

(No Model.)

2 Sheets—Sheet 1.

F. H. RICHARDS
SEWING MACHINE.

No. 558,662.

Patented Apr. 21, 1896.

Fig. 2.

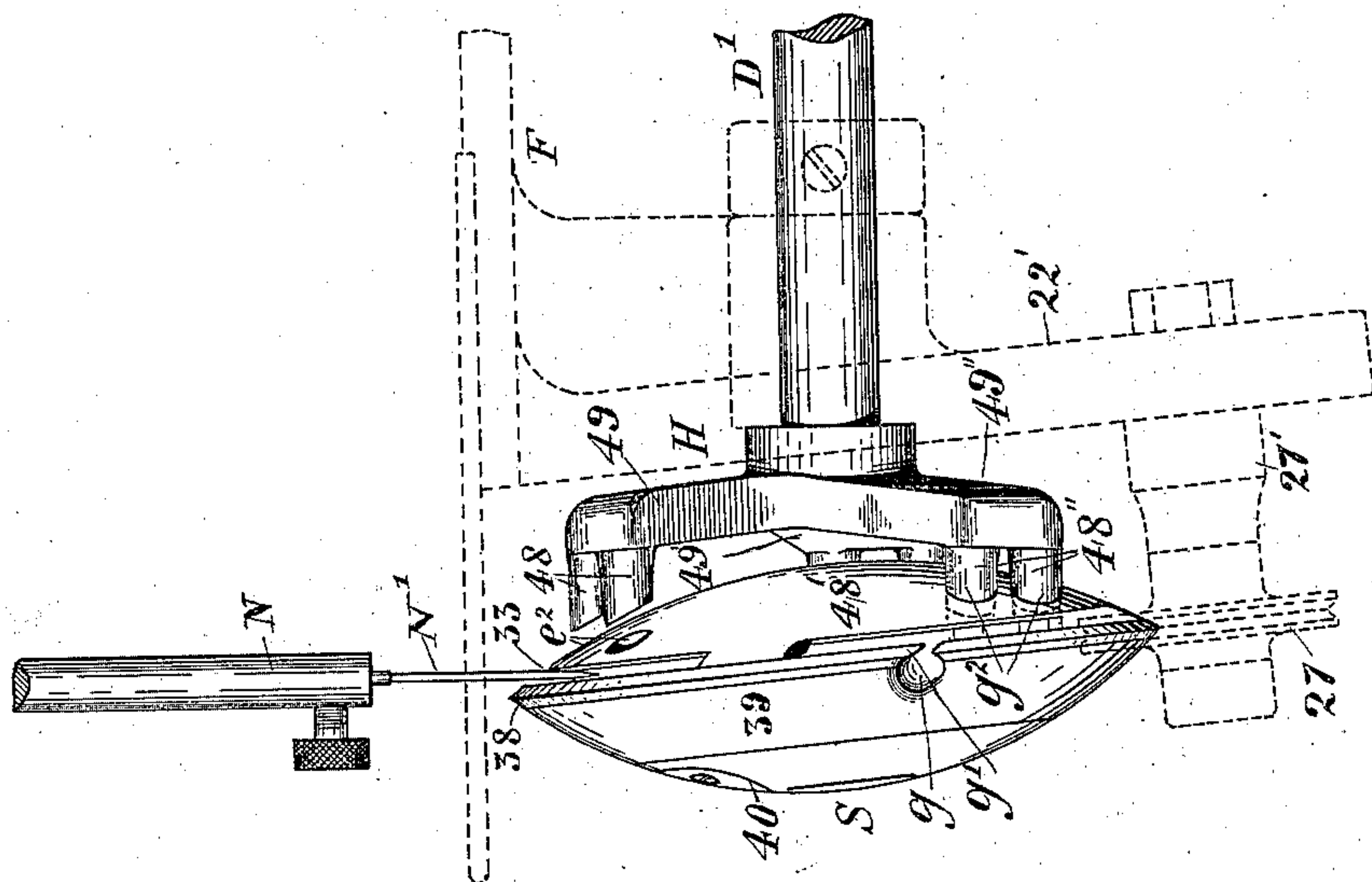
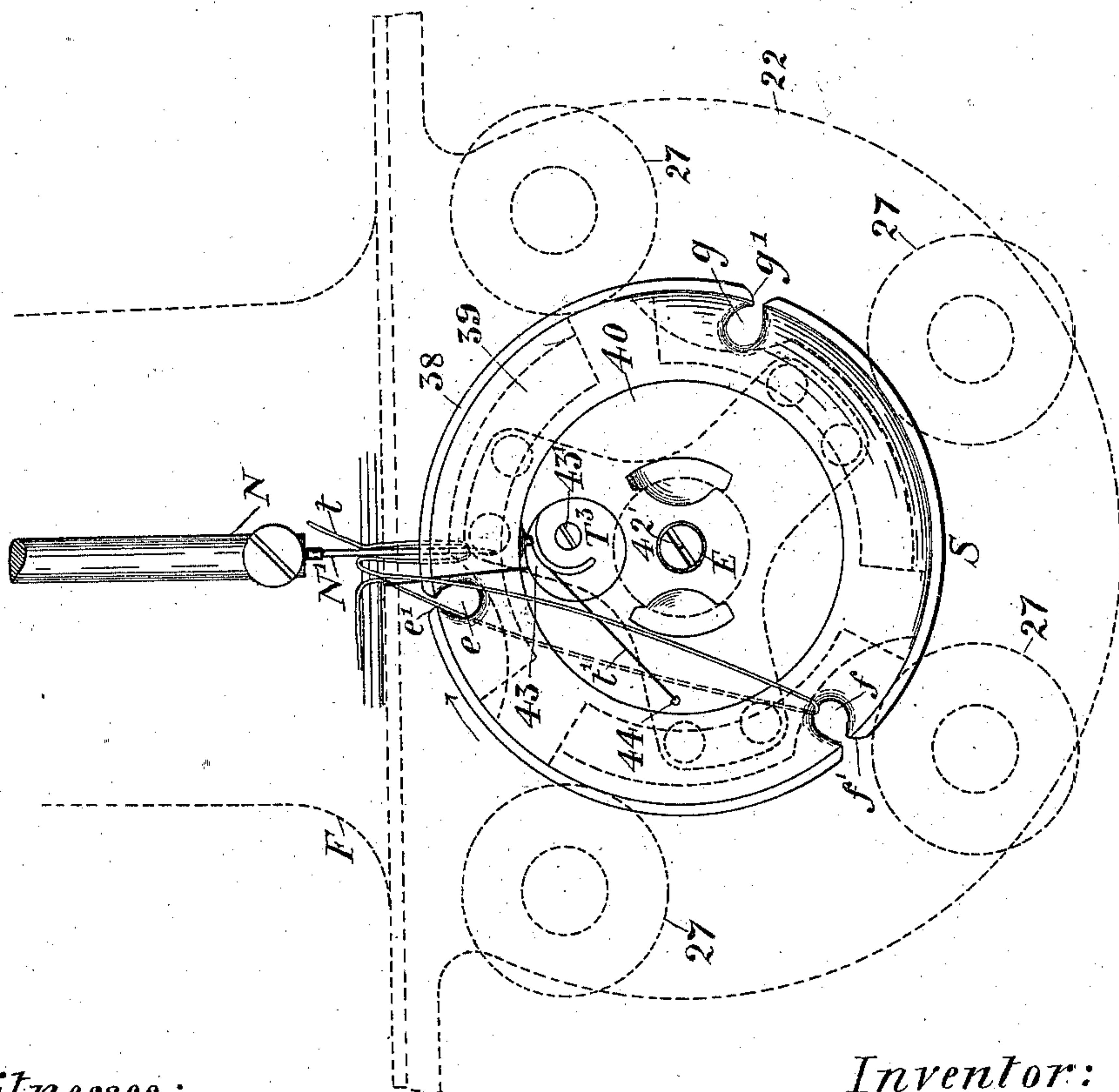


Fig. 1.



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(No Model.)

2 Sheets—Sheet 2.

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Fig. 3.

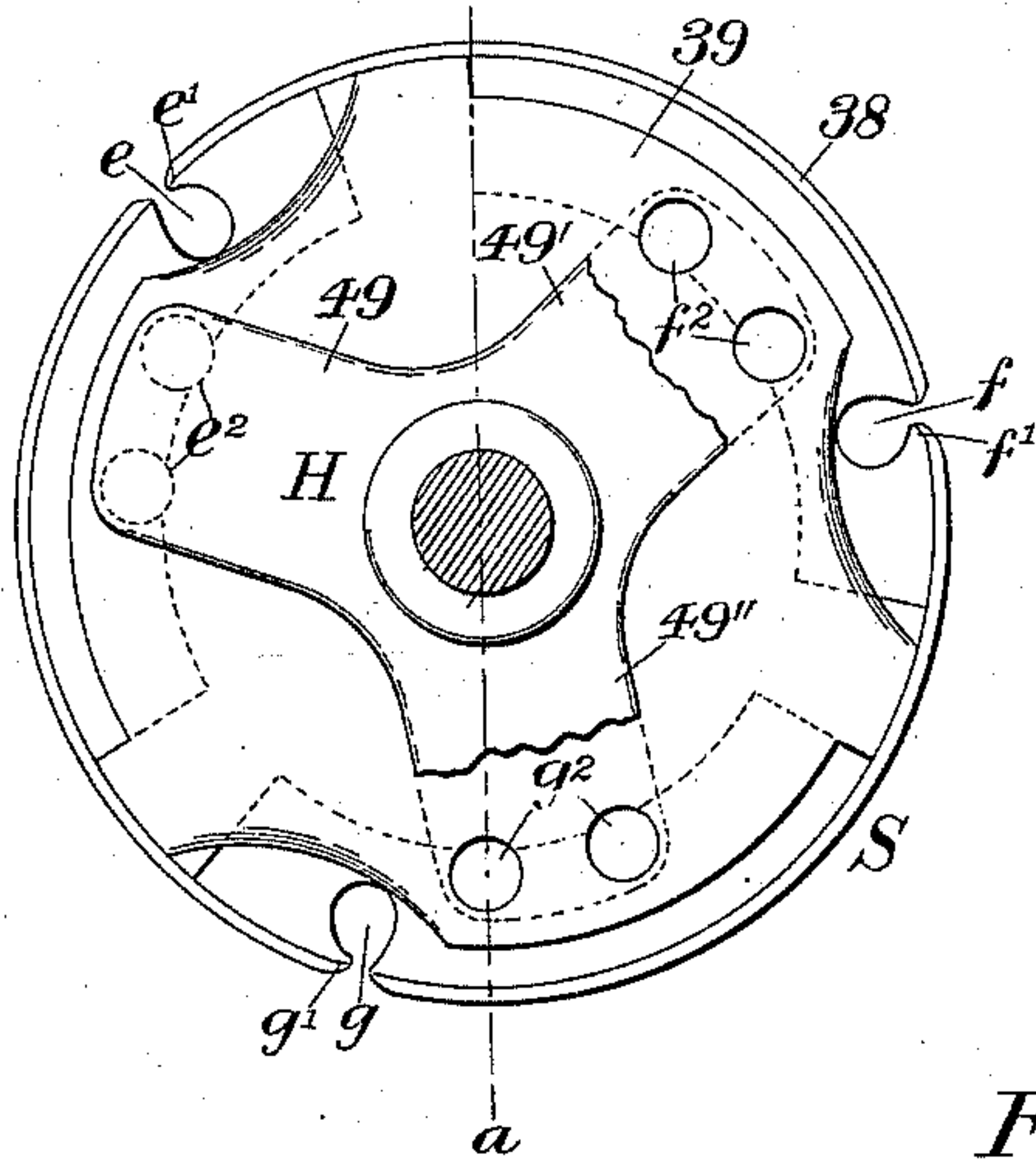


Fig. 4.

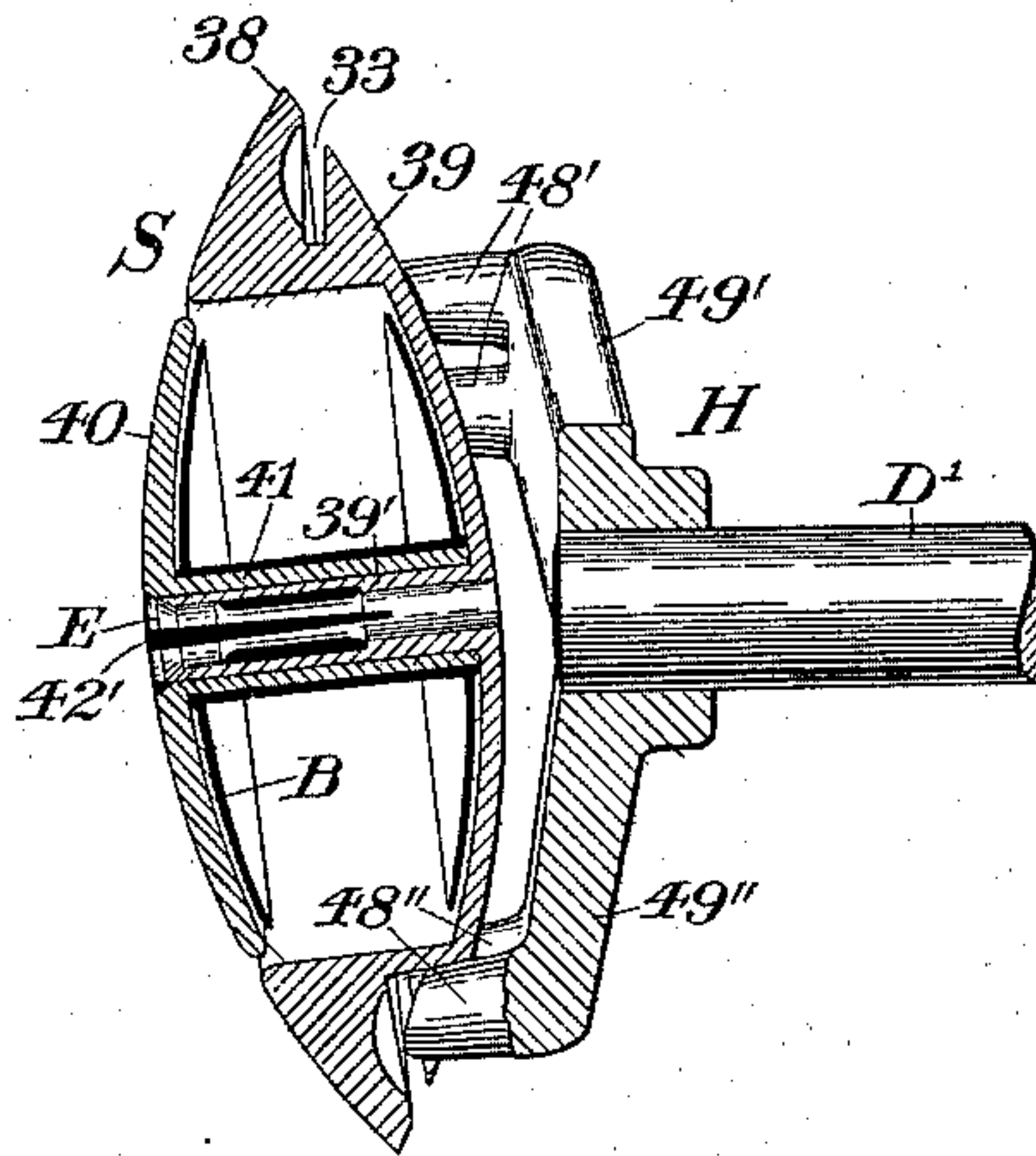


Fig. 5.

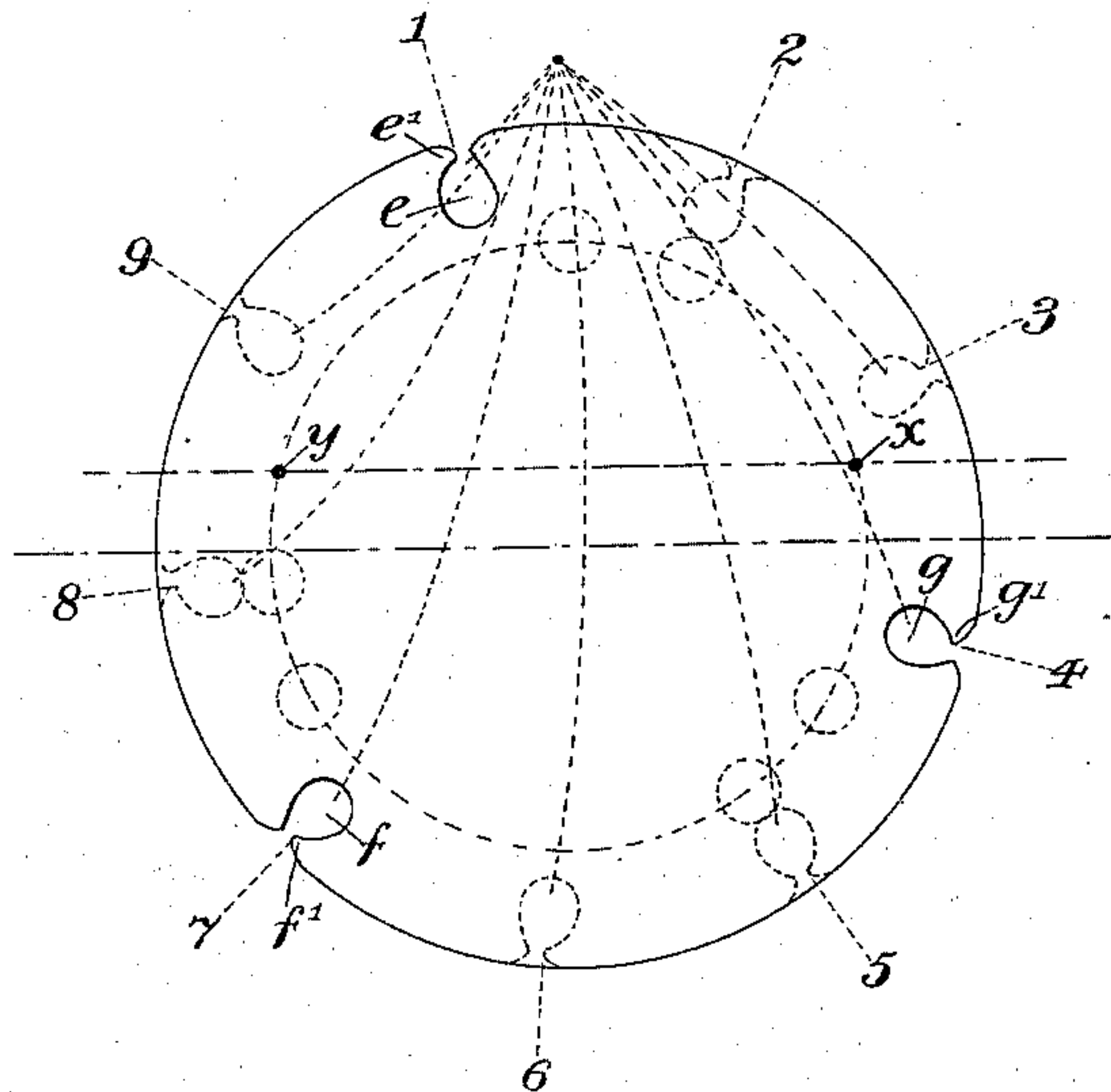
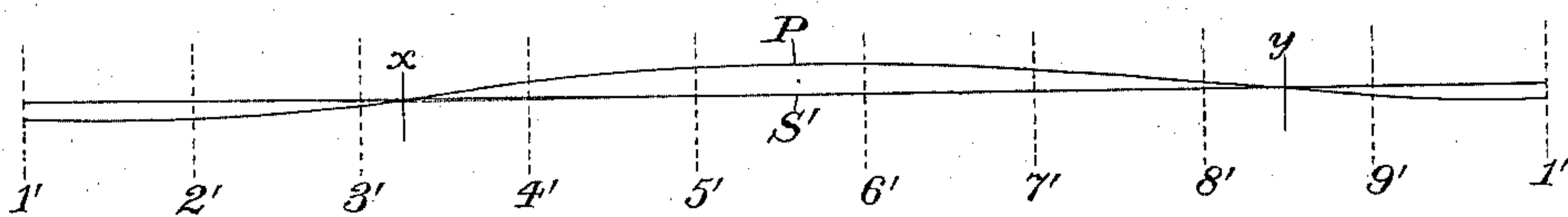


Fig. 6.



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UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 558,662, dated April 21, 1896.

Application filed March 22, 1895. Serial No. 542,800. (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 shuttle mechanisms for that class of sewing-machines in which a revoluble shuttle or loop-taker is employed for making a stitch, and in which the loop of the needle-thread is engaged by the loop-taker and is carried entirely around the same to inclose a second or lower thread to form a lock-stitch, or in which one loop of the needle-thread is carried by the loop-taker through a preceding loop to form a chain-stitch.

My present improvement is especially applicable to sewing-machines, as described in my prior application for Letters Patent of the United States, Serial No. 531,931, filed December 15, 1894, which sewing-machine has a vertically-reciprocating needle-bar, a revoluble shuttle or loop-taker having a series of driving-sockets in one side thereof adapted for engagement by the driver-pins of a revoluble driver, and has a series of peripheral loop-engaging hooks in position and adapted for engaging the successive loops of the needle-thread and for carrying said loops around the loop-taker to inclose a second or lower thread to form a stitch, said loop-taker being supported at an inclination to the path of movement of and below the needle-bar, and a revoluble driver having a series of driver-pins in fixed relation thereon and in position and adapted for successively engaging in the driver-sockets in the loop-taker and for continuously rotating said loop-taker, the axis of said driver being inclined relatively to the axis of said shuttle or loop-taker.

In a shuttle mechanism comprising a three-hook loop-taker having driving-sockets therein, and a revoluble driver set with its axis inclined to the axis of the loop-taker and having a series of driving-pins in fixed relation thereon, it is desirable, in order to secure the best mechanical action, that the inclination of the axis of the loop-taker or the oblique path of movement of said loop-taker rela-

tively to the axis of the driver be as small as possible, and it is a positive requirement, with this class of loop-takers, that the loop of the needle-thread taken by a hook of the loop-taker, and by means of which hook said loop is carried around said loop-taker, shall pass freely between the ends of the driver-pins and the side of the loop-taker as the loop is drawn out and the driver-pins approach their engaging positions or approach the side of the loop-taker during the rotation thereof.

The object of my present invention is, primarily, to provide, in connection with a sewing-machine of the class specified, or in connection with a machine having a vertically-reciprocating needle-bar, together with means for supporting and means for actuating a revoluble shuttle, an improved shuttle mechanism, comprising a revoluble shuttle or loop-taker having peripheral loop-engaging hooks, and a revoluble driver set with its axis at an inclination to the axis of the loop-taker and adapted for engaging said loop-taker at predetermined successive points in the rotation thereof and for continuously rotating said loop-taker and also adapted for supporting said loop-taker in a fixed peripheral relation to the axis of rotation thereof, and to so construct and organize said cooperating parts that the successive driver-pins will engage the loop-taker at successive points immediately adjacent to and in advance of the successive hooks of said loop-taker, so that one driver-pin or one set of driver-pins will engage the loop-taker at a point immediately adjacent to but slightly in advance of one hook of the loop-taker—for instance, the hook carrying the needle-thread loop—and between this hook and the center of the arc or segment intermediate to this hook and the next preceding hook; whereas the next succeeding driver-pin or set of driver-pins will stand at the greatest available distance remote from the first-mentioned hook of the loop-taker, thereby enabling the loop taken by the first-mentioned hook of the loop-taker to be drawn out the major part of its full length before the driver-pins in the rear of or next succeeding the hook carrying said loop come into alinement with the loop of the needle-thread, thus permitting the loop to readily pass between said succeeding driver-pins and the shuttle at a point

in advance of the next adjacent succeeding hook of the loop-taker (which hook the loop is to pass free of) and considerably remote from the hook carrying the loop.

5 Another object of my present invention is to reduce the inclination of the plane of rotation of the loop-taker relatively to the plane of reciprocation of the needle, and relatively to the plane of rotation of the driver-pins of the driver to the minimum, so that the loop-taker, when taking the loop of the needle-thread, will draw out the loop of the needle-thread as nearly as possible in the plane of the needle, thereby more evenly distributing the stress on the two sides of the loop and at the same time, owing to the reduction in the degree of inclination of the two revolving parts—*i. e.*, the loop-taker and its driver—the duration of engagement of the successive driver-pins of the driver with the loop-taker will be prolonged. The rolling action of the driver-pins in the sockets of the loop-taker will be practically obviated, and the friction of working surfaces, owing to the obviation of such rolling action, will be reduced to a minimum.

In the drawings accompanying and forming a part of this specification, Figure 1 is an end view of a portion of a sewing-machine embodying my present invention, said figure showing a portion of the framework or bed of the machine in dotted lines and showing the shuttle or loop-taker and a portion of the needle-bar and a portion of its actuating mechanism in full lines, only so much of said machine being shown as is necessary to illustrate the operative relation between the shuttle and needle. Fig. 2 is a front view of the parts illustrated in Fig. 1 as seen from the right hand in said Fig. 1. Fig. 3 is a sectional elevation of the loop-taker actuator or driver and the loop-taker as seen from the right hand in Fig. 2, portions of the driving-arms of the driver being broken away to more clearly show the driver-sockets in the loop-taker. Fig. 4 is a vertical section of said loop-taker and driver, taken in line *a a*, Fig. 3, looking toward the right hand in said figure. Fig. 5 is in the nature of a diagram showing nine successive positions of one hook of the loop-taker and showing nine successive positions of a loop carried by said hook; and Fig. 6 is a graphical diagram showing the path of movement of the hooks of the loop-taker and the relative path of movement of the driver-pins of the driver, said Fig. 6 illustrating the relation of one driver-pin or one set of driver-pins to the loop-taker during one complete rotation of said loop-taker and driver.

Similar characters represent like parts in all of the figures.

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

The framework of the machine, a part only

of which is shown in dotted lines in Figs. 1 and 2 of the drawings and which is designated in a general way by F, may be of any suitable construction for carrying the operative parts.

The needle-bar, which is designated by N and which carries the needle N' at the lower end thereof, may be of any suitable construction, and will be supported for vertical reciprocation and actuated in the usual manner, said needle-bar only being shown herein to illustrate its operative relation with the shuttle.

The shuttle mechanism proper comprises the revoluble shuttle or loop-taker, (designated in a general way by S,) which is peripherally supported, as hereinafter more fully described, at an inclination to the path of movement of and below the needle-bar, and a revoluble driver, (designated in a general way by H,) carried at the end of the shuttle-actuating shaft D' in position and adapted, as will be hereinafter described, for engaging and for continuously rotating said shuttle or loop-taker.

The shuttle or loop-taker S, which, owing to its peculiar construction, will be herein termed the "three-hook" shuttle or loop-taker, is peripherally supported for circuitous movement in a plane oblique to the path of movement of and below the needle-bar by means of circumferentially-disposed track-rolls 27, herein shown as four in number, and revolubly carried upon track-roll carriers or studs 27', connected with the bracket 22', which bracket constitutes a part of the framework of the machine. These track-roll carriers and the bracket therefor are shown only in dotted lines in Figs. 1 and 2 of the drawings, and may be, when used in connection with the shuttle herein shown and described, of any suitable construction and organization.

The loop-taker or shuttle S in the preferred form thereof herein shown has a substantially annular needle-receiving groove 33, formed in the periphery thereof at one side of the track 38, adapted for receiving the point of the needle during the reciprocations of the needle-bar, when said loop-taker is assembled in operative position in a sewing-machine. Said loop-taker has formed in the periphery thereof three substantially equidistantly-disposed loop-receiving openings or hook-formative recesses *e*, *f*, and *g*, respectively, the rear walls of which openings are constructed to form loop-engaging hooks *e'*, *f'*, and *g'*, respectively, said hooks being, as herein shown, similarly disposed and being adapted for engaging the successive loops of the needle-thread *t*, as these are formed, and for carrying the same entirely around the loop-taker to inclose the lower thread *t'*, carried by the loop-taker or shuttle S, to thereby form a lock-stitch, as will be hereinafter more fully described.

By the rear wall of the loop-receiving openings is meant that wall which faces in the di-

rection of rotation of the loop-taker. These loop-receiving openings or hook-formative recesses extend transversely through the periphery or track 38 of the loop-taker.

5 The loop-taker or shuttle S, which will usually be, as illustrated in Figs. 1, 2, 3, and 4 of the drawings, of convexo-convex discoidal conformation, consists (when the same is assembled, as shown in Figs. 2 and 4) of an annularly-recessed or cup-shaped member 39, which member constitutes a casing for the bobbin, cop, or spool which carries the lower thread t' , and has an inwardly-projecting cylindrical hub 39', an axially-bored cap or member 40, having a cylindrical hub 41, revolvably carried upon the hub of the member 39, and adapted for carrying the cop, bobbin, or spool, and a detent or holding device (designated in a general way by E) fixed to one of said members and removably engaging the other of said members, and adapted for removably holding the parts assembled. This detent or cap-holding device is in the nature of a headed pin divided or spread longitudinally, as at 42', at the headed end thereof, to form resilient holding-arms adapted for springing laterally to engage the walls of the axial recess of the cap 40 to hold said cap against longitudinal movement upon the hub 39' of the member 39, the shank or inner end of the pin being preferably fixed in said hub 39, and the outer end or face of said pin being preferably flush with the outer face of the cap 40, as will be readily understood by reference to Fig. 4 of the drawings.

35 The lower thread-carrying bobbin B, or the cop or spool, as the case may be, is revolvably and removably carried upon the hub 41 of the removable cap 40. The cap 40 is provided at its outer side, preferably near the periphery thereof, with a tension device T^3 , which tension device is in the nature of a disk, slotted transversely at one side thereof to form a resilient thread-impinging arm 43, over and under which the lower thread is rove, the tension exerted upon the lower thread being regulated by the screw 43', by means of which the tension device is movably secured to the cap 40, as will be readily understood by reference to Fig. 1 of the drawings. Formed through the cap at one side the axis thereof is a thread-guide opening 44, through which the thread t' is extended from the bobbin, cop, or spool. By this construction and organization of shuttle herein shown and described it will be seen that the bobbin B (or the cop or spool) may be placed in proper operative position upon the hub of the cap 40 and the thread extended through the guide-opening 44 and engaged with the tension device, while the cap is disconnected from the member 39, and that the cap, together with the bobbin, may be operatively connected and disconnected from the member 39 practically in a unitary condition, thus facilitating the operation of assembling and disassembling these parts.

Formed in one side of the shuttle member 39, preferably near the periphery thereof and within the circuit of the successive loop-engaging hooks e' , f' , and g' , are a series of driver-sockets, herein shown as six in number, arranged in three pairs and designated by e^2 , f^2 , and g^2 , respectively, said pairs of driver-sockets being preferably concentric to the axis of the shuttle or loop-taker and preferably equidistantly disposed relatively to each other, as most clearly shown in Figs. 1 and 3 of the drawings. These driver-sockets are adapted for receiving corresponding driving-pins 48, 48', and 48'', respectively, upon driver-arms 49, 49', and 49'' of the shuttle-drivers, (designated in a general way by H,) the construction and operation of which driver will be hereinafter more fully described. It will be obvious that instead of providing a shuttle with six driver-sockets and arranging said sockets in pairs, as illustrated in the drawings, said shuttle might have but three driver-sockets and be operative. Therefore I do not desire to limit myself to a shuttle having any particular number of driver-sockets.

For the purpose of insuring the engagement of the successive driver-pins with the loop-taker at successive points immediately adjacent to and in advance of the successive hooks of said loop-taker, so that one set of driving-pins will engage the loop-taker at a point immediately adjacent to and in advance of the hook carrying said loop, and so that the next succeeding set of driver-pins will engage the loop-taker at the greatest available distance from the hook carrying the loop, to thereby enable the loop taken by the first-mentioned hook to be drawn out the major part of its full length before the driver-pins in the rear of or next succeeding the hook carrying the loop come into alinement with the loop of the needle-thread and permit the loop to pass between said succeeding driver-pins and the shuttle at a point in advance of the next adjacent succeeding hook and at a distance considerably remote from the hook carrying the loop, I have shown the driver-sockets e^2 , f^2 , and g^2 formed in the shuttle immediately adjacent to and in advance of the loop-engaging hooks e' , f' , and g' , respectively, each driver-socket, or each pair of driver-sockets, as the case may be, being located in close proximity to and in advance of a loop-engaging hook and between this hook and a point central between this hook and the next adjacent preceding hook—that is to say, the driver socket or sockets e^2 , for instance, are located immediately adjacent to and in advance of the loop-engaging hook e' and between the hook e' and the center of the arc or segment intermediate to this hook and the next adjacent preceding hook g' .

As a means for directly actuating the shuttle from the horizontal shaft D' , and as a means for holding said shuttle in a fixed peripheral relation with the peripherally-disposed track-rolls (between which rolls the

shuttle is supported) and concentric to a fixed axis of rotation, and thereby prevent radial movement or vibratory movement of the shuttle when a loop-receiving opening comes opposite or contiguous to the periphery of the track-roll during the rotation of said shuttle, I have provided in connection with the shaft D' (which shaft will be actuated in any suitable or usual manner) a shuttle-supporting driver H, which driver, in the form thereof herein shown, has three driver-arms 49, 49', and 49'', preferably radially disposed, and each having at the free end thereof two outwardly-projecting shuttle driving and supporting pins, said pairs of driver-pins being designated, as hereinbefore stated, by 48, 48', and 48'', respectively, the successive driver-pins being adapted during rotation of the driver for intermittently engaging in the corresponding driving-sockets with which said respective driver-pins register, and being adapted for rotating the shuttle and also for maintaining said shuttle against radial movement or vibratory movement during the rotation thereof.

In the diagram Fig. 5 I have shown nine successive positions assumed by a loop-engaging hook of the shuttle or loop-taker during one complete rotation of the loop-taker, the nine successive positions of the loop-engaging hooks being represented by radial lines 1, 2, 3, 4, 5, 6, 7, 8, and 9, respectively.

In the graphical diagram Fig. 6, which illustrates the relative paths of movement of the shuttle and driver-pins, (the path of movement of the shuttle driver-pins being represented by the horizontal line designated by S', and the path of movement of the shuttle being represented by the curvilinear line P,) I have shown nine successive positions of one pair of driver-pins, corresponding to the nine successive positions they occupy relatively to the adjacent loop-engaging hook, when said hook is in the successive positions represented by radial lines 1, 2, 3, 4, 5, 6, 7, 8, and 9, as shown in diagram Fig. 5, which successive positions of the driver-pin in Fig. 6 are represented by vertical lines 1', 2', 3', 4', 5', 6', 7', 8', and 9', respectively. The vertical line designated by x, Fig. 6, represents the point at which the driver-pins engage the shuttle, and the vertical line y in said Fig. 6 represents the point at which the driver-pins release said shuttle. These points are also represented by dots x and y in the diagram Fig. 5.

By a comparison of Figs. 5 and 6 it will be seen that the driver-pins engage and release the shuttle at points slightly above a horizontal line drawn through the axis of said shuttle. It will also be seen by reference to Fig. 5 of the drawings that the engagement of the driver-pins with the shuttle is slightly in advance of the loop carried by the succeeding hook next adjacent to said driver-pins and that by the time the next succeeding set of driver-pins arrive at the point designated by x,

and in position to engage the shuttle, the hook carrying this loop will have arrived approximately at its lowest position, and the loop carried by said hook will have been fully drawn out and carried between this next succeeding set of driver-pins and the shuttle. In other words, when a set of driver-pins next preceding a hook carrying a loop arrives at the point designated by 4' (the loop being at this time at 4 and in position to pass between the next succeeding set of driver-pins) the next succeeding set of drivers are at the point designated by 1' in Fig. 5 and are most remote from the inner face of the shuttle. Thus it will be seen that no obstruction to the free passage of the loop of the needle-thread between the succeeding sets of driving-pins and shuttle is possible, owing to the peculiar relative disposition of the driver-sockets and the loop-engaging hooks, as hereinbefore described. This is a matter of the utmost importance in sewing-machines of the class specified having revoluble loop-takers, as it insures a perfection in operation not possible with sewing-machines employing revoluble loop-takers of ordinary construction, in that it obviates the possibility of the loop of the needle-thread being caught and broken by the succeeding drivers during the rotation of the loop-taker in forming a stitch.

By reference to Figs. 1, 2, and 5 of the drawings it will be seen that the three pairs of driver-sockets at one side of the loop-taker are immediately adjacent to the three hook-formative recesses, respectively, and are located radially of the loop-taker in a circle between the axis of said loop-taker and the orbit of the formative recesses; and also that there is one pair of driver-sockets immediately in advance of each succeeding hook-formative recess and between this hook-formative recess and point central between this recess and the next adjacent preceding recess. By forming the driver-sockets in the relation to the formative recesses, as just described, the driver-pins of the driver H will engage the loop-taker in advance of the hook carrying the loop and between the orbit of the path of movement of the bight of the loop and the axis of the loop-taker. By reason of this particular disposition of the driver-sockets relatively to the hook-formative recesses and by reason of the particular arrangement of the driver, as hereinbefore described, a driving engagement is perfected between the driver-pins and loop-taker at points which will preclude the possibility of severing a loop during the engaging operation of the driver, as frequently happens with revoluble loop-takers of known construction.

Having thus described my invention, I claim—

1. In a sewing-machine, a loop-taker having three equidistantly-disposed peripheral hook-formative recesses, and also having three pairs of equidistantly-disposed driver-sockets in one side thereof immediately adja-

cent to the three hook-formative recesses, respectively, and located, radially of the loop-taker, in a circle between the axis of said loop-taker and the orbit of the formative recesses; and said driver-sockets being also located, one pair immediately in advance of each succeeding hook-formative recess, and between this hook-formative recess and a point central between this recess and the next adjacent preceding hook-formative recess, substantially as described.

2. In a sewing-machine, a discoidal loop-taker having three equidistantly-disposed peripheral hook-formative recesses, and also having three pairs of equidistantly-disposed driver-sockets in one side thereof immediately adjacent to the three hook-formative recesses, respectively, and located, radially of the loop-taker, in a circle between the axis of said loop-taker and the orbit of the formative recesses; and said driver-sockets being also located, one pair immediately in advance of each succeeding hook-formative recess and between this recess and a point central between this recess and the next adjacent preceding hook-formative recess; in combination with a driver supported for rotation at an inclination to the path of movement of the loop-taker, and having three equidistantly-disposed pairs of driver-pins in position and adapted for successively engaging in the successive pairs of driver-sockets in the loop-taker, and so disposed relatively to the loop-taker as to engage and release said loop-taker at a point above, and in parallelism with, a horizontal line drawn through the axis of said loop-taker, whereby said driver-pins have an operative engagement with the loop-taker between the orbital path of movement of the

formative recesses and the loop-taker axis, and whereby said driver-pins will continue in operative engagement with said loop-taker for more than one-half the entire rotation thereof, substantially as described, and for the purpose set forth.

3. In a sewing-machine, in combination, a discoidal loop-taker having three equidistantly-disposed peripheral hook-formative recesses, and also having three equidistantly-disposed driver-sockets in one side thereof immediately adjacent to the three hook-formative recesses, respectively, and located, radially of the loop-taker, in a circle between the axis of said loop-taker and the orbit of the formative recesses; and said driver-sockets being also located, one immediately in advance of the succeeding hook-formative recess, and between this hook-formative recess and a point central between this recess and the next adjacent preceding hook-formative recess; a series of supporting-rolls in peripheral engagement with, and supporting, the loop-taker at an inclination to a vertical line; and a driver supported at an inclination to the path of movement of the loop-taker, and having three equidistantly-disposed driver-pins in position and adapted for successive engagement in the successive driver-sockets in the loop-taker, and for engaging and releasing said loop-taker at a point above, and in parallelism with, a horizontal line drawn through the axis of said loop-taker, substantially as described, and for the purpose set forth.

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