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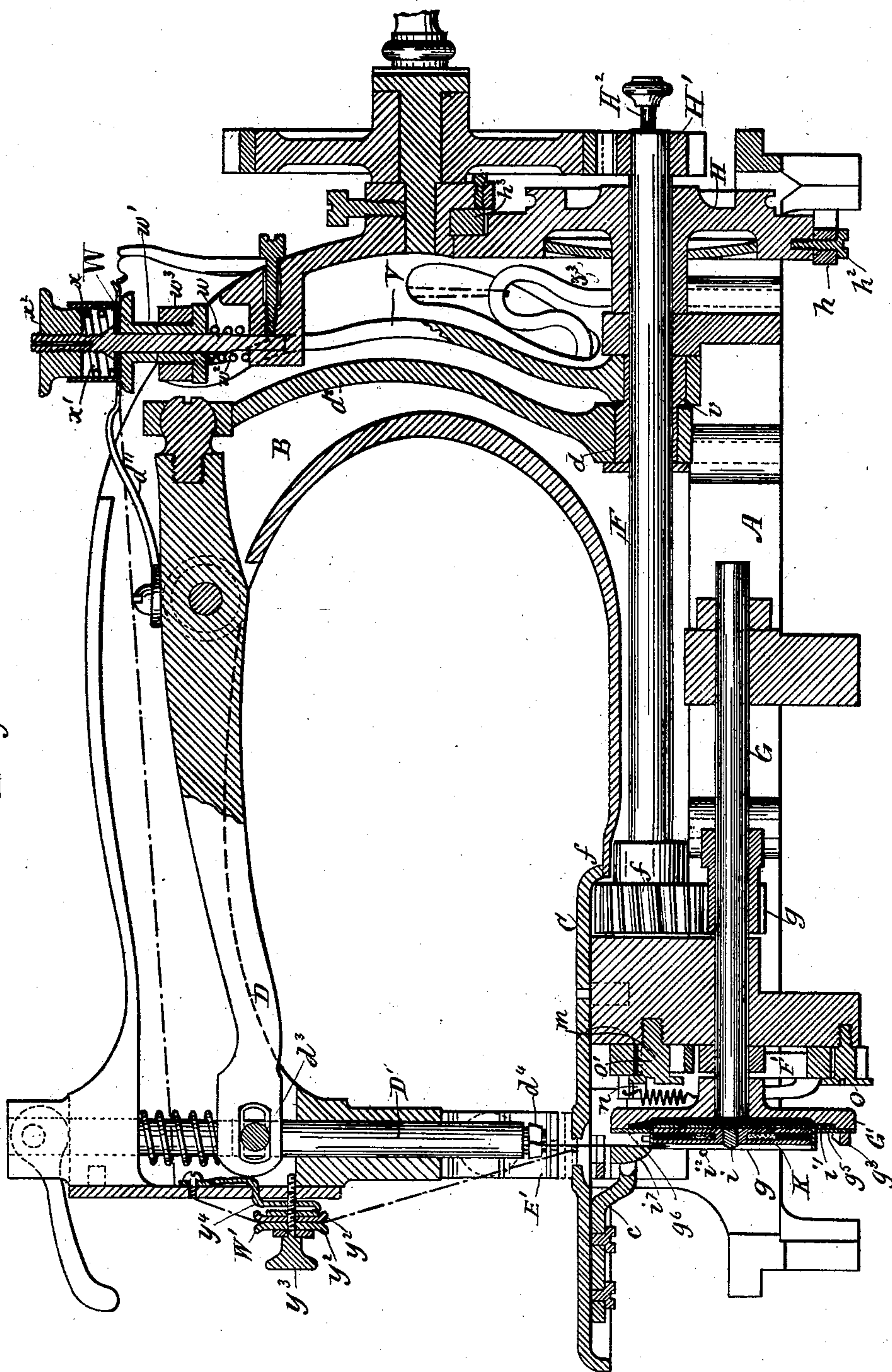
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M. C. GRITZNER.
Sewing Machine.

No. 243,444.

Patented June 28, 1881.

Fig. 1



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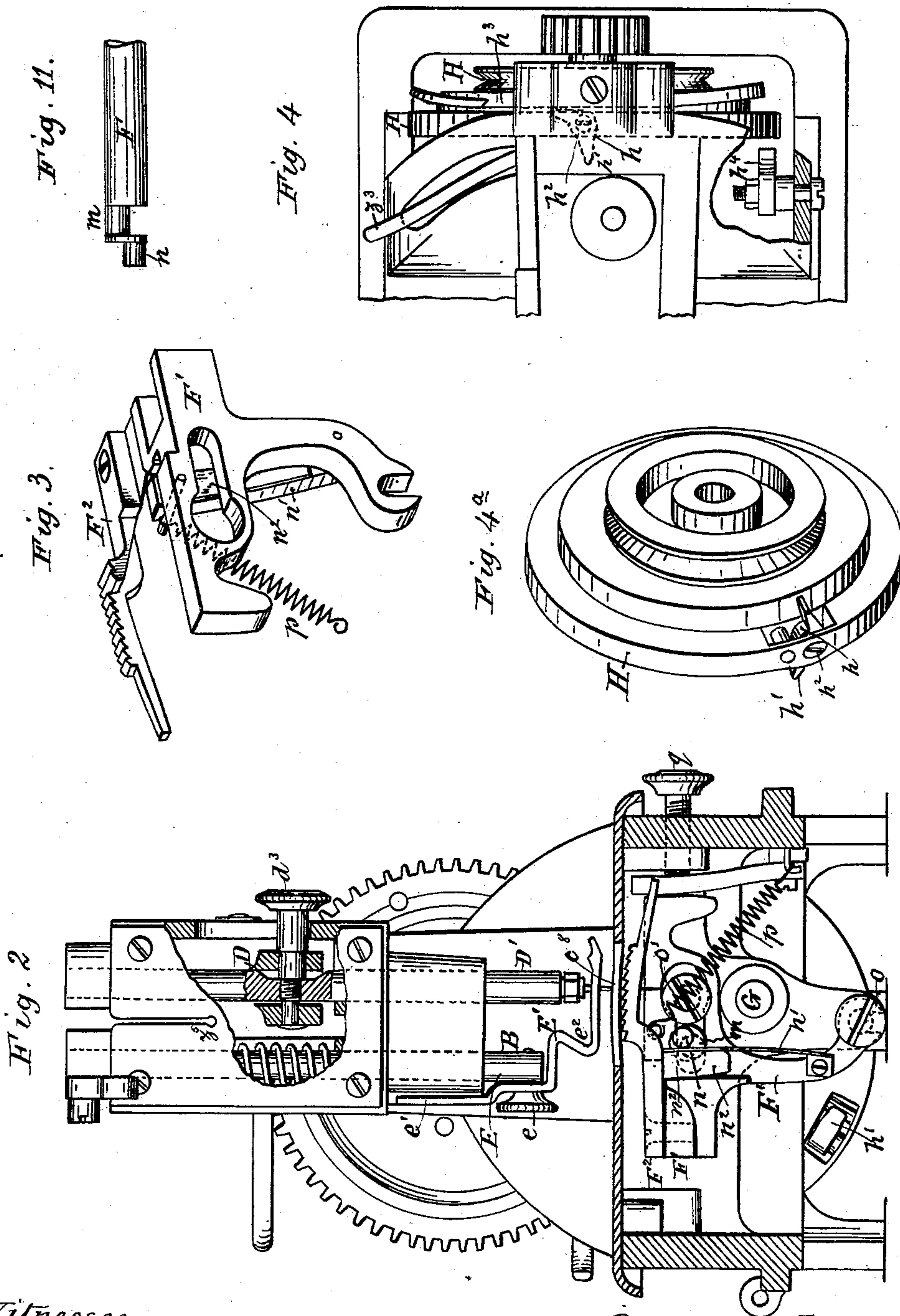
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M. C. GRITZNER.
Sewing Machine.

No. 243,444.

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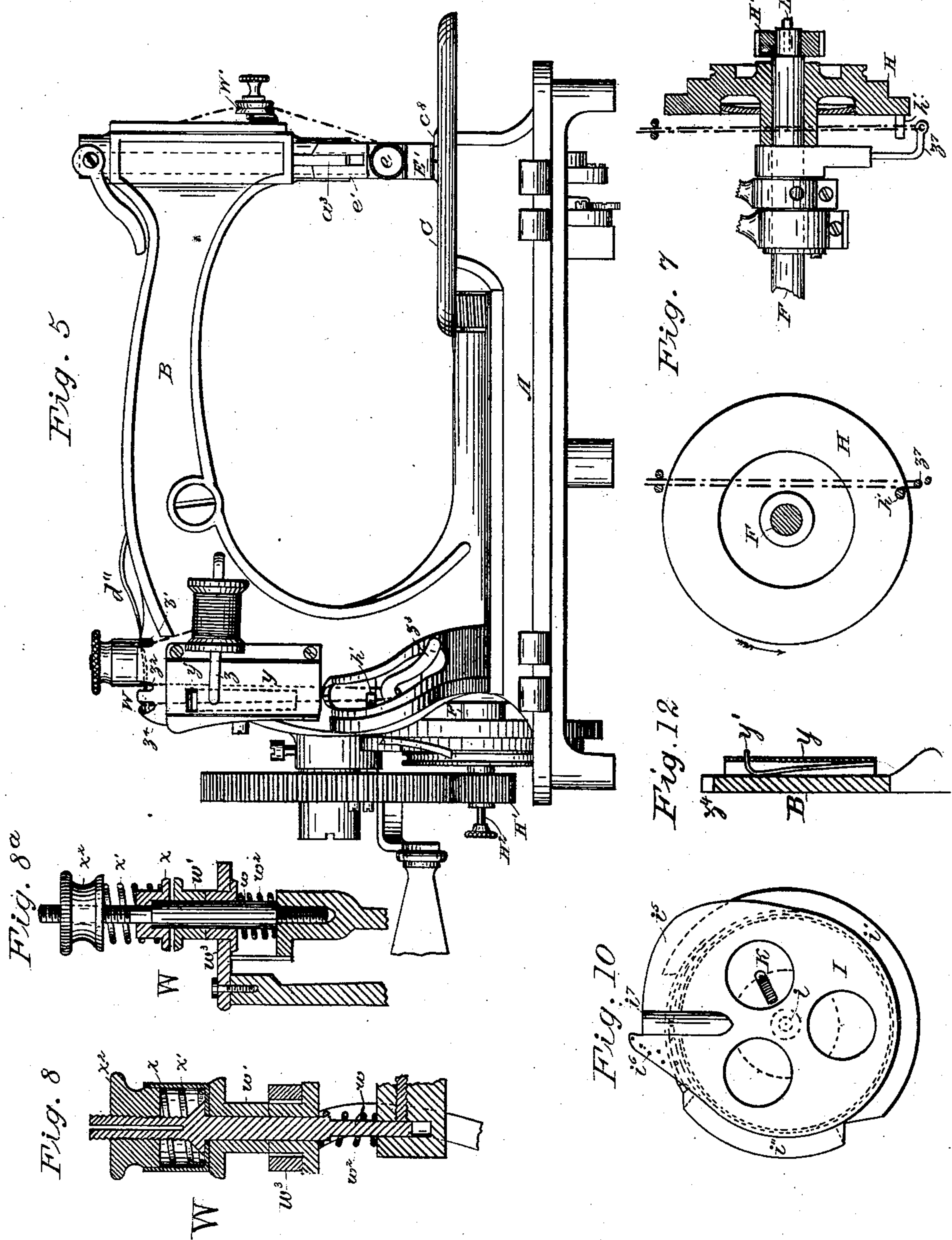
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4 Sheets—Sheet 3.

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Sewing Machine.

No. 243,444.

Patented June 28, 1881.



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UNITED STATES PATENT OFFICE.

MAX C. GRITZNER, OF BADEN, GERMANY.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 243,444, dated June 28, 1881.

Application filed June 11, 1880. (Model.) Patented in Germany December 20, 1878, and in England August 25, 1879.

To all whom it may concern:

Be it known that I, MAX CHARLES GRITZNER, of Baden, Germany, have invented a new and useful Improvement in Sewing-Machines, which invention is fully set forth in the following specification.

This invention relates generally to machines for sewing, embroidering, or otherwise stitching fabrics, but has special reference to what are known as "rotary-hook lock-stitch" machines. In this class of machines the needle-loop is carried around a stationary bobbin or shuttle, which is usually contained in a suitable case.

The present invention comprises improvements, first, in the construction of the hook and bobbin-case, so as to avoid undue strain upon the needle-loop in passing over the bobbin-case, and thus to enable the finest fabrics to be satisfactorily sewed; second, in the devices for producing the necessary tension upon the upper thread to enable the stitches to be properly tightened; third, in the take-up, which is of the rotary type; fourth, in the feed mechanism; and, lastly, in minor elements of the machine.

It is not necessary here to recite the construction of the various machines heretofore known and used, as the invention can be understood without such explanation, the particular improvements constituting the same being hereinafter fully set forth.

The following description will enable those skilled in the art to which it appertains to make and use my invention, reference being had to the accompanying drawings, which form a part of this specification.

Figure 1 is a view in vertical longitudinal section, partly in elevation, of a machine embodying the invention; Fig. 2, an end view, partly in section, the rotary hook being removed; Fig. 3, a perspective view of the feed-rocker with the retractile spring and other parts immediately connected therewith; Fig. 4, a plan view, partly in section, illustrating the construction of the take-up; Fig. 4^a, a perspective view of the fly-wheel carrying the take-up lever; Fig. 5, an elevation, partly in section, on the side opposite to that on which the operator takes his position; Fig. 6, views of the hook and bobbin-case detached; Fig. 7, views

of another form of rotary take-up that can be used in connection with other parts of the machine; Fig. 8, an enlarged view of the automatic tension, with an adjusting device; Fig. 8^a, a modification of the same; Fig. 9, a series of diagrams illustrating the formation of the stitch, and Fig. 10 a form of bobbin-case with the open side toward the hook. Fig. 11 is a detail view, showing the end of the main shaft next the hook, with the eccentric-pins for operating the feed; and Fig. 12, a detail view, showing the devices for preventing dancing of the thread between the take-up and eye of the needle.

The same letters indicate like parts where they occur on all the figures.

A is the frame of the machine; B, the goose-neck or arm; C, the cloth-plate; D, the vibratory needle-lever; E, the presser-bar; F, the main shaft of the machine; G, a secondary shaft, and H a fly-wheel on the main shaft. These two shafts have their bearings in the frame of the machine, and are connected with each other by the gears *f g*, (see Fig. 1,) of which the former has just twice the number of teeth of the latter, so that the shaft G makes two revolutions to one of the shaft F. The needle-lever is fulcrumed in the goose-neck, and is vibrated by the eccentric *d* on the main shaft F and connecting-rod *d*².

At the outer end of the goose-neck, or in the head of the machine, the needle-bar D' is free to move in suitable guides. It is connected with the needle-lever by a single pin, *d*³, which screws into a hole in the needle-bar, and the ends of which rest in slots in the needle-lever. This pin *d*³ projects through a slot in the side of the head and prevents the turning of the bar. Other means, however, might be employed, as a spline on the bar arranged to fit in a corresponding groove. The needle is secured to the bar in any ordinary or suitable way. The nut *d*⁴, as shown, should be small enough in diameter to pass readily through the holes in the head of the machine, which serve as guides.

At the end of the main shaft F the eccentric-pins *m n*, for operating the feed, are placed.

F' is a rocker turning on the pin *o*, attached to the machine-frame and fitting in a slot in the lower part of the rocker. A large-headed screw, *o'*, prevents lateral displacement of the

rocker, while permitting sufficient endwise and vertical movement by means of a suitable recess or slot in the upper part of the rocker. The pin or eccentric m works in a slot in this rocker and imparts to it the vertical movement required in feeding. The eccentric-pin n works against a spring, n' , fastened at one end to the rocker, so that it always rests in contact with the pin n . Upon the side opposite to the latter it is cushioned by leather or other suitable material, n^2 . The rocker is moved forward to feed the fabric sewed by the pin n acting against the spring. It is returned by the spring p . The use of the spring n' and cushion n^2 is to avoid the noise which would be produced by the striking of the pin n against the body of the rocker. A set-screw, q , regulates the length of the stitch. Other devices, such as an eccentric on a horizontal axis, could be used.

The feed-bar F^2 , carrying the feed-surface, is attached to the feed-rocker. The feed-surface is arched to correspond with the arc in which the rocker moves. The cloth-plate C or the throat-plate is similarly arched on its upper surface, as indicated by c^3 .

The hook G' is secured to the end of the shaft G , and is rotated thereby. Its construction is best seen in Fig. 6. On the face it is recessed at g^7 and at g' , from which latter recess an opening, g^2 , extends to the periphery of the hook.

At g^3 is the hook proper. In plan it approximates the general shape of an oblique-angled parallelogram, being cut away or inclined in front and rear. The words "front" and "rear" are relative to the motion of the hook. It is cut away in front on the inside (to the right, Fig. 1) and in the rear upon the outside. On the top, or side farthest from the center of the hook, is a triangular-shaped projection, g^4 , which extends backward, and which in operation catches the loop and prevents it from being drawn up too rapidly.

Two strips or cap-pieces, g^5 g^6 , are secured on the face of the hook G' near the periphery, so as to overhang the recess g^7 . One of these strips, g^6 , is preferably attached so as to be readily removed or turned aside, as shown in dotted lines, Fig. 6.

I is the bobbin or shuttle case, which holds the bobbin K and supports it on a central pin, i , whereon it is free to turn. The case is of a general cylindrical shape. Upon the side which fits against the hook, around two-thirds of the circumference, or thereabout, is a flange, i' . The side away from the hook is preferably left open, so that the bobbin may be inserted and removed from the case without taking the latter from the hook. A small wire, i^2 , is provided as a safeguard against accidental slipping out of the bobbin. The bobbin-case may, however, be closed on the outside and open toward the hook, as shown in Fig. 10; but in that case to take out the bobbin would require the removal of the case also. At i'' the side of the case is beveled in opposite directions,

so as to guide the two parts of the loop on opposite sides of the case and bobbin. On top of the case is a small flat spring, i^3 , the free end of which bears on a projection on the case, over which the thread from the bobbin is passed from the hole i^4 . A small screw, i^8 , is provided, which bears on the spring, so that by turning it the tension on the under thread can be readily changed. A flat extension, i^5 , upon the upper part of the case directs the loop and prevents it from catching when drawn up. In this extension are holes i^6 , through which the under thread is passed. By passing the thread through several holes the tension will be stronger than if it be passed through one hole only. These holes therefore furnish another means for regulating the tension on the under thread, which may be employed instead of or in addition to the screw i^8 for varying the pressure of the spring i^3 .

In order to secure the bobbin in position in the hook, it is first placed in the bobbin-case, and the strip g^6 being turned outward, as shown in dotted lines, Fig. 6, the flange i' is placed in the recess g^7 under the projecting or overhanging edge of the strip g^5 , and the strip g^6 , being turned upward and secured, holds the case in position on the hook. A projection, i^7 , on the case enters a groove on the stop-piece c , fastened to the under side of the cloth-plate. The hook is free to revolve, and the bobbin-case is prevented from turning with it in either direction by the contact of the projection i^7 against the stop-piece c .

The automatic tension is indicated by W . (See Figs. 1, 8, and 8^a.)

Upon a vertical pin, w , fixed on the arm or goose-neck of the machine is a slide, w' , which is pressed upward by a spring, w^2 . A collar, w^3 , attached to the rod V , which is reciprocated by an eccentric, v , on the main shaft F , encircles the slide w' , and by means of a circular projection thereon depresses it at each downward movement of the rod V . The thread is held between the upper surface of the slide w' and the flat surface formed by the bottom of a small cup, x , held down by a spring, x' , the pressure of which is adjusted by a set-nut, x^2 . The part x is formed cup-shaped in order to hold and conceal the spring. The slide w' being automatically depressed releases the thread at certain intervals and constitutes the automatic tension. By making the part against which the thread is held adjustable by means of a set-nut the tension can be readily regulated while sewing. A collar on the pin w limits the upward movement of the cup x . Instead of interposing the spring and cup or equivalent device, the thread could be held against the lower surface of the set-nut, if desired. The slide w' is preferably in two parts, so that the upper may be able to turn freely, while the lower is held by the collar w^3 . In Fig. 8^a the movement downward of the part x is limited. In this case the spring x' should be stronger than that marked w^2 .

At the back of the machine (see Fig. 5) is

a plate, y , to which the spring y' (shown in dotted lines) is fastened at one end, the free end projecting through a slot in the plate. This spring presses upon the upper thread on its way to the eye of the needle and prevents its dancing.

In order to avoid irregularity in the tension on account of the weight of or inequalities in the spool, a stiff wire, d'' , is secured to the needle-lever D , so as to project back of the automatic tension and by its movement upward to unwind thread from the spool. The spool of thread is placed on the rod z . The thread is then passed through the notch z' , over the wire d'' , around the pin w , between the slide w' and the cup x , over the wire d'' , through the notch z^2 , under the plate y , around the rod z^3 , back under the spring y' , through the notch z^4 , and thence to the head of the machine, in which it rests in a slot, z^5 . It is then, after being led between the disks of tension W' , hereinafter described, passed through the eye of the needle from left to right, Fig. 1.

The wire d'' may be shortened so as to act only on that portion of the thread between the notch z' and the automatic tension; but as the threading is easier and the danger of the threads coming underneath the wire is avoided, the construction shown is preferred.

The arm or goose-neck of the machine is slotted, as shown, so that the thread is concealed therein and protected. A groove in the upper surface of the goose-neck would serve a similar purpose. The take-up is formed by a projection, h' , on the side of the fly-wheel H .

Referring to Figs. 1, 4, 4^a, and 5, a right-angled lever, h , is pivoted in a recess in the fly-wheel near its periphery, the pivot h^2 being in line with one of the radii. The thickness of the wheel is such that the two arms of the lever are on opposite sides.

At h^3 is a shield fixed to the machine-frame, and at h^4 is a projection, formed preferably of leather, the two parts being arranged on opposite sides of the wheel and close to its surface. In passing by the shield h^3 an arm of the bent lever comes into contact therewith, and is held so that the arm h' forms a projection which is practically stationary on the wheel for the time being. The length of the shield is calculated so that the slack loop-thread is taken up when the right-angled lever has just passed the end of the shield. The thread yielding no longer, it causes the right-angled lever to turn aside, and the thread is released from the end of the lever. If, in consequence of any accidental resistance in the fulcrum of the lever, (dirt, dried oil, &c.,) the lever should not readily yield to the action of the thread, it passes in the next instant the projection h^4 , and, striking it, is turned aside so as to permit the thread to slip off the lever. The rod z^3 is bent so that the thread is drawn into the bend, where it is held directly in the path of the arm or projection h' . The thread is therefore caught and the slack

is taken up. When h' strikes the projection h^4 it is slackened again. The shield at the end which the lever-arm strikes so as to cause the arm h' to project is preferably cushioned, so as to lessen the noise.

It is preferred that the projection h' should catch the thread between the rod z^3 and the needle, and not that from the automatic tension. Both threads may, however, be caught. In Fig. 7 the projection h' is fixed on the fly-wheel and is arranged to catch both threads. The rod or pin z^7 , around which the thread is drawn, is placed below the periphery of the wheel. With this construction the thread is slackened gradually, and not released at once.

In addition to the automatic tension which is placed between the spool-pin and take-up, an additional tension, W' , is placed between the take-up and eye of the needle. This tension should be adjustable while sewing, and may be of ordinary or suitable construction, but is preferably intermittent in its action, so as to clutch the thread when it is required to act, and at other times to leave it free to be drawn up by the take-up. As shown, this tension is placed upon the head of the machine, and consists of two disks, y^2 , a thumb-screw, y^3 , for attaching them to the head of the machine, and a bent spring or elastic lever, y^4 . The spring or elastic lever is fastened at one end to the head of the machine, and the other end, being bent back, lies behind the inner tension-disk. It is so disposed that it is struck by the end of the needle-lever while the needle is below the cloth-plate, and, being pressed outward, presses together the tension-disks y^2 , so that they clutch the thread between them. The pressure of the disks against each other is regulated by turning the screw y^3 . When the end of the needle-lever rises the pressure on the disks is relieved and they are allowed to separate and release the thread.

The additional tension W' , when made intermittent in its action, as shown, might with propriety be called an "automatic tension," as well as the tension W , since the term "automatic," as understood in the art and as employed in this specification, is intended to distinguish the tension W from ordinary tensions by the devices for automatically applying or releasing the tension upon the thread at the proper times; but for the sake of distinction the tension W' is referred to herein as an "intermittent tension."

The fly-wheel is or may be provided with a pulley for a belt. As shown, a pinion, H' , is also provided, which can be operated by a larger spur-wheel, with which is connected a handle or detachable treadle. H^2 is a pin on which the bobbin is placed for winding. At the lower part of the presser-bar E the presser-foot E' is secured by means of the single screw e . At the back of the foot is an extension, e' , grooved and fitting over a spline, a^3 , on the head of the machine, which prevents the foot from turning and steadies it. The under side

of the presser-foot is arched, as indicated by e^2 , so as to correspond with the curved surface of the cloth-plate and of the feed.

The operation of the machine is as follows:

5 The bobbin K is filled by screwing it by means of a pivot-screw to the end of the main shaft and then turning the machine so that the thread coming from an ordinary spool pivoted on the table at a convenient distance behind the bob-
 10 bin gradually fills it with the thread, and is then, with its case I, secured in position in the hook G' by means of the strips g^5 g^6 and flange i' , as already explained, the thread being passed from the interior of the case through
 15 the hole i^4 , under the spring i^3 , out at one of the lower holes, i^6 , and then back through the highest hole. The upper thread is passed through the tensions and through the eye of the needles, as before stated. The length
 20 of stitch is adjusted by the screw q . Motion being imparted to the main shaft F, the needle is caused to descend to the position marked I in Fig. 9. Upon the ascent of the needle the point of the hook enters the
 25 loop (see position II) and carries it around to position III, where the loop is turned and divided by the beveled side i'' of the bobbin-case. When the needle has reached its highest position the loop, owing to the revolution of the
 30 shaft G being more rapid than the main shaft, has been carried more than half-way round, as seen in position IV. Instead of dropping off the hook, it is caught by the projection g^4 , which retains it until the hook proper, g^3 , has
 35 passed the needle-hole and the needle is about to again penetrate the fabric. (See position V.) While the needle is still ascending the feed-surface is raised by the pin m , and before the needle has descended to position V the pin
 40 n has moved forward the rocker and advanced the fabric the distance of one stitch. As soon as the needle leaves the fabric the arm or projection h' on the fly-wheel comes into contact with and begins to draw up the slack thread,
 45 and continues to do so until the needle just begins to enter the fabric again, when the thread is released. The take-up will not ordinarily draw up the loop tight, but nearly so, or sufficiently to avoid slack loops, and to
 50 tighten the diminutive loop which remains and to complete the stitch the tension W' is employed. When the needle is near the lowest point of its stroke the disks y^2 are pressed together with a pressure adjusted to corre-
 55 spond with the work in hand and clutch the thread between them until the hook, catching the next loop presented by the needle, tightens the former loop and completes the stitch. The automatic tension is raised soon
 60 after the hook has caught the loop, and the thread continues comparatively loose until the needle passes out of the fabric. After position V the needle descends to position VI, and then to its lowest point, or position I, when
 65 the operations before described are repeated. When the needle descends the wire d'' is lifted,

and the automatic tension, being at that time closed, draws off from the spool, so that the thread required for each stitch is taken from the slack thread thus furnished. When, for
 70 any reason, it is desired to remove the needle-bar to set the needle, or for other purpose, this can readily be done by unscrewing the pin d^3 . In passing around the bobbin the loop is not pressed or subjected to tension between
 75 the bobbin and rotary hook, but moves freely in the recess g' in the face of the latter.

Modifications may be made in the details of construction, as hereinbefore described.

It is obvious that parts of my invention can
 80 be used without the others. For example, the take-up or feed or improvement in other parts could be adapted readily to machines of other-
 wise ordinary or suitable construction; but it is preferred to combine the several parts, as al-
 85 ready explained.

Having thus fully described my said invention, and the manner in which the same is or may be carried into effect, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a flanged bobbin-case, of a rotary hook provided with a groove for the flange on the bobbin-case, a recess for the needle-loop back of said groove, and an opening leading from the aforesaid recess to
 90 the periphery of the hook in front of the hook proper, as set forth.

2. A rotary hook consisting of a disk provided with a groove and a recess back of said groove, as indicated, and the hook proper projecting from the disk near its circumference, and being beveled or cut away front and rear, an opening extending from the said recess to the periphery of the disk in front of the hook
 100 proper, substantially as described.

3. In a rotary hook having an undercut groove for the reception of a flange on the bobbin-case, a strip or cap-piece pivoted to the hook and adapted to be swung into and out of position, for securing the bobbin-case in the
 110 hook, or for permitting its removal and replacement, substantially as described.

4. The combination, with a rotary hook comprising a disk provided with an undercut groove and a recess located back of said groove, and the hook proper projecting from the said disk and being beveled or cut away in front and rear, of a bobbin-case having a flange, whereby it is secured in position in the hook, substan-
 115 tially as described.

5. The combination, with a grooved rotary hook recessed on its face back of the groove, and provided with an opening leading from said recess to the front of the hook proper, of a bobbin-case of general cylindrical form, hav-
 120 ing a flange at the end which is to be placed next the rotary hook, substantially as described.

6. A cylindrical bobbin-case and a rotary hook, with the hook proper equal in width to
 130 said case, and having on its upper surface a retaining device for catching the needle-loop

as it is drawn up, in combination with a needle-bar and connecting mechanism, for imparting to the rotary hook two revolutions for each reciprocation of the needle-bar, substantially as described.

7. In a rotary hook, the hook proper, having on top a backwardly-extending projection, with its outer end free, substantially as described.

8. The triangular-shaped overhanging projection on the hook, extending backward—that is, in a direction opposite to its rotation—substantially as described.

9. A bobbin-case having on the outer side a flat extension beyond the periphery of the main body of the case, and provided with a tension-spring on the top of the case, behind the said extension, substantially as described.

10. The combination, with the fly-wheel of a sewing-machine, of a bent lever pivoted therein, and means, substantially as described, for causing one arm of said lever to project during a portion of its revolution, as set forth.

11. A flat cloth-plate arched at the throat, in combination with a presser-foot having the under side similarly arched, and an arc-of-the-circle feed, substantially as described.

12. The combination, with the feed-rocker and eccentric-pin or device for operating the same, of a spring fastened at one end to said rocker, so as to bear at all times against said pin or device, and cushioned at the free end, where it comes into contact with the rocker through the movement of the pin or device, substantially as described.

13. The combination, with an automatic tension, of an additional tension adjustable while sewing, and arranged to act upon the thread between the take-up and eye of the needle, substantially as described.

14. The combination, with the needle, needle-bar, and take-up of a sewing-machine, of a ten-

sion device acting upon the upper thread between the take-up and spool-pin, an additional intermittent tension acting upon the same between the take-up and needle-eye, and means, as indicated, for bringing said additional tension into action while the needle is below the cloth-plate, so that the formation of the next succeeding stitch tightens the small loop not drawn up by the take-up, substantially as described.

15. The combination, in an automatic tension, of a stationary pin, a slide, devices for moving said slide at intervals lengthwise of said pin, a clamping-surface between which and said slide the thread is held, and a thumb-nut engaging with a screw-thread on said pin and operating to adjust said clamping-surface, substantially as described.

16. A presser-foot for sewing-machines, pierced with a needle-hole and arched on the bottom in the direction of its length to correspond with the movement of the feed-surface in an arc-of-the-circle feed, substantially as described.

17. The combination, in a sewing-machine, with an eye-pointed needle and co-operating devices for locking an upper with an under thread, of a take-up, an automatic tension arranged to act upon the thread between the spool-pin and take-up, and an adjustable intermittent tension arranged to act upon the thread between the take-up and eye of the needle, substantially as described.

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

M. C. GRITZNER.

Witnesses:

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EDMUND M. SMITH.