(No Model.) 5 Sheets—Sheet 1.

C. H. WILLCOX, C. CARLETON & S. BORTON.

SEWING MACHINE.

No. 603,988. Patented May 10, 1898.

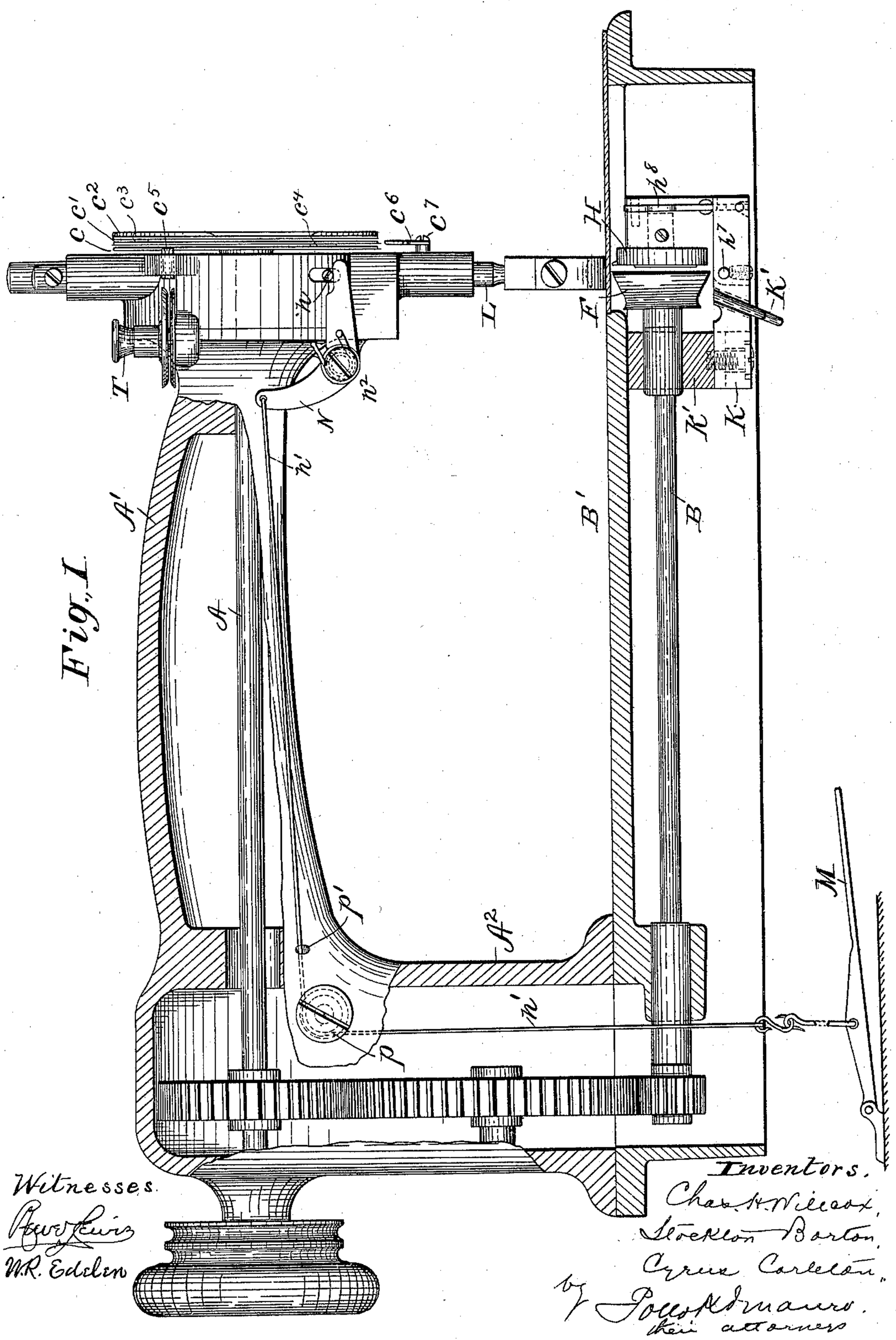


Fig. 1.

Witnesses.
Peter Lewis
W. R. Eddon

Inventors.
Chas. H. Willcox,
Stockton Barton,
Cyrus Carleton,
by Pollock & Munro.
their attorneys

(No Model.) 5 Sheets—Sheet 2.

C. H. WILLCOX, C. CARLETON & S. BORTON.

SEWING MACHINE.

No. 603,988. Patented May 10, 1898.

Fig. 16.

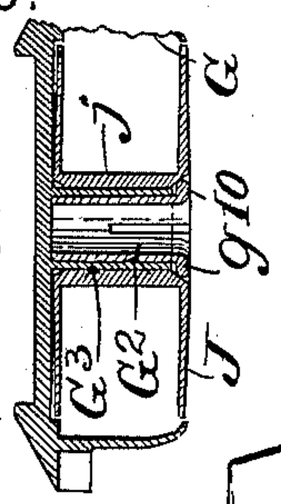


Fig. 17.

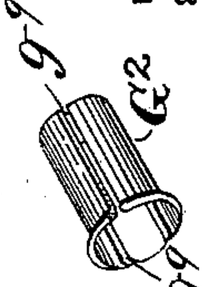


Fig. 7.

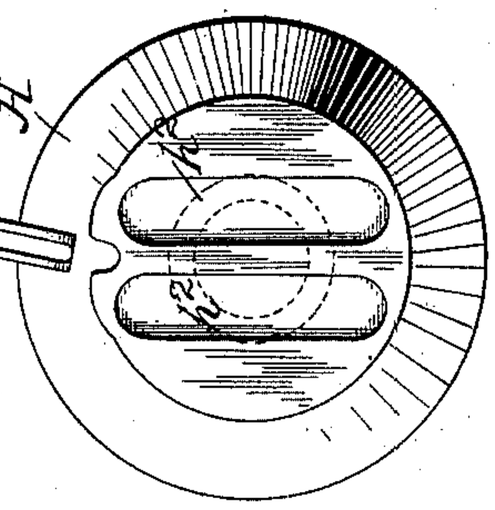


Fig. 5.

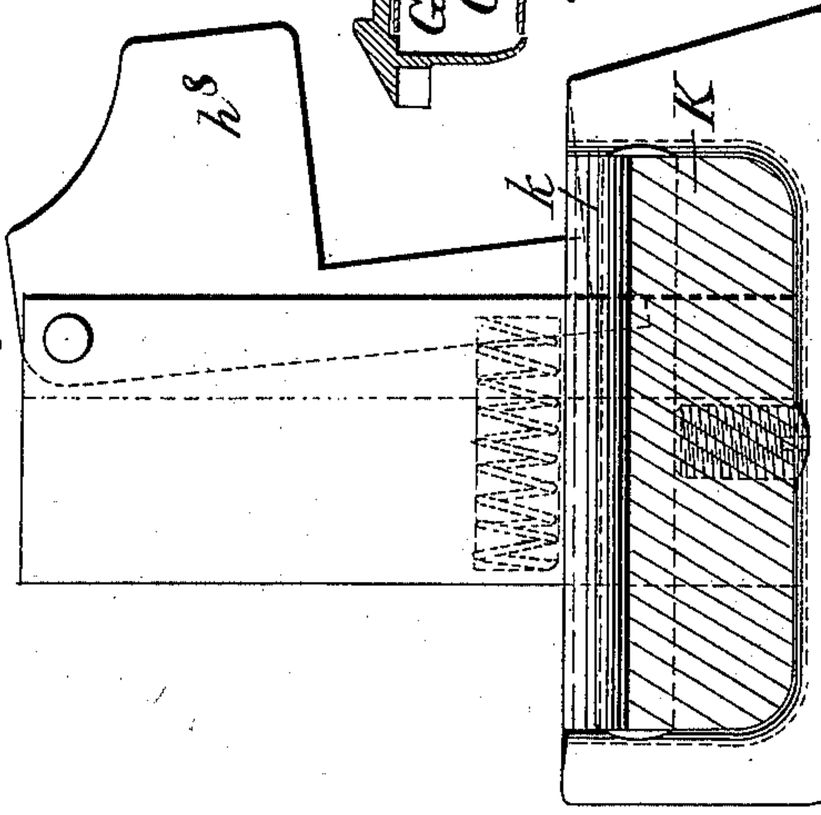


Fig. 4.

Fig. 6.

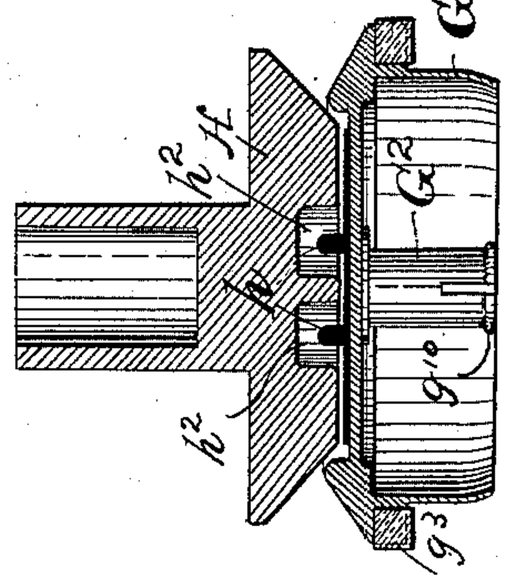


Fig. 3.

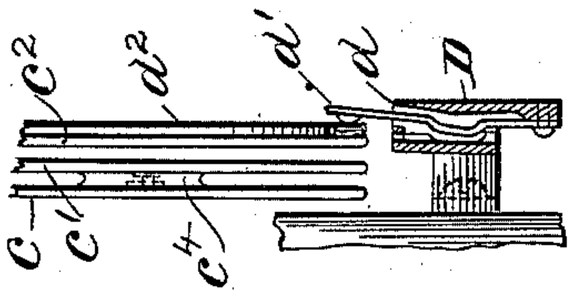


Fig. 8.

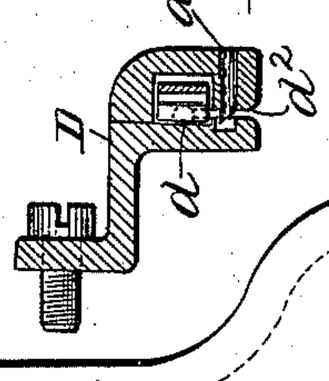


Fig. 15.

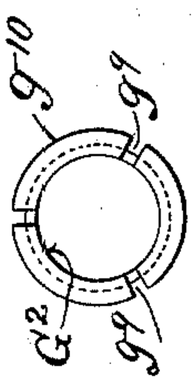


Fig. 2.

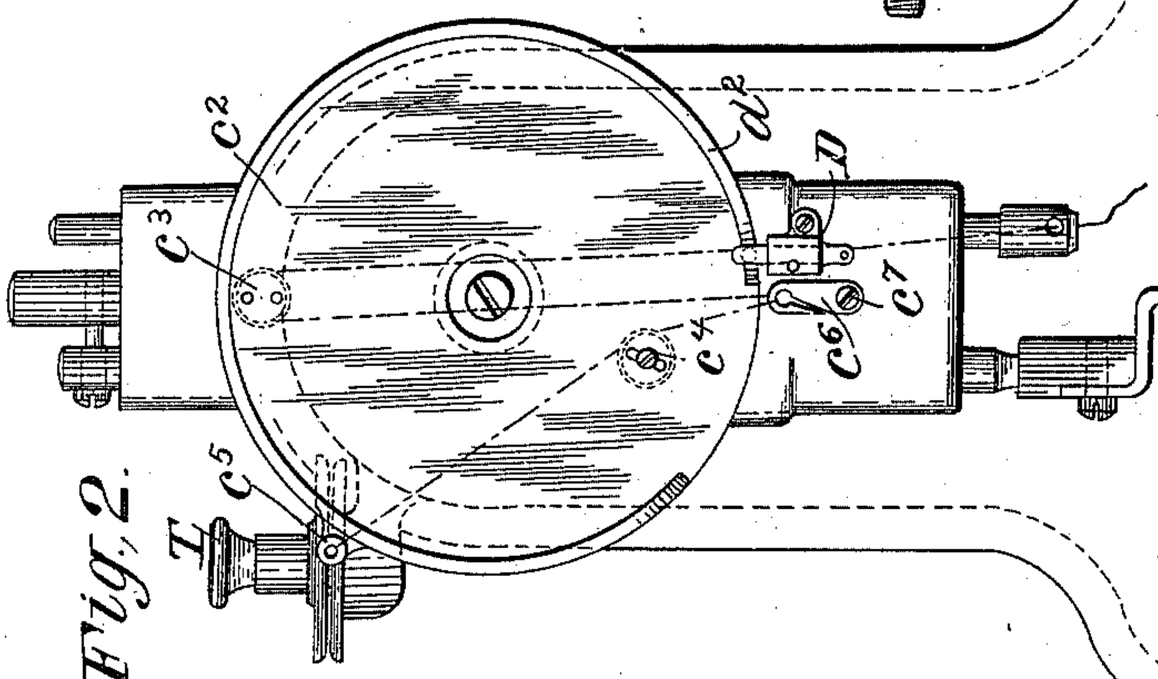
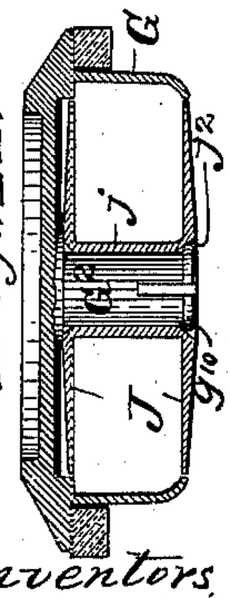


Fig. 14.



Witnesses
Geo. Lewis
W. R. Edelin.

Inventors.
Chas. H. Willcox,
Stockton Borton,
Cyrus Carleton,
by Tolton & Mauro,
their attorneys.

(No Model.) 5 Sheets—Sheet 3.

C. H. WILLCOX, C. CARLETON & S. BORTON.

SEWING MACHINE.

No. 603,988. Patented May 10, 1898.

Fig. 8.

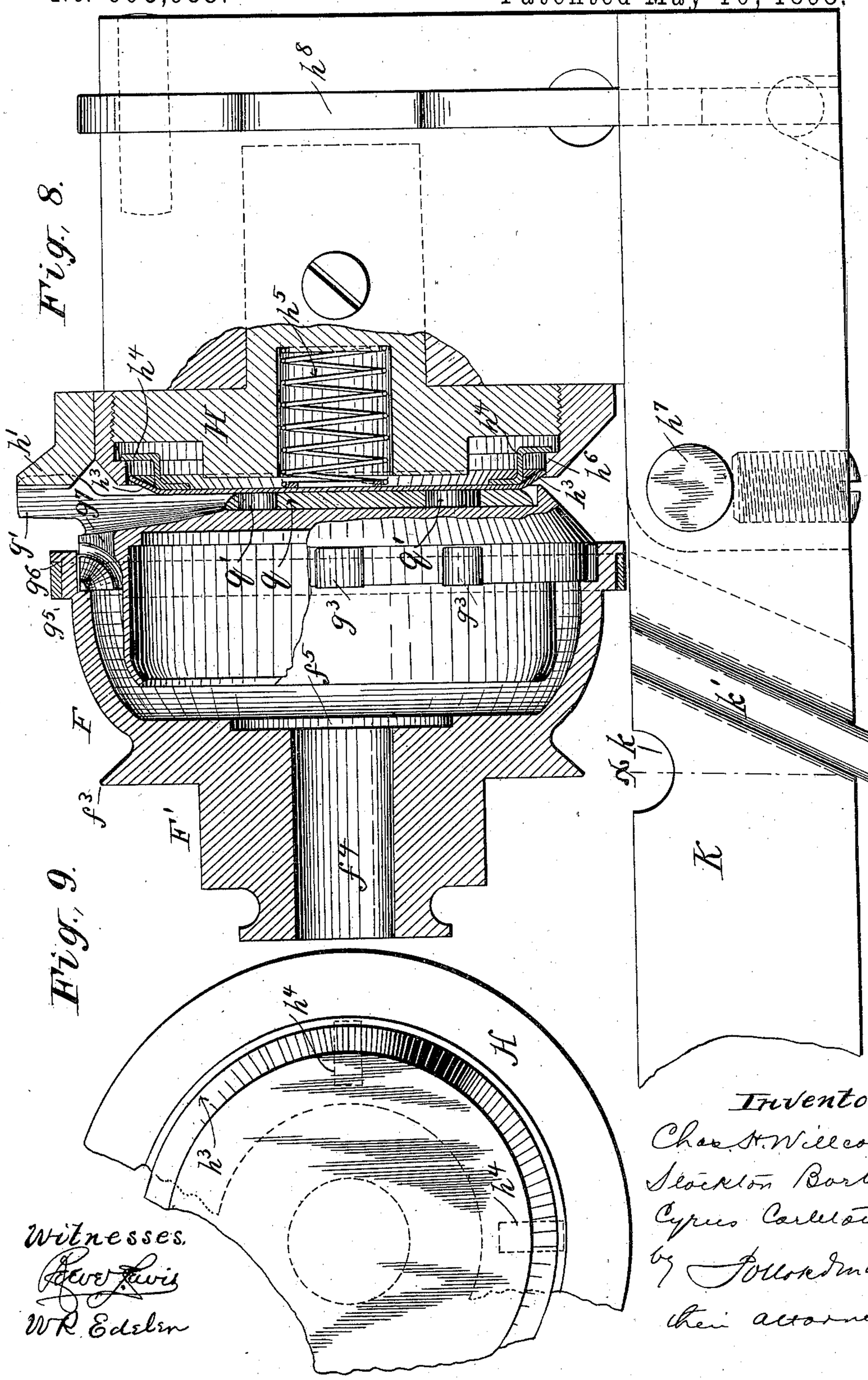


Fig. 9.

Witnesses.
Peter Lewis
W R Edelen

Inventors.
Chas. H. Willcox,
Stockton Borton,
Cyrus Carleton,
by Pollock & Mauro,
their attorneys

(No Model.) 5 Sheets—Sheet 4.

C. H. WILLCOX, C. CARLETON & S. BORTON.

SEWING MACHINE.

No. 603,988. Patented May 10, 1898.

Fig. 13.

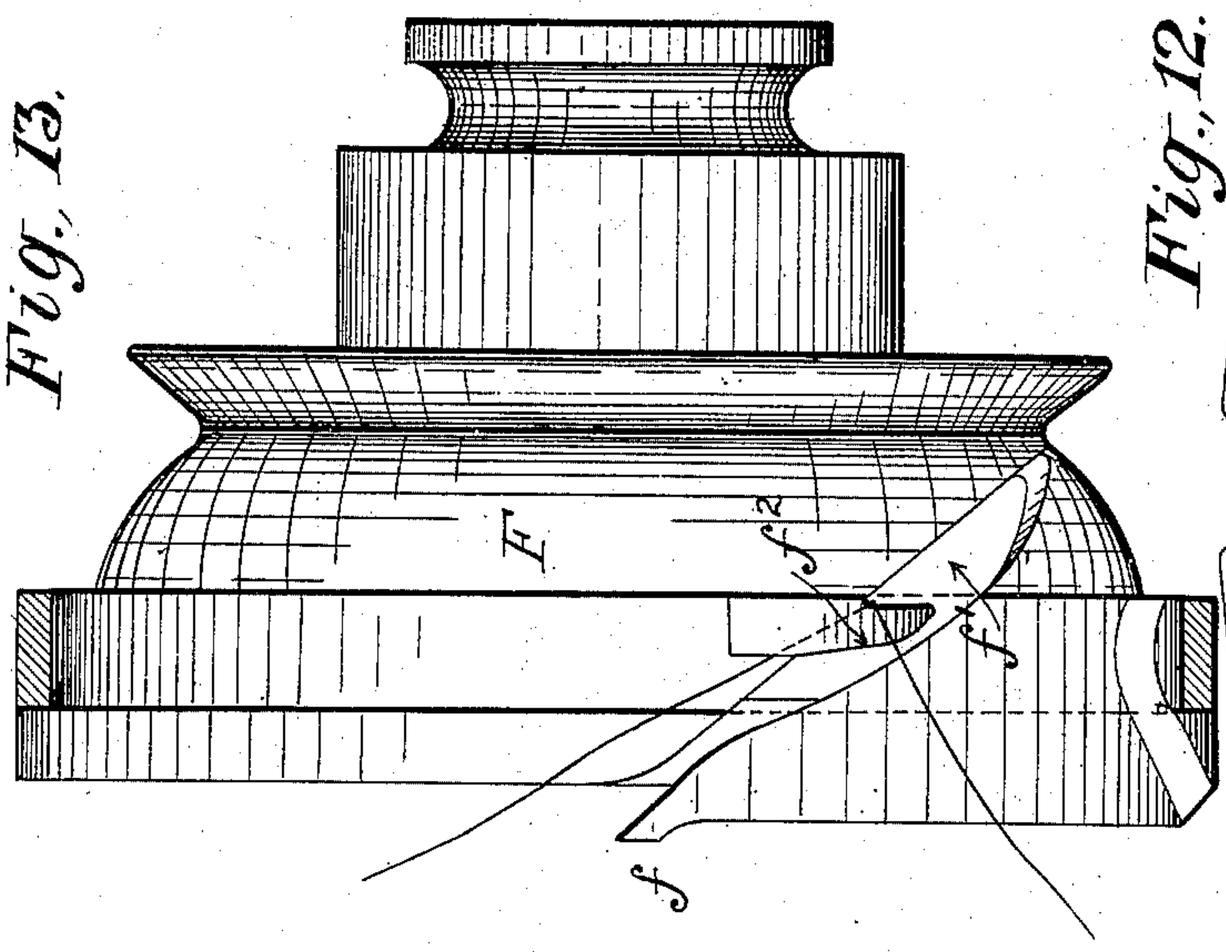


Fig. 12.

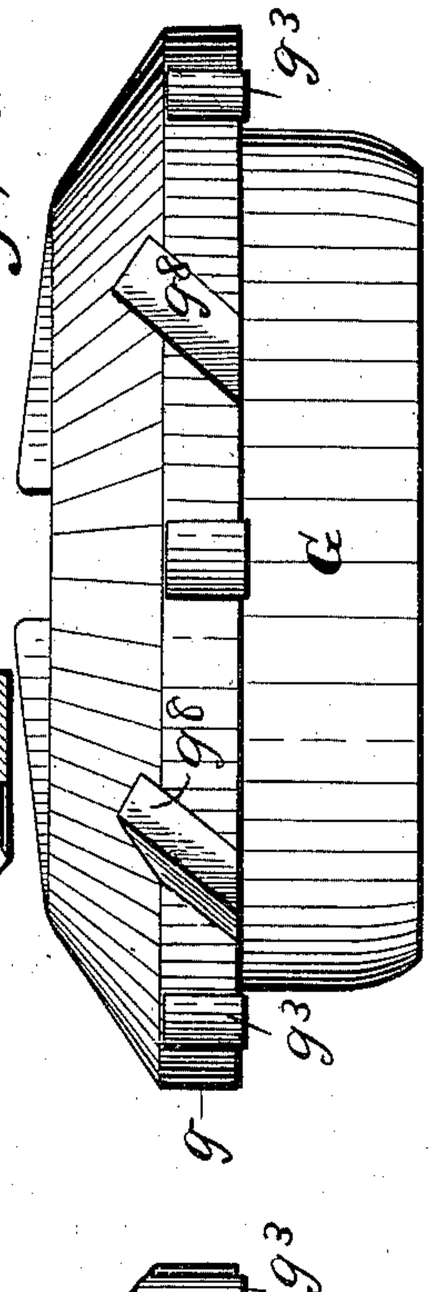


Fig. 10.

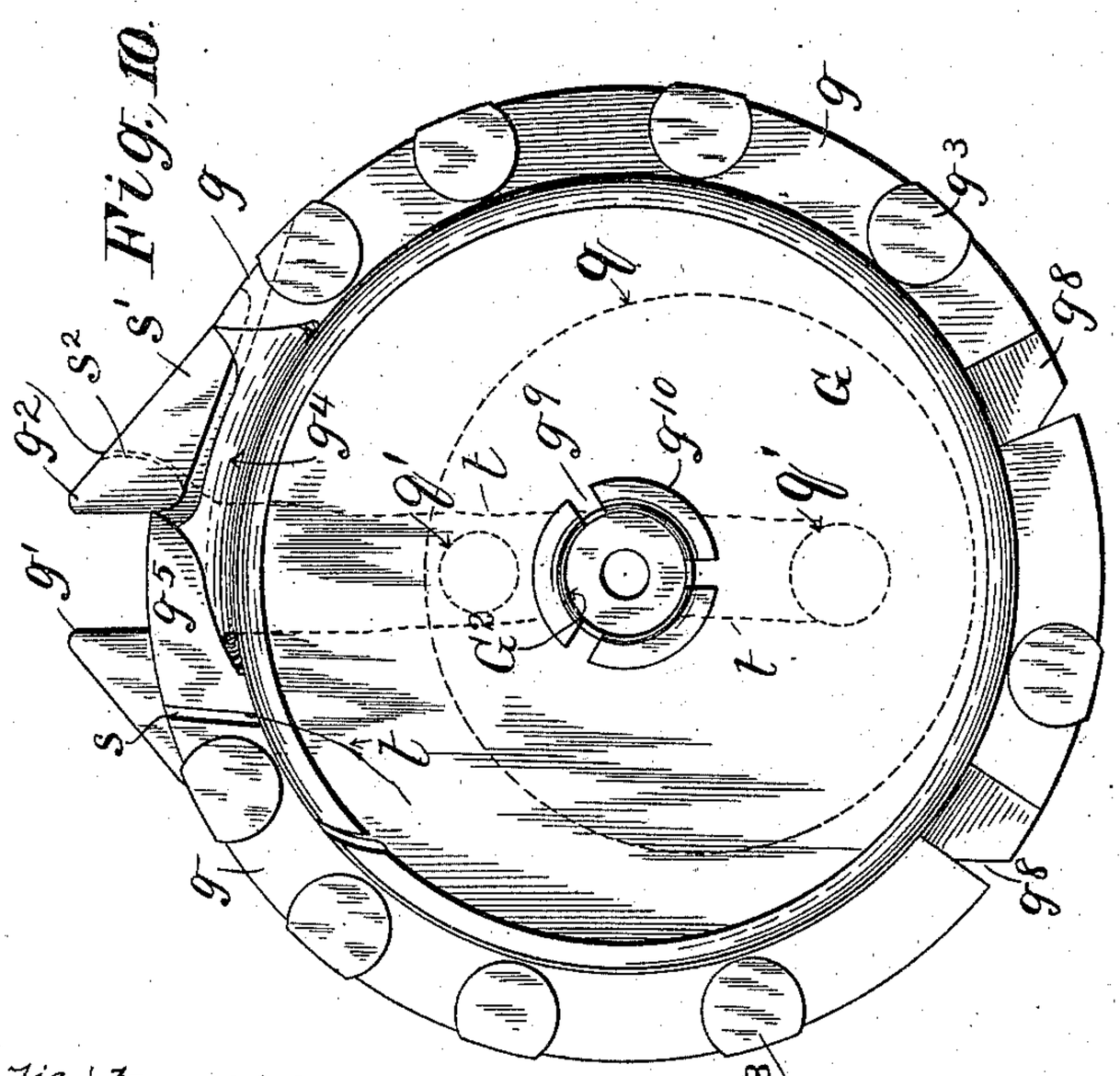
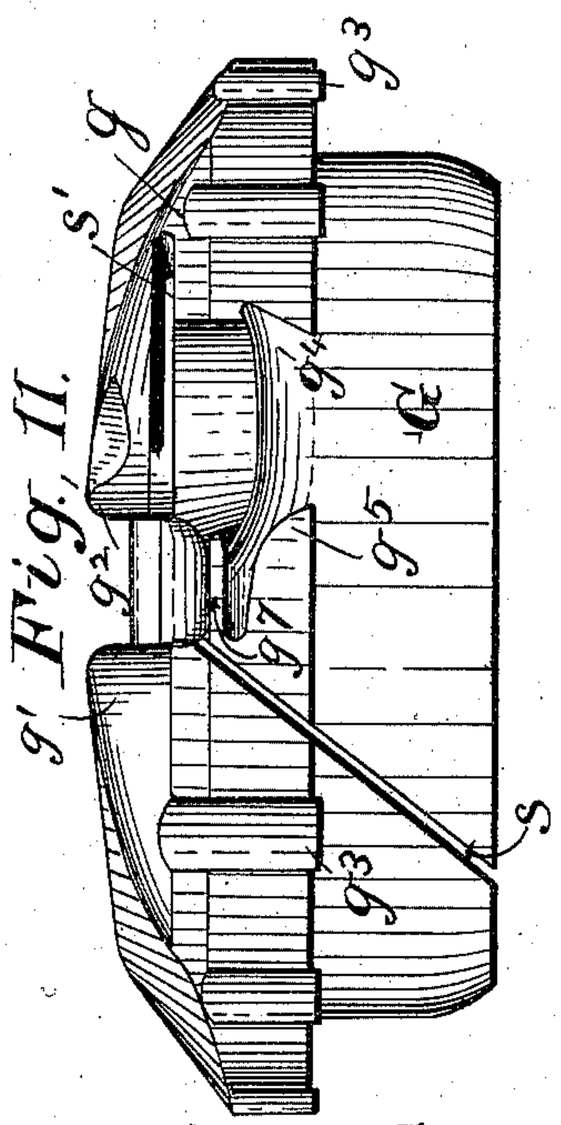


Fig. 11.



Witnesses
Chas. Lewis
W. R. Edelen.

Inventors.
Chas. H. Willcox.
Stockton Borton,
Cyrus Carleton.
by Foster & Freeman.
their attorneys.

(No Model.) 5 Sheets—Sheet 5.

C. H. WILLCOX, C. CARLETON & S. BORTON.

SEWING MACHINE.

No. 603,988. Patented May 10, 1898.

Fig. 18.

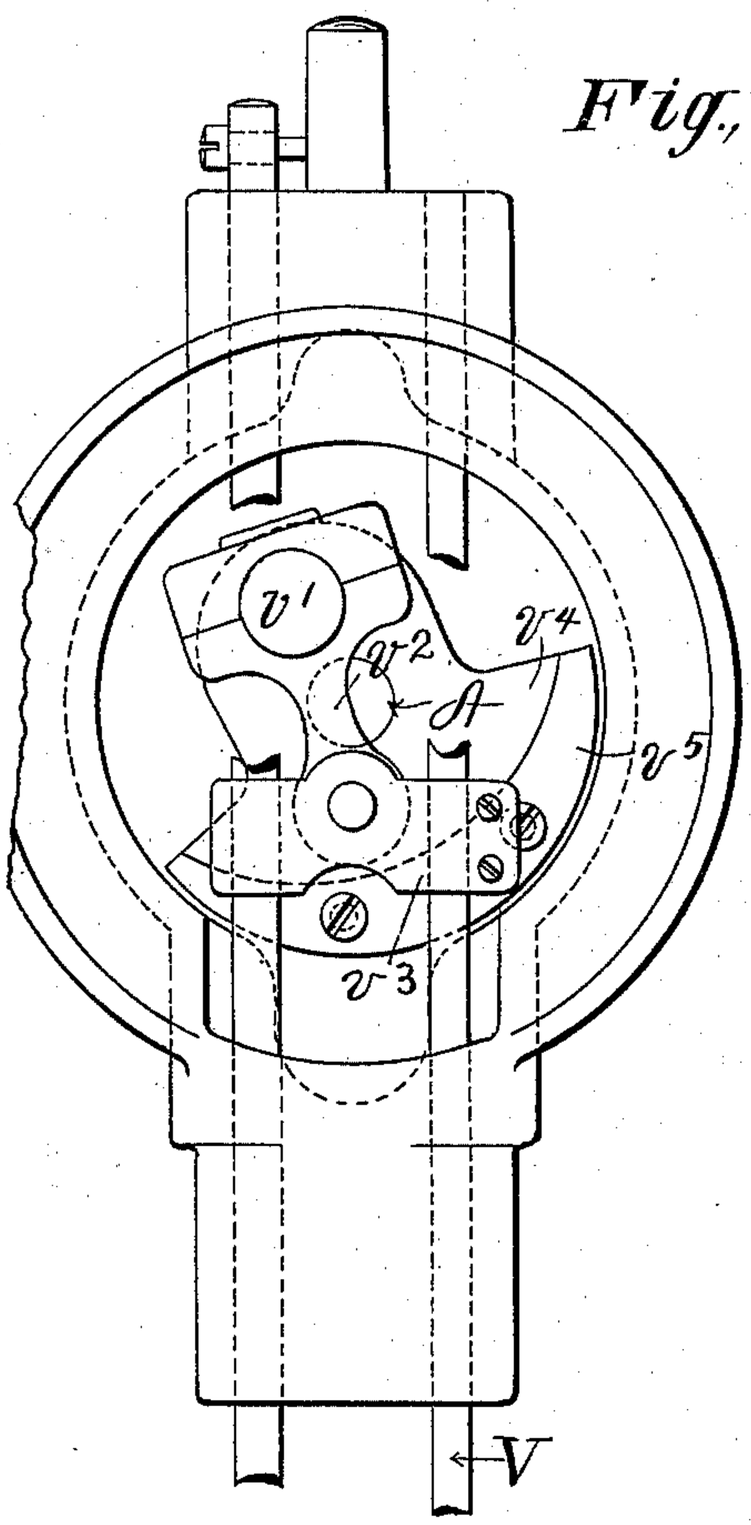
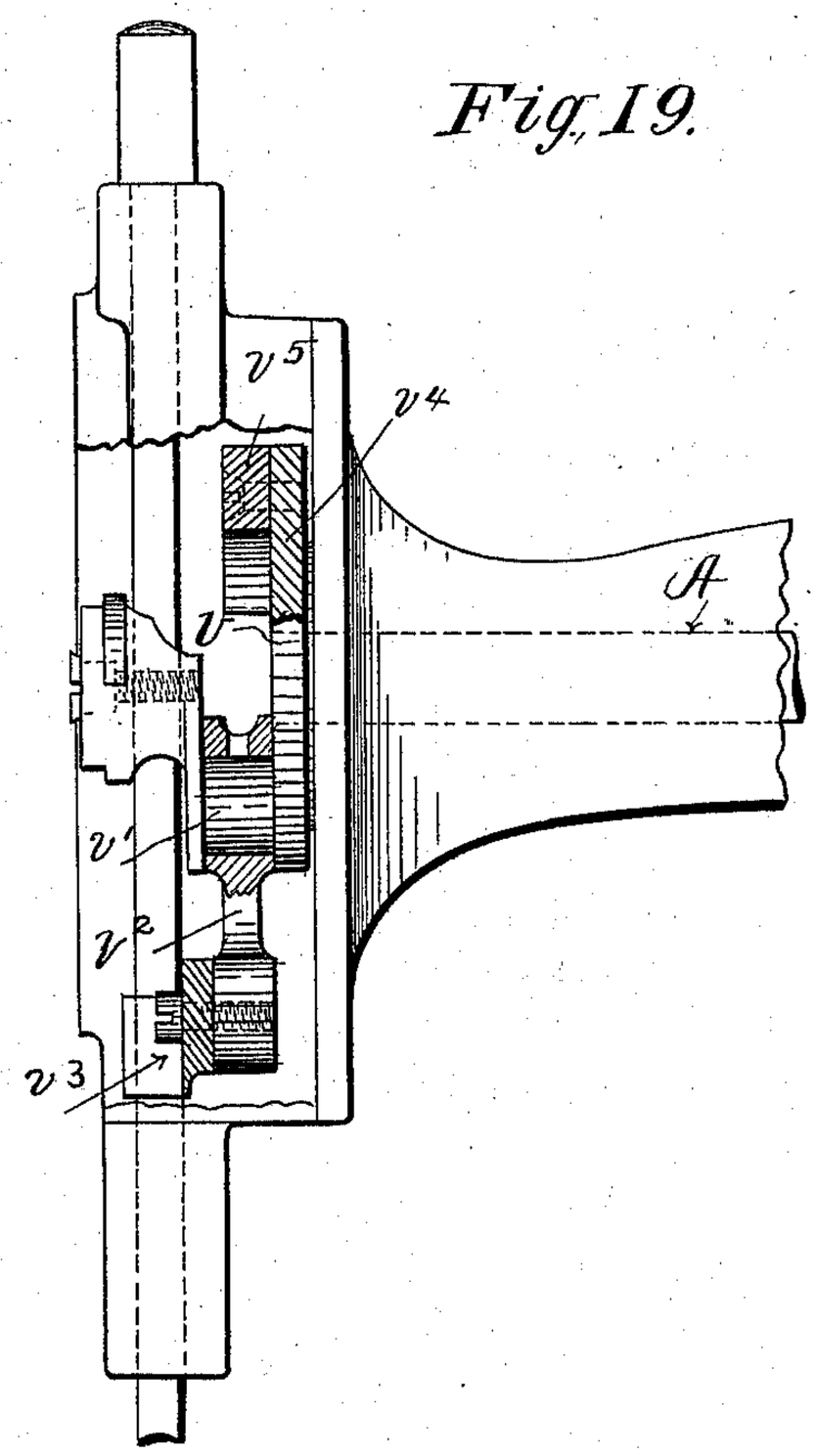


Fig. 19.



Witnesses.
Geo. W. Lewis
W. R. Edelen.

Inventors
Chas. H. Willcox
Stockton Borton,
Cyrus Carleton,
by Pollok & Mauro,
their attorneys.

UNITED STATES PATENT OFFICE.

CHARLES H. WILLCOX, OF NEW YORK, N. Y., CYRUS CARLETON, OF PROVIDENCE, RHODE ISLAND, AND STOCKTON BORTON, OF BROOKLYN, NEW YORK, ASSIGNORS TO THE WILLCOX & GIBBS SEWING MACHINE COMPANY, OF NEW YORK, N. Y.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 603,988, dated May 10, 1898.

Application filed July 18, 1896. Serial No. 599,728. (No model.)

To all whom it may concern:

Be it known that we, CHARLES H. WILLCOX, of New York, N. Y., CYRUS CARLETON, of Providence, Rhode Island, and STOCKTON BORTON, of Brooklyn, New York, have invented new and useful Improvements in Sewing-Machines, which are fully set forth in the following specification.

This invention has reference to the construction of sewing-machines for making a lock-stitch by means of two threads; and it embraces certain improvements which have for their general object the production of stitches of the described sort at high speed.

The take-up is of the rotary type; and the object of this part of the invention is to permit of the use of a simply-constructed take-up of small diameter. To this end the take-up employs two pins arranged to work as a double crank, the thread being passed from a thread-eye around one pin, then through a stationary thread guide or eye, and then around the other pin. In the simplest arrangement of these devices the pins are on opposite sides, respectively, of the same plate or disk, and in the preferred form of construction the take-up is composed of three plates, one pin being in the space between the middle and outer plates and the other in the space between the middle and inner plates. In this part of the invention are embraced certain improvements in construction and arrangement of the parts, as will be hereinafter described in detail.

The thread controller or device for keeping the thread taut while the needle descends (thus preventing the slack given out by the take-up from getting on the wrong side of the needle or being impaled on its point) acts by putting a tension on the thread between the take-up and needle at the time the needle is descending and removes this tension, leaving the thread entirely free at other times. This controller may conveniently be operated by means of a cam or eccentric carried by one of the take-up plates.

Usually in machines of the type under consideration the bobbin-case is suspended from a stationary bobbin-hanger, which is adjacent to the rotary hook. According to the present invention the bobbin-case is supported entirely within the hook itself, being held from rotating by means of a suitable stop. An objection to this construction would arise from the contact of the bobbin-case with the interior of the hook, necessitating the oiling of these metal surfaces. To obviate this objection, plugs of soft material, such as leather, are set in the rim of the bobbin-case at suitable distances apart, these plugs projecting slightly beyond the surface of the rim, so that the latter does not come into contact with the hook at all. To diminish the friction, the plugs may be saturated with oil, which will keep the parts lubricated for a long time without removal and without spreading oil over surfaces with which the thread makes contact. Plugs of other antifriction material may be used. The rim of the bobbin-case is also provided with means for clearing the space between it and the hook from accumulations of dust and lint, these means being preferably in the form of inclined cuts or grooves, the walls of which act as strippers or clearers, the grooves themselves permitting the discharge of the foreign substances from the interior of the hook.

After the loop passes the lowest part of the bobbin-case it is necessary or desirable to prevent the loop from slackening or bulging up. If the thread at this time were left entirely free, it might twist or spring out of the position which it should assume in being drawn up by the take-up. For this reason a thread-detainer is provided to check or retard the passage of the loop across the face of the bobbin-case after being slackened by the hook. According to the present invention the thread-detainer is placed between the face of the bobbin-case and the adjacent walls of the bobbin-holder, or the device of whatever sort that keeps the bobbin-case in place in the

hook. The thread-detainer may be of many different forms which will usefully subserve the described function. For example, an obstruction to the movement of the thread may be provided by a projection or rib on one of the adjacent surfaces entering a groove or recess in the other, these devices putting a drag upon the thread; or the same effect may be obtained by means of a floating plate or strip pressed by a light spring, which plate or strip forms one of the surfaces of the thread-passage, or the principle of this part of the invention may be applied in other ways.

The invention also includes an improved means of securing the bobbin in its case, as will be hereinafter described.

One of the chief difficulties we have experienced in constructing high-speed machines which shall be in every way practical and satisfactory has been due to the property which oil has of escaping from bearings and spreading in every direction. The effort to prevent oil from working its way to parts of the machine where it would soil the thread or work has involved many perplexing problems. The present invention includes means hereinafter to be described to prevent oil which may be thrown off either from the hook or shaft from reaching the front of the bobbin-holder or other surfaces where its presence would be detrimental.

The rotary hook makes two or more revolutions to each reciprocation of the needle and to each revolution of the take-up. It is important that the strand of the needle-loop which is being drawn by the take-up should be held to the proper side of the point of the hook as it passes the strand. To aid in securing the proper action, a horn is formed by a cut in the rim of the bobbin-case, the cut constituting a thread-passage under the horn. Preferably this thread-passage is curved upwardly in the form approximately of a circular arc, so that the thread, after passing under the horn, emerges vertically between the horn and a thin upright wall or shield and is thus held out of the way of the approaching hook-point. The rotary hook is provided with a horn or projection extending across the oblique cut which forms the hook-point. This horn is for the purpose of controlling the strand of the loop on which the take-up is acting. The horn slips out of the loop as it (the horn) passes the needle-hole.

The invention embraces other improvements in details of construction and combinations of parts, as hereinafter explained.

In the accompanying drawings, which form part of this specification, Figure 1 is a vertical longitudinal section, partly in rear elevation, of a machine constructed in accordance with the invention. Fig. 2 is an elevation looking at the head of the machine. Fig. 3 is an enlarged elevation of the thread-controller. Fig. 4 is a cross-section thereof. Fig. 5 is a sectional elevation of the bracket carrying the bobbin-holder, the section being on line $x\,x$ of Fig. 8. Fig. 6 is a horizontal section of the bobbin case and holder. Fig. 7 is a face view of the holder. Fig. 8 is an enlarged side view, partly in vertical section, of the bobbin-holder, bobbin-case, and hook Fig. 9 is a partial face view of the bobbin-holder, showing the thread-detainer, which is of different construction from that of Figs. 6 and 7. Fig. 10 is a rear view, Fig. 11 a top view, and Fig. 12 a bottom view, of the bobbin-case. Fig. 13 is a top view of the rotary hook. Figs. 9 to 13 show the parts greatly enlarged. Fig. 14 is a sectional view of the bobbin and bobbin-case, and Fig. 15 is an end view of the sleeve or hollow spindle of the bobbin-case. Figs. 16 and 17 are views of parts of the bobbin and bobbin-case. Fig. 18 is an end elevation of the head of the machine, the take-up being removed to show the parts within the head. Fig. 19 is a front elevation of the head of the machine, partly in section.

A represents the main shaft, turning in bearings in gooseneck or arm A′, and B the hook-shaft, supported in bearings beneath the work-plate B′.

The take-up is composed of three plates c c' c^2. Plates c' c^2 are connected by a pin c^3 and plates c c' by a pin c^4, these pins, with their common supporting-plate c', constituting a double crank. The thread passes from the tension T through thread-eye c^5, which is near the upper left-hand corner of the take-up, (looking at the head of the machine,) and thence over or around the inner take-up pin c^4. From this pin the thread is led through thread-eye c^6, beneath the take-up, and thence around the outer take-up pin c^3 to the needle. Pin c^3 is that which in action draws up the loop and tightens the stitch which has been completed when the pin reaches the position shown in Fig. 2. During the descent of pin c^3 slack is given out much more rapidly than is required by the descent of the needle; but during this period the pin c^4 comes into action upon the thread. It takes up the slack less rapidly than it is given up by pin c^3, leaving a proper amount of free thread for the needle to take down. This differential action of the two pins is due partly to the relative positions of the thread-eyes c^5 c^6 and partly to the fact that pin c^4 is nearer the center of the take-up than pin c^3. In order to provide for a varying action to suit different thicknesses of work, one or both of the pins may be made adjustable, as shown in the case of pin c^4, Fig. 2, by having a slot connection with its supporting-plate. Thread-eye c^6 may also be adjusted by loosening the screw c^7, which attaches it to the frame, and turning the thread to one side or the other.

The thread controller or device for holding the thread taut while the needle descends acts like an intermittent tension. As shown in

Figs. 2, 3, and 4, it consists of a bracket D, attached to the frame, having a vertical thread-passage d, through which the thread passes on its way to the needle, and a light tension-spring d', adapted to bear on the thread in the thread-passage. The upper end of spring d' is in the path of a cam d^2, which extends the greater part of the way around the face of take-up plate c^2, this cam when engaging the spring holding the latter away from the thread, which is therefore free during the greater part of a revolution. When the needle is about to descend, as in Fig. 2, the spring is released by the cam and bears on the thread until the other end of the cam engages and lifts it.

The thread is introduced into the thread-passage d through a slit d^2 in the side of bracket D, Fig. 4. This slit is crossed by a pin d^3, having an inclined outer face, the end of the pin projecting into a recess at one side of slit d^2. When the thread is introduced into the slit d^2 and slightly drawn upon, it slips across the inclined end of pin d^3, and thus is guided past said pin into the passage d.

The rotary hook F is on the end of shaft B, which receives from the main shaft through suitable gearing a multiple revolution. In the machine illustrated the hook-shaft makes three revolutions to one of the main shaft. This hook has a chamber for receiving the bobbin-case G, the chamber having an enlarged annular portion to receive the rim g of the bobbin-case. The latter, instead of being suspended from a hanger adjacent to the end of the hook, rests entirely within the latter, being held therein by the vertical face of the bobbin-holder H, as in Fig. 6, on the spring-plate h^3, as in Fig. 8. The bobbin is held from rotation with the hook by means of a stop h', which enters the space between abutments g' g^2 on the face of the bobbin-case.

In the rim g of the bobbin-case are inserted at suitable intervals the plugs g^3, of soft material, such as leather, which preferably project slightly beyond the rim, so as to prevent contact of the metal of the rim with that of the hook. These plugs are intended to hold a certain quantity of oil.

The rim g of the bobbin-case is cut away on top, as at g^4, Figs. 10 and 11, for the passage of the needle-loop behind the bobbin-case when drawn down by the hook. On one side of this thread-space is an overhanging horn g^5, whose function is to aid in holding the strand of thread as it passes behind the bobbin-case and out of the slit in the hook when the latter is passing the strand, it being understood that the hook is allowed one or more idle revolutions to give the take-up time to draw up and tighten the stitch. This strand of thread passing under the horn g^5 is held thereby in its proper position relative to the path of the point of the hook. Preferably the cut under horn g^5 instead of passing entirely across the rim is curved upward, as best shown in Fig. 8, forming an arc-shaped passage g^6, so that the strand after passing under the horn g^5 emerges vertically between said horn and a thin shield g^7 and is thus with greater certainty held out of the way of the hook-point.

While the take-up is performing its action, which is slow compared with that of the hook, the upper thread must be controlled in order to insure a proper operation. This control is effected in part by a thread-detainer which according to the present invention is arranged to act upon the thread between the face of the bobbin-case G and the adjacent face of the holder H. Two forms of thread-detainer embodying the principle of the invention are shown in the drawings.

Referring first to Figs. 6 and 7, the face of the bobbin-case G is shown as provided with two ribs or projections h, while opposite to these the holder H has depressions h^2, into which the ribs enter, leaving ample space over and at the sides of the ribs for the thread to pass. Obviously in crossing the space between these two surfaces the thread will be bent back and forth and encounter such resistance or drag as will prevent it from springing out of place. The same result is effected by the means shown in Figs. 8 and 9, wherein the holder H is provided on its face with a floating plate h^3, pressed toward the opposite face of the bobbin-case by a spring h^5. The plate is held loosely in position by ears h^4, which engage behind a flange h^6 on the bobbin-holder. The rotary hook is also provided with a loop controlling device, as shown in Fig. 13. The hook-point f is formed by an oblique cut f', into which is carried the strand of the needle-loop which passes behind the bobbin-case. To prevent this strand from leaving the cut f' prematurely, a horn or projection f^2 is extended part way across the cut in a direction opposite to that in which the hook rotates, which horn detains the loop, as indicated in Fig. 13. The take-up acting on the thread keeps it taut upon this horn and draws it up through the slit f' out of the path of the hook-point. The rotation of the hook carries this horn out of the loop and permits its release at the proper moment.

It is found that lint, dust, and other foreign matters are liable to accumulate between the hook and bobbin-case, and to keep the space between these two devices clear the rim of the bobbin-case is provided with oblique cuts g^8, Figs. 10 and 12. The edges of these cuts act as strippers or clearers against the rapidly-rotating surface of the hook, and the cuts themselves form channels for conducting the accumulated foreign substances outward.

The bobbin J, Fig. 14, is mounted, as usual, to turn on a hollow spindle or sleeve G^2 in the center of the recess in the bobbin-case.

Heretofore the bobbin has been held on the spindle by a split ring sprung into an annular groove in the bore of the barrel j of the bobbin, this ring clamping the sleeve G^2.

According to the present invention the sleeve or hollow spindle G^2 is made springy or elastic at its outer end by the longitudinal cuts g^9 and provided on its extreme end with a rib or enlargement g^{10}. The bobbin is countersunk at the end of its barrel j, as shown at j^2, Fig. 14, to receive the rib or enlargement g^{10}, and may be similarly countersunk at its other end to facilitate its passage over the sleeve. When the bobbin is pushed over the sleeve, its split end contracts sufficiently to permit the bobbin slipping over it, and when the latter is in place the end expands and holds it from displacement, while permitting it to turn freely on the sleeve.

As shown in Figs. 6 and 14, the elastic sleeve G^2 is made in one piece with the bobbin-case and constitutes the spindle on which the bobbin turns; but it is easier and more practical to make it separate, as shown in Figs. 16 and 17, and apply it to the spindle of the bobbin-case. In this construction the retaining-sleeve G^2 has one of the cuts g^9 extending from end to end, as shown in Fig. 17. It can thus be compressed and inserted in the hollow spindle G^3, Fig. 16, and when released it expands against said spindle, holding to it by friction.

The tension for the bobbin-thread is located on the face of the bobbin-case and comprises a circular spring-washer q and pins q'. (Shown in Fig. 8 and in dotted lines in Fig. 10.) The arrangements for conveniently threading the bobbin-thread are shown in Figs. 10 and 11. An oblique cut or thread-slit s is made through the body of the bobbin-case G and rim g, extending from the rear of the case forwardly to the space between the abutments g' g^2 and adjacent to the abutment g'. In the rear of abutment g^2 is a thread eye or guide formed between said abutment and a spring plate or tongue s', soldered or otherwise attached thereto. The shape of this tongue is shown in Fig. 10. Its free end presses backward by the elasticity of the metal against the rim g, so that the space between it and the abutment g^2 and which constitutes the thread eye or passage is closed. The threading is very quickly performed. The operator takes hold of the end of the bobbin-thread, draws it through the slit s, and carries it down the face of the bobbin-case under tension-washer q, around lower tension-pin q'. Then drawing the thread against the end of tongue s' the latter yields, permitting the thread to pass, and then resumes its normal position, preventing the escape of the thread. The latter lies against the rounded edge s^2, Fig. 10, and thence passes to the hole in the work-plate. The course of the thread is indicated by the line t in Fig. 10.

The bobbin-holder H is pivoted at h^7 to a bracket K and provided with a spring-latch h^8, as usual, to hold it in its normal or elevated position. There is no novelty in this arrangement. Bracket K, however, is attached to the piece K', in which the rotary hook-shaft B has its bearing, Fig. 1, and extends beneath the hook F. The latter has an annular flange f^3, Fig. 8, to prevent the progress of oil along the hook toward the parts that act on the thread and to cause the oil to be thrown off by the rotation of the hook. From this flange oil will drop on bracket K, and its progress in the direction of the bobbin-holder must be prevented. To this end a groove or recess k is formed beneath flange f^3, and between this groove and the bobbin-holder the bracket is provided with a backwardly-inclined shield k', constituting also a drip-surface and terminating beneath the bracket in a drip-angle k^2. This angle may be directly beneath the bracket, as indicated in dotted lines in Fig. 5, and so constructed the device is effective to intercept the spread of oil during the ordinary use and operation of the machine; but it has been found that when the machine is tilted on its side, as is done to examine and clean the machine, oil collected at the angle k^2 would run along the lower edge of the shield and get past the latter when the machine is righted. To obviate this, it is necessary to have a drip-angle at one side of the shield, as at k^3, formed by making the shield flare outwardly from the bracket, so that the oil may drop from this angle when the machine is tilted.

Preferably the shield is formed, as shown in full lines, Fig. 5, with a single drip-angle k^4 at one side of the bracket formed by the intersection of the oblique side and oblique lower edge of the shield. This angle forms the lowermost point of the shield in whichever position the machine is placed.

The rotary hook F is attached to its shaft by boring a hole f^4, Fig. 9, axially through the hub F' of such size that the shaft will fit as closely as possible therein. It is necessary, for practical reasons, that the hole should be bored entirely through the hub, so as to communicate with the chamber of the hollow hook. Experience shows that by centrifugal action developed by the rapidly-rotating hook oil which comes from the adjacent bearing of the hook-shaft is sucked into the chamber of the hook, and that this will occur no matter how tightly the shaft fits in the bore of the hub. This would be a serious defect, and to obviate it a recess is formed in the base or rear of the hook entirely around the hole f^4, and in this recess is fitted a washer f^5, which covers the end of the shaft and is soldered against the rear wall of the hook. This construction effectually prevents the entrance of oil into the hook.

To obtain requisite smoothness of running

and avoid jar due to the rapid vibration of the needle-bar, it is necessary to provide the crank which operates the needle-bar with a counterbalance, and this has usually been done by extending the piece of metal forming the crank on the opposite side of the shaft from the crank-pin, forming a fan-like extension, so as to obtain as much weight as possible in the counterbalance. It has been found impracticable, within the limits to which the size of the head should be confined, to obtain a counterbalance of sufficient size. The improvement illustrated in Figs. 18 and 19 has therefore been devised. The needle-crank v is attached, as usual, to the end of the main shaft A, and carries the crank-pin v', which operates the needle-pitman v^2. The latter is attached at its lower end to the cross-bar v^3, which is clamped to the needle-bar V. On the opposite side of the main shaft from crank-pin v' crank v has an extension v^4, which extends radially from the shaft as far as the size of the chamber in the head of the machine will allow, this extension constituting part of the counterbalance. The construction as thus far described is not new. To the edge of the extension v^4 is secured by screws or otherwise a curved or crescent-shaped piece of metal v^5. When the crank-pin v' is above the shaft, the lower end of the needle-pitman v^3 will just clear the inner edge of this projection, as shown in Fig. 18. This construction has several advantages. In the first place it furnishes the proper amount of weight to counterbalance the needle-bar and its actuating devices—the crank, crank-pin, and pitman. Furthermore, to insure a perfect counterbalance it is theoretically desirable that the two balanced parts should be as nearly as possible in the same vertical plane. For this reason improved results are obtained by making the counterbalance so that it, in part, overhangs the needle-pitman and comes into close proximity to the needle-bar.

In Fig. 1 is shown an arrangement for lifting the presser-bar L by means of a treadle M, actuated by the foot of the operator. A bell-crank lever N, pivoted to the frame, has one arm, which engages under a pin n, fixed to the presser-bar. The other end of this lever is connected by a cord n' to treadle M. The particular improvement in this part of the mechanism consists in carrying this cord inside the frame of the machine through a hole p' and passing it over a pulley p, located inside the hollow vertical standard A^2, to which the arm A′ is attached. This arrangement has the advantage of convenience and of avoiding connections outside the frame of the machine. A spring n^2 around the hub of lever N returns the latter to its normal position when the treadle is released.

The description and drawings present the invention in the best forms now known to us; but we do not limit ourselves to precise details of construction. Parts of the improvements may of course be used without the whole.

What we claim as new, and desire to secure by Letters Patent, is—

1. In a sewing-machine, the combination with the needle and looper, of a take-up comprising a rotating plate or support, and two crank-pins on opposite sides respectively of said plate or support, substantially as described.

2. In a sewing-machine, a take-up comprising a rotary support and two crank-pins, one on each side of said support, in combination with a thread eye or guide through which the thread is passed between the pins, substantially as described.

3. In a sewing-machine, the take-up, comprising a rotary support and two crank-pins one on each side thereof, one of said pins being nearer the center of the support than the other, substantially as described.

4. In a sewing-machine, the take-up comprising a rotary support and two crank-pins one on each side of the support, and at points nearly diametrically opposite, so as to constitute in operation on the thread a double crank, substantially as described.

5. In a sewing-machine, a take-up comprising three plates, a crank-pin between the middle and inner plates, and a second crank-pin between the middle and outer plates, substantially as described.

6. The combination with the rotary take-up, needle and looper, of a spring for holding the thread taut while the needle is descending, and a cam carried by the take-up for intermittently raising said spring and leaving the thread free, substantially as described.

7. The combination with the cup-shaped rotary hook, of the inclosed bobbin-case provided with plugs inserted at intervals in its periphery or rim, substantially as described.

8. The combination with the cup-shaped rotary hook, of the non-rotating bobbin-case inclosed therein and supported entirely by the hook, said bobbin-case being provided with peripheral plugs of soft or antifriction material, such as leather, projecting a slight distance beyond the metal of the rim thereby preventing contact of the latter with the surface of the hook, substantially as described.

9. The combination with the cup-shaped rotary hook, of the non-rotating bobbin-case having a rim of larger diameter than the body of the case, said rim being provided with oblique cuts or grooves, substantially as and for the purpose set forth.

10. The combination with the needle and the cup-shaped rotary hook, of the inclosed bobbin-case having an annular rim cut away at its upper part to form a space for entrance of the thread into the hook, said rim being undercut on one side of said space forming an overhanging horn, substantially as and for the purpose set forth.

11. The combination with the needle and the cup-shaped rotary hook, of a bobbin-case inclosed in said hook and having an annular rim cut away at its upper part forming a thread-space, said rim being provided on one side of said space with a cut constituting a thread-passage, curving upwardly from the rear of said horn and terminating on the top of the rim, said passage having between it and the path of the hook a thin upright wall or shield, substantially as described.

12. The combination with the needle, the rotary hook, the inclosed bobbin-case, and the bobbin-holder, of a loop-detaining device acting upon the loop between the adjacent surfaces of the bobbin-case and bobbin-holder, substantially as described.

13. The combination with the needle, the rotary hook, the inclosed bobbin-case, and the bobbin-holder, of a floating plate on said holder, and a spring for pressing said plate toward the adjacent face of the bobbin-case, substantially as described.

14. The combination with the needle, the rotary hook, means for imparting to the rotary hook a plurality of revolutions to each reciprocation of the needle, the bobbin-case inclosed in said hook and the bobbin-holder, of a loop-detaining device acting upon the loop of needle-thread between the adjacent surfaces of the bobbin-case and bobbin-holder, substantially as described.

15. The combination with the bobbin-case provided with a hollow sleeve having a split end and an enlargement thereon, of a bobbin having a barrel adapted to fit over said sleeve and to be placed on and removed from the same by compressing the enlarged split end, the bore of said barrel being countersunk to receive said enlargement, substantially as described.

16. The combination with the bobbin-case having a hollow spindle for the bobbin, of a split sleeve fitted within said spindle, and having on its outer end an enlargement or bead, and a bobbin having a barrel countersunk at the end to receive said enlargement or bead, substantially as described.

17. The combination with the bobbin, of a bobbin-case having on its face a tension for the bobbin-thread, and a rim interrupted at the top forming abutments, said case having a thread-slit extending from the rear of the case to the space between said abutments, so that the thread can be led through said slit and space to the tension, substantially as described.

18. The combination with the bobbin, of the bobbin-case, and the tension on the face of said bobbin-case, the latter having a rim interrupted at the top forming abutments overhanging the tension, a thread-slit extending from the rear of the case to the space between said abutments, and adjacent to one of the abutments, and a thread-guide or eye adjacent to the other abutment, substantially as described.

19. The combination of the bobbin-case having a rim interrupted at the top forming a thread-passage and an abutment at one side of said passage, the tension on said bobbin-case, and a spring-tongue forming with said abutment a thread-guide, the free end of said tongue pressing against the adjacent surface of the rim to close the thread-guide against the escape of the thread, substantially as described.

20. The combination with the hook-shaft, of the hollow or cup-shaped rotary hook having a hub axially bored for reception of said shaft, the bore extending into the chamber of the hook, and a washer covering the end of the shaft and secured to the rear wall of the hook, substantially as described.

21. In a sewing-machine, and in combination with the needle, take-up, and bobbin-case, of a cup-shaped rotary hook having a slot extending obliquely from the edge toward the rear or base of the cup and forming the hook-point or loop-catcher, and provided with a loop-detaining device in the form of a horn extending part way across said slot, so that the loop will be drawn against and detained by said horn, substantially as described.

22. In a sewing-machine, the combination with the rotary hook having an oil-flange, the hook-shaft having a bearing in the block beneath the bed-plate of the machine, and a bracket attached to said bearing beneath the hook and having a groove or recess to catch the oil thrown from said flange, and an inclined rib or shield extending beyond the sides and bottom of said bracket, substantially as described.

23. In a sewing-machine, the combination with the rotary hook having an oil-flange, the hook-shaft having a bearing in the block beneath the bed-plate of the machine, and a bracket attached to said bearing beneath the hook and having a groove or recess to catch the oil thrown from said flange, and an inclined rib or shield extending beyond the sides and bottom of said bracket, said shield being provided with a drip-angle, substantially as described.

24. In a sewing-machine, the combination with the rotary hook having an oil-flange, the hook-shaft having a bearing in the block beneath the bed-plate of the machine, and a bracket attached to said bearing beneath the hook and having a groove or recess to catch the oil thrown from said flange, and an inclined rib or shield extending beyond the sides and bottom of said bracket, said shield having an oblique lower edge and an oblique side intersecting the same, and forming at one side of and beneath the bracket a drip-angle, substantially as described.

25. The combination with the presser-bar having a cross-pin or shoulder, of a bell-crank lever having one arm beneath said pin, a pulley inside the hollow vertical standard at the rear of the machine, a treadle beneath the

machine, and a cord running from said lever over said pulley, and vertically through the interior of said standard to said treadle, substantially as described.

26. The combination with the needle-bar, and the shaft, crank and pitman for oscillating said bar, of a counterbalance extending from the shaft in the direction opposite to said crank, and having a projection on the side toward the needle-bar and overhanging said pitman, substantially as described.

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

CHAS. H. WILLCOX.
CYRUS CARLETON.
STOCKTON BORTON.

Witnesses as to Willcox and Borton:
J. H. COOKE,
J. A. REIDENBACH.

Witnesses as to Cyrus Carleton:
GILMAN E. JOPP,
THOS. A. MILLETT.