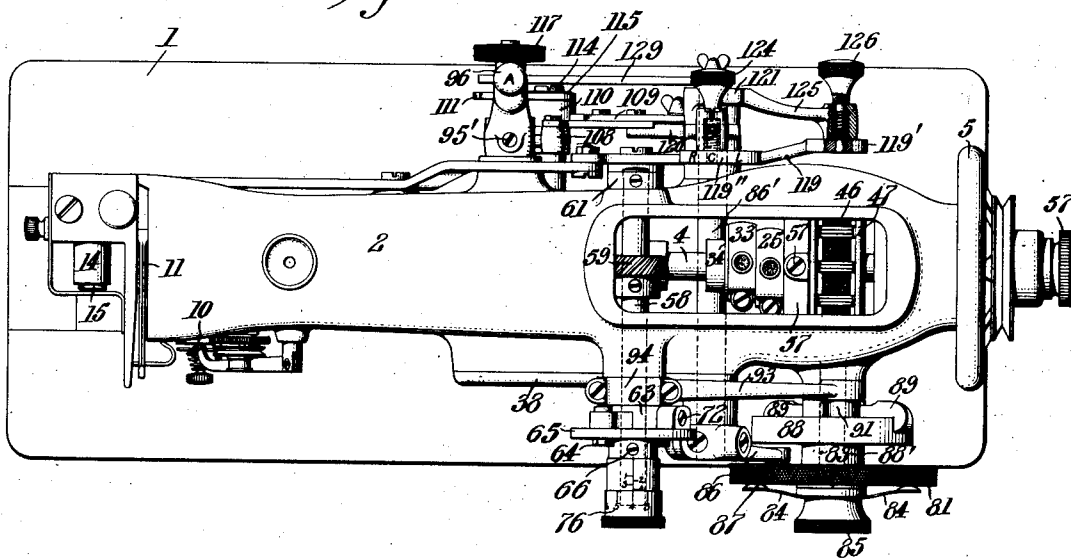


1,338,074.

6 SHEETS—SHEET 1.



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EMBROIDERY SEWING MACHINE.
APPLICATION FILED MAY 24, 1916.

1,338,074.

Patented Apr. 27, 1920.

6 SHEETS—SHEET 2.

Fig. 3.

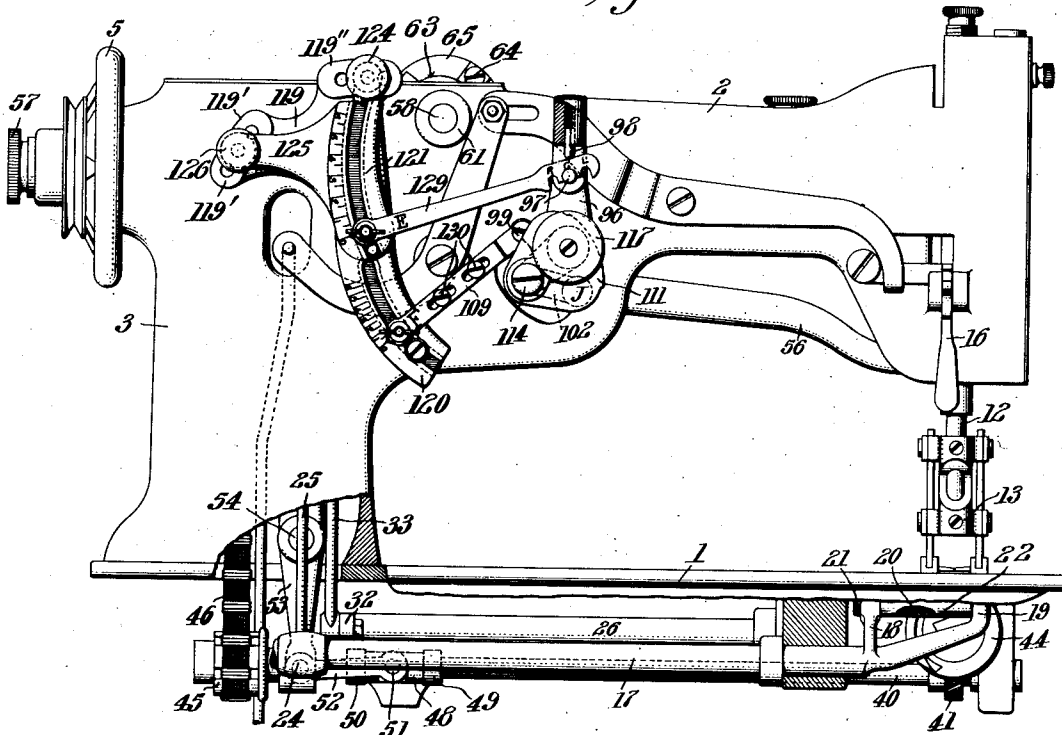


Fig. 8.

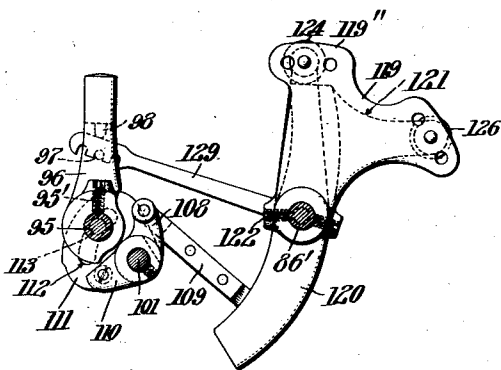
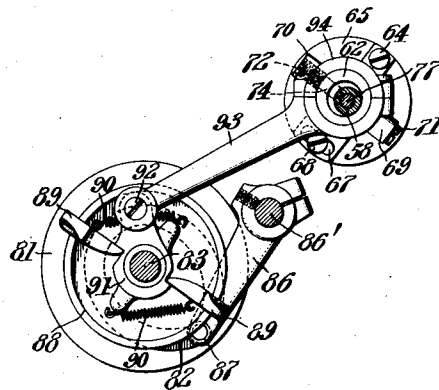


Fig. 9.



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6 SHEETS—SHEET 3.

Fig. 4

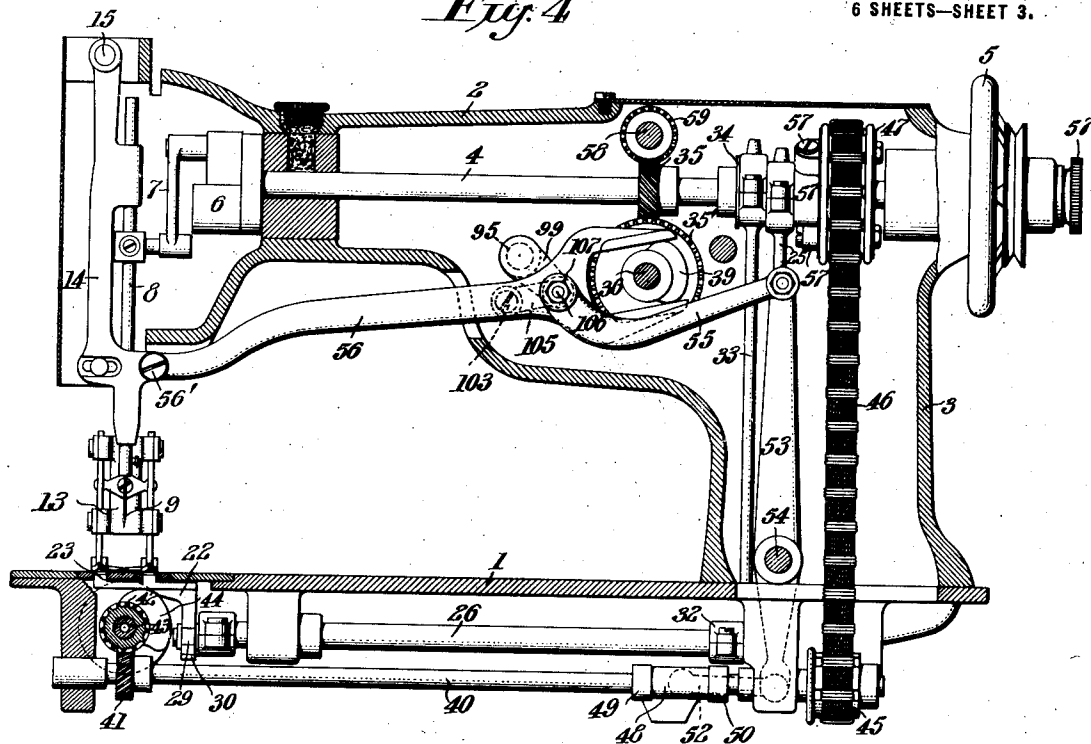
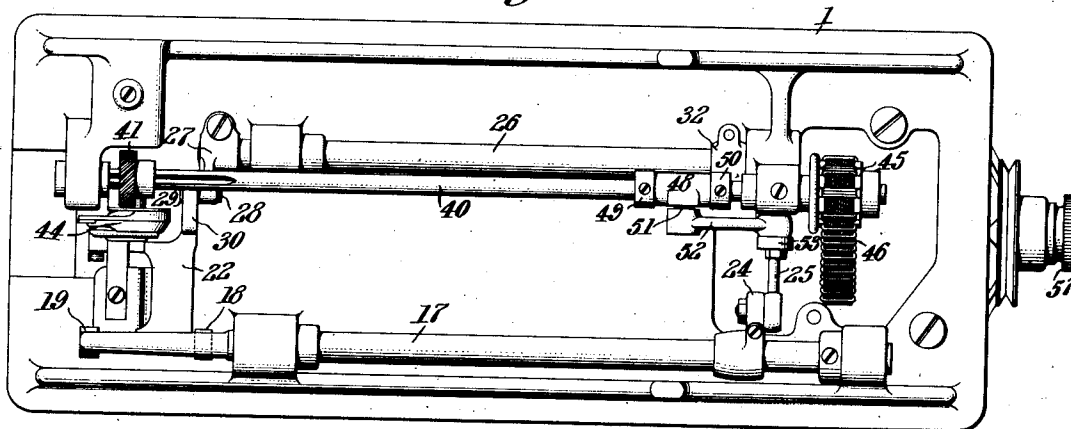


Fig. 6



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6 SHEETS—SHEET 4.

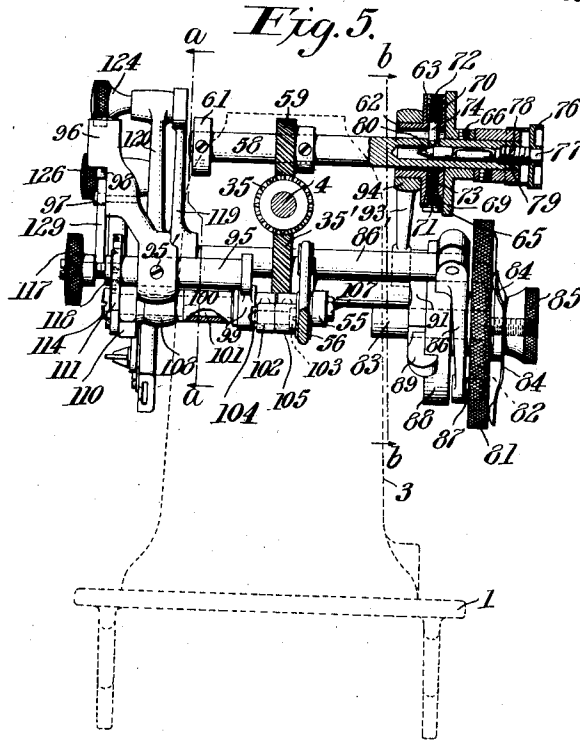


Fig. 10.

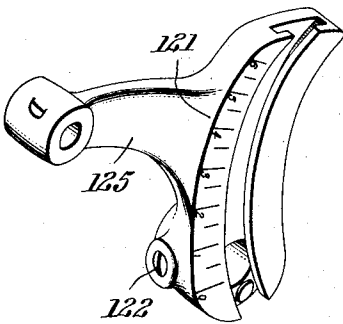


Fig. 11.

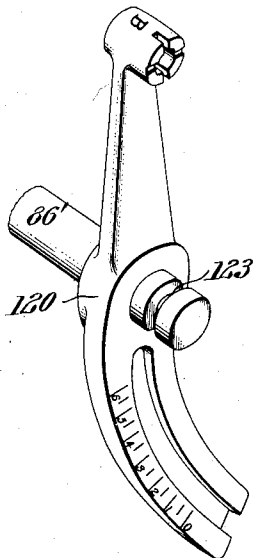
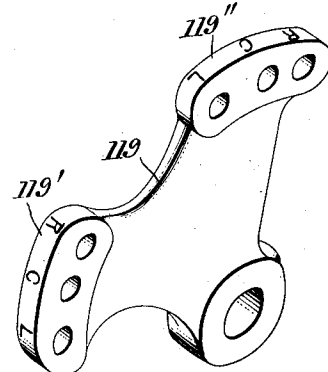


Fig. 12.



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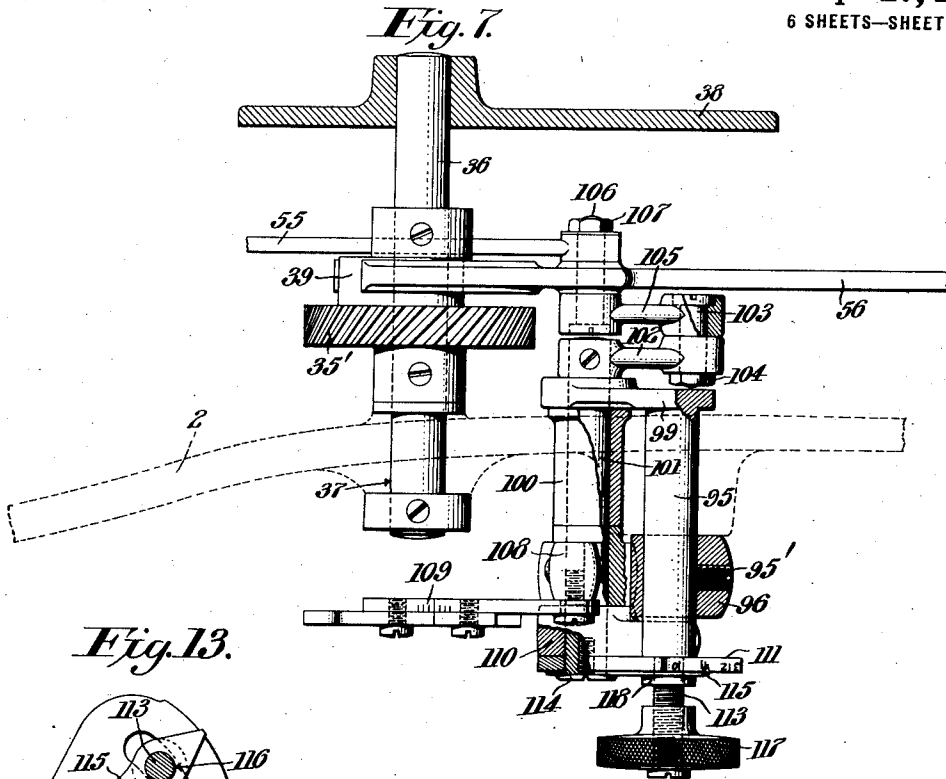
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6 SHEETS—SHEET 5.

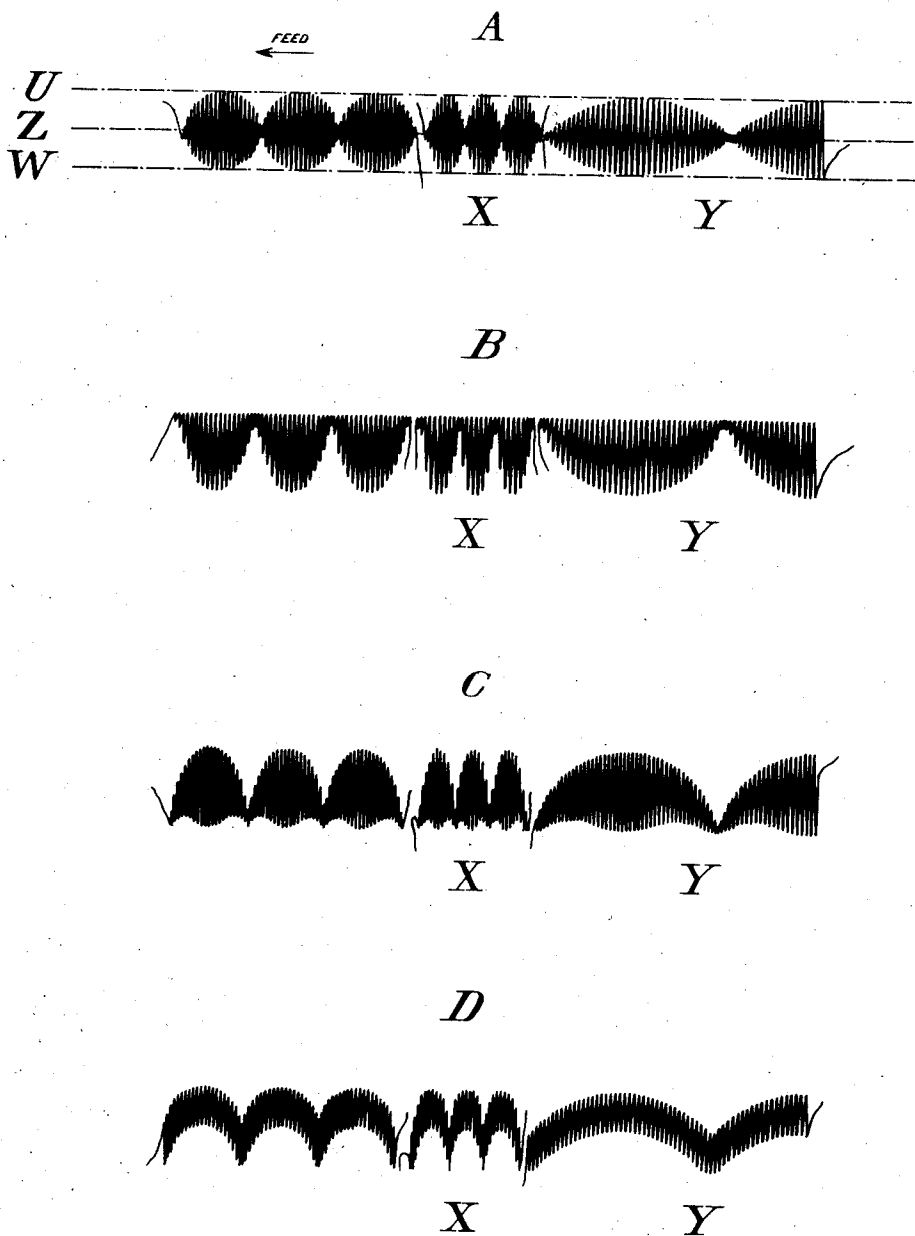


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APPLICATION FILED MAY 24, 1916.

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6 SHEETS—SHEET 6.

Fig. 10.



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UNITED STATES PATENT OFFICE.

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EMBROIDERY-SEWING MACHINE.

1,338,074.

Specification of Letters Patent.

Patented Apr. 27, 1920.

Application filed May 24, 1916. Serial No. 99,490.

To all whom it may concern:

Be it known that we, GEORGE M. EAMES and JOHN S. FINCH, citizens of the United States, residing at Bridgeport, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Embroidery-Sewing Machines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to improvements in sewing machines of the embroidery class, and has for its object to provide means for effecting given designs controlled to produce variations in such designs by adjustments which effect a rearrangement of and changes in the amplitude of movement of the parts comprising said controlling means without any change in the construction or combination of elements comprising the means for effecting said given designs.

Prior to the present construction it has been common to provide means for effecting a given embroidery design controlled to effect variations of such design, but it is believed that it is new to automatically effect a multiple of given designs without any change in the construction or combination of the elements comprising such means.

The present invention comprises improved means, over that employed in the embroidery machine construction represented by United States Patent No. 1,196,534, August 29, 1916, to Eames and Finch, for automatically effecting, by a given construction, a greater range of embroidery designs than is possible by any construction known to applicants at the present time.

Referring to the drawings, Figure 1 is a view in front side elevation of a sewing machine embodying the present invention. Fig. 2 is a top plan view of Fig. 1. Fig. 3 is a view in rear side elevation of Fig. 1, the arm-bracket and bed-plate being slightly broken away to better illustrate the feed-dog actuating mechanism. Fig. 4 is a view in front side elevation illustrating the main portion of the arm-bracket and bed-plate in section. Fig. 5 is a detached view of the means for actuating the pattern-cam and certain of the needle controlling elements, later to be referred to, actuated by said cam, together with dotted line view of the rear end of the sewing machine frame. Fig. 6 is an under side view of Fig. 1. Fig. 7 is

a plan view of certain elements comprising the needle controlling mechanism, later to be referred to. Figs. 8 and 9 are views on the lines *a-a* and *b-b*, respectively of Fig. 5 looking in the direction indicated by the respective arrows. Figs. 10 to 15, both inclusive, are detailed views to be referred to hereafter, and Fig. 16 is a view of certain of the embroidery designs and variations of the latter, common to the products of the present improved means.

Referring to the figures, 1 represents the bed-plate of the sewing machine upon which is mounted the bracket-arm comprising the arm-bracket 2 and standard 3, 4 the main or needle-bar driving shaft provided at its rear end with a band-wheel 5 and at its opposite end with a shaft flange 6 to which is pivotally connected the needle-bar actuating link 7 operatively connected with the needle-bar 8 carrying the needle 9, 10 and 11 the needle-thread tension and take-up, respectively, 12 the cloth-presser carrying-bar and 13 the cloth-presser. The needle carrying bar 8 is mounted to move vertically in the needle-bar carrying frame 14 pivoted at its upper end on a stud-bolt 15 threaded into the bracket-arm, and 16 represents the presser lifting lever for moving the cloth-presser vertically to accommodate the positioning of the fabric with respect to the line of needle actuation. 17 represents the feed rock-shaft mounted in suitable bearings formed at the under side of the bed-plate and having formed integral with it the bearing lugs 18 and 19 into which is threaded the bolt 20 secured against accidental movement by a nut 21, and upon said bolt is pivoted a feed-dog carrying bracket 22 provided with a feed-dog 23, the opposite end of said shaft being connected by an arm 24 with a feed connection 25 whose upper end embraces the usual feed connection eccentric (not shown) carried by the main-shaft, thus transmitting from said last mentioned shaft feed movements to the feed-dog.

26 represents the feed lift rock-shaft mounted in the manner of shaft 17 and carrying at its forward end an arm 27 provided with a stud-screw 28 carrying a slide-block 29 which engages the usual slot formed in the extension 30 of the feed-dog carrying bracket 22, the opposite end of said feed lift rock-shaft being connected by an arm 32 with a feed lift connection 33 whose

upper end embraces a feed lift eccentric 34 carried by the main-shaft and from which vertical movements are transmitted to the feed-dog.

- 5 35 represents a spiral gear carried by the main-shaft 4 said gear meshing with a spiral gear 35' carried by a cam-shaft 36 mounted at one end in a bearing 37, shown in dotted lines only Fig. 7, formed in the
10 bracket-arm and at its opposite end in a suitable bearing formed in a bracket-arm plate 38, said gears being of the ratio of 2 to 1, thus giving to the cam-shaft 36 one rotation to two rotations of said main-shaft.
15 On the cam-shaft is mounted a needle vibrating cam 39, to be referred to herein-after.

- 40 represents a rotary loop-taker actuating shaft mounted in suitable bearings depending from the sewing machine bed-plate and carrying at its forward end a spiral gear 41 which meshes with a like gear 42 secured on the rotary loop-taker shaft 43, the latter being mounted in the usual manner below said bed-plate and carrying a
25 loop-taker 44. Upon the rear end of the shaft 40 is secured a belt driven pulley 45 operatively connected by a belt 46 with a belt driving pulley 47 carried by the main-shaft, said belt-driving and driven pulleys being of the ratio of 2 to 1, thus giving to the loop-taker two rotations to one rotation of said main-shaft.
30 of said main-shaft.

- 48 represents a sleeve loosely mounted on
35 the shaft 40 and held against lengthwise movement by collars 49 and 50, said sleeve having formed integral with it a bearing hub 51 upon which is pivoted one end of the loop-taker actuating shaft link 52, the opposite end of said link being pivotally attached to the lower end of the loop-taker actuating shaft shifting lever 53, the latter mounted to oscillate on a bearing stud 54 secured in the standard 3 and pivotally connected at its
40 upper end with the shifting lever connection 55 pivotally attached to the needle carrying frame connection in the form of a vibratory lever 56.

- The means herein employed for controlling the amplitude of movement of the feed-dog is the same as is illustrated, described and claimed in U. S. Patent No. 718,988, of January 27, 1903, to W. F. Dial *et al.* and it is deemed sufficient to designate the parts
55 illustrated by the numeral 57.

- 58 represents a pattern-cam feed-shaft provided with a spiral gear 59 meshing with the spiral gear 35 carried by the main-shaft, said shaft being mounted in suitable bearings
60 formed in the arm-bracket and held against endwise movement by the collar 61 and eccentric 62, the latter formed integral with the eccentric frame 63 pivoted by screw 64 on a disk 65 secured upon the shaft 58 by
65 screw 66. 67 denotes a slot formed in the

eccentric-frame 63 opposite the pivot screw 64 and 68 a headed screw fitted within said slot and tapped in the disk 65. 69 and 70 denote pockets formed in said eccentric-frame the outer ends of which are closed by the respective screws 71 and 72 tapped therein, and within the pocket 69 is housed a coiled spring 73 one end of which bears against the shaft 58 while the other end abuts against the screw 71, and within the
75 pocket 70 is a beveled end screw-pin 74 whose threaded head takes within the internally threaded outer end of the pocket 70 and is backed up, after the manner of a jam-nut, by the screw 72. 76 represents a feed
80 adjusting cap provided with a stud-screw 77 threaded, as at 78, to enter the threaded portion 79 in the shaft 58, the beveled end 80 of said stud acting through the adjustment of the cap 76 to position the eccentric 62
85 more or less eccentric to the shaft 58.

The means just described for adjusting the eccentric 62 is the same as that employed for adjusting the feed eccentric 8 of U. S. Patent No. 718,988 previously referred to
90 and the same as that employed in the present construction to control the amplitude of movement of the feed-dog in which the parts illustrated are designated by the numeral 57.

81 represents a pattern cam provided with
95 an egg-shaped pattern cam-groove 82, said cam being journaled on a stud 83 suitably secured in the arm standard and held to rotate on said stud by the friction spring 84 secured by nut 85 threaded onto said stud.
100 86 denotes a cam-follower lever suitably secured upon the outer end of a segment lever rock-shaft 86' mounted in suitable bearings formed in the bracket-arm, said cam-follower lever being provided with a cam-follower 87 tracking the cam-groove 82. 88
105 denotes a feed-disk loosely mounted on the stud 83 and provided with a hollow hub 88' carrying the pattern cam 81, said feed disk through the pawls as 89, springs as 90 and
110 the toothed arm 91 loosely mounted on the stud 83 and connected by pivot screw 92 with the eccentric connection 93 provided with the eccentric strap 94 encircling the eccentric 62, effecting, through the rotation
115 of the shaft 58, step-by-step rotary movements of the pattern cam 81.

95 represents an oscillating shaft mounted in a suitable bearing formed in the bracket-arm and on said shaft is secured by screws
120 as 95' a needle-bar positioning arm 96 provided with a registering pin 97 and spring-plunger 98, the inner end of the shaft 95 being provided with an integrally formed crank-arm 99 provided with a bearing sleeve
125 100 in which is journaled a link adjusting shaft 101, and on the inner end of the latter is suitably secured one end of a crank-arm 102 whose opposite end receives a threaded bolt 103 secured by a nut 104, and on said
130

bolt is fulcrumed one end of a link 105 whose opposite end is fulcrumed on a bolt 106 passing through suitable bearings formed in the connection 55 and 56 and secured against accidental movement by the nut 107.

Upon the shaft 101 is suitably secured a crank-arm 108 to which is pivotally connected a two part connection 109, later to be referred to, and upon the extreme outer end of the shaft 101 is suitably secured a lug 110 carrying a plate 111 indexed J on its front face and 0, 1, 2, 3 and 4 on its upper edge and provided with an arcuate slot 112 in which tracks a reduced portion 113 of the shaft 95, and upon a screw 114 threaded into the end of the shaft 101 is mounted an indexing finger 115 provided at its opposite end with an opening 116 through which passes the reduced portion 113 of the shaft 95. On the outer end of the shaft 95 is threaded a nut 117 which acts upon a washer 118 to secure the plate 111 against movement except about the axis of the shaft 101, as is required when stitching certain of the designs, later to be explained.

The segment lever rock-shaft 86' has suitably secured upon it a bracket 119 having arms 119' and 119'' indexed R. C. L., a loosely mounted segment lever 120 indexed 0, 1, 2, 3, 4, 5 and 6 and a loosely mounted segment bracket 121, indexed 0, 1, 2, 3, 4, 5 and 6, the latter held against accidental movement in the direction of the length of the shaft 86' by the teated screw 122 tracking the groove 123 formed in the latter shaft. The upper end of the lever 120 is indexed B and provided with a spring-plunger 124 registering with either of the openings, R. C. L. of the arm 119'' depending upon the design or figure required, and the free end of the arm 125 of the bracket 121 is indexed D and provided with a spring-plunger 126 for registering with either of the openings R. C. L. in the arm 119' forming a part of the bracket 119, as the character of the embroidery may require.

The two part connection 109 indexed F, and pivotally connected at one end with the crank-arm 108, has its opposite end adjustably and pivotally connected with the index-lever 120 which, at will, is an idle or active power-transmitting connection dependent upon the character of the product, and the connection 129, indexed E at one end and at its opposite end R. C. L., is pivotally and adjustably connected at one end with the segment bracket 121 and at its opposite end adjustably connected with the pin 97 carried by the arm 96.

It will be evident from the foregoing, in connection with the drawings, that the cam 39 imparts to the connection 56 under all conditions equal vibratory movements on

both sides of an imaginary line connecting the shaft 36 with the pivot screw 56' corresponding with the mean lateral position of said connection and the crank-arms 99 and 102 are of substantially the same length as the swinging link 105, it therefore results that in any of the positions of the needle-bar positioning arm 96, the rock-shaft 101, which with the crank-arm 102 constitutes the fulcrum-support, will assume such a position that the fulcrum-stud 103 may be shifted from a neutral point in the said mean position of the connection 56 to a position coaxial with the shaft 95.

As the rock-shaft 101 is movable in an arcuate path concentric with the shaft 95 inclined to and crossing the mean position of the connection 56, it will be observed that such supporting shaft 101 is adapted to assume positions spaced apart not only lengthwise of such connection but upon opposite sides of its mean position, thereby sustaining the fulcrum 103 in such manner that the latter is permitted to assume its extreme maximum throw position coaxial with the shaft 95 and in neutral position upon said imaginary line, between which extreme positions it will so control the direction of movement of the link 105 that its pivotal connection 106 with the connection 56 will assume in each alternate movement one of its extreme positions corresponding with the maximum throw of the needle, as in the constructions represented by Patent No. 1,196,534 herein referred to.

It is evident that the stitch-forming mechanism, besides the loop-taking device, comprises the following primary features operating in combination to produce a novel effect (1) means for endwise reciprocating the needle consisting of the driving shaft 4, shaft-flange 6, link 7 and needle-bar 8; (2) actuating mechanism for transmitting lateral movements to the needle consisting of an actuated cam 39, vibratory lever 56, pivot-pin 106, link 105, fulcrum 103 for the lever 56 and needle-bar frame 14; (3) mechanism connected with the lateral-movement actuating mechanism for controlling the amplitude of the lateral movements of the needle consisting of an actuated pattern-cam 81, rock-shaft 86', oscillating bracket 119, segment 120, link 109, rock-shaft 101 and link 102 connected with the fulcrum 103; (4) mechanism connected with the amplitude controlling means for controlling the field of lateral movement of the needle in the formation of a predetermined design and also for controlling the variations in the amplitude of the lateral movements, consisting of the oscillating bracket 119 actuated from the pattern-cam and connected by means of the segment 121, link 129, arm 96, rock-shaft 95 and positioning arm 99 with the shaft 101. It will be observed that

while both the amplitude and field controlling mechanisms are operated from a single element, they are interconnected to produce relative variations in their effective action.

- 5 The operation to produce said variations will now be described in detail:—

Viewing the machine as shown in Fig. 3 of the drawings throughout the following description and with both of the links 109
10 and 129 operative, as the bracket 119 swings step-by-step to the right, the arm 96 is moved to the right, thereby rocking the arm 99 about an arc a horizontal component of which movement is the extent of throw of
15 the fulcrum 103 to the left and therefore of the lever 56 to swing the needle to the left into a different field. The rocking movement of the arm 96 rocks the shaft 101 about the shaft 95 as its axis. Now assuming the
20 segment 120 to be stationary, this movement of the shaft 101 causes a counter clockwise rocking movement thereof on its own axis, due to the link connection 109 with the segment 120. This moves the fulcrum
25 103 to increase the lateral throw of the needle. However the segment 120 is at this time actuating the link in a direction to the left, consequently rocking the shaft 101 a greater distance in a counter clockwise direction and increasing the lateral throw
30 of the needle to a still greater extent.

From this it is evident that the extent of lateral vibration of the needle is multiplied by the movement to the left of the working
35 field of the needle. Conversely, the extent of vibration of the needle is lessened when said working position is moved to the right. In other words, while the links 109 and 129 receive a constant ratio of movement from
40 the bracket 119 in any of their adjusted positions, the effect upon the shafts 95 and 101 is at a constantly varying ratio and this relative difference in the ratio of movement will vary constantly as the angular position
45 of the arm 99 changes.

In the resulting embroidery figures produced when the links 109 and 129 are both set in operative positions it is possible to automatically maintain a substantially
50 straight line representing the central or mean positions of vibration of the needle during a portion of the embroidery figure simultaneously with variations in the extent of lateral vibrations of the needle, and during
55 another portion of the same figure automatically change both the central line and the extent of vibration either with a constant or varying ratio according to the adjustment of the parts. The primary feature
60 of the present mechanism is that it is possible to obtain radical changes in the extent of vibration during a substantially constant field of action for a portion of an embroidery figure and in the same figure vary both
65 the field of operation and the extent of vi-

bration without change in adjustment. Such an embroidery figure is illustrated for instance at C in Fig. 16' of the accompanying drawings.

There will now be explained the sequence 70 of movement for effecting different designs and figures and varieties of such products.

To effect the centrally arranged embroidery design of Fig. 16, commercially termed
75 "coin spot," the plungers 124 and 126 and pin 97 are each set at C, the connection 109 and 129 at O and the plate 111 unsecured by the nut 117, and when so adjusted the cam-groove 82 of the pattern-cam 81 acts on the cam follower 87 to, through the cam-follower 80 lever 86, rock the shaft 86' carrying the two arm bracket 119, which latter through the pin 124 rocks the lever 120 and through the connection 109 transmits rocking movements
85 to the shaft 101 carrying the crank-arm 102, thus causing the link 105 to be rocked on the stud 106 to vary the amplitude of the lateral movements of the needle across its zero or center line of ornamental seam formation Z to the positions required for the
90 present design. The variety X of the present design being effected by increasing the amplitude of step-by-step movement of the pattern-cam 81 through the adjustment of the feed-adjusting cap 76, and the variety
95 Y by decreasing the amplitude of said step-by-step movements. It being understood that in effecting the present design the connection 129 has no power transmitting action on the shaft 95.

To effect the so termed left-hand embroidery design B of Fig. 16, the plungers 124 and 126 and pin 97 are set to register with the openings L and the connection 109
100 and 129 at O, as in design A, which causes the connection 109 to rock the shaft 101 to carry the pivotal bolt 103, of the crank-arm 102 and link 105, downward or to a position to cause the needle to effect lateral movements to the left of the dotted line U of
110 design A. The varieties X and Y of the present design are effected as in the like designated varieties of design A.

To effect the shield like design C, of Fig. 16, the plungers 124 and 126 and pin 97 are
115 registered at R, the connection 129 at 3 and the connection 109 at 2, and when so adjusted the connection 109 transmits rocking movement to the shaft 101 which, as in the previously described designs, has the effect
120 of increasing and diminishing the amplitude of the needle vibration, and the connection 129 transmits rocking movements to the shaft 95 which has the effect of shifting the overseam stitches laterally with respect to
125 the fabric, so it results that in the present design overseam stitches are placed at the right and across the central line Z of design A.

To effect the scallop design D of Fig. 16, 130

the plunger 124 is disconnected from the arm 119' of the bracket 119, the plunger 126 registering with the opening R of the arm 119' of said bracket and the pin 97 in the notch R of the connection 129 whose opposite end is secured at 3 on the segment bracket 121, the connection 109 being inoperative owing to the adjustment of the pin 124, and the indexing finger 115 at 2 of the index on the periphery of the plate 111, said finger being secured against accidental movement by the tightening of the nut 117, and when so adjusted the shaft 101, through the action of the connection 129, is moved about the axis of and synchronously with the rocking movement of the shaft 95, thus maintaining a given amplitude of lateral movement of the needle but shifting the field of such lateral movement to the requirements of the present design, the varieties X and Y being effected as in the like designated varieties of design A.

From the foregoing description of the sequence of movements of the needle-controlling elements for effecting the embroidery designs, and the varieties of the latter illustrated, it is to be understood that in the present improved means the pattern-cam is a controlling element which through adjustments of the connections connecting it with the needle effects many distinctly unlike designs and that by the adjustment of the means for controlling the step-by-step movements of the pattern-cam many varieties of such designs may be effected, all of which is accomplished without change in construction, and it is self evident that if a different design of pattern-cam were employed the present chain of connections between it and the needle would effect an equal number of unlike designs and varieties. The few designs and varieties herein illustrated and described have been selected as best illustrating the general application of the present means for automatically effecting predetermined design stitching.

From the foregoing it is to be understood that the position of the center line Z of the ornamental seam-formation can be automatically shifted relatively to the center of the lateral movements of the needle and the latter relatively to the line Z.

Having thus set forth the nature of the invention, what we claim herein is:—

1. In a sewing machine, the combination with stitch-forming mechanism including a needle, a driving shaft, and actuating mechanism for imparting endwise reciprocating movements and lateral movements to said needle, of a pattern-cam, means for driving said pattern-cam, and operative connections between said pattern-cam and said actuating mechanism for automatically varying the mean positions of the lateral movements of the needle and for automatically varying

the amplitude of said lateral movements, said operative connections including means for automatically varying in inverse ratios the mean position variations relatively to the amplitude variations in the needle movements.

2. In a sewing machine, the combination with stitch-forming mechanism including a needle, a driving shaft, and actuating mechanism for imparting endwise reciprocating movements and lateral movements to said needle, of a pattern-cam, means for driving said pattern-cam, operative connections between said pattern-cam and said actuating mechanism for automatically varying the amplitude of the lateral movements of the needle, and means brought into action by said pattern-cam for automatically multiplying and lessening the effective action of said operative connections.

3. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating needle-bar, a needle carried by said needle-bar, a driving shaft, and means for imparting lateral movements to said needle including a needle-bar carrying frame and a frame-connection, of a movable fulcrum for said frame-connection independent of the means for imparting lateral movements to said needle for controlling the amplitude of lateral movement of the needle, a movable supporting element for said fulcrum controlling the mean position of said lateral movements, and automatic means for actuating said movable supporting element to thereby vary both the mean positions of said lateral movements and the amplitude thereof.

4. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating needle-bar, a needle carried by said needle-bar, a driving shaft, and means for imparting lateral movements to said needle including a needle-bar carrying frame and a frame connection independent of the means for imparting lateral movements to said needle, of a movable fulcrum for said frame connection, a movable supporting element for said fulcrum, a pattern-cam, and mechanism operated from said pattern-cam to displace said fulcrum to vary the amplitude of the lateral movements of the needle, and mechanism also operated from said pattern-cam to displace said movable supporting element to vary the mean positions of said lateral movements.

5. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating needle, a driving shaft, and means for imparting lateral movements to said needle, of a pattern-cam, means for driving said pattern-cam, a rocking bracket operatively connected with said pattern-cam, and connections intermediate

said bracket and said needle for varying the amplitude of the lateral movements of the needle and for varying the mean positions of said lateral movements in inverse ratios throughout an embroidery figure.

6. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating needle, a driving shaft, and means for imparting lateral movements to said needle, of a pattern-cam, means for driving said pattern-cam, a rocking bracket operatively connected with said pattern-cam, a pair of segment levers each adjustably secured to said rocking bracket, connections intermediate one of said segment levers and the needle to vary the amplitude of the lateral movements of the needle, and connections intermediate the other segment lever and said first mentioned connections to vary the mean positions of said lateral movements.

7. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating needle, a driving shaft, and actuating mechanism for imparting lateral movements to said needle, of a pattern-cam, means for driving said pattern-cam, operative connections between said pattern-cam and said actuating mechanism for varying the mean positions of the lateral movements of the needle and for varying the amplitude of said lateral movements, and means constantly varying in effect for automatically varying in inverse ratios the mean position variations relatively to the amplitude variations in the needle movements.

8. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating needle, a driving shaft, and actuating mechanism for imparting lateral movements to said needle, of a pattern-cam, means for driving said pattern-cam, operative connections between said pattern-cam and said actuating mechanism for automatically varying the mean positions of the lateral movements of the needle and for automatically varying the amplitude of said lateral movements, and means permitting adjustment of said operating connections to produce a predetermined design in any one of a plurality of fields of operation.

9. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating needle, a driving shaft, and actuating mechanism for imparting lateral movements to said needle, of a pattern-cam, means for driving said pattern-cam, operative connections between said pattern-cam and said actuating mechanism for automatically varying the mean positions of the lateral movements of the needle and for automatically varying the amplitude of said lateral movements, means permitting adjust-

ment of said operating connections to effect a predetermined design in any one of a plurality of fields of operation, and means permitting adjustment of the degree of the mean position variations.

10. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating needle, fabric feeding mechanism, a driving shaft, and actuating mechanism for imparting lateral movements to said needle, of a pattern-cam, means for driving said pattern-cam, operative connections between said pattern-cam and said actuating mechanism for automatically varying the mean positions of the lateral movements of the needle and for automatically varying the amplitude of said lateral movements, means for controlling the movement of the fabric feeding mechanism, and means including an adjustable eccentric for controlling the driving means for the pattern-cam.

11. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating and laterally movable needle, means for reciprocating the needle, and actuating mechanism for transmitting the lateral movements to said needle, of a bodily movable rock-shaft independent of said actuating mechanism, a controlling connection between said rock-shaft and said actuating mechanism, automatic means for moving said rock-shaft bodily to vary the mean positions of the lateral movements of the needle, and means for axially oscillating said rock-shaft to vary the amplitude of said lateral movements.

12. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating and laterally movable needle, means for reciprocating the needle, and actuating mechanism for transmitting the lateral movements to said needle, of a bodily movable rock-shaft independent of said actuating mechanism, a controlling connection between said rock-shaft and said actuating mechanism, a pattern-cam, means for driving said pattern-cam, and operative connections intermediate said pattern-cam and said rock-shaft for bodily moving the latter to vary the mean positions of the lateral movements of the needle and thereby vary the amplitude thereof.

13. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating and laterally movable needle, means for reciprocating the needle, and actuating mechanism for transmitting the lateral movements to said needle, of a bodily movable rock-shaft independent of said actuating mechanism, a controlling connection between said rock-shaft and said actuating mechanism, a second rock-shaft sustaining said first mentioned rock-shaft, a pattern-cam, connections intermediate said

pattern-cam and each of said rock-shafts whereby said first mentioned rock-shaft moves angularly about the axis of said second rock-shaft to vary the mean positions of the lateral movements of the needle, and means whereby said bodily movement of the rock-shaft imparts a rocking movement thereto on its own axis to vary the amplitude of said lateral movement of the needle.

14. The combination with a reciprocating and laterally movable needle, of a vibratory and endwise movable lever connected with and adapted to impart to said needle lateral movements, means for vibrating said lever, a swinging link pivotally connected with said lever, a fulcrum for said link, a pattern-cam, operative connections between said pattern-cam and said link for moving said fulcrum in an arcuate path crosswise of said lever, and means also operated from said pattern-cam for changing the position of said arcuate path of movement relatively to said lever.

15. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating and laterally movable needle, means for reciprocating said needle, and actuating mechanism for imparting the lateral movements to said needle, of a pattern-cam, an oscillating bracket actuated from said pattern-cam, a bodily movable rock-shaft independent of said actuating mechanism, a controlling connection between said rock-shaft and said actuating mechanism, needle positioning segments adjustably sustained by said oscillating bracket, and operative connections intermediate said segments and said rock-shaft to move the latter bodily to vary the mean positions of the lateral movements of the needle and axially to vary the amplitude of said lateral movements.

16. In a sewing machine, the combination with stitch-forming mechanism including a reciprocating needle, actuating mechanism for transmitting lateral movements to said needle, including a vibratory lever, a movable fulcrum for said lever, a bodily movable rock-shaft sustaining said fulcrum, and a second rock-shaft sustaining said first mentioned rock-shaft, of a pattern-cam, means for intermittently driving said pattern-cam, an oscillating bracket actuated from said pattern-cam, a plurality of segment-levers adjustably secured to said bracket, an operative connection adjustably secured to one of said segment-levers and adapted to axially oscillate said first mentioned rock-shaft to move said fulcrum and thereby vary the amplitude of the lateral movements of the needle, and an operative connection adjustably secured to the other segment lever to bodily move said first

mentioned rock-shaft above the axis of said second rock-shaft to vary the mean positions of said lateral movements of the needle, said last named connection operating through said first mentioned connection to further vary the amplitude of lateral movement of the needle.

17. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating and laterally movable needle, and actuating mechanism for transmitting the lateral movements to said needle, of a primary rock-shaft controlling the mean positions of said lateral movement, a secondary rock-shaft sustained by and movable in an arcuate path about the axis of said primary rock-shaft, operative connections intermediate said secondary rock-shaft and said actuating mechanism whereby axial oscillations of the secondary rock-shaft vary the amplitude of the lateral movements of the needle and whereby bodily movements thereof vary the mean positions of said lateral movements, means for actuating said primary rock-shaft to impart said bodily movements to the secondary rock-shaft, and means for locking said secondary rock-shaft against axial oscillations during said bodily movements to prevent variations in the amplitude of said lateral movements.

18. In a sewing machine, the combination with stitch-forming mechanism including an endwise reciprocating and laterally movable needle, and actuating mechanism for transmitting the lateral movements to said needle, of a primary rock-shaft controlling the mean positions of said lateral movements, a secondary rock-shaft sustained by and movable in an arcuate path about the axis of said primary rock-shaft, operative connections intermediate said secondary rock-shaft and said actuating mechanism whereby axial oscillations of the secondary rock-shaft vary the amplitude of the lateral movements of the needle and whereby bodily movements thereof vary the mean positions of said lateral movements, means for actuating said primary rock-shaft to impart said bodily movements to the secondary rock-shaft, an index plate carried by one of said rock-shafts, and means for adjustably securing said index plate to the other rock-shaft to prevent axial oscillations of the secondary rock-shaft during its bodily movements.

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

GEORGE M. EAMES.
JOHN S. FINCH.

Witnesses:

STANLEY N. SMITH,
WM. A. SAUTTER.