(Model.)

3 Sheets—Sheet 1.

C. WUTERICH & G. V. SHEFFIELD.

SEWING MACHINE.

No. 276,653. Patented May 1, 1883.

Fig. 2.

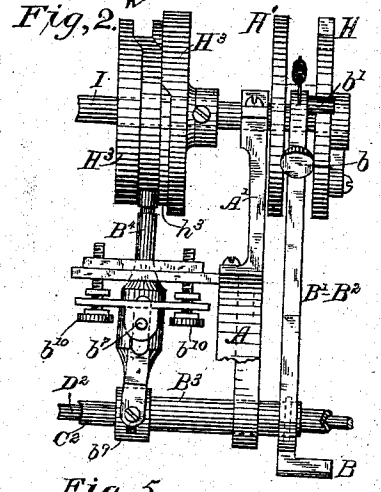


Fig. 3.

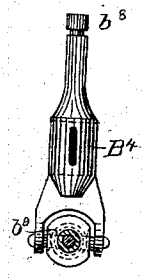


Fig. 1.

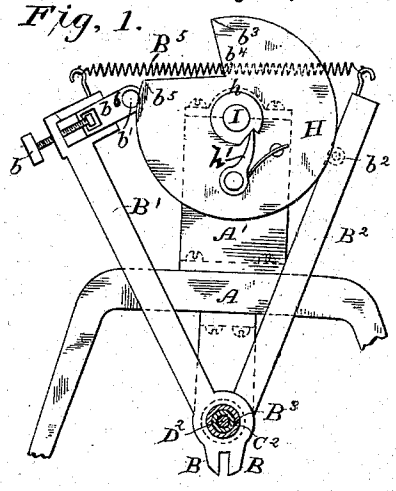


Fig. 5.

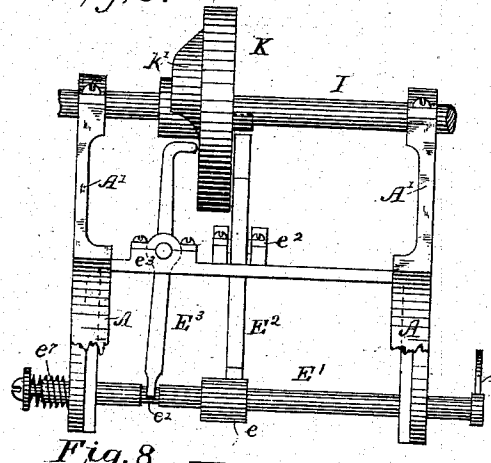


Fig. 6.

Fig. 4.

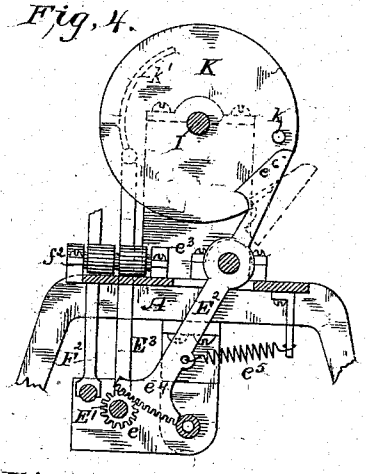


Fig. 8.

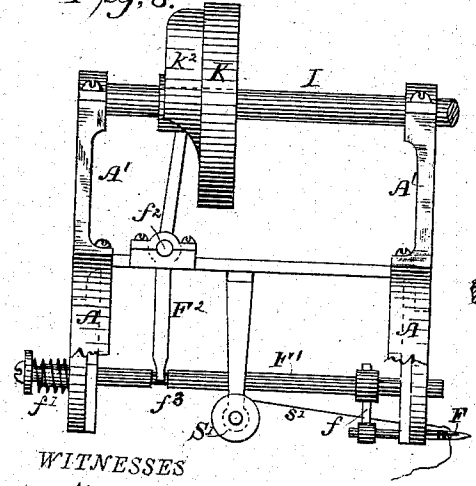


Fig. 9.

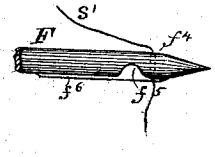
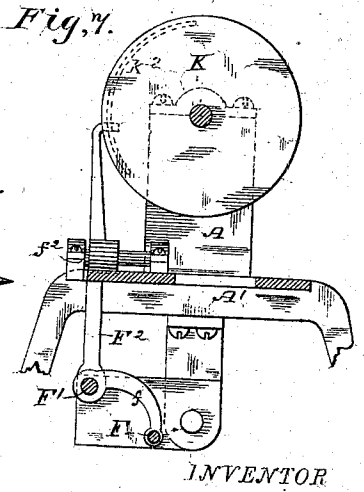


Fig. 7.



WITNESSES

Wm A Skinkle

Wm J. Dannes

INVENTOR

Christian Wuterich.

George V. Sheffield.

By M. J. Dannes

Associate Attorney.

(Model.)

3 Sheets—Sheet 2.

C. WUTERICH & G. V. SHEFFIELD.

SEWING MACHINE.

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Fig. 10.

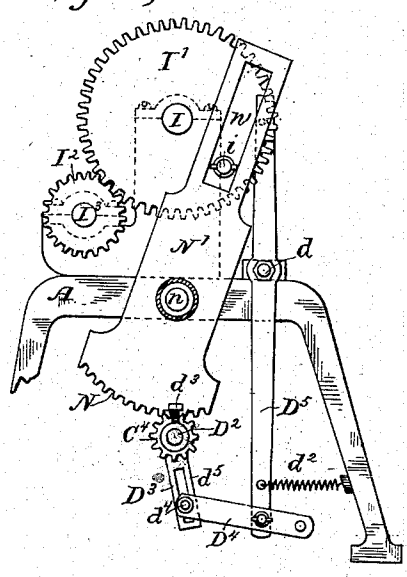


Fig. 11.

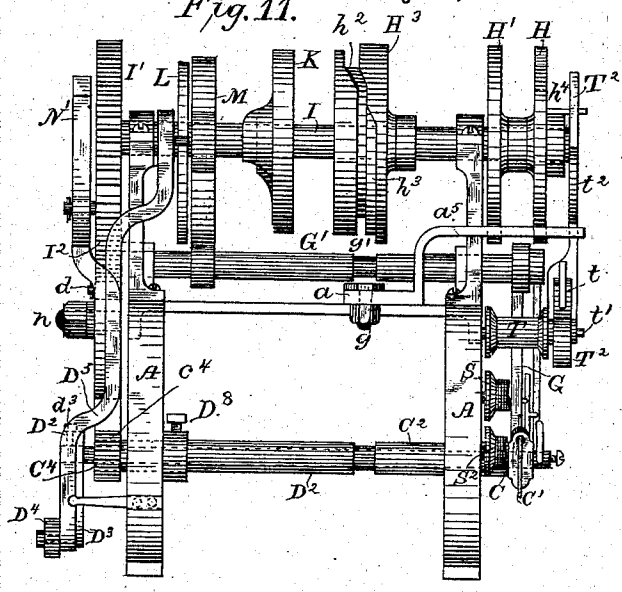


Fig. 15.

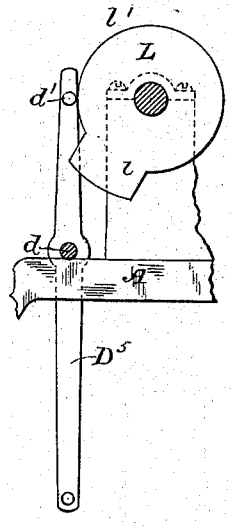


Fig. 14.

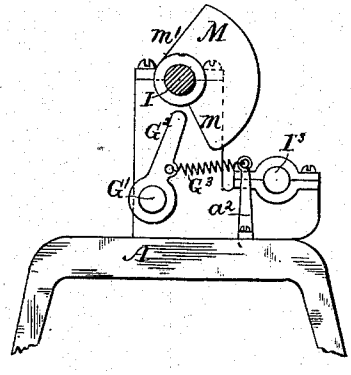


Fig. 16.

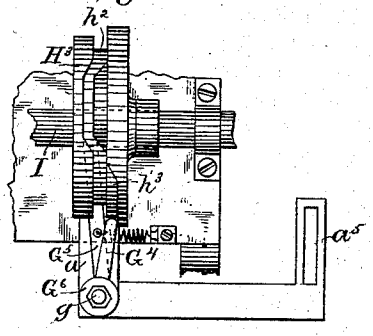


Fig. 23

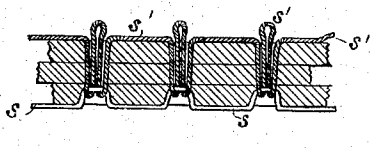
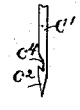


Fig. 17.



WITNESSES

Wm. A. Skinkle.

Wm. J. Tanner.

INVENTOR

Christian Wuterich

George V. Sheffield

By F. Jamus. Associate Attorney.

(Model.)

3 Sheets—Sheet 3.

C. WUTERICH & G. V. SHEFFIELD.

SEWING MACHINE.

No. 276,653. Patented May 1, 1883.

Fig. 21.

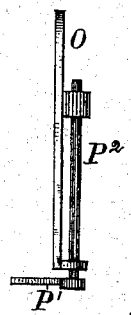


Fig. 22.

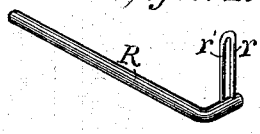


Fig. 19.

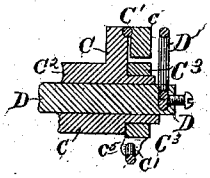


Fig. 13.

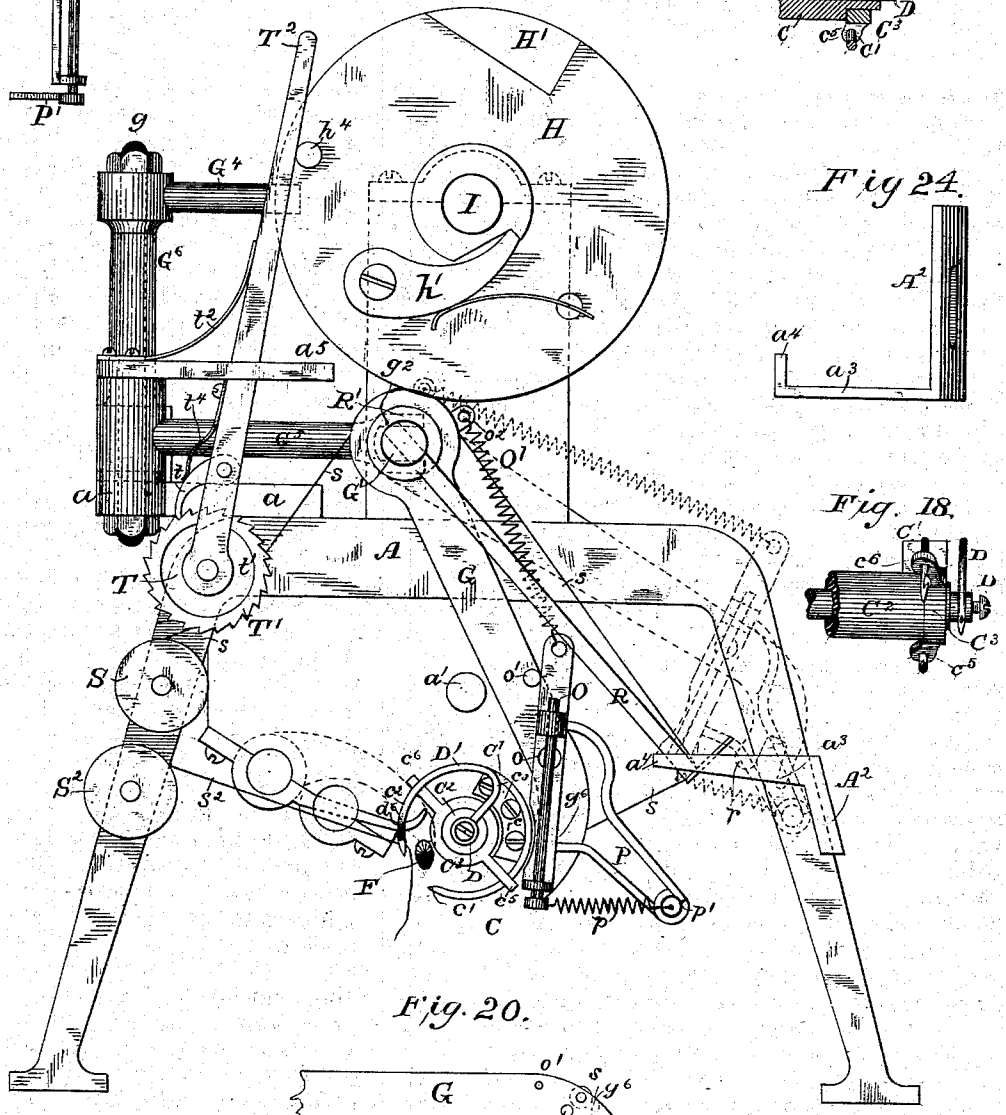
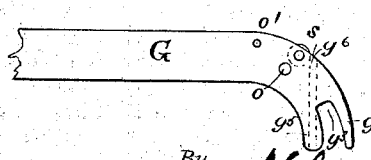


Fig 24.

Fig. 18.

Fig. 20.



WITNESSES

Wm A. Skinkle

Wm J. Tanner

INVENTORS,
Christian Wuterich
George V Sheffield.

By Munn & Co
associate attorney.

UNITED STATES PATENT OFFICE.

CHRISTIAN WUTERICH AND GEORGE V. SHEFFIELD, OF NEW YORK, N. Y., ASSIGNORS TO SHEFFIELD & WUTERICH SEWING MACHINE COMPANY, OF SAME PLACE.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 276,653, dated May 1, 1883.

Application filed February 11, 1881. (Model.)

To all whom it may concern:

Be it known that we, CHRISTIAN WUTERICH and GEORGE V. SHEFFIELD, of the city, county, and State of New York, have invented certain new and useful Improvements in Sewing-Machines for Sewing or Fastening Heavy Leather-Work, such as shoe-soles, belting, harness, trunk-work, &c.; and we hereby declare the following to be a full and c'ear description thereof, which will enable others skilled in the art to make and use our improved machine.

The object of this invention is to produce a machine for sewing both the insole and outsole of a shoe with the same machine, using either two or three waxed threads, and forming the seam in each instance on the outside, thereby obviating the difficulty of wearing shoes with waxed-thread seams inside of them, the tendency of inside seams being to draw and cramp the foot in consequence of the perspiration or heat of the foot acting injuriously upon the waxed thread.

The invention will be readily understood by reference to the accompanying drawings, of which—

Figure 1 is a sectional front elevation of the machine, showing the jaws that hold the work while it is being sewed and the mechanism for operating the said jaws. Fig. 2 is a side elevation, showing the same parts which are shown in Fig. 1. Fig. 3 is a detailed sectional elevation of the clutch-lever that moves the holding-jaws above mentioned, so as to feed the work from one stitch to the next. Fig. 4 is a transverse sectional elevation of the machine, showing a rock-shaft that operates the stitch-lifter, hereinafter described, and the operating-lever and other mechanism that moves the said lifter, as required. Fig. 5 is a sectional side elevation of the same parts which are shown in Fig. 4, the driving-shaft and upper portion of the supporting-frame being shown in this figure nearly in their entirety, but other mechanism than that under illustration being omitted from the figure for the purpose of perspicuity. Fig. 6 is a detailed end elevation of the lifter-hook and the end of its operating-shaft. Fig. 7 is a transverse sectional elevation of the machine, showing the mechanism that operates the horizontally-moving needle F, which performs an important function in the formation of the stitch or loop formed by this machine. Fig. 8 is a sectional elevation of the machine, showing the parts illustrated in Fig. 7, and in this figure, like Figs. 2 and 6, parts of the machine not under illustration are omitted. Fig. 9 is a detailed and enlarged elevation of the horizontally-moving needle pertaining to the mechanism shown in Figs. 7 and 8. Fig. 10, Sheet 2, is a rear end elevation of the machine, showing the mechanism for driving the machine, and also for working the rotating or rocking shafts that carry the curved needle-head and stitch-guide, hereinafter described. Fig. 11 is sectional side elevation of the full frame of the machine, showing clearly the parts illustrated in Fig. 10, and also the full lengths of the driving-shaft, the rock-shaft that operates the tension arm or lifter, and the rock-shafts that operate the rocking needle-head to which the curved needle is affixed, and also the curved stitch-guide, one of the last-named shafts being hollow and the other one inclosed within it. Fig. 13 is a front end elevation of the machine, showing all the operative parts on that end of the machine except the feeding-jaws, which have been removed in this figure for the purpose of showing the other parts more clearly. Fig. 14 is a detailed sectional elevation of the cam-movement that operates the tension-arm. Fig. 15 is a detailed sectional elevation of the cam-movement that rocks the curved needle-head. Fig. 16 is a sectional plan of a part of the machine, showing the vertical rocking post, with its two radial arms, and the actuating-cam that operates the tension-arm in its reciprocating movement, and also the projecting arm that forms the guide and stay for the ratchet-lever of the feeding device. Fig. 17 is a sectional elevation of the curved needle, showing its barb for catching the thread. Fig. 18 is a detail view, showing the relation of the circular needle and the stitch guide or catcher D′. Fig. 19 is a sectional elevation of the curved needle-head with its attachments. Fig. 20 is a side elevation of the outer end of the tension-arm. Fig. 21 is a front end elevation of the oscillat-

ing threading-arm attached to the side of the tension-arm. Fig. 22 is a perspective view of the thread-measuring arm, which is used in combination with the tension-arm. Fig. 23 shows a stitch in which only two of the threads are utilized. Fig. 24 is a top plan of the stop and guide piece which is fixed to and projects from the supporting-frame for the stopping and guiding of the thread-measuring arm.

All of the operative parts of the machine are built upon a suitable frame, A, portions of which, or attachments thereto, furnish the proper bearings for all axles or other bearings.

The fundamental parts of the machine consist of the jaws B, which hold the work while it is being sewed, the rocking needle-head C, with its curved needle C′, and also the rocking guide-head D, with its loop-catcher and curved stitch-guide D′, the lifter-hook E, and the horizontally-moving needle F, together with the tension-arm G, while the operating devices may be made in any shape or form equivalent to that described.

The jaws B have two movements—viz., first, to close upon the work which is placed between them like a vise; and, second, a forward-and-backward movement of about one-eighth of an inch, (more or less,) so as to carry the work forward from stitch to stitch. These holding and feeding jaws are operated by two operating arms or levers, B′ and B^2, the lower ends of which terminate in the said jaws or holders, just above which the two arms or levers are halved or jointed together like a pair of tongs or shears, and in lieu of a pivot-pin for uniting the two said arms at the point of their intersection they are attached to a collar or sleeve, B^3, which slides upon the hollow needle-shaft C^2. Either one or both of the said jaw-levers may open and close shear like; but we prefer that only one of them shall so operate, and have so shown in Figs. 1 and 2. In these views the said arms or levers are represented as having small sheaves b' and b^2, respectively, attached to them and resting against their respective supports or guides H and H′. The rest or guide H is a cam, as is clearly shown in Fig. 1. The re-entering notch or formation b^3 b^4 b^5, constructed either with rectilinear or curved lines, is just sufficient to allow the jaws B to open enough to permit the work to stand free of the said jaws, (while the work is held on the curved needle, hereinafter described,) and thereby permit the said jaws to move back, as will presently be described, so as to take a new hold on the material being sewed, preparatory to moving it forward the proper distance to form the next stitch. Except for the notch b^3 b^4 b^5, the cam H would be a circular disk concentric with the shaft I, to which it is fixed, and the roller or sheave b', on or attached to the arm B′, is held habitually against the periphery of this disk or cam by means of the tension-spring B^5. The convex face of the cam H, between the re-entering points b^3 and b^5, constitutes about seven-eighths of the periphery of the cam H, and during the rotation of this portion of said cam it, by pressing against the roller or sheave b', will hold the jaw attached to the arm B′ tightly up to the other jaw or upon the material placed between them; but when the sheave or roller b' drops into the notch or cam opening b^3 b^4 b^5 the said jaw will open, as above mentioned, so as to allow the two jaws to drop back and take a fresh hold upon the work, preparatory to the forward feed movement required.

In order to adjust the distance between the jaws B when they are closed to fit tightly upon different thicknesses of material, the attachment of the sheave or roller b' to the lever or arm B′ is made adjustable by means of the thumb-screw b, which moves the sliding block b^6, on which is placed the bearing of the sheave or roller b'. A slot or seat in the arm or lever B′ receives the sliding block b^6, so that it may easily slide therein, and the thumb-screw b is also seated in the arm B′, which forms its fulcrum, all of which construction is clearly shown in Fig. 1. By turning the thumb-screw b in or out, as may be desired, the roller or sheave b' may be adjusted accordingly, and in conformity therewith the distance between the jaws B when closed regulated as desired.

The means for holding the arm or lever B^2 in its proper place or position may be a stationary seat for pressing against the sheave or roller b^2; or it may be, as shown, a disk, H′, fixed concentrically to the driving-shaft I and revolving therewith, as does the cam H. This arrangement will reduce the frictional obstruction necessary in the forward and backward sliding of the jaws required for the feed movement. In order to adjust the machine by hand, so as to open or close the jaws B at pleasure when putting work into or taking it from the machine, the cam H is attached to the shaft I, so as to rotate with it by means of a ratchet-wheel, h, fixed to the said shaft I, but allowing the cam H to turn freely on the said shaft, except when engaged by the pawl h', which is fulcrumed or pivoted to the side of H, as shown in Fig. 1. This arrangement permits the operator to turn the cam back, so that the sheave b' will drop into the cam-recess b^3 b^4 b^5, thus allowing the said jaws B to be opened temporarily by the operator whenever required.

The opening and closing of the jaws B upon the work being operated as above fully described, we will next describe the feeding movement, which consists of a short reciprocating movement of the said jaws B to and from the front end of the machine. This movement of the jaws B must be made in one full reciprocating movement forward and backward at each rotation of the driving-shaft I, and the following-described mechanism is used to produce this result: A cam-wheel, H^3, is affixed to the said shaft I, and in the face or periphery of this wheel are cut two sets of cam-faces, h^2 and h^3. The use of the second of these, h^3, will be hereinafter explained; but the

first—viz., h^2—consists of a continuous groove cut entirely around the periphery of the said wheel H^3, but in such a zigzag form as to operate the lever B^4, as below described. This lever B^4 is fulcrumed at b^7 to some suitable stationary part of the machine, and the upper end of it terminates in a roller or sheave, b^8, which fits easily within the cam-groove h^2. The other end of the said lever B^4 is bifurcated and grasps and embraces the swivel-clutch b^9, so as to let the said clutch-band or swivel-piece rotate or rock easily within it, but not to move laterally out of it, as clutch-pins secured in the two parts of the bifurcation of lever B^4 enter an annular groove in the periphery of the clutch-piece b^9, as indicated in Figs. 2 and 3. The clutch b^9 is fixed to the inner end of the sliding collar B^3, which is placed concentrically around the needle-shaft C^2, and carries on its front end the hinged or jointed connection of the two jaw-arms B' and B^2. The curved groove h^2 in the face of the wheel H^3, the lever B^4, the clutch b^9, the sliding collar B^3, and the jaw-arms B' and B^2 are so constructed and combined that at each revolution of the shaft I and its attached wheel H^3 the lever B^4, actuated by the cam-wheel H^3, will move the sliding collar B^3 and its attached arms B and B' forward and backward once just the required distance to move the work from one stitch to the next, and the forward and retrograde movement of the said jaws B for this purpose is so timed with the opening and closing the said jaws upon the work, as above described, by reason of both operations being worked by arbitrary movements from the same driving-shaft, I, that the retrograde movement of the said jaws B will be performed during the time the said jaws are opened or freed from their hold upon the work, as described, and the forward movement of the said jaws will be made during the time the said jaws are closed upon the work, thereby carrying the work along with them the distance required from one stitch to the next. The formation of the cam H^3, with its groove h^2, is such that the rearward movement of the jaws B is performed in the one-eighth of a revolution of the shaft I, or thereabout, as above described, for the opening of the said jaws by reason of the construction of the operating-cam H, as already mentioned, and during the remaining seven-eighths of a revolution of the shaft I, or nearly in that time, the forward movement of the said jaws is accomplished, and then the jaws B and their held work remain stationary a sufficient length of time for the needles to pass through the work, carrying with them the threads, and then drawing in the threads tightly by reason of the action of the tension-arm, so as to form one perfect and completed stitch at each revolution of the machine. The method of adjusting the length of the stitch is by moving the fulcrum or pivot b^7 of the actuating-lever B^4 up or down by means of one or more adjusting-screws, b^{10}, the aperture through the said lever being slotted, as shown in Figs. 2 and 3, so as to permit the fulcrum-pin thereof the required vertical movement for this adjustment. When this fulcrum pin or pivot is moved up it is obvious the lower arm of the said lever will be lengthened, and the lateral movement of the jaws B will then be the greatest, and when the said pivot-pin is moved down the lower arm of the lever will be shortened, and the lateral movement of the jaws B will then be the least, and in this manner the operator can easily and quickly set the machine to sew a long or a short stitch.

The sewing or stitching made by this machine is the joint work of five distinct devices, which perform separate and specific operations in the formation of the loop-stitch which is the product of the machine. These separate devices are the loop-lifter E, the curved needle C′, the stitch-guide D′, the horizontally-moving needle F, and the tension-arm G; and these several devices will now be described in the order named, and then will follow a combined description of their united functions and operations.

The loop-lifter E is a small curved hook, (shown clearly in Figs. 5 and 6,) and it is fixed to the overhanging end of the shaft E′ at the front end of the machine. The shaft E′ and its attached hooked lifter E have a rocking motion about the axis of the shaft and a longitudinal sliding movement in the direction of the axis of the shaft. The rock-shaft E′ has its bearings in the frame A, so as to allow the said shaft to rotate or rock easily therein; but it is not confined in the said bearings by any shoulder or collar, and it will consequently have freedom to move longitudinally, as desired. At some convenient point on this shaft there is fixed to it a cogged wheel, *e*, and at another convenient point in said shaft there is a circumferential groove, *e′*, cut thereon; or, in lieu thereof, there is a concentric collar fixed to the shaft.

In connection with the wheel *e* and the groove or collar *e′* are respectively placed two levers, E^2 and E^3, which are respectively fulcrumed by suitable pins, e^2 and e^3, to some part of the frame A or its attachments. These levers E^2 and E^3 are actuated by the cam-wheel K, which is fixed to and rotated with the driving-shaft I. This cam-wheel carries, projecting from one of its sides, a pin or stud, *k*, Fig. 4, which strikes and operates the lever E^2, and on the opposite side of the said cam-wheel K are fixed two concentric projecting cam-plates, k' and k^2, (shown respectively in Figs. 4 and 5 and 7 and 8,) the plate k' being used to actuate the lever E^3. The lower end of the lever E^2 terminates in a cogged sector, e^4, as shown best in Fig. 4, and this cogged sector gears into the cogged wheel *e* and actuates it, so as to rock the shaft E′, to which it is fixed, in the desired manner.

A tension-spring, e^5, is fixed by one of its

ends to some stationary part of the machine or the frame A, and the other end of the said spring is attached to or placed in contact with the lever E^2, so as to throw it habitually to one side to the limit of its movement, thereby rotating the cogged wheel e, and with it the rock-shaft F′, to one side; but the spring e^5 has sufficient elasticity to allow the lever E^2 to move to the opposite limit of its movement, as it will do at every revolution of the driving-shaft I by reason of the pin or stud k striking the upper end of the said lever E^2 and forcing it to one side, as indicated by the dotted lines in Fig. 4. A small projection, e^6, on the side of the lever E^2, next the pin k, forms a seat for the said pin to strike against, as shown in Fig. 4, and the exit end of this seat terminates abruptly, as is also shown in Fig. 4, so as to allow the lever to drop back suddenly by means of the action of the spring e^5. The length of the seat e^6, as will be seen in the drawings, is quite short, and the complete forward-and-backward movement of the lever E^2 is made between the moment the pin k first strikes the seat e^6 and the time the lever first drops back to its normal position after leaving the said seat e^6. This construction gives to the lever E^2 a short jerking movement backward and forward once at each revolution of the cam-wheel K, and produces the consequent rocking backward and forward of the shaft E′ at the same time, thereby giving to the hook or lifter E first an upward movement and then a downward movement at each revolution of the machine, and then the hook will remain lowered at the same time the spring e^5 holds the lever stationary, which will be during seven-eighths (more or less) of the time occupied in one revolution of the shaft I.

The lever E^3 moves the shaft E′ longitudinally in its seat, and for this purpose the lower end of the said lever is forked and made to enter the annular groove e', or attached to the collar, which may be used in lieu of the said groove, so as to allow the shaft E′ to rotate at the same time it is held and governed by the lever E^3 as to its longitudinal movement. The shaft E′ is held habitually drawn in from the front of the machine by the spring e^7, which is adjustably attached to the rear end of the said shaft by the screw e^8, the spring being attached to the shaft so as not to interfere with its rotation or its forward movement, but of sufficient force to draw the shaft back endwise to the limit of its movement as soon as its forward movement shall have been completed.

The cam-plate k', which operates the lever E^3, as is clearly shown in Figs. 4 and 5, is a short curved plate fixed to the side of the cam-wheel K, the curvature of the said plate being concentric with the wheel K. This curved plate extends about one-eighth (more or less) of the distance round the said wheel K, and imparts movement to the actuated lever E^3 only during about one-eighth of the time (more or less) of the revolution of the cam-wheel K and its driving-shaft I. The cam-plate k', which actuates this lever, is made with its front end gradually sloping, so as to allow the end of the lever E^3 which bears against it to rise up easily on it as the wheel K rotates, and the rear end of the said plate is made to terminate abruptly, so as to allow the lever to drop suddenly off the said cam-plate, thereby allowing the spring e^7 to draw the shaft rearward almost instantly as soon as the lever leaves the working-face of the said cam-plate.

The combined mechanism above described for operating the rock-shaft E′ is so constructed and arranged that the said shaft E′ and its hook E will first move forward toward the front end of the machine about one inch, more or less. Then the shaft will rotate and the free end of the hook lift up, so as to grasp the thread in the act of forming the stitch, as hereinafter explained. Then the shaft will be drawn back by the action of the spring e^7 to its normal longitudinal position, carrying the loop of thread with it, and then the hook will suddenly drop, in the manner hereinafter explained, in which latter position—*i. e.*, down and back—the hook or lifter will remain during about seven-eighths (more or less) of the revolution of the machine, and then the above-described movements of the hook or lifter will be again performed. When the hook is drawn back and dropped down it will drop the looped thread forming the stitch free to the control of other parts of the machine, and this completed movement of the hook E will be performed once at the formation of each and every stitch sewed on the machine.

The needle F is moved forward and backward in a reciprocating movement by means of its operating shaft or bar F′, to the end of which it may be directly attached or connected therewith by means of the connecting-bar f. The needle F is driven forward by means of its actuating-lever F^2, and is drawn back by means of the retaining-spring f', which holds the bar and its attached needle habitually drawn in, back from the front end of the machine, as shown in Fig. 8. The actuating-lever F^2 is pivoted at f^2 to some suitable part of the frame A, so as to allow the said lever to move the bar F′ forward as required, the lower end of the said lever being forked and made to engage in the groove f^3 in the said bar or shaft, or otherwise attached thereto, so as to readily move it forward as desired. The upper end of the said lever F^2 is engaged with and moved by the curved cam-plate k^2, which is fixed to the cam-wheel K, substantially as hereinbefore described, the whole being operated by the driving-shaft I, so as to combine the movements of the needle F with the other parts of the machine, in order that the movements of the said horizontally-moving needle shall be arbitrary and automatic, in combination with the other mechanisms for forming the stitch produced by this machine.

The horizontally-moving needle F is con-

structed as shown in Fig. 9, and consists of a cylindrical or flattened bar, sharpened at the end and pierced with a transverse hole or eye, f^4, (shown by dotted lines in said Fig. 9,) the said hole or eye being near the end of the said needle. Close behind the said eye there is a notch, f^5, formed transversely in one side of the needle and perpendicular to the axis of the eye f^4. A small flat or round spring, f^6, is attached securely to the side of the needle one or two inches (more or less) back from the point thereof, and the said spring lies along by the side of and parallel with the said needle F, but a short distance therefrom—say one-sixteenth of an inch, more or less—until just at the point of the spring it touches just in front of the eye f^4, the spring being stiff enough so hold the outer point of it habitually and with gentle pressure against the side of the said needle.

The driving-shaft I, from which all the operative parts of this machine are driven, has its bearings in suitable pillow-blocks, A′, attached to the frame A, and this driving-shaft is driven by a band-wheel placed directly upon it, or by a cogged wheel, I′, and a spur-wheel, I^2, gearing into the said wheel I′ and mounted on a counter-shaft, I^3, Figs. 10 and 11. There is on one of these axles or shafts a fly-wheel (not shown) to assist in regulating the movement of the machine. The driving-shaft I may be driven by power or by a treadle or other means, as occasion or circumstances may require.

In addition to the wheels or cams H, H′, H^3, and K, already described as being upon the shaft I, and the cogged wheel I′, which may be used as a driving-wheel, and which also acts as a crank-wheel to a vibrating arm, hereinafter described, there are placed upon the said shaft and actuated by it two other cams, L and M. (Shown in Figs. 11, 14, and 15, and hereinafter described more fully.)

The sewing done by this machine is principally formed by the curved needle C′, which is already shown in Figs. 11, 13, 17, and 19. This needle is fixed to the head C, which is mounted on the shaft C^2, and, with it, rocks in a circular path. The rocking needle C′ is curved so as to be annular in outline, forms about seven-eighths of a complete circle, and is secured centrally to the rocking-head C by means of the small segmental clamping-plate *c*, which leaves its ends c' and c^2 free to perforate or pass through the material being sewed. The segmental plate *c* is attached by small screws c^3, which are withdrawn or loosened when a needle is to be removed and tightened when a needle is to be fastened into the machine. The end c' of the said curved needle is sharpened, as shown in Fig. 13, and, during the first movement or backward rock of the needle-head, acts as an awl to pierce the material being sewed. The end c^2 is sharpened to a point, and has the barb or notch c^4 formed near its end, as shown in Fig. 17. In order to brace the ends of the needle C′ while passing alternately into and through the material being sewed, they are made to pass through two adjustable guides, c^5 and c^6. These guides are simply two arms attached to and extending radially from the hub-band C^3 on the extreme outer end of the needle-shaft C^2. This hub-band and its projecting arms c^5 and c^6 are rotated with the said shaft C^2 at each one of its semi-rotations forward and backward until one of the radiating arms strikes one of the projecting jaws B, when it will stop and allow the needle-head C to continue its rotary movement to the end of its stroke, thereby pressing the curved needle on through its guide c^5 or c^6, as the case may be, and allowing the needle to be supported and braced by the said guide as required, so as to obviate the liability of breaking the needle. During the time the guides c^5 and c^6 are stationary and guiding the needle ends, as above described, and the needle-head is moving, the shaft C^2 rotates within the hub-band C^3, which at other times rotates with the said shaft C^2, the frictional contact between the said shaft and the said hub-band being sufficient to turn the said hub-band when it is left free to turn, but is not too much to prevent the shaft from rotating within the said hub-band when the band is stopped by contact of one of the guides c^5 or c^6 against the jaw B, as above explained. The needle-head C is segmental in form, as clearly shown in Fig. 13, and the segmental length of it is about fifty degrees (more or less) as is also shown in said Fig. 13, while the arms or guides c^5 and c^6 being radially opposite each other the circumferential distance between the said arms is nearly one hundred and eighty degrees, thus allowing about forty degrees (more or less) for the circumferential movement of the needle-head C, which will be amply sufficient to carry the needle C′ through the thickest work required.

The shaft C^2, which operates the curved needle, is, as shown, hollow, and contains within it a shaft, D^2, which has a distinct movement and operation to perform, as will presently be explained. The said hollow shaft C^2 has its bearings in suitable attachments to the frame A, and it is long enough to extend the whole length of the said supporting-frame and overlap it at each end, carrying on its front end the before-mentioned needle-head C, and at its rear end a cogged pinion-wheel, C^4, which meshes with the cogged sector N, formed on the lower end of the vibrating lever N′, the said lever being pivoted to the rear end of the machine by the pivot-pin *n*.

A crank-pin, *i*, fixed in or to the side of the wheel I′, enters and travels in the slot n', formed in the upper end of the lever N′, as shown in Fig. 10, and as the said crank-pin rotates around its central shaft, I, traveling in the said slot n', it will vibrate the lever or vibrating arm N′ forward and backward as desired, so as to cause its sector N to actuate the cogged wheel

C^4, and with it the attached shaft C^2, forward and backward in a rocking movement about a half a revolution (more or less) of the said shaft C^2 for the proper operation of the driving-head for the needle C', as hereinbefore explained.

The small shaft D^2, Fig. 19, which is placed within the shaft C^2 and has its bearings therein, also has a rocking movement, but at a different time than is occupied for the movement of the shaft C^2. A crank lever or arm, D^3, is fixed to the rear end of the said shaft D^2, which projects beyond the end of the shaft C^2 on that end far enough to allow for the attachment of the said lever or arm D^3. A connecting-rod, D^4, (shown in Figs. 10 and 11,) connects the lower end of the arm D^3 with the lower end of its actuating-lever D^5, the latter lever being fulcrumed to the frame A by its pivot-pin d, and actuated or moved forward by the cam L, on the driving-shaft I, coming in contact with the said lever, or with the pin d', projecting therefrom, and then the spring d^2 draws the lever D^5 back to its normal position as soon as the pin d' has been released from the projecting part l of the said cam L. The projecting part l of the said cam L, which moves the lever D^5 forward, occupies about one-eighth (more or less) of the circumference of the cam L, as clearly shown in Fig. 15, and the depressed or smaller diametered part, l', of the said cam L consequently forms about seven-eighths (more or less) of the circumference of the said cam-face, and as the spring d^2 draws the lever D^5 back with a smart jerk as soon as it leaves the projected face l it is evident that the movement communicated to the shaft D^2 through the intermediate connections, D^4 and D^3 is a short jerky rocking movement of about one-eighth of a revolution (more or less) of the shaft D^2 at each revolution of the driving-shaft I, which movement is communicated to the curved stitch-guide D', which is attached to the front end of the inclosed shaft D^2. (Shown in section Fig. 19.) The use of the stitch-guide D' is to measure and form the successively-interlocking loops of the stitch, as will be hereinafter more fully explained.

The stitch-guide D' is a sharp pointed steel wire of about the same size as the needle C', perforated with a thread-eye at d^6, and is curved around for about a half a circle (more or less) on the same radius as that of the needle C', and when fixed to its driving-head it stands in a plane parallel with that occupied by the needle C' and about one-eighth or one-quarter of an inch (more or less) distant therefrom, as may be required to form the length of the stitch-loop desired, and this distance of the loop-former D' from the needle C' may be regulated at will to suit different work by sliding the shaft D^2 endwise in its inclosing-shaft C^2 and securing it in the proper position by one or more adjustable collars, D^6, on the said shaft D^2; and for this purpose the rocking arm or lever D^3 may be used as a retaining-washer and set adjustably to the said shaft D^2 by means of the set-screw d^3. The shaft D^2, with its attachments, may also be adjusted to rotate more or less, as may be desired, by moving the wrist-pin d^4, that connects the connecting-bar D^4 with the crank arm or lever D^3, up or down in the slot d^5 in the said arm D^3, thereby lengthening or shortening the stroke of the said connecting crank-pin d^4 and limiting the movement of the shaft D^2 as desired.

The tension-arm G, that draws the stitches tight in the seam sewed, is another principal feature of this machine, and its movements are as indicated by the full and dotted lines in Fig. 13, the two positions indicated being the limits of its movements as it vibrates on its center of motion, which is the axis of the shaft G', to which it is attached and by which it is operated. The shaft G', like all other operative parts of the machine, has its bearings in the frame A or in some suitable attachment thereto, and it, like the shaft E', hereinbefore described, has, in addition to a rocking movement, a sliding movement longitudinally, the rocking movement being communicated to it by the cam M, cam-arm G^2, and the retaining-spring G^3, and the longitudinal movement by the cam-wheel H^3, with its cam groove or face h^3, and the levers G^4 and G^5, Fig. 13, which are fixed respectively to the upper and lower ends of the rocking post G^6, the latter being mounted on and rotated around a fixed vertical axle, g, which is also fixed to the frame A, a lateral arm, a, being used as an intermediate support and secured firmly to the frame A, so as to allow the base of the rocking post G^6 to rest on top of the said supporting-arm a. As both the cams H^3 and M are fixed to and driven by the shaft I, from which all the other operative parts of the machine are driven, it follows that the shaft G' and arm G, moved by these said cams, will move arbitrarily and in combination with the parts B, C', D', E, and F, already described. The spring G^3 holds the rock-shaft G' habitually so as to throw the arm G down into the position shown by the full lines in Fig. 13, in which position the lower part of the said arm G rests against the stop a', which is fixed to and projects from the frame A, as shown in Fig. 13. This limits the downward movement of the said arm G, and the spring G^3, that moves it into and holds it in that position, is shown in Fig. 14.

The cam M, attached to the driving-shaft I, is slightly more than a quadrant of a circle, terminating in two abrupt lines, m and m', at its respective ends, the said end lines, m and m', forming the cam M, being nearly radial from the central hub by which the said cam is fixed to the driving-shaft I. By this construction of the said cam M the front face of it, m, strikes the cam-arm G^2 and suddenly throws it up to the full limit of its stroke, thereby causing the arm G to suddenly fly up from the position shown by full lines in Fig. 13 to the position shown by dotted lines in the same figure, and

this sudden and forcible throwing up of the arm G draws the stitch or thread forming the stitch up tightly into the material being sewed, as will be presently more fully explained. From the moment the arm G^2 first attains the full limit of its stroke, by reason of the extreme outer end of it reaching the curved periphery of the cam M as the said cam revolves, the said arm G^2 will be held stationary for a moment, as well as the connected shaft G′ and the arm G, by reason of the end of the said arm G^2 being held stationary on and by the curved periphery of the cam M until the abrupt terminal end m' of the cam comes round and allows the arm G^2 to be suddenly drawn back to its normal position by the spring G^3. At this sudden, almost instantaneous, action of the spring G^3 the arm G is drawn down to its normal position of rest upon the projecting pin or stop a', and there remains, ready for the next stroke forward, and so on, the strokes or vibrations of the arm G being repeated and continued, forming or tightening a stitch at each revolution of the machine. The reciprocating movement of the arm G and its actuating-shaft G′ is for the purpose of carrying the thread forming the stitch into the barb of the needle, as will be presently explained. The shaft G′ has a slot, g', cut circumferentially in it, as shown in Fig. 11, and this slot is occupied by the forked end g^2 of the arm or lever G^5, which said arm projects horizontally from the lower end of the vertical rocking post G^6, and the said arm G^5 is moved backward and forward as required, the said post being rocked in the desired manner by the horizontal arm or lever G^4, the free end of the last-named arm or lever being engaged in and moved by the groove or cam surface h^3 of the cam H^3, the whole operating in combination with each other and with the shaft I, from which they are driven, so as to produce the desired reciprocating movement of the arm G. The outer end of the arm G is curved downwardly, as shown in Fig. 20, and the notch g^3 in its outer end forms that part into the bifurcations g^4 and g^5, the latter being perforated with an aperture, g^6. (Shown by the dotted lines in detail, Fig. 20.) Through this aperture the thread s from one of the spools is passed, a small sheave being used to run the thread over into the hole g^6. When the arm G is thrown down to the lower limit of its movement and the needle C′ is rotated so that its barbed end has passed through the material being sewed, the further rotation of the needle C′ to the end of its stroke will carry the barbed end of it into the notch g^3, which will then overlap the needle-point and allow the thread s to drop into the barb c^4. Just at the moment that the thread s thus overlaps the barb c^4 the lever or arm G is moved laterally rearward, and thereby the thread s is held in the barb c^4, so that it must be certainly drawn back by the next semi-rotation of the needle C′ and carried along with it into and through the substance of the material being sewed.

A small vibrating arm, O, two or three inches in length, (more or less,) is pivoted to the side of the arm G toward its outer end by the pivot-pin o, and when the arm G is in its lower position, as shown by the full lines of Fig. 13, the arm O will stand in nearly a vertical position, as is also shown by the full lines in Fig. 13, and in this position it will be held by the stop o' in the side of the arm G, against which it strikes, and the tension-spring O′ attached by one of its ends to the top end of the said arm O, and by its other end to the ring o^2, fixed to the hub of the arm G on the top of the shaft G′. This arrangement of the spring O′ will draw the vibrating arm O into the position shown by the full lines in Fig. 13, yet permit it to assume the position shown by the dotted lines in the same figure when it or its attached arm P strikes the stop and guide A^2 in the upward movement of the arm G, (shown also in Fig. 13,) the said stop and guide piece A^2 being fixed securely to some part of the frame A for this purpose. The stop or guide A^2 has a projecting horizontal arm, a^3, from the inner side of which projects a short lug, a^4, as shown in detail, Fig. 25.

The small arm P, attached to the rear side of the vibrating arm O, is constructed of a bent wire one-eighth of an inch (more or less) in diameter and curved over to the rearward of the said arm O, from which it projects two or three inches (more or less) substantially in the form shown in Fig. 13, so as to form an attachment for the small coiled spring p, which connects the rearmost projection, p', of the arm P with the outer end of the vibrating button P′, which is secured on the lower end of and moves with the rod P^2, as shown in Fig. 21.

To the outer end of the rocking shaft G′, and outside of the arm G, is movably attached a small radial arm, R, as shown in Fig. 13, and in detail at Fig. 22, having an angular projection, r, attached to or formed on the extreme outer end of this arm, which has a central longitudinal slot, r', for the passage of the thread to the needle C′, as hereinafter explained. As the shaft G′ rocks backward, so as to let the arm G fall down to its lowest position—*i. e.*, that shown by the full lines of Fig. 13—the projecting arm R will fall with it as far as the projecting lug a^4 of the arm a^3, on which it will catch and stop for a moment, while the arm G proceeds on in its downward movement. This stop of the arm R on the lug a^4 will only be for a moment, for just at that instant the inward longitudinal movement of the shaft G′ will commence, and by it the arm R will be released from its hold on the stop or lug a^4, and it will then continue its downward movement until it stops at the lower limit of its movement in a position parallel with the arm G, or nearly so. The button P′, before alluded to, is a small projecting arm pivoted to the bottom end of the vibrating arm O, as shown in Fig. 21. The spring p is attached to this button or arm, so as to hold its free end inward on a line parallel with the shaft C^2;

but the said spring will allow the projecting or free end of the said piece P′ to be moved back across the thread *s* every time the arms G O are raised up by reason of the projecting end *p′* of the button coming in contact with the sewing-thread *s*, while the said thread is drawn tightly between the work in the jaws B B and the slotted end of the lever G. As the thread *s* becomes slackened by the descent of the tension-arm G the springs O′ and *p* co-operate to draw the arm O and button P′ into their normal positions, the arm of the button P′ being directly behind and across the notched end of tension-arm G. In this manner the said button P′ will hold the thread *s* upon the ends of the projections g^4 and g^5 during the downward movement of the arm G, with its attachments, and, thus extended across the opening g^3, the thread *s* will catch on the barb of the needle C′ on its entering the said notch g^3, and then as the needle C′ rocks backward it will carry a loop of the thread *s* along with it into the material being sewed, and the arm of the button P′ will be drawn forward far enough by the tightening of the thread *s* to allow the thread to slip off the end of the said arm, and in this manner the operation of the machine will be continued, the button P′ holding the thread on the lips g^4 and g^5 at every stroke of the arm G, so as to insure the thread catching in the barb of the needle C′.

The ratchet T′, hereinafter described, will at each rotation of the machine feed out a sufficient quantity of the thread *s* to form one stitch or loop; and in order to prevent the thread so paid out forming too large a loop on the barb c^4, or the barb catching other than in the center of the loop, and consequently being run back to the proper length over the said barb c^4, thereby abrading the thread, the swinging arm R is employed to measure and divide the thread so that each individual loop of the thread *s* will be of equal and uniform length, and the center of each loop be caught squarely on the barb c^4. This arm R is constructed as above described, and as shown in Figs. 13 and 22. The attachment of this arm to the shaft G′ is by means of a frictional band, R′, which surrounds the end of the said shaft, and is moved therewith simply by friction. Thus the arm R will move with the shaft G′ when the arm G commences to move downwardly; but it will stop in its downward movement a moment when the arm R strikes the stop a^4 and allow the shaft to continue its partial rotation, thus moving on the said shaft as well as with it. While the arm R is held on the stop a^4 it will draw back the slack of the thread *s*, passing through its slotted end *r r′*, and thereby divide the thread, or rather the loop formed on it, so that the loop will be of the proper length, and the center of the loop will be caught on the barb c^4 as desired.

The two principal threads with which the seams of this machine are sewed are carried on the two spools S and S′, the first of which is shown in Figs. 11 and 13 and the latter in Fig. 8. The auxiliary thread is carried on the spool S^2, which is also shown in Figs. 11 and 13. All of these spools are suitably pivoted on the machine, so that the threads may readily unwind therefrom. The thread *s* from the spool S is wound around the feeding-drum T, which is moved by the ratchet T′, the pawl *t*, and the lever T^2, so as to feed out a certain required amount of thread at each revolution of the machine. The drum T and ratchet T′ are mounted on an axle, *t′*, which is mounted on the frame A. The actuating-lever T^2 is mounted on the axle or pivot-pin *t′*, which forms the fulcrum for the said lever. The lever T^2 is thrown forward on its operating-cam by means of the spring t^2, which is fastened by one of its ends to some stationary part and arranged to allow its free end to press forward against the lever T^2, as shown in Fig. 13. The lever T^2 will be moved forward once at each revolution of the machine by means of a special cam or by the pin h^4, projecting from the side of the cam-wheel H. A pawl, *t*, pivoted or fulcrumed to the said lever t^2, has a spring, t^4, which habitually presses it into or against the teeth of the ratchet-wheel T′, and as the lever T^2 is moved forward by the cam-pin h^4 the ratchet-wheel and its attached spool or feeding-drum T will be turned around far enough to feed the thread *s* (which passes from the spool S to the vibrating arm G) out enough to form one stitch. A suitable retaining pawl or dog (not shown) may also be fitted against the wheel T′ to hold it against a rearward movement while the pawl *t* is being moved back for a new hold. The thread *s* will pass from its spool S once or twice or more around the feeding-drum T, and thence through the slot *r′* in the outer end of the feeding-arm R, and thence down through the aperture g^6 in the outer end of the arm G, from which it will pass to the needle C′, the book or barb of which needle will catch this thread and draw it through the work at each backward rotation of the said needle.

From the foregoing it will be seen that the needles *c′*, c^2, and F, the stitch guide or catcher D′, lifter E, and the tension-arm G co-operate as follows: The upper thread, *s*, having been measured, as described, is held across the notch in the arm G by the pivoted button P′ and brought down near to the needle *c′* c^2, during which time the end *c′* of the needle has been forced through the work and retracted and the barbed end c^2 of the said needle has been passed through the said hole, and as it projects through the work it catches the thread *s*, which is waiting for it, stretched across the notch g^3. The thread so caught is then at once pulled some distance through the work, and, as soon as the barbed needle reaches the upward limit of its stroke, the needle F passes horizontally through the suspended loop, and, when far enough through, the catcher D′ turns down into the notch f^5 and catches the thread *s′*. The needle F then recedes and leaves a horizontal loop on the catcher D′, the said loop extending through the vertical loop of the ten-

sion or upper thread, *s*, still suspended on the barbed needle c^2. The lifter E now tips the vertical loop off the barbed needle and the tension-arm draws it back, taking with it the horizontal loop, which is thereby doubled and drawn into and nearly through the work, it having been released by an upward movement of the catcher D′ at the moment the tension was sufficient to prevent disarrangement of the horizontal loop. When it is desired to use a third thread the auxiliary thread s^2 is passed through the eye in the end of the catcher D′, and it is thereby carried through the notch f^5 and into the loop of thread *s*′ from the horizontally-moving needle as each stitch is formed, and thus becomes interwoven with the said thread *s*′, and by the action of the thread *s* and tension-arm is drawn into the work with the other threads, the movement of the feeding-jaws and the pull of the tension serving to feed the auxiliary thread through the eye of catcher D′ as fast as required.

Having described our invention, we claim—

1. The feeding-jaw arms or levers B′ B^2, hinged and fulcrumed to the sliding sleeve B^3, in combination with the actuating-cams H and H′ and the tension-spring B^5, whereby the said jaws are released from or press upon the work, substantially as described.

2. The cams H and H′, ratchet *h*, and pawl *h*′, in combination with the jaw-arms B′ and B^2 and the tension-spring B^5 to allow the jaws B to be moved to or from each other automatically by the operations of the machine and also by the operator independently of the working of the machine, as and for the purpose set forth.

3. In combination with the movable jaws B′ B^2, the vibrating lever B^4, with its attached sliding sleeve B^3, and the actuating-cam H^3, adapted to communicate the required reciprocating feed movement to the said jaws, substantially as specified.

4. The combination of the holding and feeding jaws B, the jaw-lever B′, the sliding block b^6, the sheave *b*′, and adjusting-screw *b*, so as to adjust the distance between said holding and feeding jaws B, as described.

5. The adjustable fulcrum-pin b^7, with its adjusting-screws b^{10}, in combination with the vibrating lever B^4, sliding collar B^3, and jaws B, for the purpose of regulating the length of the stitch or feed movement.

6. The cam-wheels H, H′, and H^3, lever B^4, sleeve B^3, and jaw arms or levers B′ B^2, combined together so as to produce the required holding and feeding movements of the jaws B, as described and set forth.

7. The lifter-hook E and its operating-shaft E′, in combination with the operating-levers E^2 and E^3 and the actuating-cam K, having pin *k* and projection *k*′, substantially as described.

8. The horizontally-moving needle F, provided with a guard-spring, f^6, thread-aperture f^4, and transverse slot f^5, substantially as described.

9. The needle F, with its sliding bar or shaft F′, in combination with its moving lever F^2, spring *f*′, and actuating-cam K, provided with projection k^2, substantially as described and set forth.

10. The needle F, in combination with the curved needle C′, carrying their respective threads *s* and *s*′, and the loop-catcher or stitch-guide D′, as described and set forth.

11. The curved needle C′, in combination with the rocking head C, the adjusting-plate *c*, and the perforated stiffening-guides and stops c^5 c^6, substantially as shown and described.

12. The rocking needle-head C, the hollow rocking shaft C^2, and its pinion C^4, in combination with the vibrating arm N′, driving-wheel I′, and the driving-shaft I, substantially as described.

13. The curved needle C′, the horizontally-moving needle F, the lifter E, and the stitch-measurer D′, combined together so as to form a double-looped stitch of the threads *s* and *s*′, as described.

14. The loop-catcher or stitch-guide D′ and operating mechanism, in combination with the needle F, the shaft F′, spring *f*′, operating-lever F^2, and adapted to fall into and through the slot f^4 of the said needle at the extreme point of the forward movement of the said needle F, thereby catching the thread *s*′ and holding it in a loop of the desired length, substantially as described.

15. The curved stitch-guide D′, with its rocking shaft D^2, in combination with its operating-levers D^3 and D^5, with their connecting-link D^4 and actuating-cam L, as and for the purpose set forth.

16. The lever D^3 and connecting-rod D^4, adjustably combined together by means of the sliding pin d^4 and slot d^5, so as to regulate the movement of the attached loop-guide and catcher D′, as described and set forth.

17. The tension-arm G, combined with the rock-shaft G′, operating-lever G^2, spring G^3, and actuating-cam M, adapted to impart a radial vibratory movement to the said tension-arm G, as shown and described.

18. The tension-arm G and its rock-shaft G′, in combination with the reciprocating mechanism G^3 G^4 G^6 and the actuating-cam H^3, so as to produce a reciprocating forward-and-backward movement of the said arm G for carrying the thread *s* into the barb of the needle C′, as described and set forth.

19. The tension-arm G, having a combined radial or pendulous movement and a reciprocating or forward-and-backward movement, substantially as described and set forth.

20. The tension-arm G, provided with a re-entering notch, g^3, formed in its outer or swinging end, and the overhanging lip g^4, in combination with the curved needle C′, provided with barb c^4, adapted to enter the said notch g^3 and engage the thread *s*, as described and set forth.

21. The pivoted vibrating arm O, in combination with the tension-arm G and the tension-spring O′, adapted to hold the arm O against

its stop o' except when engaged by the stop A^2, as shown and described.

22. In combination with the lever O, the projecting arm P, spring p, and the vibrating button P′, as described and set forth.

23. The vibrating button P′, in combination with the tension-arm G, arranged to hold the thread s tightly across the notch g^3 of the said arm G for the proper engagement of the thread s with the barb c^4 of the needle C′, as described and set forth.

24. The vibrating button P′, pivoted on the lower end of the arm O, combined with and held in position by the coiled spring p, attached to one of its ends and also to the spring-holder P, as described and shown.

25. The arm R, in combination with the operating-shaft G′, and the arm G, and adapted to move with and on the said shaft G′, as described.

26. The arm R, provided with a projecting and slotted elbow, r, at its outer end for the passage of the thread s, as described and set forth.

27. The vibrating arm R, its actuating-shaft G′, and the stop A^2, combined together, substantially as described, so as to move and stop the said arm R in the manner required for the purposes of its office.

28. The tension-arm G, the radial measuring-arm R, the vibrating lever or arm O, with its button P′, and the curved needle C′, combined together, substantially as described, so as to measure out a portion of the thread s sufficient to form a single stitch at each revolution of the machine, and then hook that portion so measured onto the barb of the needle C′, which will draw the loop or stitch into the work.

29. The adjustable stop and guide A^2 a^4, pivoted to the frame A, in combination with the thread-measuring arm R, tension-arm G, and operating-shaft G′, substantially as shown and described.

CHRISTIAN WUTERICH.
GEORGE V. SHEFFIELD.

Witnesses:
J. B. THURSTON,
PHILIP E. RAQUÉ.