

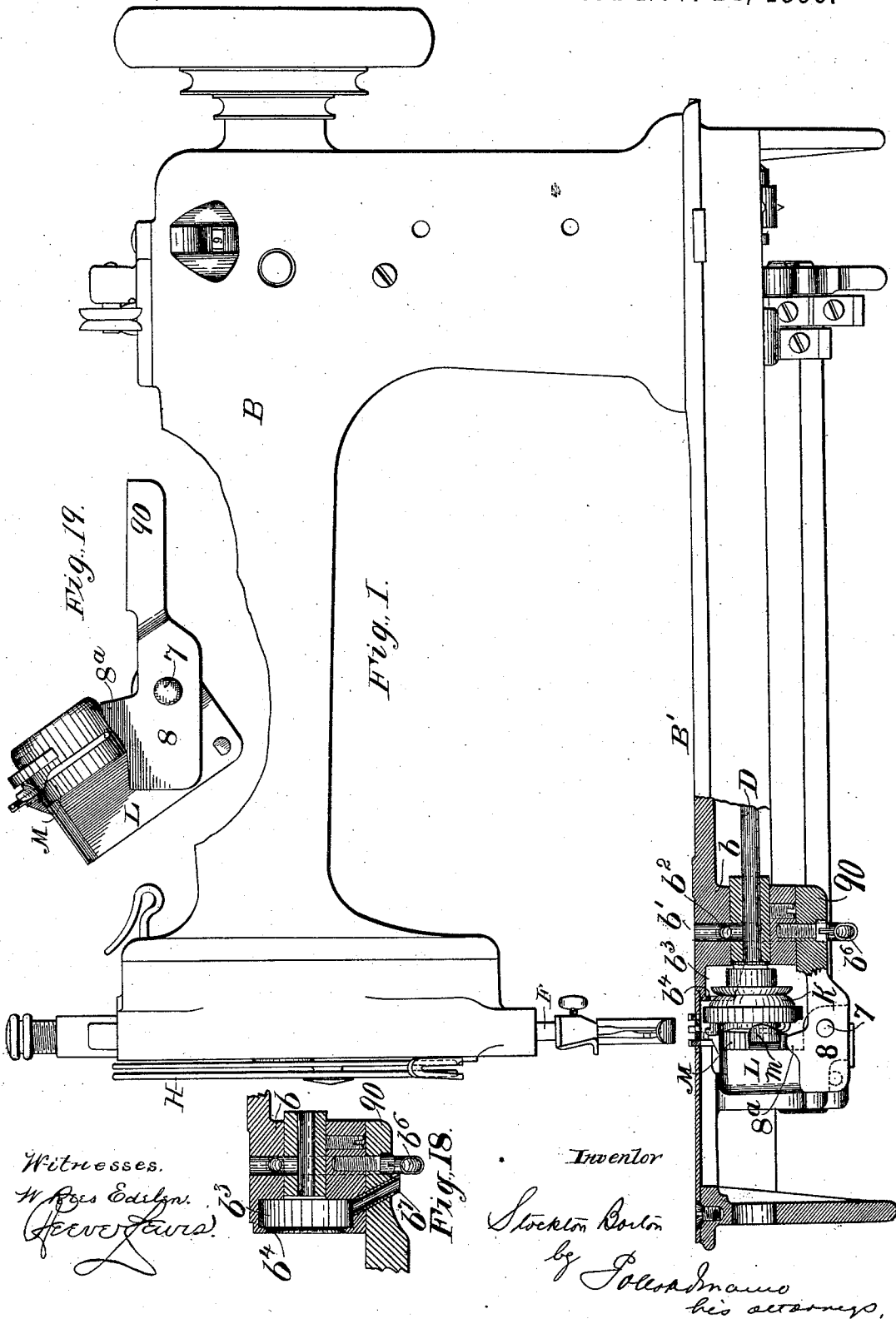
(No Model.)

4 Sheets—Sheet 1.

S. BORTON.
LOCK STITCH SEWING MACHINE.

No. 572,090.

Patented Nov. 24, 1896.



Witnesses.

W. H. Esch. Esq.

Geo. W. Laro.

Inventor

Stockton Borton

by J. C. Adams
his attorney.

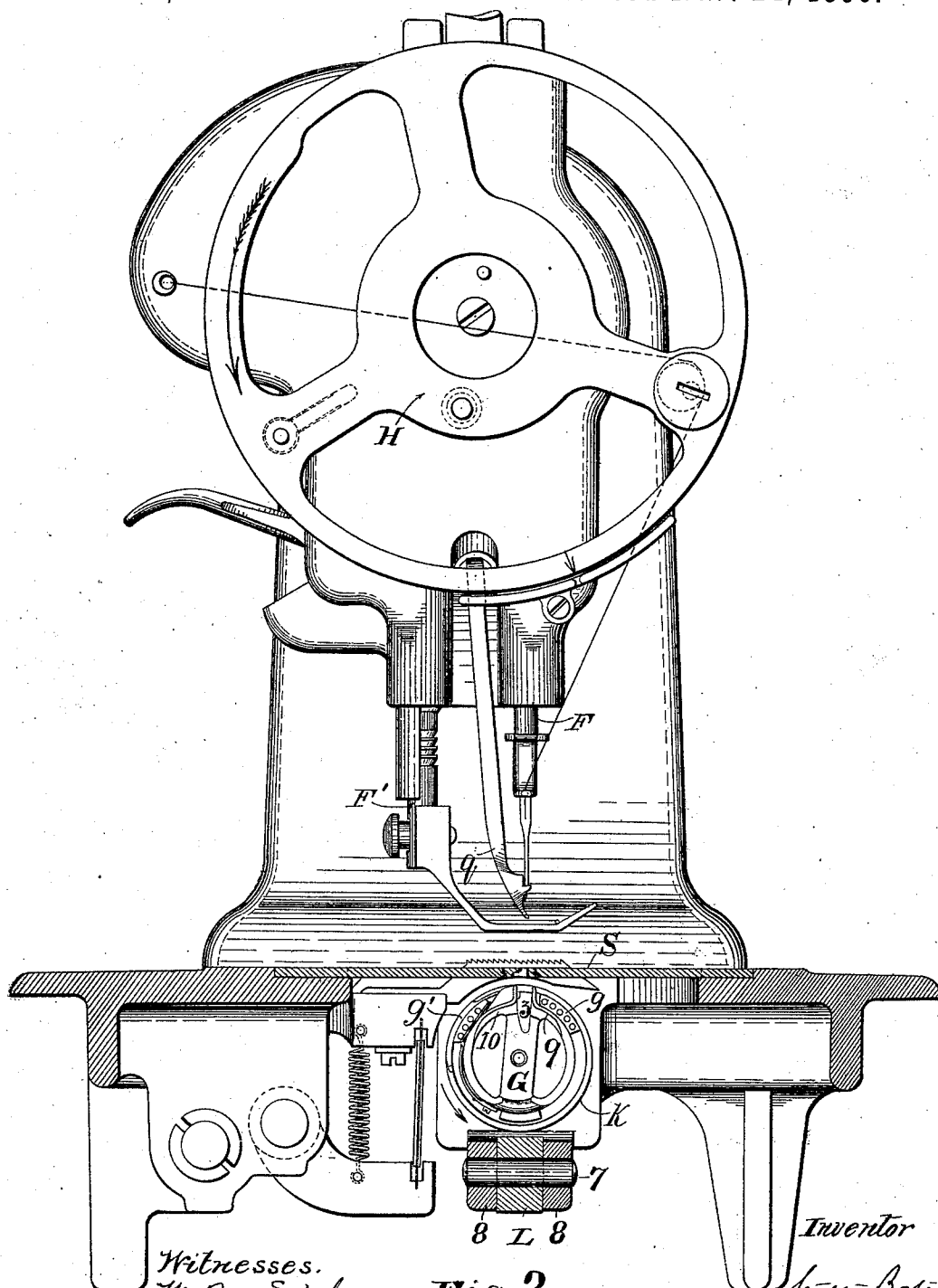
(No Model.)

4 Sheets—Sheet 2.

S. BORTON.
LOCK STITCH SEWING MACHINE.

No. 572,090.

Patented Nov. 24, 1896.



Witnesses.

H. Rees Edelen.

Geo. Lewis

Fig., 2.

Inventor

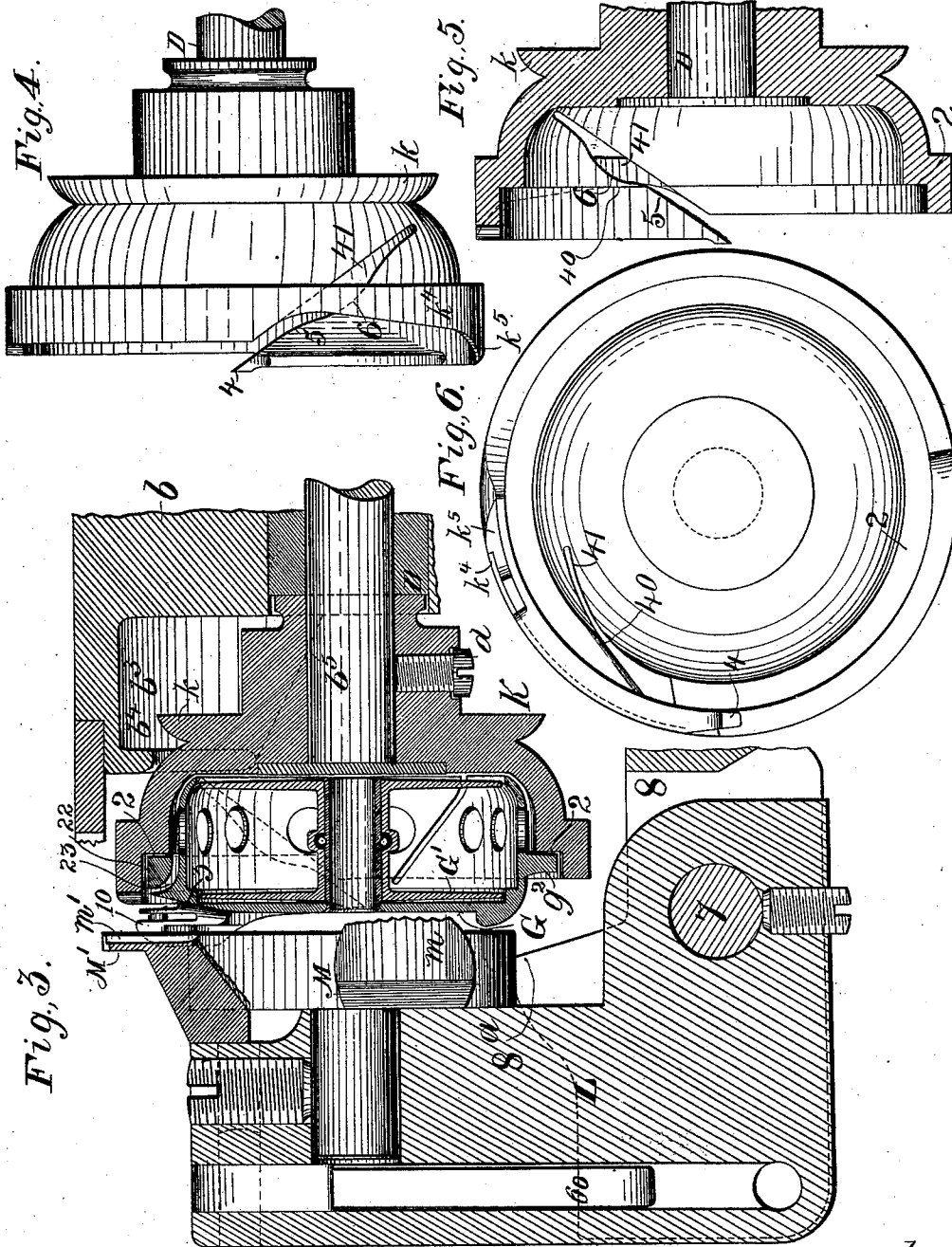
Stockton Boston

by Tolson & Mauro
his attos. rep.

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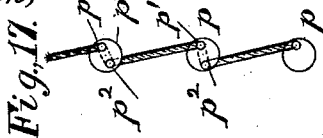
No. 572,090.

Patented Nov. 24, 1896.



Witnesses
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his attorneys.



UNITED STATES PATENT OFFICE.

STOCKTON BORTON, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE WILLCOX
& GIBBS SEWING MACHINE COMPANY, OF NEW YORK, N. Y.

LOCK-STITCH SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 572,090, dated November 24, 1896.

Application filed August 10, 1895. Serial No. 558,846. (No model.)

To all whom it may concern:

Be it known that I, STOCKTON BORTON, of Brooklyn, New York, have invented new and useful Improvements in Lock-Stitch Sewing-Machines, which improvements are fully set forth in the following specification.

This invention has reference specially to sewing-machines which make a lock-stitch by means of a continuously-revolving hook or looper which carries a loop of thread from the needle around a bobbin contained in a bobbin-case beneath the throat-plate.

The special object which the improvements of this application are designed to accomplish is to produce a lock-stitch machine capable of operating at a very high rate of speed upon thick or thin work with smoothness, ease, and lightness. The machine herein described, and illustrated in the accompanying drawings, has been operated at a rate of from three thousand to four thousand stitches per minute with little noise or jar. To attain this result, it has been necessary to modify and improve all parts of the machine; but for greater clearness the present application will be confined to the rotary hook, bobbin-case, and parts adjacent to or coöperating therewith.

For prior machines to which the present invention bears the closest resemblance reference may be made to United States Letters Patent No. 239,998, dated April 12, 1881, and No. 354,589, dated December 21, 1886, to Charles H. Willcox and James E. A. Gibbs.

The principal difficulty encountered in attempting to sew at very high speed is the breaking and chafing of the thread, which may occur from any one of a number of causes. In sewing at three thousand stitches per minute the hook-shaft (in machines of the type herein described) makes nine thousand revolutions per minute. Consequently the thread when carried down by the hook around the bobbin travels at very high speed. The contour of the surfaces over which it passes or with which it makes contact in looping around the bobbin is a matter of great importance. Much of the study and experimental work of which the present invention is the outcome have been devoted to the problem of effecting the passage of the loop

around the bobbin with the least possible friction or resistance. In machines in which the hook-shaft makes two or more revolutions to each reciprocation of the needle breaking of the thread is also caused at times by the hook on completing its first revolution catching the loop on its point or passing to the wrong side thereof. This is the more likely to happen when a rotary take-up is employed (as is preferred and is, in fact, practically indispensable in operating at a very high speed) for the reason that the loop is pulled up gradually, and the slack thread, if not controlled, is likely to present itself in the way of or to the wrong side of the hook-point. The present invention includes special means for detaining the thread-loop to prevent its slackening until the point of the hook completes its first revolution. This thread-detainer, as hereinafter described, is a projection from the hanger into the space between the hook and bobbin-case.

To facilitate the passage of the thread between the bobbin case and hanger while moving at very high speed, I have found it very advantageous to lighten the bobbin-case to the greatest practical extent. To this end instead of having a continuous rim, as heretofore, adjacent to the periphery of the inclosing hook I cut the rim away for a greater part of the circumference, leaving three comparatively short bearing-surfaces. This not only aids in giving the desired lightness, but is also attended with other advantages. This cutting away of the rim affords a space for the thread-detainer above referred to. It also affords a convenient place for application of the under-thread tension, which is placed on the periphery of the bobbin-case instead of on one face, and the thread issuing from the periphery of the case goes direct to the tension, avoiding unnecessary turns, which has been a cause of irregularity in the under tension. This location of the tension has a further object. It gives the thread a direct course to a thread guide or pin, from which it is led to the needle-hole in an approximately tangential direction relatively to the bobbin-case, so that its pull is in a direction opposite to the rotation of the hook. It is found that the friction of the rapidly-moving

hook upon the bobbin-case has the effect of crowding one surface of a notch in the latter against the stop on the hanger, by which the bobbin-case is held from turning. This closes a passage through which the ascending loop of needle-thread has to pass, and the resistance is so great as frequently to break the thread. By leading the thread from the bobbin-case to the needle-hole in a tangential direction, above described, a pull is given to the bobbin-case by the feeding of the work, which opposes the friction of the hook and keeps the thread-passage free for the loop to pass.

Other improvements in the construction of the bobbin-case will be described hereinafter.

The rotary hook is provided with devices for preventing the spread of oil from the bearing of the hook-shaft around the hook, thus saving the thread and goods from being soiled. It is to be understood that in a high-speed machine the oiling provisions are of very great importance. A copious supply of oil upon all the bearing-surfaces is necessary, and special means are required to prevent the scattering of the oil by reason of the rapid movement of the parts and its spread over surfaces that come into contact with the goods or threads.

It is important that the needle-loop when taken by the hook should pass the shoulder on the inside thereof before reaching the point of the rim or horn on the bobbin-case. Otherwise there is a possibility of the thread being caught between these two surfaces. This is avoided by the peculiar shape given the hook, the inner edge being, at the part referred to, made nearly parallel with the outer edge, so that the thread slips quickly over this part.

In the regular formation of stitches the upper thread runs from one needle-puncture to the next in an oblique direction, (that is to say, from the left-hand side of one needle-puncture to the right-hand side of the next,) and unless all these threads run parallel with each other the sewing is irregular and defective. To insure this regularity in sewing, it is desirable that the side of the loop coming from the last preceding stitch be held from slipping around to the left of the needle-puncture and that the other side of the loop, or that which goes to the take-up, be held to the left of the needle-puncture. The importance of devices for this purpose arises from the fact that the rotary hook gives a half-twist to the loop in passing it around the bobbin-case, as is well understood by persons familiar with the operation of sewing-machines of the general type to which the machine herein described belongs. The present invention embraces means whereby the rear or descending side of the loop is held to the right of the needle-puncture and the forward or ascending side to the left, the effect of the half-twist being thereby counteracted. As a

means for holding the rear or descending side of the loop in its proper relation to the needle-puncture a recess is formed in the needle-hole, piece, or throat-plate, extending rearwardly from the needle-hole and to the right of the axis thereof. This recess is on the under side of the throat-plate, not extending to the upper surface, on which side the needle-hole is simply an approximately circular opening. In operation the movement of the hook carries the side of the loop attached to the cloth into this recess and thus holds it from swinging around to the wrong side of the needle-puncture in the cloth.

The needle-hole in the presser-foot, through which passes the side of the loop-thread which goes to the take-up, is provided with a narrow slit to the left of the axis of the needle, so that as the work advances this thread is drawn into said slit and held in proper relation to the needle-puncture.

The construction of the presser-foot includes another improvement, to wit, a means for preventing the loop of the under thread from being drawn by the upper thread beyond the surface of the work. This irregularity occurred heretofore when the tension of the upper thread was accidentally in excess of that of the lower thread, the needle-hole in the presser-foot being large enough to permit the loop of lower thread to be drawn through the same. According to the present invention the thread-slit above referred to is only slightly wider than the diameter of a thread. Because of this and also because the thread-slit is not directly above the puncture, the loop of lower thread being practically transverse to the upper thread encounters the solid portion of the foot which acts as a stop, supplementing the action of the lower-thread tension. By this means the lower thread is prevented from coming through the fabric, and in practice the tension of the upper thread may be set so as to give it a slight excess over the lower-thread tension, and thus all difficulty in drawing evenly upon the two threads, so as to make the lock come between the opposite surfaces of the work, is avoided.

The invention includes certain details of construction and combinations of parts of the mechanism which can be most conveniently and clearly explained in connection with the accompanying drawings, which form part of this specification, and in which—

Figure 1 is a front elevation of a machine containing the improvements constituting the present invention, part of the mechanism beneath the work-plate being in section. Fig. 2 is an end elevation looking at the head of the machine, the hanger being removed to expose the bobbin-case. Fig. 3 is a vertical section, on an enlarged scale, through the hook, bobbin-case, and adjacent parts. Fig. 4 is a side view, Fig. 5 a section, and Fig. 6 a front view, on an enlarged scale, of the rotary hook. Figs. 7 and 8 are elevations from opposite sides, and Fig. 9 an edge view, of the bobbin-

case, these views being greatly enlarged. Fig. 10 is a top view of the bobbin-case. Fig. 11 is a detail in vertical section through the thread-pin. Fig. 12 is a perspective diagram showing parts of the needle, needle-shield, presser-foot, and needle-hole plate. Fig. 13 is a bottom plan view of the needle-hole plate. Fig. 14 is a detail showing the course of the thread from the bobbin-case through the needle-hole. Fig. 15 is a plan view of the presser-foot. Fig. 16 is a front view of the hook-shaft bearing. Fig. 17 is a diagram illustrating the formation of stitches. Fig. 18 shows a modified form of the oil-recess under the bed-plate. Fig. 19 is a side elevation of the hanger and bobbin-case.

The machine illustrated in the drawings is organized to give the hook-shaft D three revolutions to one of the main shaft, which turns in bearings in the stationary arm B, as described in Letters Patent No. 354,589, already referred to; but the improvements, or many of them, are not limited to machines having that characteristic. It also has a rotary take-up H, (the special construction of which forms no part of the present invention,) the needle-bar F, and the foot-bar F', with mechanism of any usual or suitable kind for operating these parts.

The rotary hook K on the end of shaft D is in its general form and mode of operation the same as heretofore, being cup-shaped, so as to inclose the bobbin-case. Shaft D has a bearing in the block b, depending from the bed-plate B' of the machine. This bearing must be plentifully supplied with oil, which is effected through the vertical oil-hole b'.

In order that oil may not overflow and spread over the bed-plate, an overflow-passage b², Figs. 1 and 16, intersects the vertical oil-hole at a point a little below the bed-plate, this overflow-passage extending nearly horizontally through the block b and connecting with a downwardly-curved pipe b³. The space between the bearing and the overflow-passage constitutes an oil reservoir or receptacle.

The rotary hook K is attached to its shaft by a set-screw d, Fig. 3. It is found in practice that oil will work along shaft D and out the screw-hole no matter how tightly the screw may be fitted. After once reaching the outside of the hook it can readily spread over the same and come into contact with the thread. It is important to prevent this, and for that purpose an annular flange k is interposed between the set-screw d and the main body of the hook, constituting an oil-guard, the flange having an angle at its periphery, so that the oil cannot pass to the body of the hook, but is thrown off by centrifugal force when the latter is in motion. When at rest, the oil gathered on the flange will flow down its vertical face and drop off. The oil thrown off the hook must be prevented from falling on it again, and to this end a concave recess b³ is formed on the under side of the bed-

plate, provided with a rib or guard b⁴, Figs. 1, 3, and 16. The latter curves downward for a certain distance and is connected with the vertical face of bracket b by backwardly-inclined drip-surfaces b⁵, so that the oil will be safely conducted back to the outside of the bracket, from which it can drip without damage. The oil-recess may be annular, so as to embrace or completely surround the oil-flange k. This construction is shown in Fig. 18. At the bottom of this recess is an oil-outlet or drip-opening b⁷.

The interior of the hook is made slightly larger than the bobbin-case G, which contains the bobbin G', so as to afford room for the passage of the thread between the case and hook. The interior diameter of the latter is enlarged to receive the rim of the bobbin-case, forming an annular vertical surface 2, against which the rim rests. The rim of the bobbin-case is not continuous, but is cut away, as best shown in Figs. 7 and 8, leaving three segments g g' g² for reasons which will be pointed out. The cut or notch 3 in front of segment g' is the space into which the needle descends. It is made deep, as shown in Figs. 3 and 10, to afford ample room for the loop to spread out and be taken by the point 4 of the hook. The latter carries the loop forward into the space between the segments g g'. Heretofore there was a liability of the thread being caught between the shoulder inside the hook (formed by the change from the larger to the smaller diameter thereof) and the abutment formed by the end of segment g'. This would happen if the thread instead of slipping quickly back over the shoulder 40 should hang there. In order that the loop may quickly pass this interior shoulder, the inner edge of the hook formed by the oblique cut 41, instead of being straight, as heretofore, is deflected between the points 5 6, where it crosses the shoulder 40, being between those points nearly parallel with the outer edge. Consequently the loop will slip back quickly as far as the point 6, and thus avoid being caught between the shoulder on the hook and segment g' of the rim.

The action of the hook in passing a loop taken from the needle around the bobbin-case will be readily understood by persons familiar with the operation of machines of this class. The hook entering the loop slips quickly through it until by its change of position the inner strand, which is over or inside the cut 41, forming the point of the hook, and under the overhanging strip or loop-detainer k⁴, encounters the inclined edge k⁵, by which the loop is twisted and the inner strand caused to pass down the left-hand or outer face of the bobbin-case between it and the hanger M. What was originally the outer strand (or that end of the loop which goes through the needle-eye to the take-up) slips down to the end of the cut 41, reaching the back of the bobbin-case, and passes between it and the hook.

The general operation of forming a stitch is thus the same as in the machines of the patents already referred to.

The support L of bobbin-hanger M is pivoted on a pin 7 between the forked ends 8 of a bracket 90, which is fastened by a screw to the projection *b*, in which the hook-shaft has its bearing. A spring-latch 60, such as heretofore used, retains the hanger in its operative position. (Shown in Figs. 1 and 3.) By depressing the latch the support L can be tilted downward for removal and replacement of the bobbin-case. The hanger M is disk-shaped and has on its upper edge a projection or stop M', Fig. 3, by which the bobbin-case G is held from rotation. Stop M' has a recess *m'*, in which the needle-loop spreads on the left-hand side of the needle. For suspending the bobbin-case from the hanger when its weight is not sustained by the bobbin-thread it (the bobbin-case) has on its face near the upper edge thereof horizontal projections 9 10, which overlie and rest loosely upon the curved edge of the disk-shaped hanger and are curved upwardly on opposite sides of the needle-passage 3 and embrace between them the stop *m'*. Heretofore the flange by which the bobbin-case was suspended was undercut and the edge of the hanger had a corresponding raised portion or edge to take into the undercut recess. As shown in Figs. 9 and 11, the under or bearing surfaces of the flanges 9 10 are plain and horizontal in cross-section, so that there is nothing to prevent movement of the bobbin-case toward the hook except contact of the segments of the rim with the annular surface 2 of the hook. It follows that the thread is drawn between the bobbin-case and hanger with much less resistance than heretofore. Normally the bobbin-case is suspended by the bobbin-thread from the cloth, so that the loop of needle-thread has a free passage between the case and hanger, and the surfaces of the projections 9 10 are smooth and rounded, so that the outer strand of the loop can slip easily by them. The bobbin-case being thus suspended and the peripheral surfaces of segments *g g'* being brought into contact with the interior of the enlarged part of hook K, the latter in its rapid rotation has the effect of urging the vertical face of projection 9 against the adjacent side of the stop M' of the hanger. Between these two surfaces the thread-loop must pass when it is drawn up by the take-up. Owing to the friction of the hook upon the bobbin-case it has been found that the thread encounters considerable resistance in its effort to effect a passage between the surfaces referred to, and this resistance was a cause of breakage of the thread. To counteract this friction caused by the hook, the bobbin-thread 12, Figs. 7 and 14, instead of being carried in a substantially vertical direction from the face of the bobbin-case to the needle-hole, as in the patents already referred to, is now arranged so that the pull upon it is in a direction approximately tangential to

the bobbin-case. As shown, Fig. 14, the thread 12 is led in a thread-groove 13 along the base of segment *g'* and thence under a thread-pin 17, from which it passes up in an oblique direction (opposite to that of the rotation of the hook) through the needle-hole 25 to the cloth. As the latter advances by the action of the feed it is clear that the pull on the bobbin-case, besides tending to lift the latter, as heretofore, also tends to turn it axially in the direction opposite to the rotation of the hook. This tangential pull is sufficient to counteract the pressure of the bobbin-case against its stop to such an extent as to enable the thread to effect its passage without injurious resistance between the two adjacent surfaces and to avoid breakage at this point.

As clearly shown in Figs. 8 and 14, the rear side or wall of the bobbin-case G is cut away, forming two openings *g³* on opposite sides of a central web or strip *g⁴*. This construction reduces the weight of the bobbin-case, but its main object is to provide openings through which, by the action of the thumbs of the operator, the bobbin can be pressed out of its case.

The bobbin-case G has heretofore been hung on a hook or rim on the hanger, but in the present construction the edge of the hanger M and the under surfaces of the suspending flanges 9 and 10 on the bobbin-case are made smooth, as already pointed out. Hence it is desirable to provide means to support the bobbin-case and hold it in place on the hanger while it is being introduced into the hook. To this end the bracket 8, to which the hanger-support L is pivoted, has on each of its forked ends a curved rib or flange 8^a, Figs. 1, 3, and 19, the edge of the rib or flange being an arc struck from pivot 7 as a center. When the hanger is thrown down, as indicated in Fig. 19, to introduce the bobbin-case, the latter rests on the flanges 8^a, the segment *g²* of the rim being between them. As the hanger is gradually raised to its normal position these flanges continue to support the bobbin-case, which slides over them, until it is introduced into the hook. In depressing the hanger to remove the bobbin-case the latter is in the same manner supported by the flange 8^a.

Reference has already been made to the fact that the peripheral rim of the bobbin-case is cut away. This has been found very advantageous on account of the lightness thereby secured. The perforations 15 in the segments *g g'* and the perforations 16 in the walls of the bobbin-case are made with the same object, in order that the loop of upper thread may encounter the less resistance in its passage around the bobbin-case and between the latter and the hanger. The cutting away of the rim, however, has other important advantages, as will now be pointed out. A space is thereby afforded on one side of the case for the tension-spring 14, which

is placed on the periphery of the case. The thread 12 is led from the bobbin through a diagonal cut 36 in the case directly under the tension-spring 14, whence it passes to the needle-hole in the direction above pointed out. This gives the thread a very direct course, avoiding undesirable bends and turns, which tend to produce irregularities in the tension. It also greatly facilitates the operation of threading in inserting a full bobbin. After passing along thread-groove 13 (by which it is kept out of contact with the loop of upper thread) the bobbin-thread goes under the guide-pin 17, already referred to, which performs the function of a thread-eye, but which is so constructed that the thread can be readily inserted in proper relation thereto. To this end a thin metal shield 18, Figs. 9 to 11, projects upwardly from the bobbin-case and has a perforation 19, through which the pin 17 slightly projects. The perforation is enough larger than the pin for the thread to be easily inserted between the latter and the edge of the perforation. The top of the pin is beveled off, as well shown in Figs. 9 and 11. To insert the thread, it is brought over the pin 17 in the groove or space formed between the face of the bobbin-case and the shield 18. It is then tightened and pressed downward, causing it to slide across the beveled end of pin 17, between it and the edge of perforation 19, until it reaches the under side of the pin, when it springs back into line, resting finally in the groove 20 in the periphery of the pin 17. The construction described constitutes what may be called a "self-threading" arrangement. Owing to the groove 20 and the presence of shield 18, the thread cannot escape after being properly placed.

The space furnished by cutting away the rim of the bobbin-case on the side opposite to that occupied by the tension-spring 14 affords room for a thread-detainer *m*, which is in the form of an approximately semicircular lug projecting from the hanger M, Figs. 1 and 7. The function of this device is important. It is understood that the hook performs one or more (in the machine shown, two) idle revolutions in order to give time for the rotary take-up, with its gradual method of operation, to draw up the loop. The take-up begins to act when the loop passes the lowest part of the bobbin-case; but before it has appreciably tightened the loop the point of the hook will be again approaching the thread as the latter is being drawn up. At this time it is important that the strand of the needle-loop, which is being drawn up behind the bobbin-case, should be held to the right of the point of the hook. Otherwise the latter might pass to the wrong side of the thread and consequently break it. To aid in holding the thread out of the way of the hook, a horn 22 is formed by a nearly horizontal cut 23 under segment *g* at the rear thereof, Figs. 3, 7, and 10. This cut is curved upward in

a direction approximating a circular arc, Figs. 3 and 9, forming a thread-passage, so that the strand, after passing under the horn 22, emerges vertically in a space 24 between the horn 22 and a thin wall or shield 45, Figs. 9 and 10, and is thus held out of the way of the hook. The construction just described is not of my invention; but in order that the desired operation of holding the loop from being caught by the hook may be performed with absolute certainty it is necessary to contrive means to avoid the slackening and bulging up of the loop after being cast off by the hook. Were the thread free to spring by its elasticity or twist in any direction, it would not always enter the cut 23 and pass under and around horn 22. To insure this is the function of the detainer *m*, which opposes itself as an obstacle to the progress of the loop, causing the inner strand to take the shortest direction to the needle-hole, which is under horn 22, and keeping it taut until the take-up draws upon it. The detainer is, of course, useful apart from the devices employed to shield the loop from the point of the hook.

The needle-hole 25 in the throat-plate usually has a rounded corner at its upper end and is countersunk beneath. According to this invention the needle-hole 25 has a nearly circular opening at the upper surface of the throat-plate S, but has on the under side an extension or groove 26, extending rearwardly, that is to say, in the direction of the feed of the goods, Figs. 13 and 14. This groove lies to one side (the right side) of the axis of the needle-hole. The function of this groove is to hold the end of the loop which is attached to the cloth (and which for distinction will be called the "outer" strand, since it goes outside the bobbin-case) in proper relation to the needle-puncture to insure the proper and regular laying of the stitch.

The diagram Fig. 17 illustrates the appearance of the stitch in regular sewing. The circles *p* represent a series of punctures in the cloth. The end *p'* of a strand from the preceding stitch descends into the puncture, forming the loop indicated in dotted lines. The end *p*² of the ascending or inner strand emerges at the left of the puncture, and the thread from this point to the next puncture runs in an oblique direction. In looping around the bobbin-case the strand descending from point *p'* is twisted by the hook and carried outside or to the left of the case, while the ascending strand *p*² passes behind or to the right of the bobbin-case, as already explained. The strand *p'*, first referred to, has therefore a tendency to slip over to the left side of the needle-puncture, producing an irregular and defective stitch. This is entirely obviated by the thread-groove 26 in the throat-plate, into which the strand is drawn by the hook and which holds the thread to the right of the needle, causing it to assume the proper position as the loop is drawn up. On the

other hand, the ascending or inner strand p^2 should lie on the left-hand side of the needle-puncture. It is guided and held in this position by the thread-slit 28 in the presser-foot f' , Figs. 12 and 15, extending rearwardly from the needle-hole 27 in the foot. This slit or guide lies, as shown, to the left of the axis of the hole 27, and its action on the thread will be readily understood from the explanation given of the action of thread-groove 26. The thread-slit 28 has another function, which will now be described.

Heretofore difficulty has always been encountered in maintaining proper relative adjustment of the tensions of the upper and lower threads, respectively, to insure that the lock of the two threads will be uniformly placed between the upper and lower surfaces of the cloth. When the upper tension is excessive, the lower-thread loop is sometimes drawn completely out of the cloth on the upper side, and vice versa.

The needle-hole 27 is approximately circular, and the thread-slit 28 forms a narrow extension thereof, as already explained, being just wide enough for the free passage of a thread. As the upper thread is drawn tight it passes freely through the slit, but if the lower-thread tension should be relatively feeble its loop nevertheless cannot be drawn out of the cloth, since it encounters the solid portion of the foot at the side of the slit. The foot thus acts as a stop, supplementing the action of the lower tension. In practice the upper-thread tension may be given a slight excess over the lower-thread tension, insuring that the lock shall not be formed on the under side of the work, while the means just described insure that the lower-thread loop will not be drawn above the cloth.

The improvement in the presser-foot which has just been described has an advantage over an elongated opening in that it aids in the proper laying of the stitch and in placing the lock in the proper position. It has the advantage over a simple round hole of avoiding the deflection of the upper thread out of a vertical line and the bending thereof around the edge of the hole. The friction on the edge of the hole in making long stitches at the high speed causes frequent breakage of the thread.

The presser-foot has a transverse cut 29 from one edge to the needle-hole, through which cut the thread is introduced in threading the machine.

The loop-controlling devices—to wit, the recess 26 and slit 28—may be used separately, though the best and most uniform results are insured by their coöperation. So far as I am aware, no means have been heretofore employed to control the loop and hold the strands thereof in proper relation to the line of stitching against the twisting tendency of the hook.

The needle-shield q is in its general construction and operation the same as heretofore, but an improvement has been made

therein in cutting a groove 32, Fig. 12, near the extreme end thereof on the side adjacent to the needle. This groove permits the thread passing down from the tension and take-up to swing freely around to the left of the needle-puncture.

Although the foregoing description and the accompanying drawings present the best mode known to me of applying and practically carrying out the principle of the invention, it will be clear to persons skilled in the art to which it relates that departures may be made from the forms and details of the various improvements and that parts thereof may be used separately without in either case departing from the spirit of the invention.

Having now particularly described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A cup-shaped rotary hook having an interior shoulder, and a point formed by an oblique cut, the side of this cut being deflected where it intersects said shoulder so as to be approximately parallel with the outer side of the hook-point, in combination with a non-rotating bobbin-case inclosed in said hook and having a segment of a rim over which the point of the hook passes, substantially as described.

2. The combination with the rotary hook journaled beneath the bed-plate of the machine and having an annular flange for throwing off oil, of an oil-recess in the bed-plate adjacent to the flange and inclined drip-surfaces leading from said recess, substantially as described.

3. The combination with the hook-shaft journaled in a bracket beneath the bed-plate, a rotary hook on one end of the shaft having an annular flange for throwing off the oil, an oil-recess in the work-plate having a curved rim or guard and inclined drip-surfaces leading from said rim or guard to the bracket in which the shaft has its bearing, substantially as described.

4. The combination with the bed-plate and stitch-forming mechanism of a sewing-machine, including a hook-shaft beneath the bed-plate, the latter being provided with an opening for a throat-plate, of an oil guard or flange adjacent to said opening and drip-surfaces leading downwardly and away from said opening, substantially as described.

5. The combination with the cup-shaped rotary hook, of an inclosed bobbin-case having projecting segments with intervening spaces, and a tension-spring on the periphery of the case in one of said spaces, substantially as described.

6. The combination with the rotary hook, of the inclosed bobbin-case provided with a rim having segmental projections with intervening spaces, a tension-spring on the periphery of the case in one of said spaces, and a thread-groove along the base of one of said segments leading toward the top of the bobbin-case, substantially as described.

7. The combination with the throat-plate, the hanger, the hollow rotary hook, and means for rotating the same continuously in one direction, of a bobbin-case suspended from said hanger and inclosed in said hook, said case being provided with a thread pin or guide for the bobbin-thread, arranged to one side of the opening in the throat-plate, so that the thread pulls from said pin in a direction approximately tangential to the bobbin-case and tends to turn it in a direction opposite to that of the rotation of said hook, substantially as described.

8. The combination with the bobbin-case, of a thread-guide thereon, comprising a pin and a shield having a perforation slightly larger than and embracing said pin, the head of the latter being beveled on upper side only, substantially as and for the purpose described.

9. The combination with the bobbin-case, of a thread-guide thereon, comprising a pin and a shield having a perforation slightly larger than and embracing said pin, the head of the latter being beveled on the upper side only, and the shank of said pin inside the shield being grooved or cut away, substantially as described.

10. The combination with the needle, the rotary hook, and the hanger, of the bobbin-case suspended by the hanger in said hook, and a loop-detainer projecting into a space between the bobbin-case and the hook, to keep taut the loop of upper thread after it has passed under the bobbin-case, substantially as described.

11. The combination with the needle, the rotary hook, and the hanger, of the bobbin-case suspended by the hanger in said hook, and a loop-detainer in the form of a rounded lug projecting into a space between the bobbin-case and the hook to keep taut the loop of upper thread after it has passed under the bobbin-case, substantially as described.

12. The combination with the cup-shaped rotary hook, of a hanger, and a bobbin-case inclosed in said hook, and having a projecting flange resting upon said hanger, the contact-surfaces of the hanger and flange being smooth and horizontal in cross-section, so that the bobbin-case rests loosely on the hanger, substantially as described.

13. The combination of the bobbin-case having on its face a projecting flange, a bobbin-hanger upon which said flange rests, a hanger-support and a bracket in which said support is pivoted so as to permit of the insertion and removal of the bobbin, said bracket

being provided with curved ribs upon which the lower edge of the bobbin rests when the hanger-support is tilted downward, substantially as described.

14. The combination with the stitch-forming devices of a lock-stitch sewing-machine, of a throat-plate provided with a needle-hole and a groove in the under side of said hole extending rearwardly therefrom forming a wall or shoulder for holding the thread to one side of said needle-hole, substantially as described.

15. The combination with the stitch-forming mechanism of a lock-stitch sewing-machine including a bobbin-case and a looper or hook which twists the loop in carrying it around the bobbin-case, of loop-controlling devices for holding the two ends of the needle-loop as it is drawn up on opposite sides respectively of the axis of the needle—substantially as described.

16. The combination with the needle and other stitch-forming mechanism, of a presser-foot having an approximately circular needle-hole provided with a narrow slit of less width than the diameter of the needle-hole extending rearwardly therefrom wide enough for the passage of a single thread, so that the loop of under thread, if drawn through the cloth, encounters the solid surface of the foot, substantially as described.

17. In a lock-stitch sewing-machine, the combination with the needle and other stitch-forming mechanism, of a presser-foot having a needle-hole, and a narrow extension thereof on one side of the axis of the needle, substantially as described.

18. The combination with the needle and cooperating mechanism for forming a lock-stitch, of a needle-shield for keeping the point of the needle clear of its thread, said shield being provided near its end with a groove on the side adjacent to the needle, substantially as described.

19. The combination with the hook, the bobbin-case and the bobbin-hanger, of the forked support in which the hanger is pivoted, said support being provided on its forked ends with curved ribs or flanges, upon which the bobbin-case rests while being introduced into and removed from the hook, substantially as described.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

STOCKTON BORTON.

Witnesses:

J. H. COOKE,

J. A. REIDENBACH.