

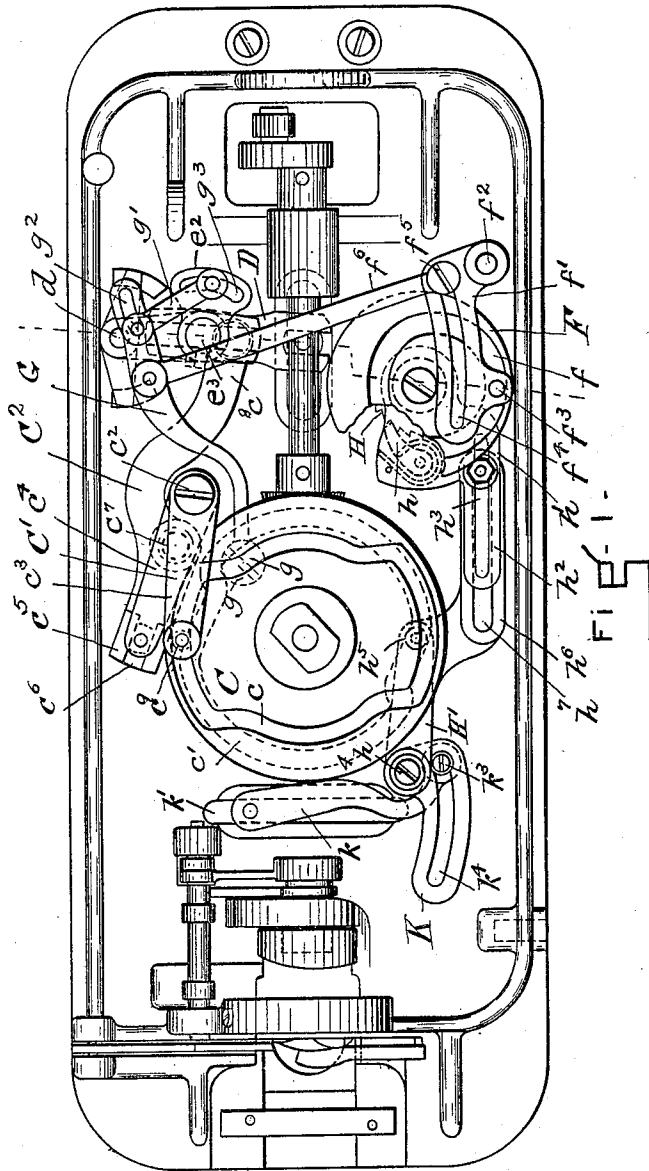
(No Model.)

5 Sheets—Sheet 1.

A. O. TOWNS & T. BARRETT.
FEEDING MECHANISM FOR SEWING MACHINES.

No. 583,422.

Patented May 25, 1897.



WITNESSES

J. W. Dolan.
E. L. Ford

INVENTORS.

Albert O. Towne
Thomas Barrett
by Louis Allen
J. H. Raymond

(No Model.)

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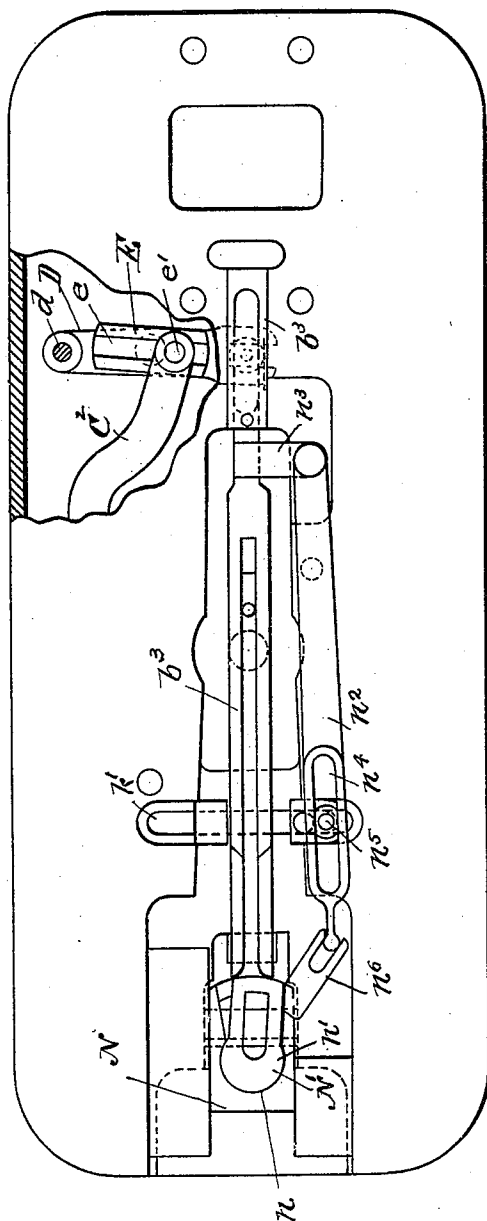


FIG. 2.

WITNESSES.

J. M. Dolan.
E. L. Ford

INVENTORS

Albert O. Towne
Thomas Barrett
by A. S. Atty
T. F. Raymond

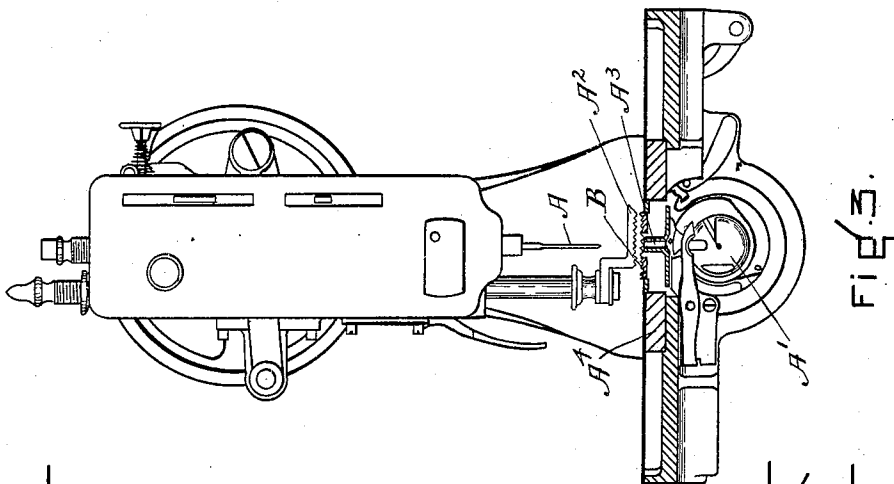
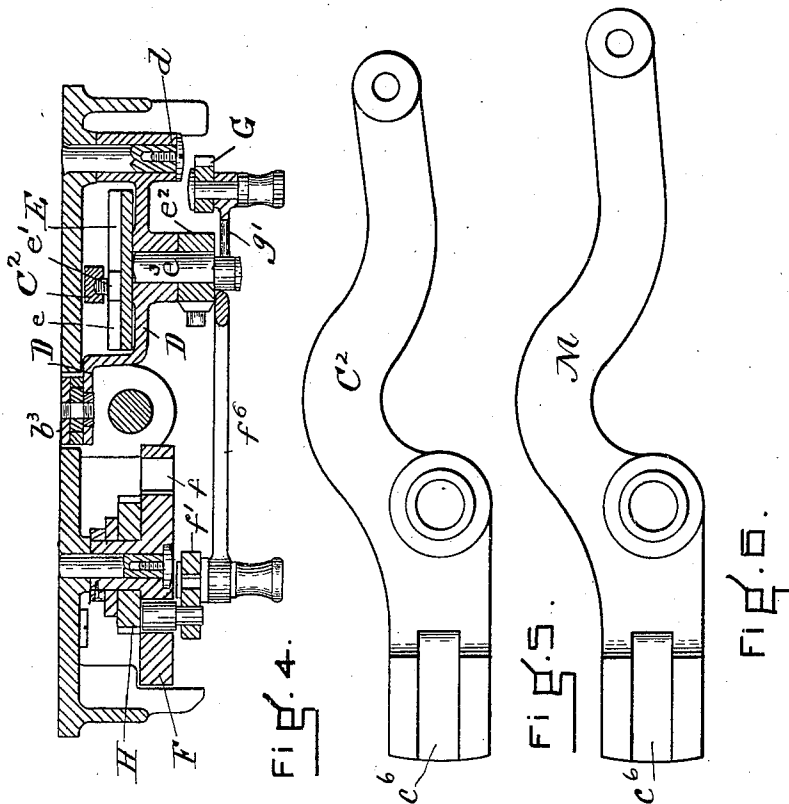
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WITNESSES.
J. W. Deane.
E. L. Ford

INVENTORS
Albert O. Towne
Thomas Barrett
by their atty
J. F. Raymond

(No Model.)

5 Sheets—Sheet 4.

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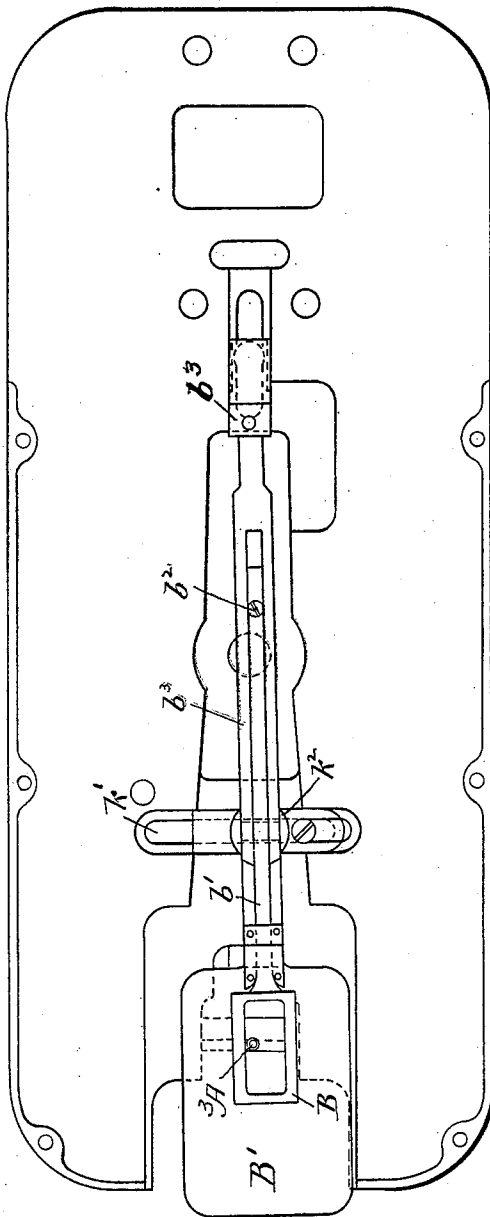


Fig. 7.

WITNESSES.

J. W. Dolan.
C. L. Ford

INVENTORS

Albert O. Towns
Thomas Barrett
by their atty-
D. F. Raymond

(No Model.)

5 Sheets—Sheet 5.

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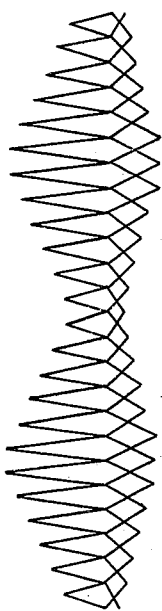


FIG. 11.

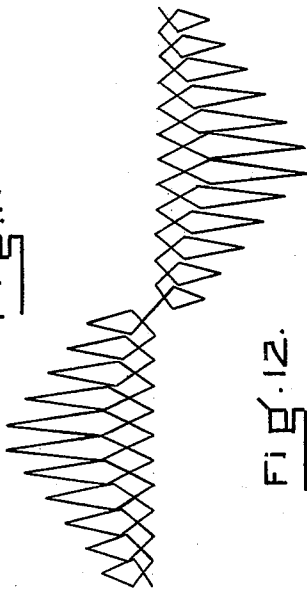


FIG. 12.

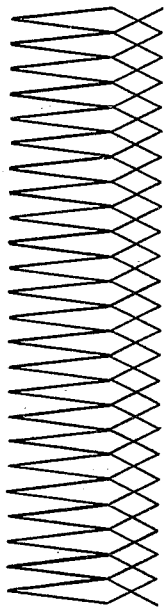


FIG. 8.

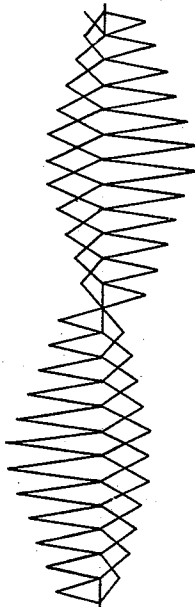


FIG. 9.

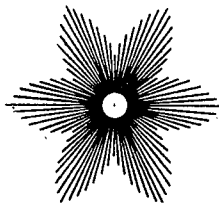


FIG. 17.



FIG. 18.

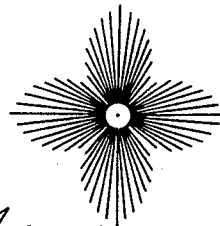


FIG. 15.

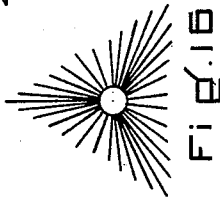
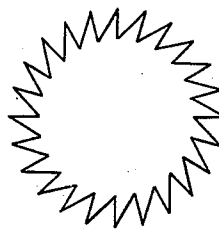


FIG. 16.

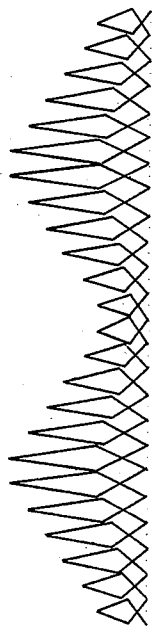


FIG. 10.



FIG. 14.

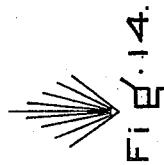


FIG. 15.

WITNESSES.

J. H. Dalton.
E. L. Ford

INVENTORS.

Albert O. Towns
Thomas Barrett
by their atty
F. F. Raymond

UNITED STATES PATENT OFFICE.

ALBERT O. TOWNS, OF HUDSON, NEW HAMPSHIRE, AND THOMAS BARRETT, OF BOSTON, MASSACHUSETTS; SAID BARRETT ASSIGNOR TO SAID TOWNS.

FEEDING MECHANISM FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 583,422, dated May 25, 1897.

Application filed June 13, 1895. Serial No. 552,662. (No model.)

To all whom it may concern:

Be it known that we, ALBERT O. TOWNS, of Hudson, in the county of Hillsborough and State of New Hampshire, and THOMAS BARRETT, of Boston, in the county of Suffolk and State of Massachusetts, citizens of the United States, have invented a new and useful Improvement in Sewing-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The improvement is based upon the Patent No. 519,676, dated May 8, 1894, granted John Thomas Jones, and relates especially to means whereby its range in the way of fancy or ornamental stitching is very much increased, and also whereby it is made applicable to the kind of stitching known as "budding." The stitch-forming mechanism of the said Jones machine is of the style known as the "Standard," and while we prefer to use this type, still we would not be understood as limiting our invention to a machine which employs it, as our invention is adapted to be used in connection with any of the well-known stitch-making appliances of the market. The invention of said patent comprised a stitch-forming mechanism and a variable feeding device or mechanism of a special type, the action of which was controlled by two cam-grooves in a cam-disk and intermediate mechanism connecting them with parts of feeding devices and whereby the feed-dog was provided with variable movements in relation to the throat of the machine. The range of the feeding movements thus imparted to the dog was limited, and while it was possible to obtain with such mechanism a variety of patterns they were all substantially restricted in that they were always made of a small number of stitches which constantly repeated themselves in succession of two, three, or four, and in that way they were always sewed upon the same line—that is, there was no provision for change or adjustment in the said mechanism to permit the machine to sew, for instance, a design made up of a relatively large number of stitches varying in length and also in arrangement as to a given

line of feed—that is, upon one side of the said line or upon the other side of said line or across said line—and there was also in said mechanism no provision by which the machine could stitch a bud or design, the stitches of which radiate from a center or circle and may vary as to length; and our present invention relates to means whereby the inflexibility, so to speak, of said variable feed of said patent is made flexible or variable—that is, it introduces a secondary mechanism for varying the variable performance of patented mechanism, as well as means whereby the mechanism can stitch that type or ornamental stitching known as "budding," meaning an embroidering or fancy stitching arranged to radiate from a center or from a circle, as contrasted with ordinary ornamental stitching, which is generally straightaway. For the straightaway stitching the feed-dog must act to advance the fabric as a whole in relation to the throat, as well as to provide it with the other movements necessary for forming the pattern. In budding the corresponding movement is not an advancing movement of the entire fabric, but is a turning movement of the entire fabric upon some center, and therefore the feed-dog for this type of stitching is not like that for straightaway work, and these distinctions will be made more obvious in connection with the specific description of the construction of the mechanism; and the present invention not only consists in the addition of devices for increasing the variable-ness of the Jones mechanism and for providing for the stitching of the budding-stitch, but it also embodies certain changes and variations in the mechanism connecting the feed cam-grooves with the feed-dogs, which variations will be hereinafter described.

Referring to the drawings, Figure 1 is a view in plan of the machine inverted. Fig. 2 is a view in plan of the bed of the machine and the parts mounted thereon, the work-plate being removed and a portion of the bed being broken out to show a part of the feed-operating mechanism below it. Fig. 3 is a view in elevation of the head of the machine and in vertical section upon a line taken through the throat of parts below the work-

plate. Fig. 4 is a view in vertical cross-section upon the dotted line of Fig. 1. Fig. 5 is a view in plan of a feed-lever which is employed in actuating the budding-feed. Fig. 6 is a plan view of a lever used in actuating the straightaway feed. Fig. 7 is a view in plan of the bed of the machine and parts carried thereon, the work-plate being removed and the feed-dog shown being the one used for straightaway feeding. Figs. 8, 9, 10, 11, and 12 are representations of ornamental stitching to show the range of the invention in straightaway variable stitching; and Figs. 13, 14, 15, 16, 17, and 18 are illustrations of budding, showing some of the possibilities of the invention in stitching patterns of that character.

It is unnecessary to but briefly refer to the stitch-forming devices, as their construction, organization, and operation are well known.

A is a reciprocating eye-pointed needle.

A' is a rotary shuttle.

A² is the presser-foot.

A³ is the throat of the machine.

A⁴ is the work-plate, and B the feed-dog.

The throat A³ and the feed-dog B are given rising and falling movements for the same purpose and in substantially the same way as are the like parts of the said invention of Patent No. 519,676; and for straightaway stitching the feed-dog B is surrounded by a thin flat plate B', in which it is vertically movable and which is otherwise moved with the dog. The dog, however, for reasons which will appear, is longer than the feed-dog of said patent and has an opening of about twice the length of the opening of the dog of said patent. This is for the purpose of permitting the dog to be so changed in its position in relation to the throat A³ that it may feed the material from either side of a straight line, having the center of the throat as a base-line or line from which the pattern extends, as well as across it, (see Fig. 12, where one part of the pattern is represented as stitched upon one side of such a base-line, while the other portion of the pattern is stitched upon the other side of such line.) The feed-dog B of Fig. 7 is mounted at the end of a spring-arm b', attached at its inner end b² to the feed-dog slide b³. It will be understood that in this instance the feed-dog slide comprises the piece at the inner end, which is a slide and an extension pivoted to its front end to swing or be movable laterally. The plate B' is attached to the feed-dog slide, and the feed-dog slide is provided with its compound feeding movements by means of the cam-grooves c and c' in the cam-disk C. This cam-disk is substantially like that described in our application, filed July 2, 1894, Serial No. 518,214. Its grooves or cam-tracks are connected with the slide in the following way: The cam-groove c, which provides the transverse movement to the feed-slide and feed-dog, is connected with it by means of a two-armed lever C', pivoted at c², and the arm c³ of which carries

at its end a cam-roll c⁹, which enters the cam-groove c, and the arm c⁴ of which lever engages, by means of a slide-block, the end c⁵ of the feed-lever C², the slide-block upon the arm c⁴ playing in a slideway c⁶ in said lever. The feed-lever C² is pivoted at c⁷, and its end c⁸ is connected with the feed-slide b³ by means of a lever D, pivoted to the bed at d and having a forked moving end into which a pin extending from the rear end of the slide enters. The feed-lever C² is connected with the lever D by means of a swiveling block E, (see Fig. 2,) the said block being attached to said lever to be carried thereby and having in its under surface a long recess or slideway e, in which a slide block or pin e' at the end of the lever C² enters and slides or moves. This swiveling block is attached to the lever D in a manner to permit it to be turned thereon so as to vary the angle of the slideway e in relation to the length of the lever, and it is through the introduction of this instrumentality and the devices which coöperate with it that the increased range of the feeding mechanism is largely obtained.

There is embodied in the machine mechanism for controlling or varying the angle of the slideway of this swiveling block from a position in which no movement would be imparted to the lever D, and consequently the slide b³ and the feed-dog, to one that would give it the range of movement necessary for stitching the longest stitch required for any pattern, and its position may be so changed as to cause the stitching to be entirely upon one side of the throat or upon the opposite side of the throat or to cross the throat or to occupy any position within the extreme range of movement which it is adapted to give the feed-dog. This change in position works a corresponding change in the operative track of the feed-dog, and the position of the slideway is automatically varied to any desired extent in order that the length of movement of the feed-dog may be automatically varied and changed to enable it to feed the material for the presentation of the work in stitching to any pattern or design desired. This automatic controlling and movement of this swiveling block is accomplished by means of a cam-disk F, having a cam-groove f of any desired configuration, which disk is adapted generally to be very slowly rotated as compared with the rotation of the cam-disk C. The speed, however, may be varied at will. The cam-groove f defines the nature of the pattern or design to a large extent, and it communicates movement to the swiveling block by means of a lever f', pivoted at f², having a cam-pin f³, which enters the cam-groove f, and a curved slot f⁴ of considerable length, extending lengthwise the lever and in which the end f⁵ of a connecting rod or bar f⁶, connecting it indirectly with the swiveling block, is adjustable. The said end of the connecting-bar is connected with the lever by a clamping pin or stud which enters the said

slot and which with a head and a washer and clamping-screw of the usual construction provides means by which the end of the bar may be secured to the lever at any point within the length of the slot. It will of course be understood that this provides an adjustment whereby variations in the throw of the thing operated by the said lever f' , which is in this case the said swiveling block, is varied from zero to the greatest limit. The connecting-bar f^6 extends to and is connected with a lever G, which is pivoted at its end g and has attached to its outer end a short connecting-bar g' , connecting it with a lever or arm e^2 , rigidly attached to the pivot or stud e^3 , which forms the center upon which the swiveling block E turns, the pivot or stud extending from the said swiveling block through a hole in the lever D and having the lever or plate e^2 attached to it upon the under side of said lever.

For the purposes of varying the throw or movement of the swiveling block and for adjusting its position the end of the connecting-rod g' is made adjustable in the curved slot g^2 at the end of the lever G, and its opposite end is also made similarly adjustable in the curved slot g^3 in the plate e^2 , and the ends of the said connecting-rod are secured to their respective levers in any desired position by suitable clamping devices which will permit of their adjustment in the slots and their fastening to the levers in their adjusted positions. It will thus be seen how the cam groove or track f controls the movement of the swiveling block, and how the extent or range of its movements may be infinitely varied, and how these movements are made to take place automatically during the stitching of the design or pattern. The feed-dog having been first set to provide any desired movement in any desired field in relation to the throat of the machine is then by the cam f moved in said field to provide any variety or form of stitch for the design, and therefore of any type of design which the cam-groove f , or any cam substituted therefor, is adapted to give and in all the forms which the variations in adjustments make possible. It will be understood that the cam-disk F is removable and that a cam-disk having any other cam or cam-groove may be substituted. We prefer that the cam-disk be rotated intermittently by a ratchet-wheel H, attached to it (see Fig. 1) and having any number of teeth, and a pawl h , which engages the teeth in successive order and intermittently turns the ratchet-wheel and the cam. This pawl is carried by a lever h' , which is pivoted on the stud carrying the cam and ratchet-wheel and has an extension h^2 , provided with a slot h^3 . Movement is communicated to this lever h' from the cam-groove c' of the cam-disk C through the lever H', which is pivoted at h^4 and has a cam-pin h^5 , which enters the cam-groove c' , and an extension h^6 , which has a slot h^7 , the said ex-

tension and slot being over the extension and slot h^2 h^3 , respectively, of the pawl-lever h' , so that the two lever extensions h^2 and h^6 may be connected with each other by an adjustable pin, the pin extending through both slots and being adjustable lengthwise, both to effect a variation or change in the throw of the pawl h when desired. The movement of the pin toward the outer end of the slot h^3 decreases the throw, while its movement in the other direction increases the throw. An extension K from the said lever H communicates the feeding movement to the feed-dog B, it being connected with the slide b^3 , actuating said feed-dog, by means of a connecting-bar k and a slide k' . (See Fig. 7.) The said slide has extending across it a recess k^2 , in which the slide b^3 is movable. This recess may be circular in shape and may hold a circular block for the reception of the slide. We would say at this point that the part b^3 is made in two sections, one being fitted in the bed to slide only and the other being pivoted to the first so that it may be swung or oscillated at desired intervals by the slide k' , operated from the cam c' . The extent of this sliding movement of the slide k' may be varied, without disconnecting the cam c' , from a position of rest to its greatest throw by making the connection between the end k^3 of the connecting-bar adjustable in the extension K of the lever H', and this adjustment is obtained by providing the extension with the curved slot k^4 , in which a pin at the end k^3 of the connecting-bar is adapted to be moved, and which pin is adapted to be secured to the lever at any point in the length of the slot.

Thus far we have described the machine as adapted to stitch the straightaway designs or patterns of Figs. 8 to 12, inclusive, or any other straightaway designs or patterns, and when so used the lever represented in Fig. 5 will form a part of the mechanism; but before proceeding with our description of the budding mechanism, or, rather, the variations necessary for adapting the machine to stitch this form of design, we wish to say that one essential element of the invention is the shape of the levers and connecting parts and the relation which the pivotal points of these various devices bear to each other, as it is by these means that the range and flexibility of the invention is largely achieved; and it is for this reason that for adapting it for the budding-stitch we prefer to substitute for the feed-lever C² (represented in Figs. 1 and 5) the budding feed-lever M of Fig. 6. This lever is adapted to be slipped on the same fulcrum or pivot and to have the same connections with the arm c^4 of the lever C' and with the slideway of the swiveling block E, but the variation in the shape of the lever brings the connection with the slideway at the center of the swiveling block instead of in advance of said center. In stitching the budding-stitch the material is fed upon a circle or arc of a circle or upon a center and the

stitch extends from the center or circle or are outwardly; and by so adjusting the end of the budding-lever in relation to the swiveling block certain advantages in the forming of the budding-stitch in connection with the other instrumentalities are obtained. Not only is it desirable to use this different form of lever, but the feed-dog for the budding-feed varies from the straightaway feed-dog in these respects: First, it is carried in a slide-plate which has an up-and-down movement and is connected with the slide b^3 to be moved back and forth in relation to the throat; second, this plate is recessed to receive the feed-dog, the feed-dog being shaped to be swung or moved on a center in said plate which is at one side of the throat, an oscillating movement being imparted to the dog by practically the same mechanism as is employed for moving the dog bodily in the straightaway-design stitching. In Fig. 2 we have shown this construction. N is the slide-plate which has the rising-and-falling movement and is moved backward and forward in respect to the throat by the slide b^3 . N' is the budding feed-dog, mounted on said plate, the plate N having the curved section n to receive the curved end n' of the dog and also being cut away to permit the dog to be oscillated, the oscillating movement upon its center being provided by means of the slide k' , which is not connected with the slide b^3 to oscillate it, but extends under it and is connected with the lever n^2 to oscillate it. The said lever moves back and forth with the slide b^3 , being connected thereto by the extension n^3 , to the outer end of which the lever is pivoted, and the connection between the slide k' and the lever n^2 is such as to permit its back-and-forth movement, the connection being by means of a slot n^4 , into which the connecting-pin n^5 extends and loosely fits. The end of the lever n^2 is connected with the feed-dog by the arm n^6 , extending from the dog. There is thus provided the feed-dog, by substantially the same mechanism already described, movements by which it is adapted to feed the material in the necessary directions in relation to the throat, and stitching mechanism for stitching any type or design of budding-stitch.

The operation of the machine and the effect of the adjustments have been described in connection with the description of the various parts.

It will be observed that the cam C, with its cam-tracks c c' , is the instrumentality which directly provides the feeding-dog with its feeding movements, whether for straight-away stitching or for budding, according to the connections between the slide b^3 and the dog and the character of the dog used. It will also be seen that the swiveling block E may be changed in position by varying the length of the feed-lever c^2 or its shape, and it will also be seen that the position of the swiveling block in relation to the lever D may

be kept constant or may be varied in respect thereto by the actuating and adjusting devices connected therewith.

As heretofore stated, the feed-dog B has rising-and-falling movements imparted to it in the same manner as shown in Patent No. 519,676, heretofore referred to, and the feed-dog N' has likewise rising-and-falling movements imparted to it by this same mechanism through the plate N. The feed-dog B has also, in addition to its rising-and-falling movements, work-advancing movements transverse to the work-plate and lateral movements lengthwise of the work-plate to form the lateral or ornamental stitches, these work-advancing and lateral movements being imparted thereto in substantially the same manner as described in said Patent No. 519,676. The feed-dog N' has also work-advancing movements, although these movements are in the arc of a circle instead of being directly transverse to the bed-plate, and these circular work-advancing movements are imparted to the said feed-dog N' from the same device, to wit: the slide k' , by which the work-advancing movements are imparted to the feed-dog B. It may therefore be stated that in either form of our invention hereinbefore described the feed-dog is what is known as a "six-motioned" feed-dog, in that it has lateral movements in addition to its back-and-forth or work-advancing movements and its rising-and-falling movements. The gist of our present invention, as distinguished from what is shown by the patent to Jones, No. 519,676, hereinbefore referred to, consists in the addition to the mechanism for imparting the six-motion movements to the feed-dog, as in the said patent, of an automatic mechanism for varying the lengths of the lateral stitches, as also in the means by which the work is fed in a circular path, for budding, by the oscillating feed-dog N'. This mechanism for automatically varying the lengths of the lateral stitches is operated by what may be termed a "secondary" feed-cam or pattern-cam F, the lateral stitches, *per se*, being produced by the lateral movements of the feed-dog imparted to the latter from the cam-groove c of the primary feed-cam C through the connections hereinbefore described. It will thus be seen that we have combined with the six-motion feeding mechanism of the Jones patent means for automatically varying the lengths of the lateral movements of the feed-dog, and also means for varying the feeding mechanism of the said patent in such a manner as to permit the work to be fed in a circular path to form radial stitches either of uniform or of varying lengths.

Having thus fully described our invention, we claim and desire to secure by Letters Patent of the United States—

1. In a sewing-machine, the combination with a stitch-forming mechanism, of a feed-dog, the horizontal feed-cam C, intermediate

connections arranged beneath the work-plate of the machine between said cam and feed-dog whereby work-advancing and lateral movements are imparted to the latter, a rotating cam F, also arranged beneath the work-plate of the machine, and devices whereby said cam F is joined with said intermediate connections, to automatically vary the lengths of the lateral feeding movements of said feed-dog.

2. In a sewing-machine, the combination with a stitch-forming mechanism, of a feed-dog, a feed-cam C, connections between said cam and feed-dog whereby work-advancing movements are imparted to the latter, a feed-lever, as C², operatively connected with said cam to be vibrated thereby, a vibrating lever D operatively connected with said feed-dog to impart lateral movements thereto, a swiveling block E provided with a slideway and serving as a connection between said levers C² and D, and means for automatically varying the position of said block and thereby changing the angle of inclination of said slideway to vary the lengths of the lateral movements of the said feed-dog to make longer or shorter lateral stitches.

3. In a sewing-machine, the combination with a stitch-forming mechanism, of a feed-dog, a feed-cam C, connections between said cam and feed-dog whereby work-advancing movements are imparted to the latter, a feed-lever, as C², operatively connected with said cam to be vibrated thereby, a vibrating lever D operatively connected with said feed-dog to impart lateral movements thereto, a swiveling block E provided with a slideway and serving as a connection between said levers C² and D, a rotating cam F, a lever f' vibrated by said cam, and connections between said lever f' and said swiveling block whereby the position of the latter may be automatically varied while the machine is in operation.

4. In a sewing-machine, the combination with a stitch-forming mechanism, of a feed-dog, a feed-cam C, connections between said cam and feed-dog whereby work-advancing movements are imparted to the latter, a feed-lever, as C², operatively connected with said cam to be vibrated thereby, a vibrating lever D operatively connected with said feed-dog to impart lateral movements thereto, a swiveling block E provided with a slideway and serving as a connection between said levers C² and D, an intermittingly-rotating cam F, a lever f' vibrated by said cam, the lever G, the connecting-rod f⁶ joining said levers G and f', and connections between said lever G and said swiveling block whereby the position of the latter may be automatically varied while the machine is in operation.

5. In a sewing-machine, the combination with a stitch-forming mechanism of a rising-and-falling feed-dog, the cam C provided with the cam-tracks c and c', the lever H' connected with said cam-track c', and also with

said feed-dog, to impart work-advancing movements to the latter, a feed-lever, as C², the two-armed lever c³, c⁴ connecting said cam-track c with said feed-lever, the vibrating lever D operatively connected with said feed-dog to impart lateral movements thereto, the swiveling block E provided with a slideway e, a slide, as e', fitting in said slideway and operated by said feed-lever and serving, through said swiveling block, to impart vibrating movements to said lever D, the intermittingly-rotating cam F operatively connected with said cam-groove c', the lever f' vibrated by said cam F, the lever G, the connecting-rod f⁶ joining said levers G and f' and the connecting-rod g' adjustably connected with the said lever G and to said swiveling block to enable the position of the latter to be changed.

6. In a sewing-machine, the combination with a stitch-forming mechanism, of a feed-dog and means for imparting six-motion feeding movements thereto, automatic means for varying the lateral position of the said feed-dog, so that it will perform its lateral movements on one side or the other of the line of the needle, and means for automatically varying the lengths of the lateral movements of the said feed-dog to form side or depth stitches of different lengths.

7. In a sewing-machine, the combination with a stitch-forming mechanism, of a rising-and-falling feed-dog, the feed-cam C having the cam-tracks c and c', a feed-lever, as C², operatively connected with said cam, connections between said feed-lever and the feed-dog, the pattern-cam F, means for connecting said pattern-cam F and feed-dog whereby the lateral movements of the latter are varied, the ratchet-wheel H for operating said pattern-cam, the lever h' for operating said ratchet-wheel, the feed-pawl h carried by said lever h', the lever H' pivoted to the bed-plate and operatively connected with said cam C, slotted extensions on said levers H' and h', and means for adjustably connecting said extensions to vary the throw of the feed-pawl h.

8. In a sewing-machine, the combination with a stitch-forming mechanism, of a rising-and-falling feed-dog, the feed-cam C having the cam-tracks c and c', a feed-lever, as C², operatively connected with said cam, connections between said feed-lever C² and the feed-dog, the pattern-cam F, means for connecting said pattern-cam and feed-dog whereby the lateral movements of the latter are varied, the ratchet-wheel H, carried by said pattern-cam, the lever h' for operating said ratchet-wheel, the feed-pawl h carried by said lever h', the lever H' pivoted to the bed-plate and operatively connected with said cam C, slotted extensions on said levers H' and h', means for adjustably connecting said extensions to vary the throw of the feed-pawl, the lever K pivoted to the bed-plate and connected with said lever H', said lever K having the slot k⁴, the slide k', the connecting-

bar k adjustably mounted in said slot k^4 and joining said lever K and slide k' , said slide k' being connected with said feed-dog to impart work-advancing movements to the latter.

5 9. In a sewing-machine, the combination with a stitch-forming mechanism, of a rising-and-falling feed-dog, a rotating cam, connections between said cam and feed-dog to impart lateral movements to the latter, means
10 for giving said feed-dog an oscillating movement in an arc of a circle, and a pattern-cam and connections for automatically varying the lateral movements of said feed-dog.

10. In a sewing-machine, the combination
15 with a stitch-forming mechanism, of a rising-and-falling feed-dog oscillating in the arc of a circle, a primary cam and connections for imparting lateral movements to said feed-dog, a secondary or pattern cam for automatically
20 varying the lateral movements of said feed-dog, and connections between said feed-dog and primary cam to impart oscillating movements to said feed-dog.

11. In a sewing-machine, the combination
25 with a stitch-forming mechanism, of the slide b^3 , the plate N reciprocated thereby, a primary cam and connections for operating said slide

and plate to effect lateral feeding movements, the oscillating and rising-and-falling feed-dog N' carried by said plate N , the lever n^2 30 reciprocated by said slide b^3 , and connections between said lever n^2 and primary cam whereby oscillating movements are given said feed-dog N' .

12. In a sewing-machine, the combination 35 with a stitch-forming mechanism, of a rising-and-falling feed-dog, means for imparting lateral movements to said feed-dog, and automatic mechanism for giving oscillating movements to said dog to feed the fabric in a cir- 40 cular path.

13. In a sewing-machine, the combination with a stitch-forming mechanism, of a rising-and-falling feed-dog, means for imparting lateral movements to said feed-dog, a pattern- 45 cam and connections for automatically varying said lateral movements, and mechanism for giving oscillating movements to said dog to feed the fabric in a circular path.

ALBERT O. TOWNS.
THOMAS BARRETT.

In presence of—

F. F. RAYMOND, 2d,
J. M. DOLAN.