shuttle, needle-bar, and reversing mechanism into proper coöperative relation it is simply necessary to adjust the two members of the reversing mechanism so that the clutch-pin sockets thereof will accurately register one with the other when the needle carried by the needle-bar of the machine comes to a neutral position or to a position intermediate of and common to two opposing hooks of the shuttle. In this position the needle is in substantially the position shown in Fig. 2, and therefore substantially midway between a pair of hooks, one of each of the two sets of hooks, and consequently in such position that when it moves upward to throw a loop and has actually thrown such loop a hook of one or the other set of hooks, according to the direction of rotation or whether a chain or a lock stitch is to be made, will be carried into position to coöperate with such needle and take the loop. At this midway or neutral position of the needle the slots of the two sleeve members are in register; but when the needle has moved upward and thrown out its loop and the loop-taker—as, for instance, of the chain-stitch set *e'*—has arrived at the point where it will take such loop, then, as will be obvious, the slots of the sleeve members no longer register. Now presuming that the machine has been running and it is desired to change from the chain-stitch to the lock-stitch, the machine is stopped, at which time it will be unlikely that the needle will be in its neutral position relatively to the hooks, but in some other po-

sition, so that the hook of one set or the other will be nearer the needle than is shown in Fig. 2. By turning the driving-wheel either forward or backward, so as to shift the sleeve, which is connected with the looper-shaft by the clutch-pin, such looper-shaft will be rotated to shift the looper circumferentially to reset the same to have the needle in a neutral position or in a position intermediate of or common to the two opposing hooks of the two sets of hooks, as shown in Fig. 2. This shifting of the sleeve either backward or forward, as the case may be, brings the slots of the two sleeves into register, thus resetting the looper in the position shown in Fig. 2, at which time by the shifting of the clutch-rod 37 the clutch-pin is moved from the slot of one member to the slot of the other, whereupon on the operation of the driving-wheel of the machine the looper will rotate in a direction reverse to that in which it was previously rotated, and thus coöperate with the hooks of the other set of hooks—as, for instance, the hooks *e f g*—this reversal of the looper being thus effected without changing the direction of rotation of the main driving-shaft or reversing the needle mechanism or the feed mechanism and without turning the looper by first detaching it. By thus resetting the looper in the manner just indicated the hooks of the two sets are brought into such position relatively to the needle that such needle is in position to coöperate with either set of hooks, and consequently when on the further operation of the machine the needle is moved upward and has thrown out a loop that loop-taker of the set which is to coöperate with the needle will be in proper position adjacent to the needle to take such loop. By this construction and organization of shifting mechanism it is practicable to secure such absolute precision in the operative relation between the looper or shuttle and the needle-bar that one hook of said looper or shuttle will have an operative relation to the needle-bar and needle when the looper or shuttle is rotated in one direction, and another hook will have an operative relation to the needle-bar and needle when the looper or shuttle is rotated in the opposite direction, and the direction of rotation of the shuttle or looper may be reversed by simply shifting the clutch-pin into engagement with one or the other of the members of the reversing mechanism without in any way affecting such coöperative relation between the loop-engaging hooks and the needle.

Another advantage of the reversing mechanism shown and described is that no precaution is necessary when shifting the clutch to change the direction of movement of the looper or shuttle for fear of throwing the same out of operative relation with the needle, as said clutch cannot be shifted until the looper is in the correct position to bring the proper loop-engaging hook into operative relation with the needle, as will be readily un-

derstood by a comparison of the several figures of the drawings.

In practice, with sewing-machines of the class herein shown and described, the looper 5 or shuttle and the needle-bar will be so connected and timed in their movements that they will have comparative movements of relatively - varying velocities the ratio of which will be as two to three, the looper or 10 shuttle making two complete rotations while the needle-bar makes three complete reciprocations.

It will be obvious that the construction and organization of the mechanism herein shown 15 and described may be modified within wide limits and still be within the purview of my invention.

Having described my invention, I claim—

1. In a sewing-machine having a vertically- 20 reciprocating needle-bar, the combination therewith of a revoluble looper having sets of peripheral loop-engaging hooks, the hooks of one set being oppositely disposed relatively to the hooks of another set, and each hook 25 having a loop-receiving opening contiguous thereto; driving mechanism in operative connection with and adapted for simultaneously operating said needle-bar and looper at comparative velocities of a predetermined ratio; 30 and looper locking and reversing mechanism in operative connection with, and adapted for changing the direction of movement of, said looper, and also adapted for maintaining an operative relation between the needle-bar 35 and one or the other of the sets of hooks of the looper.

2. In a sewing-machine, an annular recessed looper having sets or series of peripheral loop-engaging hooks, the hooks of 40 one set of which are oppositely disposed relatively to and alternate with the hooks of another set, in combination with reversing driving-gearing composed of members mounted on the loop-taker-driving shaft, and 45 adapted for rotating said shaft, and thereby the looper, in one or the other direction.

3. In a sewing-machine of the class specified, the combination, with a reversibly-revoluble looper, of reversing driving mechanism 50 for said looper consisting of a loop-taker-actuating shaft; two gears revolubly mounted on said shaft; means in position and adapted for locking and releasing said gears reciprocally relatively to the shaft, and for 55 locking one of said gears to the shaft and to the other gear before releasing said other gear from locked engagement with the shaft, and vice versa; and means for rotating said gears in opposite directions.

4. In a sewing-machine of the class specified, the combination, with a reversibly-revoluble looper, of a loop-taker-actuating 60 shaft; two oppositely-disposed driven gears revolubly mounted on said shaft, and having notched hubs in bearing contact; a clutch member carried by the shaft and having a clutch-pin seated in a notch in one or the

other of the driven-gear hubs, and adapted for locking and releasing said gears reciprocally relatively to the looper-actuating 70 shaft, and for locking one gear to the shaft and to the other gear before the release of said other gear from locked engagement with the shaft, and vice versa; and means for rotating said driven gears in relatively oppo- 75 site directions.

5. In a sewing-machine, the combination, with a reciprocating needle and needle-actuating mechanism and with a revolubly-reversible looper and its actuator, of looper-reversing 80 mechanism in direct operative connection with the looper-actuator, and consisting of two driven gears revolubly mounted on said actuator; a clutch carried by said actuator in position and adapted for locking and releasing 85 said gears reciprocally relatively to said actuator, and for locking one gear to the actuator and to the other gear before the unlocking of said other gear from the actuator, and vice versa; a driving-gear in mesh with 90 and adapted for rotating said driven gears in opposite directions; and means for rotating said driving-gear.

6. In a sewing-machine, the combination, with a reversibly-revoluble looper having sets 95 of peripheral loop-engaging hooks, the hooks of one set being oppositely disposed relatively to and alternating with the hooks of another set, and with a vertically-reciprocating needle-bar and its actuating-shaft, of a looper- 100 actuating shaft carrying a driver in position and adapted for rotating the looper; an intermediate shaft operatively connected with the needle-bar-actuating shaft, and carrying a driving-gear adjacent to the looper-actuating 105 shaft; two reversing driven gears revolubly mounted on the looper-actuating shaft and meshing with the driving-gear of the intermediate shaft; and a clutch device carried by the looper-shaft in position and adapted for 110 locking and releasing the driven gears reciprocally relatively to said shaft, and for locking one of said gears to the shaft and to the other gear before unlocking said other gear from the shaft, and vice versa; and also adapted 115 for maintaining an operative relation between the needle-bar and the sets of hooks of the loop-taker, irrespective of the direction of movement of the loop-taker.

7. In a sewing-machine, the combination, 120 with a revolubly-reversible looper having oppositely-disposed loop-engaging hooks, and with a looper-actuating shaft carrying a driver in position and adapted for rotating said looper, of looper-reversing mechanism comprising two independent oppositely-disposed 125 driven gears, two independent sleeves revolubly mounted on the looper-actuating shaft, and having clutch-pin sockets in adjacent ends thereof, adapted for receiving a clutch- 130 pin, and each sleeve carrying one of said driven gears; a clutch shiftably carried by said shaft, and adapted for engaging in the clutch-sockets in the two sleeves reciprocally

of the driven gears, and adapted for locking one sleeve and gear to the other sleeve and to the shaft before unlocking said other sleeve from locked engagement with the shaft, and vice-versa; a driving-gear in mesh with and adapted for continuously rotating the two driven gears in opposite directions; and means for actuating said driving-gear.

8. In a sewing-machine, the combination, with a reversibly-revoluble looper and with a longitudinally-recessed looper-actuating shaft, of two bevel driven gears revolubly mounted on said shaft; a clutch member supported for sliding movement transversely of the driven gears in the longitudinal recess of the loop-taker-actuating shaft, and carrying a clutch-pin between the adjacent ends of the hubs of and adapted for engaging said gears reciprocally, and adapted for locking one gear to the looper-actuating shaft and to the other gear before unlocking said other gear from said shaft, and vice versa; a bevel driving-gear in mesh with said driven gears, and adapted for continuously rotating said driven gears in opposite directions, respectively; and means for supporting, and means for rotating said driving-gear.

9. In a sewing-machine, the combination, with a reversibly-revoluble looper, of a looper-actuating shaft having an axial bore, and having a transverse recess in communication with said bore; a driver carried by said shaft in position and adapted for engaging and rotating said looper; two driven gears revolubly carried upon said shaft, one at each side of the transverse recess of said shaft, and having sleeves the inner adjacent ends of which are notched to form clutch-pin sockets; a clutch-rod shiftably supported in the axial bore of the looper-actuating shaft and carrying a clutch-pin which projects through the transverse recess in said shaft and is adapted for engaging in a socket in one or the other of the driven-gear sleeves, and also adapted for locking one sleeve and its driven gear to the shaft and to the other sleeve and its driven gear before releasing said other sleeve and its driven gear from locked engagement with said shaft; a driving-gear in constant mesh with the driven gears, and adapted for continuously rotating said driven gears in opposite directions, respectively; and means for supporting, and means for actuating said driving-gear.

10. In a sewing-machine, the combination, with a reciprocating needle and actuating mechanism therefor, of a reversibly-revoluble looper having sets of oppositely-disposed hooks, alternating the hooks of one set relatively to those of another set; reversing looper-driving mechanism in operative relation with the needle and looper, and embodying two oppositely-revoluble and reciprocally-effective looper-driving members; and means in position and adapted for reciprocally effecting an operative relation between said driv-

ing members and looper at one predetermined point in the rotation of said looper, whereby one set of hooks is operative when one driving member is effective for rotating the looper, and whereby the other set of hooks is operative when the other driving member is effective for rotating said looper.

11. In a sewing-machine, the combination, with a reciprocating needle and actuating mechanism therefor, of a reversibly-revoluble looper having two sets of peripheral opposing loop-engaging hooks, the hooks of one set alternating with those of the other set; driving mechanism in connection with and adapted for actuating the needle and looper at comparative velocities of a predetermined ratio; and a combined looper locking and reversing mechanism in connection with the looper, and adapted for effecting a change in the direction of rotation of said looper at a point in the rotation thereof corresponding with the neutral position of the needle relatively to two opposing hooks, one hook of each set of hooks, and adapted for preventing such change in the direction of rotation of the looper until the needle occupies this neutral position between the two opposing hooks.

12. In a sewing-machine, the combination, with a reciprocating needle and actuating mechanism therefor, of a reversibly-revoluble looper having two sets of oppositely-disposed hooks, the hooks of one set alternating with those of the other set; a looper-locking device in position and adapted for maintaining an operative relation between the needle and the two sets of hooks reciprocally irrespective of the direction of rotation of the looper; and a reversing driving mechanism in connection with said looper and adapted for changing the direction of movement of said looper without affecting the cooperative relation of the hooks and the needle.

13. The combination, with a looper having opposing loop-engaging hooks, of a reciprocating needle-bar; and reversing driving mechanism in operative connection with and adapted for rotating the looper in opposite directions, said mechanism comprising locking means for preventing a change in direction of rotation of the looper until the needle-bar has arrived at a neutral position with respect to the opposing hooks of said looper.

14. In a sewing-machine, the combination, with a reversibly-revoluble looper, having a plurality of loop-engaging hooks, a needle-bar and mechanism for revolving the looper and reciprocating the needle-bar, of reversing mechanism including a locking device for reversing the direction of rotation of the looper and maintaining a proper operative relation between the latter and the needle.

15. In a sewing-machine of the class specified, a revoluble looper having a plurality of sets of oppositely-disposed loop-engaging hooks, each of which hooks has a loop-receiving opening contiguous thereto, and the hooks

of one set alternating with those of another set, and adapted the hooks of one set for engaging the loops of the needle-thread when the looper is rotated in one direction to form one kind of stitch, and the hooks of the other set for engaging the loops of the needle-thread when the looper is rotated in the opposite direction to form another kind of stitch; needle mechanism; and driving mechanism in operative connection with and adapted for simultaneously operating the looper and needle mechanism at relatively varying velocities of a predetermined ratio, said driving mechanism involving reversing-gearing effective to shift the looper to reset it and for changing the direction of rotation of the looper when desired.

16. The combination, with a looper having at its periphery a plurality of sets of oppositely-disposed hooks so located that the hooks of one set alternate with those of another set, and each hook of each set having a loop-receiving opening contiguous thereto, of gearing effective to shift the looper to reset it and for driving the looper-actuating shaft in one direction and the reverse; and means for maintaining an operative relation between the looper and the needle, whereby the hooks of one set engage the loops of the needle-thread when the looper is rotated in one direction to form one kind of stitch, as a lock-stitch, and the hooks of another set engage the loops of said thread when the looper is rotated in the opposite direction to form another kind of stitch, as a chain-stitch, or a lock chain-stitch.

17. In a sewing-machine, in combination, with needle mechanism, a recessed bobbin-carrying loop-carrying looper having a series of sets of peripheral loop-engaging hooks, the hooks of one set of which are oppositely disposed relatively to the hooks of another set, and each hook of which is separated from the next adjacent hook of the same set by a track-segment, in combination with reversing-gearing carried by the looper-driving shaft and adapted for rotating said looper in one or the other direction as desired and also effective to shift the looper to reset it; and means for maintaining an operative relation between the loop-taker and the needle mechanism.

18. In a sewing-machine, the combination, with the framework, having a vertically-reciprocating needle-bar and means in connection with and adapted for reciprocating said needle-bar, of a revoluble looper peripherally supported below the said needle-bar and at an inclination to the path of movement thereof, and having sets or series of peripheral loop-engaging hooks, the hooks of one set being oppositely disposed relatively to and alternating with the hooks of the other set, the hooks of one set of which are adapted to be brought into operative relation with the needle-bar when the looper is rotated in one direction, and the hooks of the other set of

which are adapted to be brought into operative relation with the needle-bar when the looper is rotated in the opposite direction, and means in connection with and adapted for rotating the looper in one or the other direction and also effective to shift the looper to reset it.

19. In a sewing-machine, a revoluble loop-taker having sets or series of loop-engaging hooks, the hooks of each set being oppositely disposed with relation to and alternating with the hooks of another set, and each hook having a loop-receiving space contiguous thereto, and said looper also having a series of driving-sockets formed in one side thereof, each of which sockets is located intermediate two opposing hooks, being one hook of each set of hooks, in combination with a revoluble driver for rotating the looper, said driver having a series of driving-pins in position and adapted for successively engaging in the successive sockets of the looper.

20. In a sewing-machine, the combination, with a reciprocating needle, of a reversibly-revoluble driving-shaft and looper, the latter having a plurality of sets of hooks in its periphery, the hooks of one set being arranged alternately with and oppositely to the hooks of the other set, and each hook having a beak to take the loop from the needle and a heel to let it off; and means whereby the rotation of the looper-driving shaft may be reversed when it is desired to change from one set of opposing hooks to another for the purpose of making either a lock-stitch or a chain-stitch, said means including an adjusting and locking device, the adjusting and locking being accomplished by said device by one movement of the same.

21. In a sewing-machine, a revoluble looper having sets or series of loop-engaging hooks, the hooks of one set being oppositely disposed relatively to the hooks of the other set, and each hook of each set having a loop-receiving opening contiguous thereto, in combination with looper-reversing gearing loosely mounted on the driving-shaft; and a clutch for connecting said gearing with said shaft, whereby the same may be rotated in either direction.

22. In a sewing-machine organized for making two kinds of stitches, the combination with a needle and actuating mechanism therefor, of a movable looper having loop-takers, located one for making one kind of stitch at one position of the looper, and another for making another kind of stitch at a different position of said looper; means by which said looper may be shifted from one to another working position relatively to the needle mechanism to bring the loop-taker required for use into position for action, whereby one kind of stitch or another kind of stitch may be produced by the same machine; and means for actuating the looper.

23. In a sewing-machine organized for making two kinds of stitches, the combination

with a reciprocatory needle and actuating mechanism therefor, of a rotary looper having loop-takers, located one for making one kind of stitch at one position of the looper, and another for making another kind of stitch at a different position of said looper; means by which said looper may be shifted circumferentially from one to another working position relatively to the needle mechanism to bring the loop-taker required for use into position for action, whereby one kind of stitch or another kind of stitch may be produced by the same machine; and means for rotating the looper.

24. In a sewing-machine organized for making two kinds of stitches, the combination, with a reciprocatory needle, of means for actuating said needle; a rotary looper having sets of loop-takers, located one set for making one kind of stitch at one position of the looper and another set for making another kind of stitch at a different position of said looper; mechanism by which said looper may be shifted from one to another working position relatively to the needle mechanism to bring the set of loop-takers required for use into position for action, the construction being such that one kind of stitch or another kind of stitch may be produced by the same machine; and means for rotating the looper.

25. In a sewing-machine organized for making two kinds of stitches, the combination with a needle, of a movable looper having loop-takers located one for making one kind of stitch and another for making another kind of stitch; driving means for said needle and looper; and means by which said looper may be shifted from one to another position relatively to the needle mechanism, thereby to reset the looper so as to bring the loop-taker required for use into action, whereby one kind of stitch or another kind of stitch may be produced by the same machine without reversing the entire driving mechanism.

26. In a sewing-machine organized for making two kinds of stitches, the combination with a reciprocatory needle, of a rotary looper having loop-takers located one for making one kind of stitch and another for making another kind of stitch; driving means for said needle and looper; and means by which said looper may be shifted circumferentially relatively to the needle mechanism, thereby to reset the looper so as to bring the loop-taker required for use into action, whereby one kind of stitch or another kind of stitch may be produced by the same machine without reversing the entire driving mechanism.

27. A machine organized for making different kinds of stitches, comprising a needle and a reversible looper having oppositely-disposed loop-takers, means by which said looper may be shifted from one to another working position relatively to the needle and the needle moved into a neutral position relatively to two opposing loop-takers, and means rendered

effective when said needle is in said neutral position to change the direction of movement of said looper whereby on the further operation of the machine a different kind of stitch will be made.

28. A machine organized for making different kinds of stitches, comprising a needle and a reversible looper having oppositely-disposed loop-takers, means by which said looper may be shifted from one to another working position relatively to the needle and the needle moved into a neutral position relatively to two opposing loop-takers, and means rendered effective when said needle is in said neutral position to change the direction of movement of said looper whereby on the further operation of the machine a different kind of stitch will be made, said means being also effective to prevent the changing of the direction of movement of said looper until the needle occupies such neutral position between the two opposing loop-takers.

29. In a sewing-machine, the combination with a needle and a rotatable and reversible looper having loop-takers, effective one to make one kind of stitch on the rotation of the looper in one direction and another effective to make a different kind of stitch on the rotation of the looper in the opposite direction; driving means for said needle and looper; and means by which said looper may be reset into a predetermined position relatively to the needle to permit on the reversal of said looper the proper cooperation between the needle and the loop-taker of the set with which it cooperates.

30. In a sewing-machine organized for making two kinds of stitches, the combination with a reciprocatory needle and with a rotary looper supported in proper position for co-action with the needle, of a connecting driving mechanism for operating the needle and the looper in proper timing for the making of the stitches, and looper-position-changing means in connection with said driving mechanism, by which to reset the looper so that the working position of the looper relatively to the needle may be changed, as required for the making of one or the other of the two kinds of stitches.

31. In a sewing-machine organized for making two kinds of stitches, the combination with a needle and a rotary reversible looper, of driving means for said needle and looper, and means by which the position of one of said devices relatively to the other may be changed, thereby to permit the proper cooperation between said needle and looper on the rotation of said looper in either direction.

32. In a sewing-machine organized for making two kinds of stitches, the combination with a needle, of a rotatable looper having loop-takers located, one for making one kind of stitch and another for making another kind of stitch; driving means for said needle; a looper-driving shaft carrying a driver in po-

sition to engage and rotate said looper; and
means by which said looper may be shifted
from one to another working position rela-
tively to the needle together with its driver
5 without affecting the operative relation be-
tween such looper and driver, thereby to bring
the loop-taker required for use into position

for action, whereby one kind of stitch or an-
other kind of stitch may be produced by the
same machine.

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Witnesses:

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