No. 663,807. Patented Dec. 11, 1900.

P. DIEHL.

CIRCULARLY MOVING HOOK SEWING MACHINE.

(Application filed Nov. 8, 1899.)

(No Model.) 3 Sheets—Sheet 1.

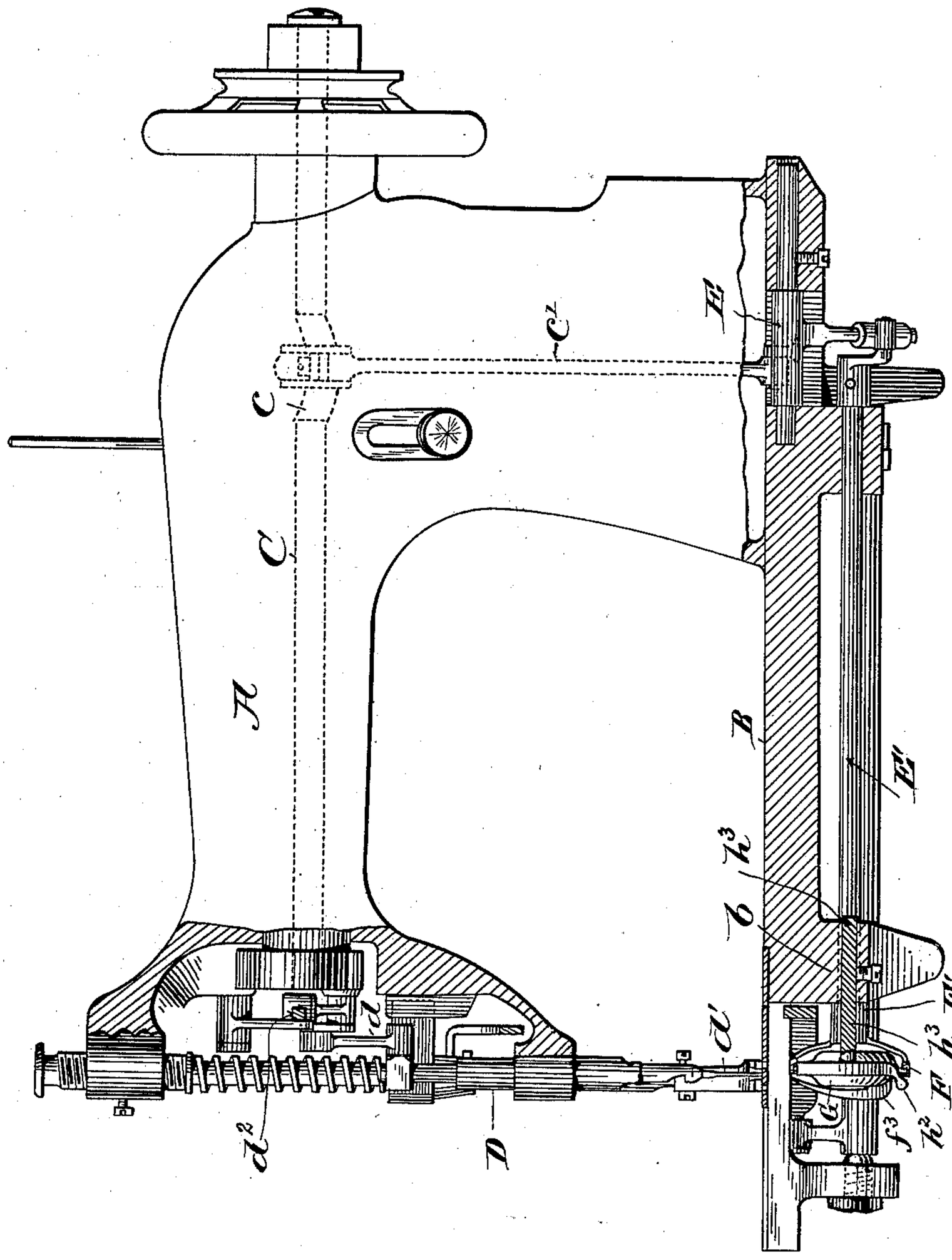

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

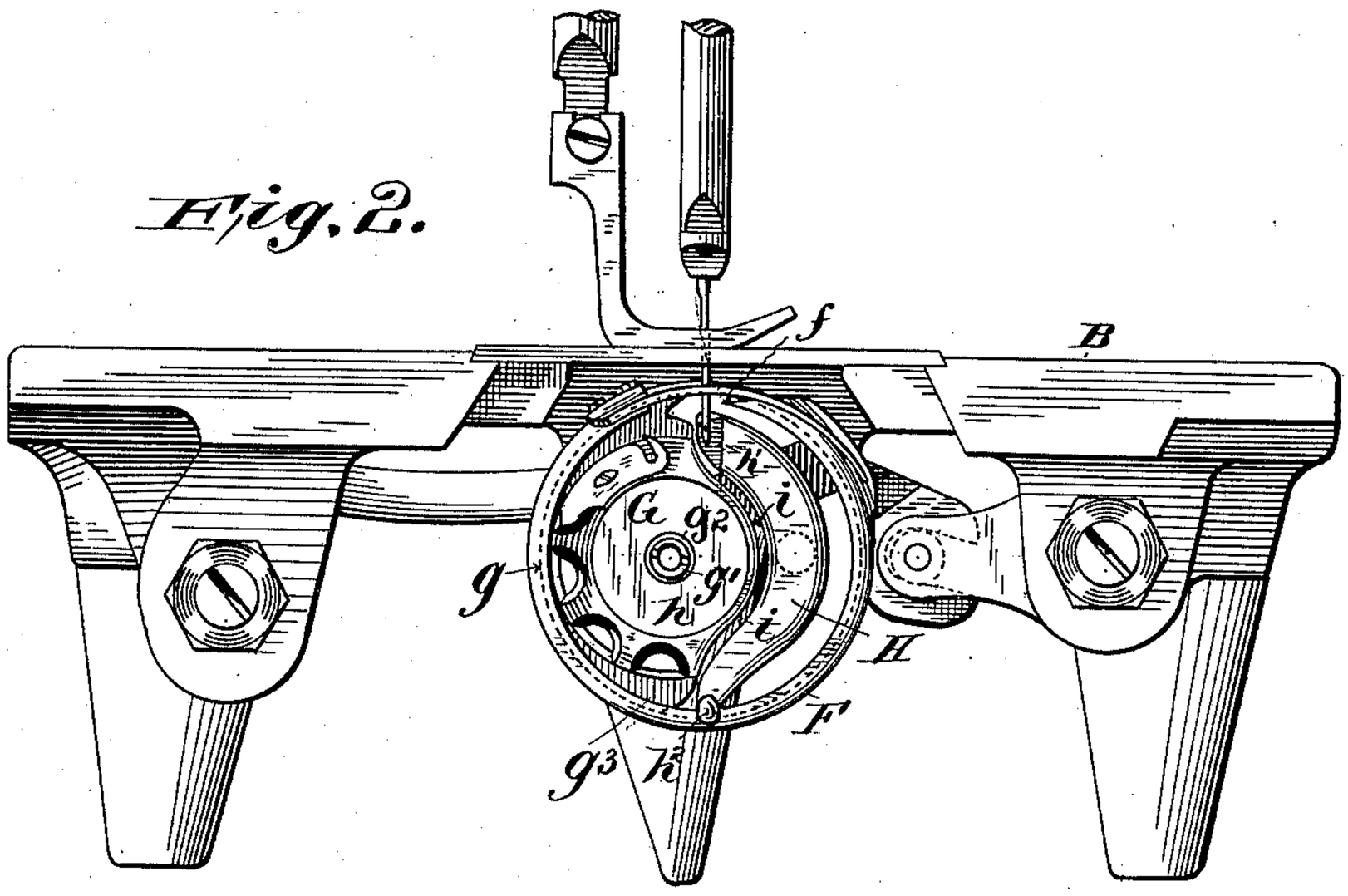

Fig. 3.

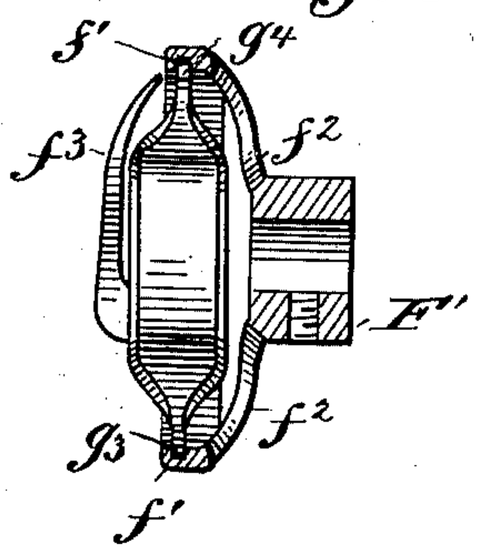

Fig. 4.

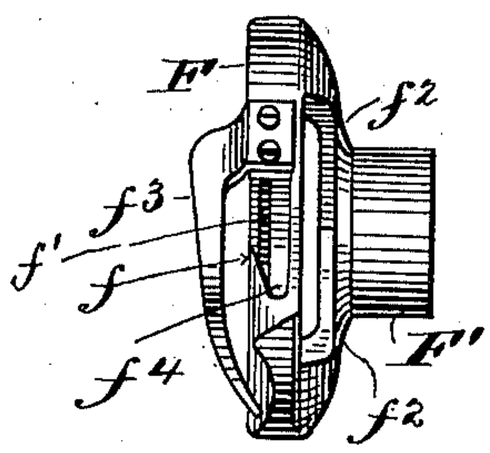

Fig. 5.

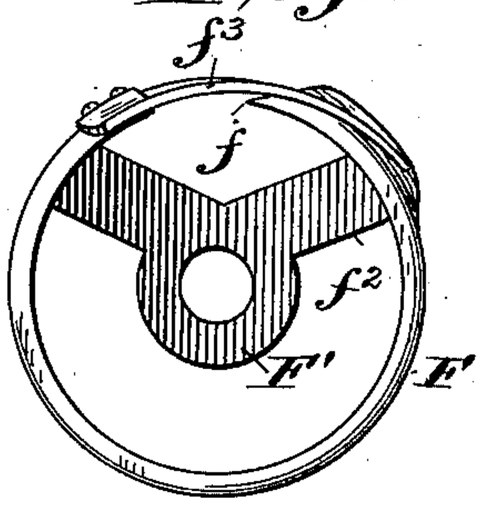

Fig. 6.

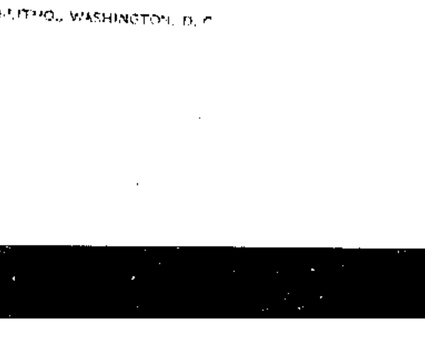

Fig. 7.

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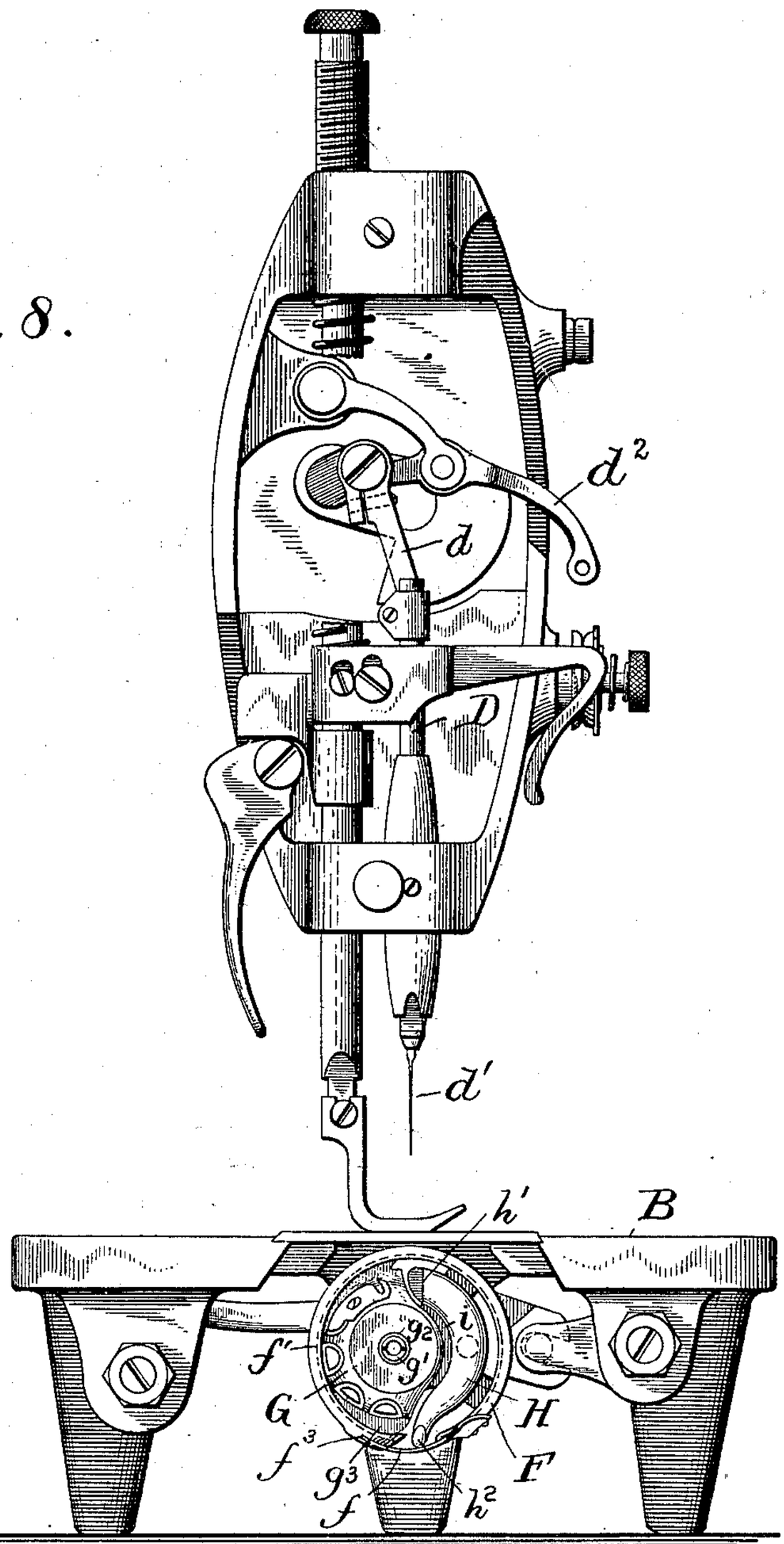
Fig. 8.



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CIRCULARLY-MOVING-HOOK SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 663,807, dated December 11, 1900.

Application filed November 8, 1899. Serial No. 736,263. (No model.)

To all whom it may concern:

Be it known that I, PHILIP DIEHL, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Circularly-Moving-Hook Sewing-Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to that class of sewing-machines in which the loops of needle-thread are carried around the lower or locking thread, the mass of which is contained in a stationary thread or bobbin case by a circularly-moving—*i. e.*, oscillating or rotating—hook or loop-taker.

The objects of my invention are to produce a machine of said class which, at the high speeds now demanded, will run lightly, easily, noiselessly, with little friction, wear, or strain, and with a minimum amount of strain, wear, kink, or snarl of the thread, and which is adapted by its simplicity for general use. To these ends in the preferred embodiment of my invention I have introduced improvements in location, conformation, size, supporting, holding, timing, loop-guiding, or combinations thereof, which improvements are more particularly described hereinafter, and pointed out in the claims. These improvements all combine for the most perfect attainment of the said objects; but I do not wish to be understood as limiting my invention to the presence of all of said improvements, since an approximation to said objects may be attained by the use of portions only of said improvements. The following is a general and specific description of one form of machine combining all of said improvements.

In this improved machine the thread-case is supported by the hook, with which it has a comparatively short arc of peripheral contact, and said thread-case is preferably arranged eccentric to and, in fact, mainly to one side of the axis of the circularly-moving hook and on that side of said axis toward which the needle-loops are first carried by said hook, so that the body of said thread-case is mainly within the sector of a semicircle commencing at the loop-taking position of the hook and extending in the direction in which the needle-loops are carried by the hook, whereby an early cast-off of the needle-loops in the circular movements of the hook is secured, and thus by saving time in the circular movements of the hook in carrying the needle-loops to cast-off position relative to the thread-case more time in the rotation of the driving-shaft for the operation of the feed and take-up is afforded, and in embodying the invention in machines in which oscillating movements are imparted to the hooks only comparatively short oscillating movements will be required, so that the movements of the hooks are easy and friction is reduced to a minimum. The invention is thus especially adapted for use in high-speed and light-running machines, such as are demanded by the present advanced state of the sewing-machine art.

In that class of sewing-machines to which this invention relates and in which the loops of needle-thread are carried around stationary thread-cases containing the mass of lower or locking thread without passing the needle-loops between the inner surfaces of the circularly-moving hooks or loop-takers and the peripheries of the loop-spreading sides or portions of the thread-cases supported by the hooks it has been necessary in order to get sufficient time in the rotations of the driving-shafts for a proper action of the take-ups to impart variable or differential rotating movements to the hook-shafts or to impart two or three rotations to the hook-shafts to each rotation of the driving-shafts. This is objectionable, particularly in high-speed machines, as the variable differential movements referred to engender more friction than regular movements and are also more or less jerky and noisy, this latter objection increasing as the machines are subjected to increasing wear. The double or treble rotations of the hook-shafts are also objectionable, owing to the increased friction and owing also to the mechanical difficulties in securing such double or treble rotations of the hook-shafts from the driving-shafts. The mechanisms necessary to secure these double or treble rotary movements of the hook-shafts require the use of belt or spur gearing of some kind, and this

gearing is more or less objectionable, owing to noise, friction, or inability to withstand wear. These difficulties or objections are avoided by the present invention in that an early cast-off of the loops of needle-thread around the thread-case is secured in a machine in which the hook rotates or oscillates with a uniform movement, so as to perform the two halves of its oscillating or rotating movement in an equal time, the hook making but a single rotation or oscillation or but a single excursion to each reciprocation of the needle, and in that an unobstructed loop-discharging space on the entire side of the thread-case opposite that around which the needle-loops are carried by the hook is afforded, so that as soon as the hook arrives at its early cast-off or loop-discharging position a free loop-passage between the thread-case and the hook will be provided without necessarily requiring a further advance movement of the hook to open up such a passage. Thus as soon as a needle-loop has been discharged from the hook (and this can be done with considerable less than a half-rotation of the hook from the time the latter has taken the needle-loop) the said loop is entirely free to be drawn up and tightened by the take-up, and the movements of the take-up may accordingly be so easy that danger of breaking the needle-thread in the handling of the same by the take-up, even when the machine is running at the highest speed, is avoided. Furthermore, as in this style of machines, in which the thread-cases are supported within and by the hooks, it is possible to carry the loops of needle-thread around said thread-cases without appreciable friction on the thread between the thread-cases and their supports it will be understood that the present invention, making, as it does, provision for the entire easy handling of the needle-thread, enables the machines to be run at the highest speeds with all danger of breaking the lightest needle-threads reduced to a minimum. In other words, the present invention provides for the least possible strain on the needle-thread, as well as for the least possible friction in the running parts of the machine, all of which is very desirable in high-speed and light-running machines.

In the use of a thread-case supported within and by a circularly-moving hook or loop-taker and arranged eccentric to and mainly at one side of the axis of movement of such hook or loop-taker a holder extending within the hook or loop-taker is preferably employed to maintain the thread-case stationary. The connection between the ring of the hook and the segmental thread-case is preferably secured by a groove in the one and a rib or flange on the other extending into such groove, and as the eccentrically-arranged thread-case only partly fills the space or area within the circular hook the holder fills much of the remaining space within the hook, and thus serves not only to hold the thread-case stationary while the hook moves about it, but also serves to maintain the rib and groove supporting connection between the thread-case and hook by preventing sidewise or other displacement of the former. In other words, the thread-case has on one side a peripheral bearing on the hook and a bearing additional to said peripheral bearing, and which additional bearing is preferably afforded by said holder, which serves to maintain said peripheral bearing of the thread-case against the said hook by affording a diametric or radial opposition, so as to prevent radial displacement of said thread-case in the hook, the field of which is only partly occupied by said thread-case. This construction affords a thread-passage across the field of the circular hook-ring or hook, in which passage the needle-loops after having been discharged from the hook are steadied and guided as they are drawn up by the take-up, so that they will not kink or snarl.

In the accompanying drawings, Figure 1 is a sectional side view of a sewing-machine embodying the present invention. Fig. 2 is a partial front end view of the same. Fig. 3 is a central section of the hook or loop-taker with the thread-case in position therein, the latter being in edge elevation. Fig. 4 is an edge view of the hook, and Fig. 5 a face or front view thereof. Fig. 6 is a section of the thread-case on line 6 6 of Fig. 7, and Fig. 7 is a side or face view of the thread-case. Fig. 8 is a full front end view of the machine with the face-plate removed, the beak of the hook being in cast-off position.

A denotes the arm, and B the work-plate, of a well-known style of sewing-machine having in the upper or horizontal portion of the said arm a rotating driving-shaft C, provided at its forward end with a crank connected by a pitman *d* with the vertically-reciprocating needle-bar D, carrying the usual eye-pointed needle *d'*. Connected with the needle-bar crank, to be operated thereby, is a take-up lever d^2, which is broken off in Fig. 1. This take-up operates in what is now the usual manner in lock-stitch machines to tighten each needle-loop, and thus set each stitch before the next loop is taken by the hook or loop-taker. The driving-shaft C has, near its rear end, a crank *c*, joined by a pitman *c'* to a rocker E, which is in turn connected in a well-known manner to a rock-shaft E', having a regular rocking movement, and to the forward end of which is attached a circularly-moving hook or loop-taker F, preferably (but not necessarily) made in the form of a complete ring and provided with a loop-seizing beak or hook proper, *f*, the point of which is at the front face of the hook-ring, so that the hook requires no needle-clearance space behind or inside of its loop-seizing beak. The mechanism just referred to for imparting regular rocking movements to the shaft E' is substantially the same as that long in use in the well-known Singer "oscillating-shuttle" machine, and as the

movements of said shaft are regular the two halves—*i. e.*, the forward and the backward—of each complete movement of the hook F will be performed in an equal time, and this would be also the case if the said hook had a regular continuous rotary movement. The outer surface of the beak of the hook is inclined inwardly or away from the periphery of the hook-ring and toward the path of the point of the hook from the throat of the hook in which the loops of needle-thread are carried to the point of the hook, and thus when the hook in its loop-discharging or cast-off position shown in Fig. 8 it will point upwardly or in the general direction of the pull on the thread by the take-up, so that the latter may draw the needle-loops off the hook with little or no resistance, the take-up acting to draw a needle-loop from the hook each time the hook is in the quadrant of the circular path of the hook opposite the needle or opposite the loop-taking point of the path of the travel of the hook.

G is a stationary thread or bobbin case provided with a suitable tension device and supported within and by the hook F, the supporting connection between the said thread or bobbin case and hook being in the present instance effected by a peripheral rib or flange *g* on the thread-case extending into an annular groove *f'*, formed in the inner wall of the rim of the hook. The thread-case G is preferably of segmental form, as shown, and is located eccentric to and, in fact, mainly at that side of the axis of movement of the hook F toward which the needle-loops are first carried by the said hook, so that the thread-chamber of said case—and which chamber in the present instance receives the bobbin *h*—is also eccentric to and mainly at the said side of the axis of the said hook. In other words, the body of the thread-case is located mainly in the sector of a semicircle, commencing at the loop-taking position and extending in the direction in which the loop is carried by the hook. The peripheral arc of contact of the segmental thread-case with the hook by which it is supported is a relatively short one and is preferably considerably less than half a circle in extent, so as to permit the loops of needle-thread to be cast off or discharged over said thread-case within less than half a revolution of the hook after it has taken a loop of thread from the needle. The thread-case has, preferably, an open front or outer face, and the bobbin is in the present instance retained in its chamber by a friction device consisting of a split sleeve *g'*, secured within the post or sleeve g^2, with which the thread-case is provided and on which the bobbin freely turns to pay out its thread. The outer curved periphery of the segmental stationary shuttle or thread-case G is preferably of less than one hundred and eighty degrees or a half-circle in extent, so that less than a half-revolution of the circularly-moving hook after the latter has seized a needle-loop will be required to cast the needle-loop around the thread-case, and in any event the bearing of the thread-case in the hook does not exceed the arc traversed by the hook while the latter is carrying the loop. The curved peripheral bearing portion of the thread-case afforded by the flange *g*, which is rigid with the wall of the circular thread or bobbin chamber of said case, is in the arc of a circle of greater radius than and is eccentric to said circular bobbin-chamber.

The hook-ring F is connected with the hub F', attached to the shaft E', by one or more spokes or webs f^2, between which and the rear or inner wall of the thread-case there is an open space for the free passage of the loops of needle-thread. (See Fig. 3.) The hook-ring F is preferably provided with a thread-guard and pull-off f^3, which is arranged reversely to the loop-seizing beak of the hook and which is extended so as to overlap the said beak or hook proper, *f*. This thread-guard serves to hold the lower thread outward away from the said beak or hook proper when the latter advances to take the loops of thread from the needle, as also to draw thread from the bobbin for the next succeeding stitch.

The thread-case G is preferably of segmental form, as herein shown, and as it occupies but a portion of the circular space inclosed by the hook-ring F the remaining space is partly filled by a holder H, the upper end or horn of which at *h'* is, as herein shown, constructed and arranged to serve as a needle-guide and guard and the lower end or horn of which is preferably provided with an outwardly-extending projection h^2 to serve as a loop-guard to prevent the loops of needle-thread from catching on the said holder. The thread-case lies between the holder and the hook, and the peripheral bearing of said thread-case is retained against said hook by said holder, which thus serves as a second or additional bearing for said thread-case inside of said peripheral bearing. The holder H, as herein shown, is attached to a rod h^3, secured in the block *b*, cast with the bed-plate B, and in which block the hook-shaft E' has its forward bearing. This arrangement of the support of the thread-case holder is suitable for an oscillating hook; but for a rotating hook the holder would have to be supported from outside of the periphery of the hook. This holder H serves to maintain the thread-case stationary and in place within the circularly-moving hook as the latter travels about it, the said holder being preferably constructed to touch the said thread-case only near the extremities of its horns, there being sufficient space at times between said horns and the thread-case for the easy passage of the loops of needle-thread. In other words, the thread-case has an edge contact at one side with the hook and an edge contact at its other side with the stationary holder within the hook and not with the hook. The oscillating hook may, if

desired, be so timed in its movements as to have a tendency by its very light frictional rib-and-groove connection with said bobbin-case to open first one and then the other of the spaces or thread-passages between the practically stationary thread-case and the said holder by very slight movements of the said case; but in any event no appreciable resistance is offered to the passage of the loops of needle-thread between the holder H and the thread-case, owing to the fact that the latter merely rests lightly against the former, the weight of the thread-case and its contained bobbin and thread being sustained by the circularly-moving hook-ring F, by which said thread-case is supported. Between the holder H and the thread-case G is an unrestricted loop-passage *i*, (see Fig. 2,) so that when the hook has carried a loop of needle-thread to the heel or cast-off portion g^3 of the thread-case an unimpeded path around what may be termed the "loop-discharging" or "take-up" side of the said thread-case or the side thereof opposite that around which the loop is carried by the hook is afforded, and thus as soon as the loop reaches its cast-off position it will be entirely free to be drawn up by the take-up quite independently of any further advance movement of the hook to open up a loop-passage.

In the operation of the machine the needle descends and as it rises its loop is caught by the beak of the circularly-moving hook and is carried in the throat f^4 of the hook against the thread-stop or loop-divider afforded by the part g^4 of the stationary thread-case, and as the hook continues its onward movement and the needle moves upward above the work-plate one limb of the loop is carried behind the thread-case into the thread-space between the said case and the webs or spokes f^2 of the hook, and the other limb of said loop passes freely in front of the thread-case until it reaches the cast-off portion g^3 of the latter, when it will be free to enter the thread-passage *i* between the holder H and the thread-case and to be drawn up by the take-up, as has been described. It will be obvious that the thread-passage *i* crosses the field of the circular hook, and said thread-passage serves to guide and steady the loop after the latter has been discharged from the hook and is being drawn up by the take-up. Thus in passing around the loop-spreading side of the thread-case the loops do not pass between the peripheral flange of the said case and the hook-ring by which the thread-case is supported, a bight of the loop being carried in the throat of the hook outside of said flange, and there is consequently no appreciable friction on the needle-thread in being carried about the thread-case, as the weight of the latter does not have to be lifted by the needle-thread. As a result the lightest threads may be employed at the highest speeds of the machine with little or no danger of breakage. The hook reaches its loop-discharging or cast-off position while the needle is above the work-plate and preferably when the needle is at or near the top of its stroke, this cast-off position of the hook being in the quadrant of the hook-circle opposite the quadrant at or near the middle of which the loop was taken by said hook.

The term "stationary" as herein employed in connection with the thread-case will be understood to mean a practically stationary or non-rotating or non-oscillating thread-case, the very slight movements of the said thread-case, hereinbefore referred to, to open the thread-passages for the needle-loops adjacent to the horns of the holder being of such small extent as to be almost inappreciable. The term "excursion" as herein employed in describing the movements of the hook will be understood to mean either one complete oscillation or one complete rotation of said hook.

It will be understood that the present invention is not limited to the details of construction herein shown or to machines in which oscillating movements are imparted to the hooks supporting the thread-cases, as the invention is equally applicable to machines in which the hooks rotate.

Having thus described my invention, I claim and desire to secure by Letters Patent—

1. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving loop-taking hook, and a stationary thread-case peripherally supported by said hook and having an arc of contact with said hook of less than half a circle in extent, so as to secure an early cast-off or discharge of a loop of needle-thread about said thread-case within less than a half-revolution of said hook after it has taken a loop of thread from the needle.

2. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a stationary thread-case located eccentric to and supported by said hook, a holder for restraining the said thread-case from movement as the hook travels about it, a take-up whereby each loop is drawn up before the next loop is taken by the hook, and means for operating said take-up.

3. In a sewing-machine, the combination with a needle, of a circularly-moving hook, a stationary thread-case located eccentric to and peripherally supported by said hook, a holder for restraining the said thread-case from movement as the hook travels about it, and operating mechanism for said needle and hook whereby said hook is brought to its cast-off position when the needle is above the work-plate.

4. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, and a stationary thread-case peripherally supported by said hook and located mainly in the sector of the semicircle commencing at the loop-taking position and extending in the direction in which the loop is carried by the hook; where-

by a discharge of the needle-loops over the said thread-case in the quadrant of the circle opposite the quadrant at or near the middle of which the said loops are taken from the needle is secured.

5. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a thread-case peripherally supported by said hook and located mainly in the sector of the semicircle commencing at the loop-taking position and extending in the direction in which the loop is carried by the hook, and a holder for restraining the said thread-case from movement as the hook travels about it; whereby a discharge of the needle-loops over the said thread-case in the quadrant of the circle opposite the quadrant at or near the middle of which the said loops are taken from the needle is secured.

6. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook the beak of which, from throat to point, is inwardly inclined toward the path of its point, a thread-case supported by said hook and located mainly at one side of the axis of movement of said hook, a take-up which tightens each loop before the next loop is taken by the hook, and a holder restraining the said thread-case from movement as the hook travels about it, the beak of said hook being inclined or pointed approximately in the direction in which the pull is exerted upon the loop by the take-up when said hook is in its cast-off position.

7. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a thread-case peripherally supported by said hook and located mainly at one side of the axis of movement of said hook, and a fixed holder extending within the field of the hook for restraining the said case from movement as the hook travels about it.

8. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a thread-case having a peripheral bearing on said hook, and an opposing radial or diametric bearing additional to said peripheral bearing whereby the thread-case is held bodily to said peripheral bearing.

9. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a thread-case having a bearing on said hook, and an additional opposing radial or diametric bearing independent of said hook whereby the thread-case is held bodily to said bearing on the hook.

10. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a thread-case holder, and a thread-case held between said hook and said holder by diametric opposing peripheral or edge contact with each.

11. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook; the said hook and thread-case being constructed and arranged and the said hook being operated to cast off the needle-loops in the quadrant of the hook-circle opposite the point at which the loops are taken, and a thread-case having a peripheral bearing on the hook not exceeding the arc traversed by the hook while carrying the loops.

12. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a thread-case having a bearing on said hook; the said hook and thread-case being constructed and arranged and the said hook being operated to cast off the needle-loops in the quadrant of the hook-circle opposite the point at which the loops are taken, and a member, inside of the hook, between which and the thread-case the loops are guided after being cast off the hook.

13. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a segmental thread-case peripherally supported by said hook, and a fixed holder for restraining the said thread-case from movement as the said hook travels about it.

14. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a segmental thread-case peripherally supported by said hook and located mainly at one side of the axis of movement thereof, and a fixed holder for restraining said thread-case from movement as the said hook travels about it.

15. In a sewing-machine, the combination with a needle, of a circularly-moving hook, a segmental thread-case located mainly at one side of the axis of movement of said hook and peripherally supported thereby, a holder for restraining the said thread-case from movement as the said hook travels about it, and operating mechanism for said needle and said hook so timed as to bring the said hook into cast-off position when the needle is above the work-plate.

16. In a sewing-machine, the combination with the needle and its operating mechanism, of a circularly-moving hook, a stationary thread-case supported by said hook and located mainly within the sector of that half of the circle commencing at loop-taking position and extending in the direction in which the loop is carried by the hook, and means for operating said hook whereby it will be caused to perform the two halves of its movement in an equal time.

17. In a sewing-machine, in combination, a needle and its operating mechanism, a circularly-moving hook having a beak which from throat to point is inwardly inclined toward the path of the point, a segmental thread-case having a peripheral bearing on and being thus supported by said hook, and located mainly at one side of the axis of movement of said hook, means whereby the hook is

caused to make one excursion for each reciprocation or excursion of the needle and whereby the hook is caused to perform the two halves of its motion in an equal time or at corresponding speeds, a take-up acting upon a loop each time that the hook is in the quadrant of the hook-circle opposite the needle, and a bearing whereby the thread-case is held against its bearing on said hook.

18. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, and a thread-case comprising a circular bobbin-chamber and a flange rigid with the wall of said bobbin-chamber; said flange having peripheral bearing on said hook in the arc of a circle of greater radius than and eccentric to said bobbin-chamber.

19. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a segmental thread-case eccentric to and peripherally supported by said hook, and the periphery of which segmental thread-case is of less than half a circle in extent, and a holder within said hook for maintaining the said thread-case stationary as the said hook moves about it.

20. In a sewing-machine, the combination with a needle and its operating mechanism, of an oscillating hook, a segmental thread-case eccentric to and peripherally supported by said hook and the periphery of which segmental thread-case is less than half a circle in extent, and a holder for maintaining the said bobbin-case stationary as the said hook moves about it.

21. In a sewing-machine, the combination with a needle and its operating mechanism, of an oscillating circular hook, a segmental thread-case eccentric to and peripherally supported by said hook, and a stationary two-horned holder, extending within said hook, for maintaining the said thread-case stationary as the said hook moves about it; whereby during the opposite movements of the said oscillating hook the pressure at the points of contact between said holder and thread-case will be relaxed or the points of contact be opened for the easy passage of the loops of needle-thread.

22. In a sewing-machine, the combination with a needle and its operating mechanism, of an oscillating hook, a segmental thread-case eccentric to and peripherally supported by said hook by a rib-and-groove connection, and a fixed holder extending within said hook, for maintaining the said thread-case stationary as the said hook moves about it.

23. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a segmental thread-case peripherally supported by and within said hook and occupying but a portion of the space within the latter, the arc of contact of said thread-case with said hook being less that half a circle in extent, and a holder extending within said hook and serving to restrain said thread-case from rotation as the said hook moves about it.

24. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving loop-taker or hook cooperating with said needle, a segmental thread-case, peripherally supported at one side by said hook but out of contact with said hook at its other side, and means, extending within said hook, for holding said thread-case stationary while the hook moves about it, there being a thread-passage across the field of said hook between said thread-case and said holding means.

25. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook or loop-taker, a thread-case peripherally supported by said hook or loop-taker, and a two-horned holder for restraining said thread-case from rotation as the said hook or loop-taker moves about it; one horn or portion of said holder being constructed and arranged to serve as a needle guide and guard.

26. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook or loop-taker, a thread-case peripherally supported by said hook or loop-taker, and a two-horned holder for restraining said thread-case from rotation as the said hook or loop-taker moves about it; one horn or portion of said holder being constructed and arranged to serve as a loop-guard.

27. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving loop-taking hook, a stationary thread-case supported by its periphery in said hook and the peripheral connection of which with said hook is of less than one hundred and eighty degrees in extent, so as to afford an early cast-off or discharge of the loops of needle-thread about said thread-case within less than a half-revolution of said hook after it has taken a loop from said needle.

28. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a stationary thread-case peripherally supported by said hook and located eccentric to the axis of movement of said hook and on the side of said axis toward which the needle-loops are first carried by said hook; whereby a discharge of the needle-loops over the said thread-case in the quadrant of the circle opposite the quadrant at or near the middle of which the said loops are taken from the needle is secured.

29. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook the loop-seizing point or beak of which is inclined inwardly away from the periphery of the hook and toward the path of said point, and a stationary thread-case supported by said hook and over which the needle-loops are discharged by said

hook in the quadrant of the circle opposite the point at which said needle-loops are taken by said hook.

30. In a sewing-machine, the combination with a needle and its operating mechanism, of a circularly-moving hook, a thread-case supported by said hook, means, extending within said hook, for restraining the said thread-case from moving with said hook and for guiding or steadying the loops of needle-thread after they have been discharged from said hook, there being a thread-passage for said loops across the field of the hook between said thread-case and the loop guiding and steadying means.

31. In a sewing-machine, the combination of the following elements, namely; first, a circularly-moving hook; second, a stationary thread-case supported by said hook and located mainly to one side of the axis of movement of said hook; third, a reciprocating needle; fourth, mechanism whereby the said hook is caused to make one excursion to each reciprocation of said needle; and, fifth, means for tightening and thus completing each stitch before the loop for the next stitch is taken by said hook.

In testimony whereof I affix my signature in the presence of two witnesses.

PHILIP DIEHL.

Witnesses:
JOHN T. EARL,
HENRY J. MILLER.