3 Sheets--Sheet 1.

C. S. CUSHMAN.

Sewing-Machine.

No. 167,747. Patented Sept. 14, 1875.

Fig. 1.

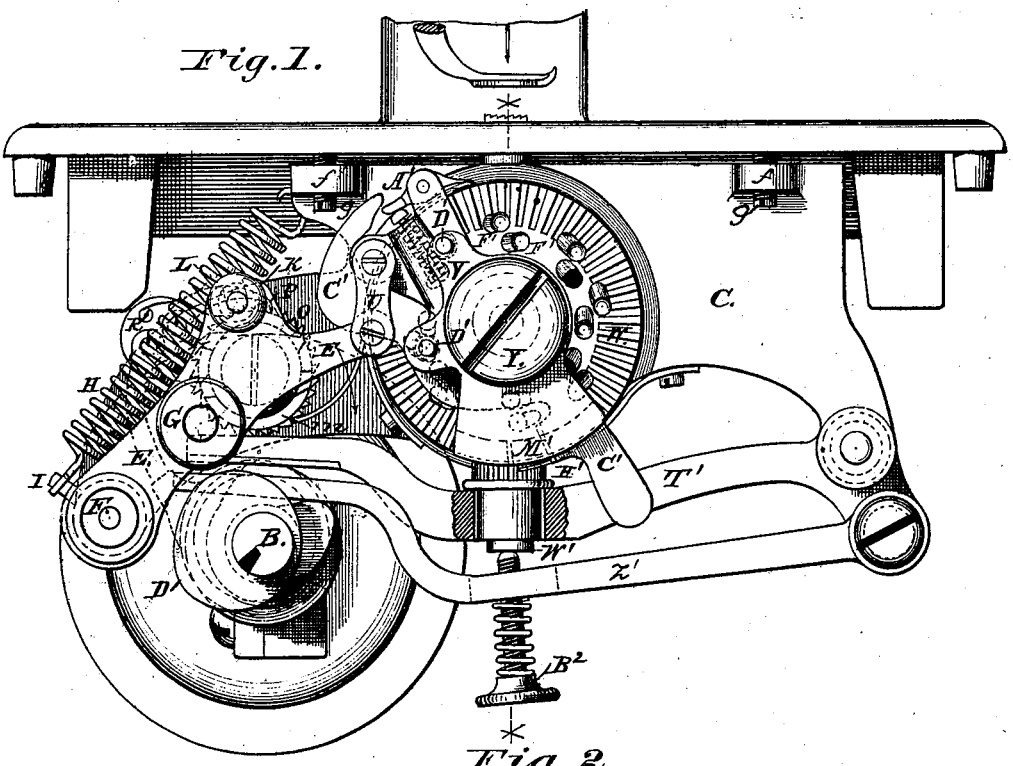
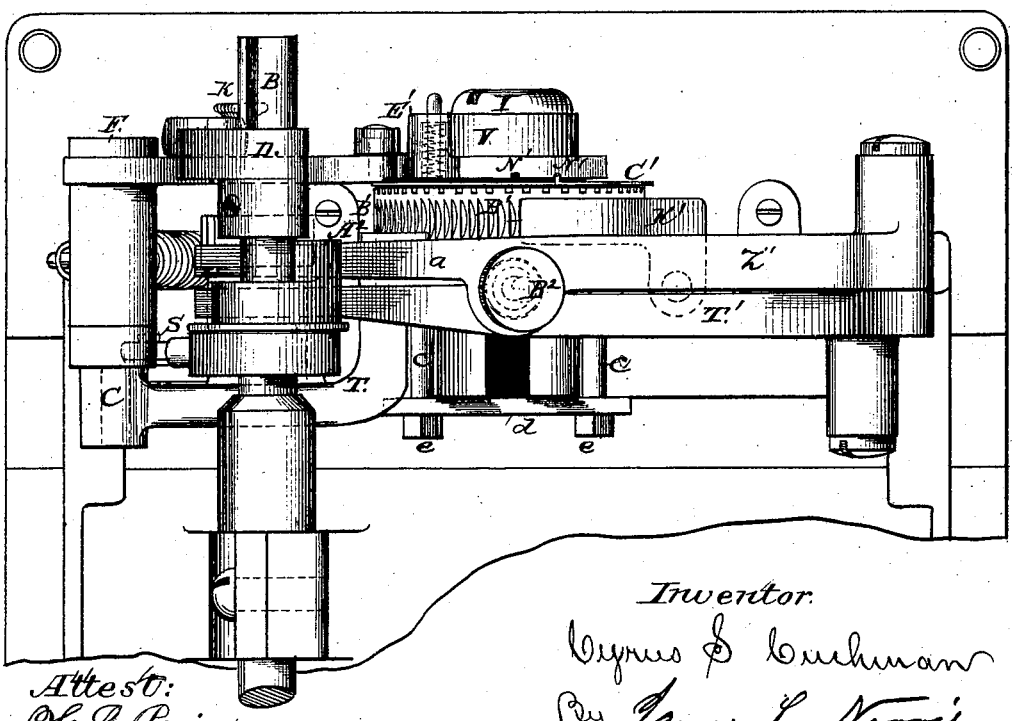


Fig. 2.



Attest:
H. L. Perrine.
W. S. Coombs

Inventor.
Cyrus S. Cushman
By James L. Norris.
Atty

C. S. CUSHMAN.

Sewing-Machine.

No. 167,747. Patented Sept. 14, 1875.

Fig. 4.

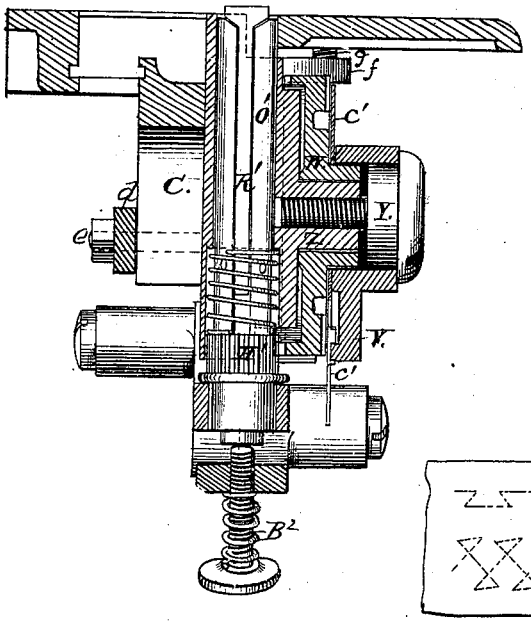


Fig. 5.

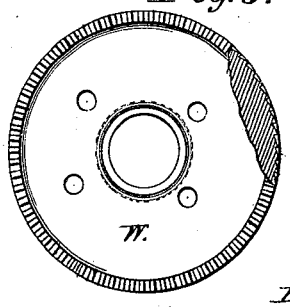


Fig. 6.

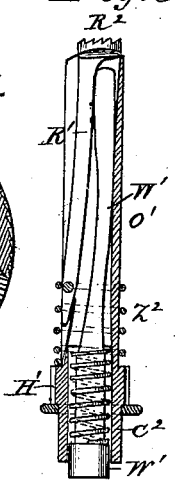


Fig. 7.

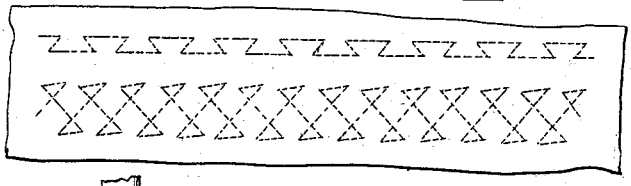
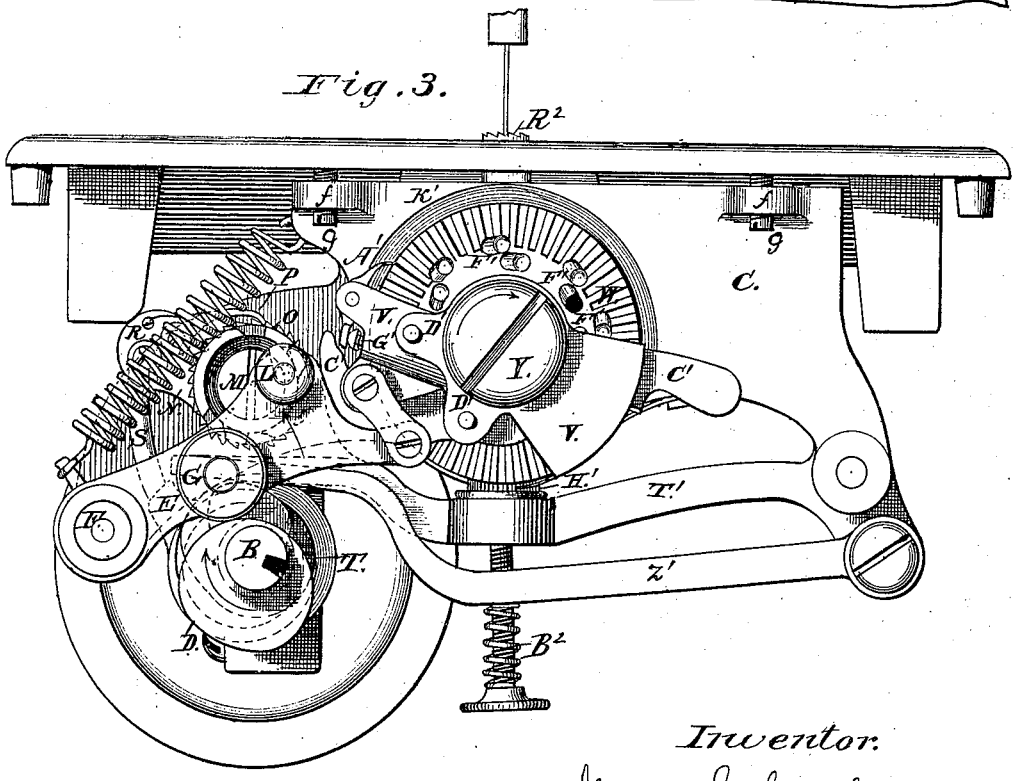


Fig. 3.



Inventor:
Byrus S. Cushman
By James L. Norris.
Atty

Attest:
H. L. Perrine.
W. S. Coombs

3 Sheets--Sheet 3.

C. S. CUSHMAN.
Sewing-Machine.

No. 167,747. Patented Sept. 14, 1875.

Fig. 8.

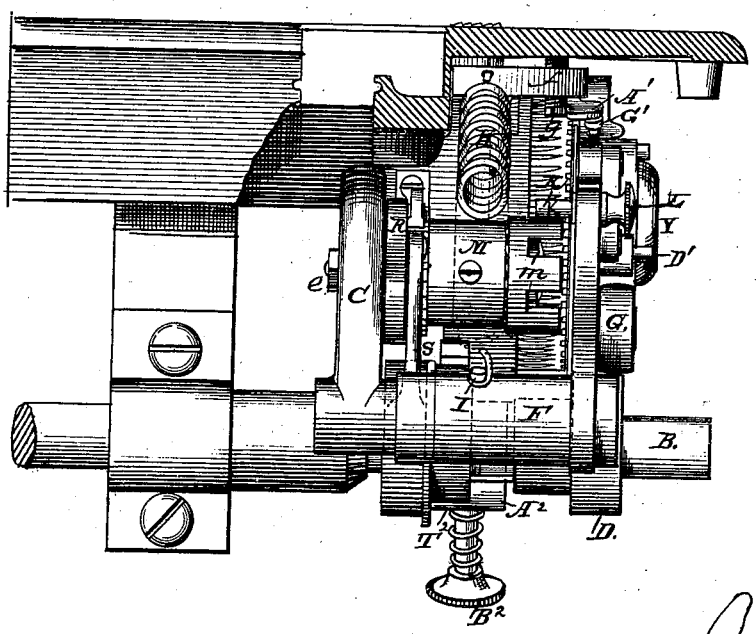


Fig. 9.

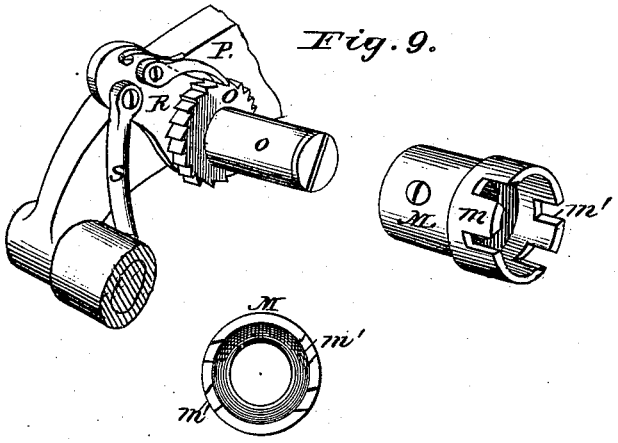
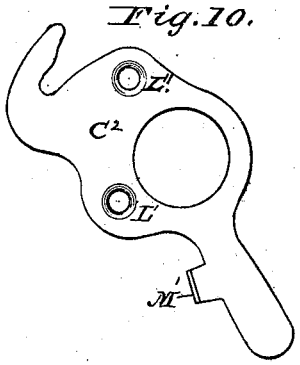


Fig. 10.



Attest:
H. L. Perrine.
Jos. S. Coombs

Inventor:
Cyrus S. Cushman
By James L. Norris.
Atty.

UNITED STATES PATENT OFFICE.

CYRUS S. CUSHMAN, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO NESBIT D. STOOPS, OF SAME PLACE.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. **167,747**, dated September 14, 1875; application filed August 28, 1875.

To all whom it may concern:

Be it known that I, CYRUS S. CUSHMAN, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification:

This invention has for its object to produce a sewing-machine in which an intermittent and variable rotary movement and a simultaneous horizontal and vertical reciprocating motion are given to the dentated feed-plate, which moves the cloth or other fabric in such manner as to carry said fabric in any direction over the bed-plate of the machine, for the purpose of forming the stitches in various designs or patterns for ornamental work.

The invention relates particularly to certain improvements in the devices for imparting the intermediate and intermittent movement to the feed-plate; and consists, first, in an improved pattern wheel or cam, consisting of a rotating cylinder provided with slots, openings, or indentations at one end, the number and position of which determine the configuration of the pattern, and adapted to be fitted to the machine so as to operate in connection with the driving-shaft and the devices for operating the crown-wheel, by which the rotary motion is given to the feed-plate shaft, as more fully hereinafter set forth; second, in the combination, with said pattern-wheel or cam, of a lever operated by a cam on the driving-shaft, and provided with a pin or pawl resting upon the periphery of the wheel or cam in such position as to drop through the slots as they are brought under it, and allow the lever to oscillate to its full extent, and rotate the crown-wheel by means of a pawl-lever, to which it is connected, as more fully hereinafter set forth; third, in the combination, with the oscillating lever operated by the cam on the driving-shaft, of an adjustable pin attached thereto, a slotted pattern-wheel operated by a cam on the driving-shaft, through the medium of a pawl and ratchet-wheel, the oscillating pawl-lever, and rotating crown-wheel, said pawl-lever being provided with sliding spring-bolts which are adapted to work into recesses on the face of the crown-wheel and carry the same forward, imparting an intermittent variable rotary motion to the same and to the feed-plate, as hereinafter more fully set forth; fourth, in the combination, with the driving-shaft of a sewing-machine, of certain devices for imparting an intermittent rotary movement to the dentated feed-plate which carries the fabric, consisting in an eccentric attached to said shaft, an oscillating lever pivoted at one end to the frame of the machine, and connected at the other, by a link, to an oscillating lever mounted upon a short journal attached to the frame of the machine, and carrying a pawl at its upper end and a ratcheted crown-wheel mounted upon the same journal and gearing into a pinion on the lower end of the feed-plate shaft, as fully hereinafter set forth; fifth, in the combination, with said pawl-lever and pawls and the recessed ratcheted crown-wheel gearing into the pinion on the lower end of the feed-plate shaft, of a regulating-lever for throwing the pawls into and out of gear, as more fully hereinafter set forth; sixth, in the combination of the above-mentioned devices for imparting a variable rotary movement to the feed-plate, as fully hereinafter described; seventh, in the combination, with the above-mentioned devices for imparting a variable, intermittent, rotary motion to the feed-plate, of certain devices for imparting vertical and horizontal reciprocating movement to the feed-plate, consisting of two cams attached to the shaft of the machine, operating two levers, which in turn operate the vertical shaft carrying the feed-plate, raising the same and advancing the feed-plate at proper intervals, and springs for retaining the feed-shaft and its attachments to position when the levers are dropped, as more fully hereinafter specified.

In the accompanying drawings, Figure 1 represents the lower portion of the front end of a sewing-machine showing my improvements attached thereto. Fig. 2 represents a view looking at the bottom of the same. Fig. 3 represents a view of the lower portion of the front end of the machine similar to the view illustrated in Fig. 1, showing the parts as shifted by the partial rotation of the driving-shaft. Fig. 4 represents a vertical section through the line *x x* of Fig. 1. Fig. 5 represents a detachable view of the ratcheted crown-wheel; Fig. 6, a detached sectional

view of the feed-plate shaft and its attachments; Fig. 7, a view of the ornamental stitching worked by the machine. Fig. 8 represents a side elevation of my invention with portions of the devices cut away in order to more clearly show the construction and operation of the pattern-cam. Fig. 9 represents detached views of the pattern-cam and its attachments, and Fig. 10 represents a detached view of the shifting-lever for throwing the pawls or the lever V into and out of gear with the crown-wheel.

The letter A represents a machine of ordinary construction, with the usual hangers below for supporting the various working parts; and B the main driving-shaft of said machine. C represents an additional detachable hanger capable of being attached to the stationary hanger on the lower part of the bed-plate for supporting my improved devices. The hanger C is provided with screw-bolts *c c* projecting from the rear of the same, which embrace the stationary hanger of the machine, and are secured around the same by means of a strap or cross-piece, *d*, by the nuts *e e*, secured on the ends of said bolts. The upper edge or side of the removable or detachable hanger is provided with lugs or projections *f*, through which project the screw-bolts *g*, the upper ends of which bear against the lower surface of the bed-plate, and by means of which the removable hanger and the working parts attached to the same may be leveled and adjusted in relation to the bed-plate of the machine. The letter D represents a cam attached rigidly to the main driving-shaft D, and E an oscillating lever, pivoted upon a short stud, F, secured to the hanger C, and forming the fulcrum of said lever. G represents a friction-wheel secured to a stud upon the lever E in a plane just above the cam D, against which said wheel bears, and by means of which an upward motion is given to the lever as the driving-shaft is rotated, the downward or return motion of said lever being effected by means of a spiral spring, H, secured at one end to a pin, I, secured to the sleeve of said lever, which sets over the stud F, the other end being secured to the hanger C or lower frame of the machine. The letter K represents an adjustable pin or pawl, secured by means of a set-screw, L, within a slot on the lever E, and projecting to the rear of the same, and adapted to work in connection with a slotted rotating cylinder or pattern-cam, M.

The pattern cam or wheel M consists of a short cylinder or tube, secured rigidly to the sleeve or boss *o* of the ratchet-wheel O. The enlarged end or crown *m* of said cylinder is provided with slots, openings, or indentations *m'*, which may vary in number and position, according to the configuration of the intended or elected pattern. In the present instance, four of such slots are illustrated in the position required to give the feed-plate the proper intermittent rotary motion, in connection with the shifting-lever C^1 and crown-wheel, to form the patterns illustrated in Fig. 7 of the drawings. Other configurations of the pattern may be formed by substituting differently slotted or indented pattern-cams for the one shown, for which purpose the cam is made detachable in order that others may be substituted in its place, when desired. In the present case the pattern-cam is illustrated as deriving its rotary movement through the medium of a pawl, P, and ratchet-wheel O, in connection with a pawl-lever, R, and eccentric strap S, secured to an eccentric, T, on the driving-shaft B, but it is evident that any mechanical equivalent or mechanism may be employed in connection with said shaft, to impart proper rotary movement to the pattern-cam. The adjustable pin or pawl K, attached to the lever E, rests upon the periphery of the pattern wheel or cam, the oscillating motion of said lever being limited thereby, until the slots are brought below said pin or pawl, when the pawl drops through the slots, allowing the lever E to oscillate to its full extent, and upon its return movement operate the crown-wheel to the proper extent to rotate or partially rotate the dentated feed-plate, so as to change the line of motion of the fabric in order to form the desired figure or pattern of the stitches. The free end of the lever E is connected by means of a link, U, to an oscillating lever, V, swiveled or pivoted upon a boss or short sleeve upon the face of the crown-wheel W, and a portion of the screw-bolt Y, by which said lever and wheel are secured to the journal Z, or directly upon said journals. Said lever is provided with a pawl or dog, A^1, at its upper end, which engages with the ratchet-teeth B^1 upon the periphery of the crown-wheel W, the rear end of said pawl being bent upward and outward, so as to fall under the hooked end of a controlling-lever, C^1, which will be hereinafter fully described. Directly under the rear end of said lever is located a spring-bolt, G', which presses the pawl into the ratchet on the face of the crown-wheel W. The lever V is also provided with two sliding bolts or pawls, D' D', setting in recesses formed in the body of the same, which also contain spiral springs E' E', which, pressing against the shoulders on said pawls, force them toward the rear of said lever. Said pawls are set at different distances from the fulcrum of the lever, in order to adapt them to work into the two series of recesses F' F' formed on the front face of the crown-wheel W. Said recesses are beveled off at one side, or in a direction opposite to that in which the wheel travels, in order to allow the pawls to slip out of the same as the lever V is drawn backward. The crown-wheel W gears into a pinion-wheel, H', on the lower end of the feed-plate shaft O', and is adapted to move only in a forward direction, being prevented from any backward movement by means of a stationary spring-pawl, K', securely attached to the hanger C, the end of the same setting into the ratchet upon the periphery of the wheel.

The controlling-lever C^1 is swiveled or mounted loosely on the boss or sleeve of the wheel W, and is provided with apertures L′ L″ at such relative points that one or the other of the pawls or sliding bolts D D may be allowed to project through the same, and enter the recesses in the wheel, as may be desired, by shifting or changing the position of said lever. The upper end of said lever is also provided with a hook, which is adapted to set over the bent arm of the pawl A^1, and lift its other end out of the ratchet, when said lever is set so as to allow the outer pawl D′ to work into the outer series of recesses F′ on the face of the crown-wheel W, for the purpose to be hereinafter explained. The lower end of the lever C^1 is in the shape of a handle, by which it may be shifted, and near said end is a catch, M′, which engages in recesses N′ on the rear face of the lower end of the lever V, and confines it in position after shifting, the said lever C^1 being made sufficiently elastic to be easily sprung in and out of said recesses.

The crown-wheel W, as before stated, gears into a pinion-wheel, H′, secured to the lower end of a vertical shaft, O′, journaled in a bore or recess for the purpose, extending vertically through the hanger C, said shaft carrying the feed-plate R^2, which projects through an opening above through the plate of the machine. Said feed-plate is attached to the upper end of a spring-rod, R^1, which rests in a vertical slot in the shaft O′, being secured to said shaft at its lower end by means of a pin, or in any other convenient manner. Z^2 represents a spiral spring surrounding the lower end of the shaft O′, and bearing against the upper face of the pinion-wheel H′, and fitting in an enlarged recess in the lower end of the vertical bore.

Z^1 represents a lever pivoted at one end to a screw-bolt, secured to the lever T^1, and extending across the machine parallel with the said lever T^1, and a little below the same. The front end of said lever Z^1 is bent upward, and rests upon a cam, A^2, attached to the driving-shaft B, and at its center it is enlarged or extended to one side, said enlarged or extended portion falling directly under the end of the shaft W′, where it is provided with a set-screw, B^2, by means of which vertical play of said shaft may be adjusted, and the throw of the feed-plate regulated. Around the shaft W′ is secured a spiral spring, C^2, the lower end of which rests upon a shoulder formed upon said shaft for the purpose, the upper end bearing against a shoulder in the recess formed in the shaft O′, said spring serving to keep the shaft W′ pressed downward. The lever T^1 extends over the driving-shaft, and is operated by means of a cam, T^2, thereon.

Having fully described the various parts of my invention, I will now proceed to describe its operation.

When the machine is put in motion, the driving-shaft B, by rotating the cam D, imparts an oscillatory motion to the lever E, the extent of which will depend upon the adjustment of the pin L, and the position of the slotted pattern-wheel or cylinder M. The lever E at each oscillation will impart a corresponding oscillatory movement to the lever V, causing the pawl A^1 to advance the wheel W the extent of one or more teeth, according to the position in which the adjustable pin I is set. This movement rotates the feed-plate slightly at each stitch, and, together with the reciprocating motion imparted to said plate, advances the work diagonally across the bed-plate of the machine.

While this operation is taking place, the slotted wheel or cylinder M is advanced at each revolution of the shaft B, through the medium of the eccentric on said shaft, and the oscillating lever R attached thereto, moving the pawl P and ratchet O, secured to the end of said cylinder, until one of the slots in the cylinder falls under the pin L, when said pin drops through the slot, allowing the lever E to move backward to its full extent, when one of the pawls D′ will enter the next backward recess F′, and upon the return movement of the lever carry the wheel W forward independently of the pawl A^1, rotating the feed-plate to such an extent as to properly change the direction of the stitches for the succeeding portion of the design.

The design, of course, will be varied by the relative distances apart of the slots in the pattern-wheel and by the number of slots formed in the same. In order, however, further to vary the character of the design or figure of the stitches, provision is made by means of the controlling-lever C^1 for throwing the pawl A^1 and the pawl or sliding bolt D′, which works in the inner series of recesses F′, out of gear, and at the same time throwing the outer pawl D′ into gear with the outer series of recesses F′. This is accomplished by shifting the lever C^1 so that its hooked end will depress the rear or bent end of the pawl A^1, and at the same time change the positions of the apertures L′ L″ so as to interpose a solid portion of said plate between the inner pawl D′ and the inner series of recesses F′, and allow the outer pawl to work into the outer series. When the parts are in this position the pawl A^1 will cease to act, and the intermittent rotary motion will be accomplished by the action of the lever E only when the pin L drops through the slots in the pattern-wheel. The wheel W in this latter case will receive no gradual forward movement, as the pawl A^1 does not act, and, consequently, the feed-plate will be operated in one direction only at the successive stitches, being only rotated periodically after sewing a straight row of stitches, when it is necessary to change the direction in which the cloth is to be moved.

It will be evident from the foregoing description that by changing the number and relative positions of the slots in the pattern-wheel that the character of the design formed

by the stitches may be indefinitely varied, and for this reason I prefer to make said said pattern-wheel easily detachable, in order that it may be removed and others substituted in its place.

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

1. The improved pattern wheel or cam, consisting of a rotating cylinder provided with slots, openings, or indentations at one end, in combination with the driving-shaft and levers which operate the crown-wheel, which gives motion to the feed-plate, substantially as described, whereby an intermittent rotary motion is imparted to the feed-plate at proper intervals to change the direction in which the fabric is moved, to form the desired configuration of the stitches.

2. The combination of the slotted rotating pattern wheel or cam, the oscillating lever operated by a cam on the driving-shaft, and a pin, pawl, or projection, adapted to drop through the slots on the pattern-cam as they are successively presented, and allow the lever to move to its full extent for the purpose of rotating the crown-wheel, and thus change the line of motion of the feed-plate.

3. The combination, substantially as herein described, of the cam D, attached to the driving-shaft, the lever E, carrying the adjustable pin K, the pattern-wheel M, operated by a pawl and ratchet, and eccentric, secured to the driving-wheel, the lever V connected to the lever E, and carrying the pawls A^1 and D′ D′, the controlling-lever C^1, and the ratcheted and recessed crown-wheel W gearing into the pinion of the feed-wheel shaft, all arranged to operate substantially as herein set forth.

4. The combination, substantially as herein set forth, of a cam attached to the driving-shaft, an oscillating lever, operated by said cam and secured by means of a link at its end to an auxiliary lever mounted upon a short journal or stud, secured to the lower part of the machine, the crown-wheel formed with ratchet-teeth on its periphery, operated by said pawl, and a pinion-wheel, into which gears the said crown-wheel, for the purpose of imparting an intermittent rotary motion to the dentated feed-plate, substantially as described.

5. The combination, substantially as herein set forth, of the oscillating lever, operated by a cam on the driving-shaft, and carrying an adjustable pin, the slotted pattern-wheel operated by a ratchet and pawl, which derives its motion from a cam on the driving-shaft, and the oscillating pawl-lever and crown-wheel, mounted on a common journal, said pawl-lever being provided with sliding spring bolts or pawls adapted to work into recesses on the face of the wheel and impart an intermittent rotary motion to the same, substantially as and for the purpose set forth.

6. In combination, with said pawl-lever, provided with sliding spring bolts or pawls and the recessed crown-wheel gearing into the pinion-wheel on the feed-plate shaft, a regulating lever for throwing the pawl and sliding bolts and pawls into and out of gear with the crown-wheel for the purpose of varying the motion of the same to change the pattern of the stitches, substantially as described.

7. The combination, with the driving-shaft and levers E V, and crown-wheel W, operated as described, the driving-shaft O′ carrying the feed-plate and its attachments with the levers for imparting a vertical and horizontal reciprocating motion to the feed-plate, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand in the presence of the subscribing witnesses.

CYRUS S. CUSHMAN.

Witnesses:

JAMES L. NORRIS,

JOS. L. COOMBS.