(No Model.)

5 Sheets—Sheet 1.

H. WYMAN.

LAPPET LOOM.

No. 603,521. Patented May 3, 1898.

Fig. 1.

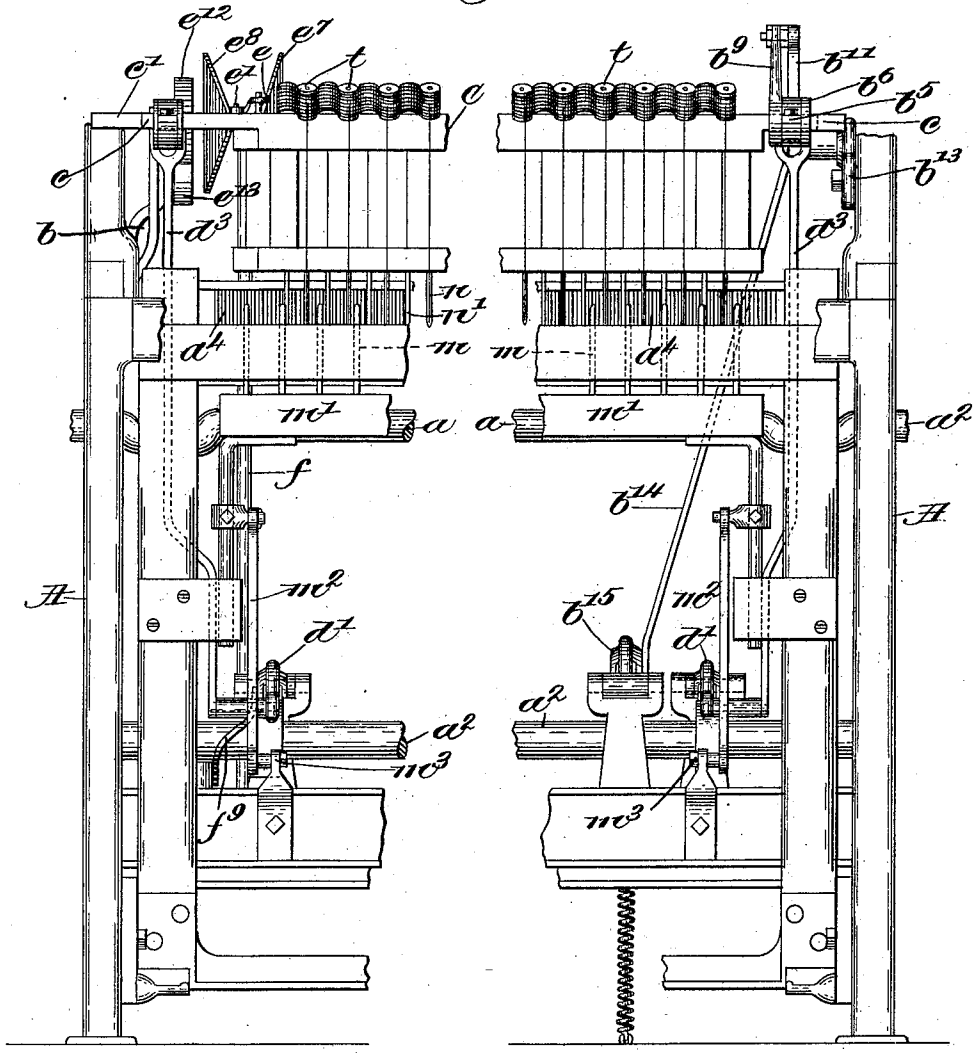
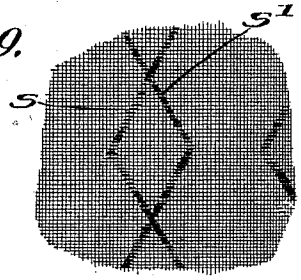


Fig. 9.



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Crosby Gregory
by Attys.

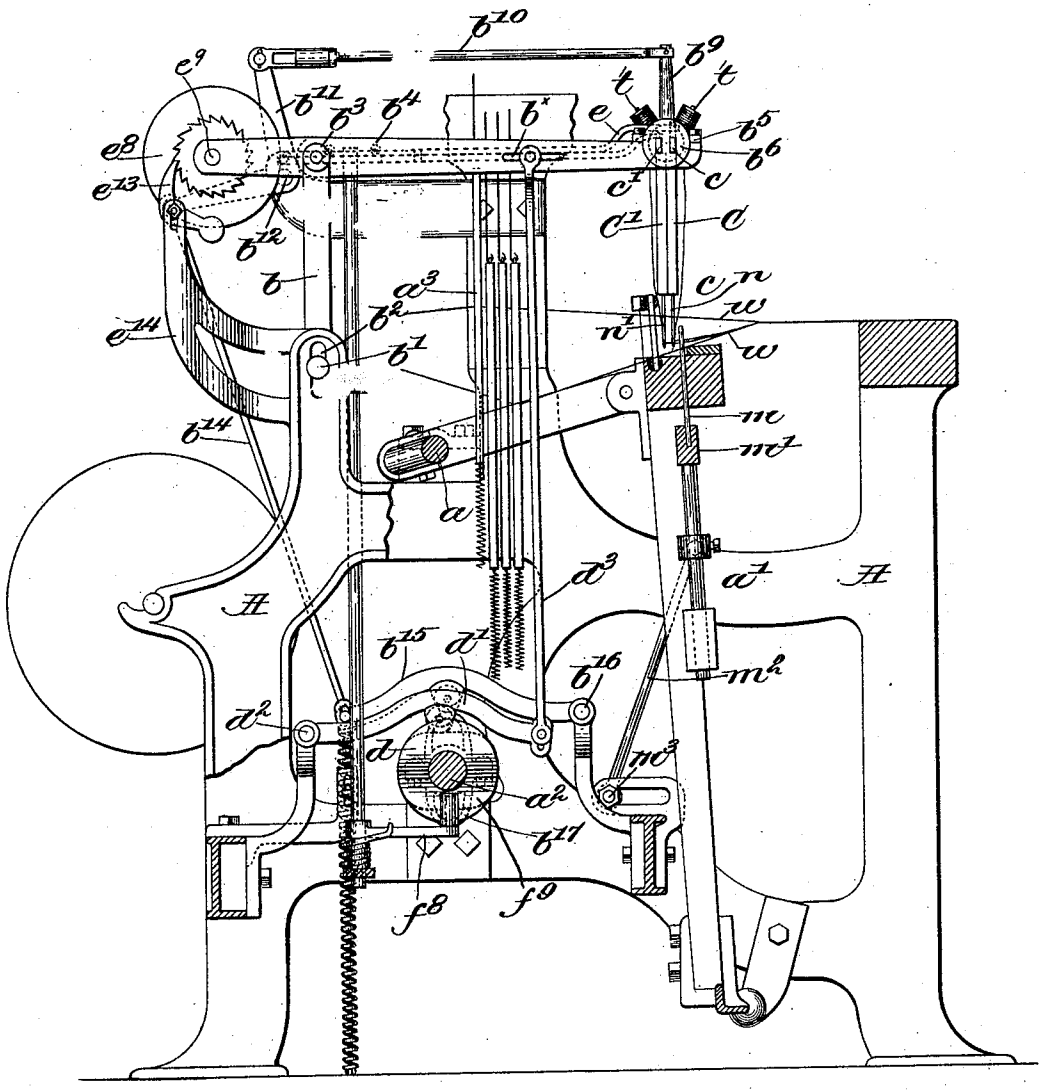
(No Model.) 5 Sheets—Sheet 2.

H. WYMAN.

LAPPET LOOM.

No. 603,521. Patented May 3, 1898.

Fig. 2.



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(No Model.)

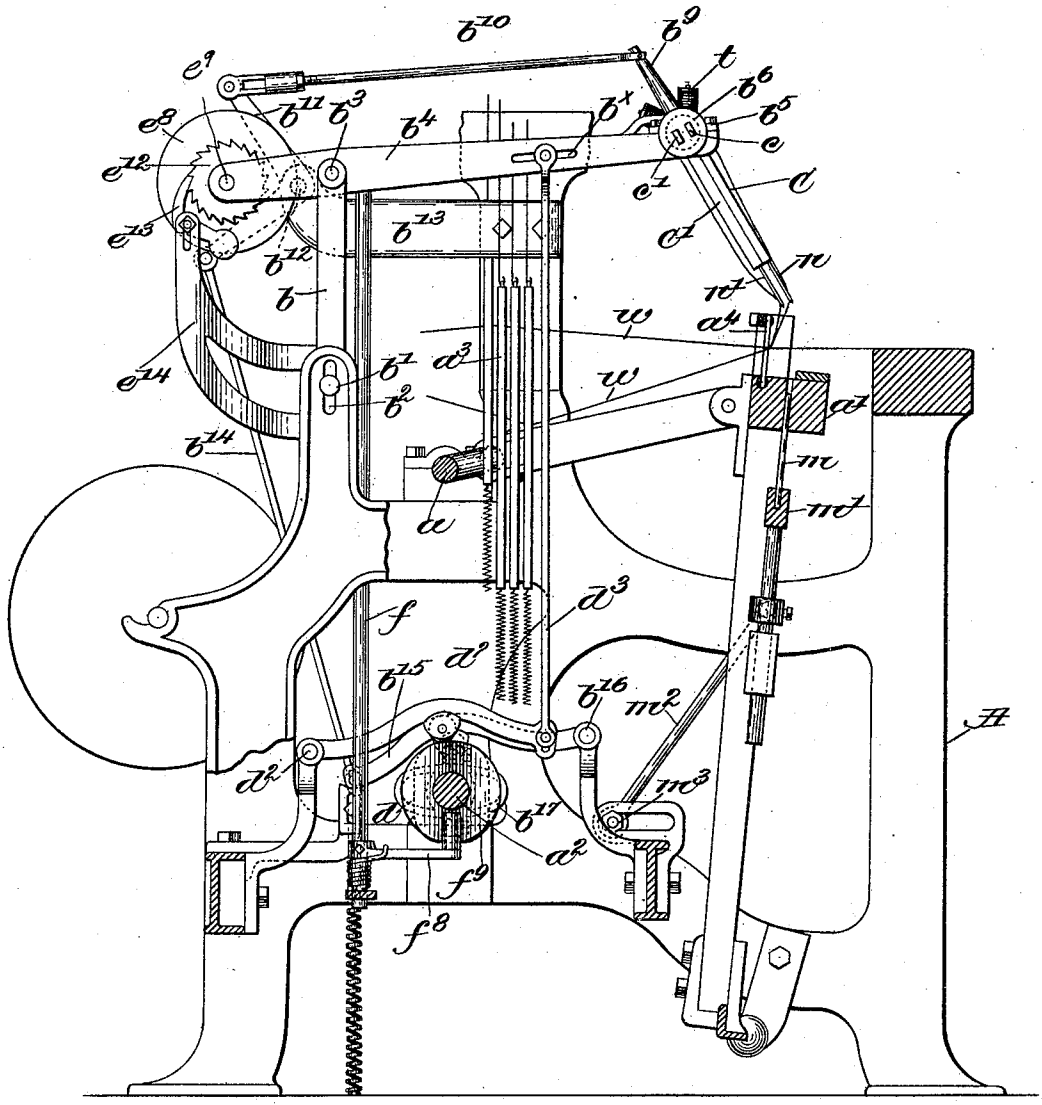
5 Sheets—Sheet 3.

H. WYMAN.

LAPPET LOOM.

No. 603,521. Patented May 3, 1898.

Fig. 3.



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5 Sheets—Sheet 4.

H. WYMAN.

LAPPET LOOM.

No. 603,521. Patented May 3, 1898.

Fig. 4.

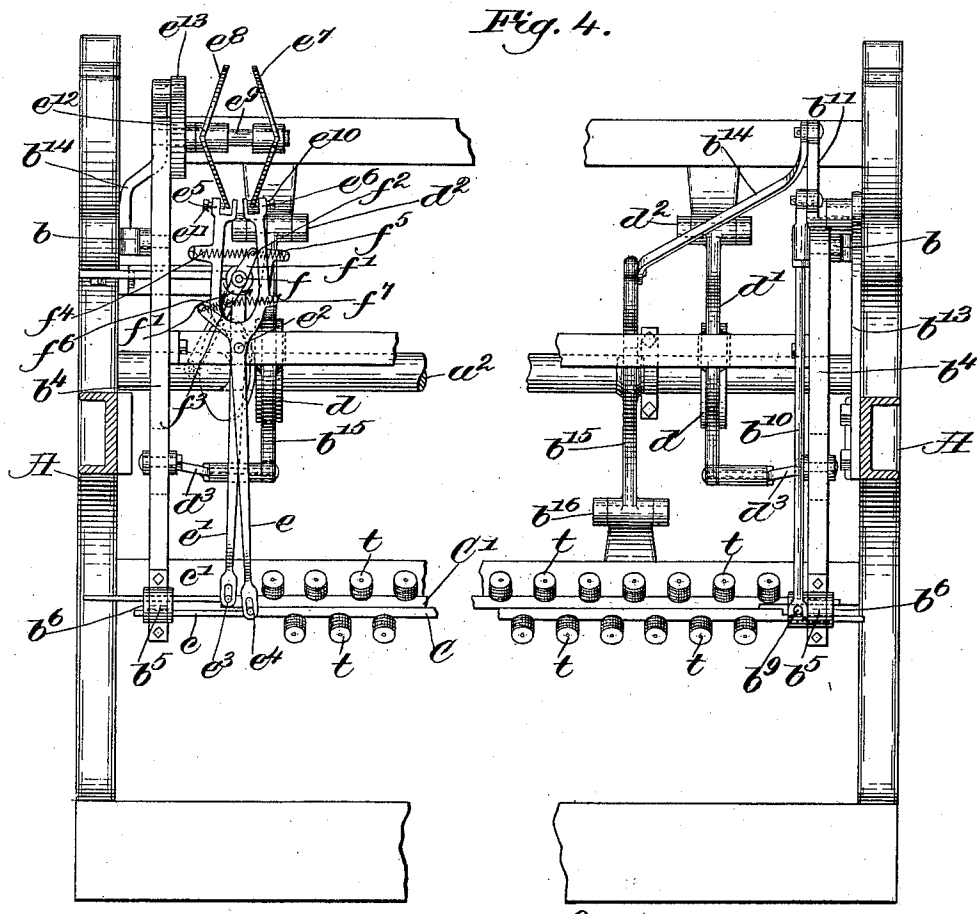


Fig. 6.

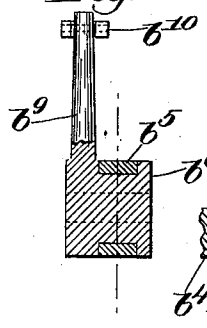


Fig. 7.

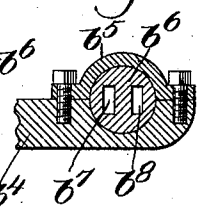


Fig. 4a

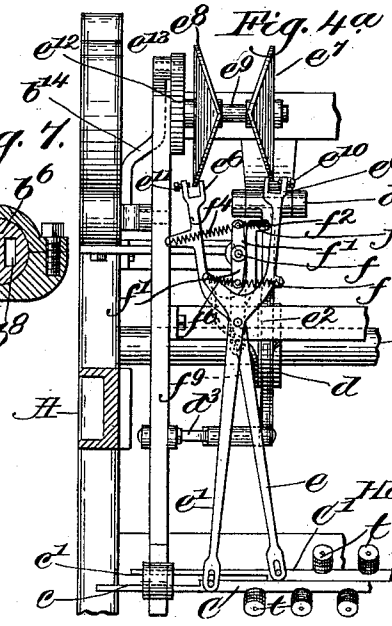
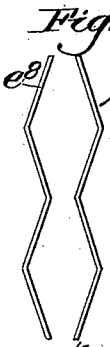


Fig. 5.



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(No Model.)

5 Sheets—Sheet 5.

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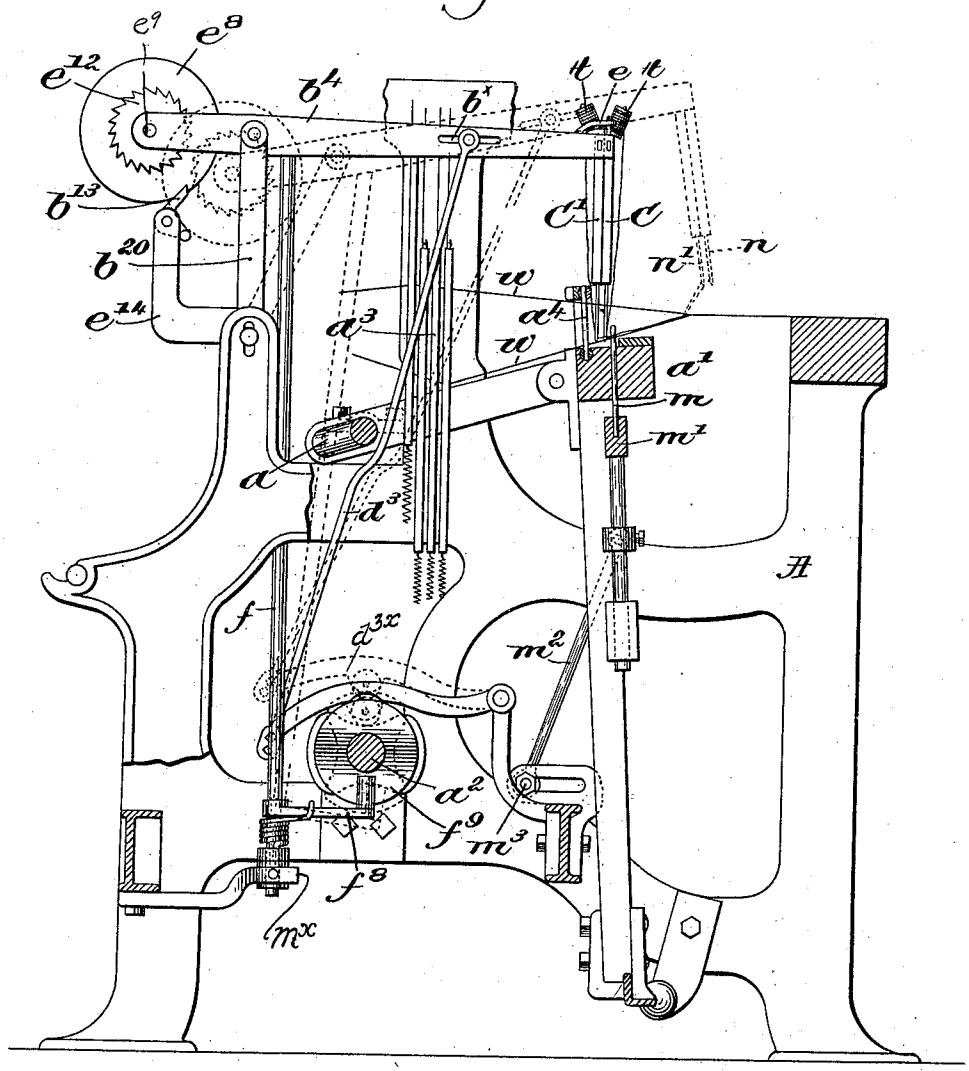
LAPPET LOOM.

No. 603,521. Patented May 3, 1898.

Fig. 8.



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UNITED STATES PATENT OFFICE.

HORACE WYMAN, OF WORCESTER, MASSACHUSETTS, ASSIGNOR TO THE CROMPTON & KNOWLES LOOM WORKS, OF SAME PLACE.

LAPPET-LOOM.

SPECIFICATION forming part of Letters Patent No. 603,521, dated May 3, 1898.

Application filed January 6, 1896. Serial No. 574,425. (No model.)

To all whom it may concern:

Be it known that I, HORACE WYMAN, of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in Lappet-Looms, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

My invention relates to lappet-looms or to lappet motions for looms—that is, motions or mechanisms applied to looms, usually of ordinary construction, for laying upon the upper surface of the fabric suitable designs formed by threads which form no part of the body of the fabric, but are of an ornamental character and bound to or into the fabric by the usual weft or filling. In looms of this type the ornamental threads are inserted in the fabric as the latter is woven by vertically-arranged needles mounted upon suitable carrier-frames which are given the necessary movements to cause the needles to insert the ornamental threads in the lower plane of the open shed and after the filling has passed through raise the said threads about the said filling to be beat with the latter up to the fell of the fabric, the needles being usually thereafter moved laterally to one side and the threads again inserted, but at distances somewhat removed from the points where they were first inserted to cause their threads to be laid in the form of stitches over and upon the face of the fabric, this lateral movement of the needles being, when desired, progressive or varied to cause the said stitches to be laid in various designs upon the face of the fabric. Prior to my invention in looms of this type it has been common to arrange these ornamental-thread-inserting needles upon and to vibrate with the lay, suitable actuating mechanism being provided for moving the needle-carrying frames horizontally upon the lay to produce the ornamental stitches, as described; but such an arrangement is sometimes open to objection in that additional weight is thereby thrown upon the lay which may limit its speed of operation, and the mechanism necessary to transmit the desired movements to the needles upon the moving lay from the actuating-shafts fixed on the loom-frame has frequently been of such a complex nature as increased the cost of the loom and, further, limited the speed thereof. This arrangement has heretofore also necessitated the employment of a supplemental take-up to remove the slack or looseness in the ornamental threads caused by the rising and falling of the needles and the forward-and-backward movement of the lay carrying the same. These ornamental-thread-inserting needles have also been arranged back of the lay; but such an arrangement is fatally defective in that the threads cannot be laid across the warp-threads and the latter drawn in the usual manner through the reed of the lay preparatory to receiving the weft, but must be raised and carried across the tops of the reed-dents specially cut down for that purpose, which have been found entirely impracticable.

The object of my invention is to simplify lappet-looms or lappet motions for looms, whereby the cost of the same may be reduced and the speed of operation of the loom increased over and above the speeds heretofore possible in looms or motions of this type.

In accordance with one part of my invention the ornamental-thread-inserting needles are arranged in front of the reed and upon a suitable carrier or carriers fulcrumed upon the loom-frame above and at the back of the lay, and the said needle-carriers, in accordance with my invention, are provided with suitable actuating mechanism for imparting to them the vertical movements necessary to cause them to insert the ornamental threads in the lower plane of the open sheds and afterward lift the said threads to draw the latter under the filling, and also for imparting to the said needle-carriers the necessary lateral progressive movements for the formation of the stitches and the laying of the same in desired ornamental designs upon the face of the fabric, and also forward-and-back lateral movements, whereby the needle-threads may be maintained as nearly as possible always of the same length.

My invention further comprehends various features of arrangement and construction to be hereinafter fully described, and particularly set forth in the claims.

In the drawings, Figure 1 in front elevation, partially broken away, shows a sufficient por-

tion of a loom embodying my invention to enable the latter to be understood; Fig. 2, an end elevation, partial section, showing the ornamental-thread-inserting needles in their lowermost positions preparatory to the laying of the weft or filling. Fig. 3 is a view similar to Fig. 2, but showing the needles in their elevated positions after having drawn the ornamental threads under the weft or filling just laid, the reed being in its forward position in the act of or having just beat up the filling; Fig. 4, a plan view of loom, Figs. 2 and 3, with the upright frames broken off; Fig. 4^a, a detail showing the carrier-actuating levers in different positions, and Fig. 5 is a view showing two of the needle-carrier-actuating cams developed. Figs. 6 and 7 are sectional details of the bearings for the needle-carriers to be described; Fig. 8, a view illustrating another means for moving the needles, and Fig. 9 a detail showing in diagram a lappet pattern produced by the mechanism shown.

In the particular embodiment of my invention herein selected for an illustration and shown in the drawings the loom-frame A, the crank-shaft a, the lay a', actuated from the said crank-shaft, the cam-shaft a^2, the harnesses a^3 and means for actuating the same, and the reed a^4 are and may be of usual or desired construction and arranged to operate in usual manner so far as concerns my present invention, except that the reed should be placed back of the line of travel of the shuttle sufficiently to allow the needles to be inserted into the shed between said reed and said line of travel of the shuttle, it being understood that my invention is applicable to any of the usual forms of looms.

In the embodiment of my invention herein shown in Figs. 1 to 7, inclusive, I have arranged upon the loom-frame and at the back of the loom suitable supports b, shown as made vertically adjustable by means of the clamping-bolts b' and the slots b^2 in the said frame, and on these supports b are fulcrumed at b^3 the vibrating levers or actuators b^4, provided at their front ends with suitable bearings b^5, (see Figs. 2, 3, 6, and 7,) for the rotatable heads b^6, provided, respectively, with the slots b^7 b^8 for the reception of the supporting-ears c c' on the horizontal sliding needle-carrying frames C C', carrying at their lower edges the needles n n'.

In the construction shown the slots b^7 b^8 and the supporting-ears c c' for the needle-carrying frames, which latter I shall hereinafter designate as "needle-carriers," are made, preferably, square or other than round, so that rotation of one or both the heads b^6, referred to, will also cause a rotative or swinging movement of said carriers, and to obtain such a swinging movement I have herein provided one of the said heads b^6 (see Figs. 2, 3, and 6) with an upwardly-extended arm b^9, to which is jointed one end of a link b^{10}, jointed at its opposite end to the upright arm of a bell-crank lever b^{11}, fulcrumed at b^{12} on an arm b^{13} of the frame. The horizontal arm of this bell-crank b^{11} is shown as connected by a rod b^{14} with the cam-lever b^{15}, fulcrumed at b^{16} on an arm of the frame and provided with a roller or other suitable surface to lie upon or in contact with a suitable cam b^{17} on and rotatable with the crank-shaft a^2, referred to, whereby rotation of the crank-shaft causes the bearing-heads b^6 and the needle-carriers mounted therein to be vibrated or swung in an arc of a circle toward and from the face of the reed at each vibration of and to clear the latter. In the present instance of my invention I have also provided the needle-carriers with a rising-and-falling movement independent of the said swinging movement, this rising-and-falling movement being shown as produced by a cam or cams d, fast on the cam-shaft a^2 and actuating the levers d', fulcrumed at d^2 and connected at their free ends by rods d^3 with the carrying-levers b^4, referred to, whereby rotation of the said cam-shaft vertically vibrates also the levers b^4 and the needle-carriers mounted upon the ends of the same.

For purposes of adjustment I have shown the levers b^4 as slotted at $b^\times$ to receive the bearings or pins in the ends of the rods d^3. I have also shown the lower ends of the said rods as also vertically slotted for the reception and adjustment of the pins or bolts in the ends of the cam-levers d', whereby not only the extent of vibration but the limits of the vibration may be also varied at will.

To vibrate the needle-carriers C C' horizontally for the formation and laying of stitches, I have in the present instance provided (see Fig. 4) at one end of the loom the actuating levers or members e e', shown as fulcrumed at e^2 on a cross-bar connecting the levers b^4 and slotted at their front ends to receive, respectively, the pins e^3 e^4 on the frames C C'. At their opposite ends the said levers are spread, as shown in Fig. 4, and are arranged with their forked ends e^5 e^6 straddling the pattern-cams e^7 e^8, fast on a shaft or stud e^9, mounted in the extended end of one of the levers b^4, (see Figs. 2 and 3,) said cams presenting at their opposite sides what may be called "pattern-surfaces." The forked ends e^5 e^6 of the said levers e e' are spread somewhat in excess of the maximum thickness of the cams e^7 e^8 to admit at all times of a limited vibration of the levers e e' relatively to their respective cams, and for varying the extent of these vibrating movements I have herein provided the forked end of the said levers with set or limiting screws e^{10} e^{11}. To vibrate these levers and the needle-carriers attached thereto, I have in the present embodiment of my invention provided the vertical shaft f, (see Figs. 2, 3, and 4,) mounted in suitable bearings on the frame and provided at its upper end with the oppositely-extended arms or head f'. These arms, which constitute the equivalent of a head, are shown as connected at opposite sides of the axis of the shaft with the levers e e'

through the medium of springs in such manner that rocking of the vertical shaft will cause the said levers to be vibrated on and about their axis within the limits fixed by their forked ends, as described. In the present instance the arms f' are provided, respectively, with the pins or projections f^2 f^3, the pin f^2 being connected by springs f^4 f^5 with the lever e', the pin f^3 being connected by springs f^6 f^7 with the lever e, as best shown in Fig. 4.

It is evident that when the shaft f is rocked in the direction of the arrow, Fig. 4, the spring f^6 will act to pull the forked end of the lever e to the right against the inner face of the cam e^7, while the spring f^5 will act to pull the forked end of the lever e' to the left against the outer face of the cam e^8, and, vice versa, when the shaft is rocked in an opposite direction the springs f^5 and f^7 will operate to move the said levers in an opposite direction from before, also against their respective cams, rocking of the shaft thus operating to vibrate the levers within the limits fixed by their forked ends and the cams referred to.

Referring to Figs. 2 and 3, the vertical shaft f is provided at its lower end with a suitable arm f^8, which is provided with a roller or other suitable stud traveling in contact with the face of a cam f^9, fast on the camshaft a^2, a suitable spring f^{10}, shown as coiled about the shaft f, acting to keep the said stud always in operative contact with its cam.

The vibrations of the levers e e' and the needle-carriers and needles connected thereto determine the length of the stitches. It now remains to provide suitable means for imparting to the said needle-carriers various progressive movement in different directions to lay the stitches in different positions upon the fabric to form desired configurations or designs. This progressive movement in the present instance of my invention is produced by cams e^7 e^8, referred to, for it is evident, by reference to Fig. 4, that rotation of said cams will cause the levers e e' to open and close, like a pair of shears, without in any wise interfering with the constant vibration of respective levers by the vertical shaft f described, for as the cams separate the forked ends of the levers the springs will extend to permit such separation, yet will continue to act to vibrate the levers within the limits of their forked ends, and as the cams again draw the levers together the springs will contract, still vibrating the levers, as described, so that the cams constitute in effect opposite or oppositely-facing movable stop or pattern surfaces to always limit the vibrations of the levers by the shaft f, yet constantly changing their positions, so that the said vibratory movements of the levers shall take place within different limiting-points or at different points relatively to the fabric.

The cams e^7 e^8 in the present instance are rotated by means of a ratchet-wheel e^{12}, rigidly connected therewith and adapted to be engaged by a pawl e^{13}, pivotally mounted in a bracket e^{14} on the frame. The fulcrum of the pawl is fixed, but as the lever b^4, carrying the cams, drops the ratchet-wheel e^{12} is at each vibration brought against the pawl e^{13} and moved through one notch of its rotation. The cams shown will produce a series of designs upon the fabric like that illustrated in Fig. 9, wherein will be seen the stitches s s', produced, respectively, by a needle n and a needle n', and as the successive stitches are laid they are laid farther apart as the cams e^7 e^8 separate the levers e e', and then, again, the said stitches are gradually brought together by the closing of the levers e e' by the said cams e^7 e^8, thus forming a diamond-shaped figure, which is repeated at each complete rotation by the cams e^7 e^8, and the same figure or series of figures is produced by each of the needles n and their corresponding needles n'.

The ornamental threads are herein shown as mounted upon spools t, arranged along the upper edges of the carriers C C', the thread being conducted thence to the eyes of the needles, the operation of the loom being then as follows, viz: As the lay moves to its rearmost position, Fig. 2, the warp-threads w are opened to form a shed, and the needle-carriers are at the same time moved to insert the needles n and n' from the top of the shed through the warp-threads in the upper plane thereof into or through the warp-threads of the lower plane of the shed, so that the weft when shot through will pass over the ornamental threads, as well as the threads in the lower plane of the shed. The lay now moves forward to beat up the weft, and at the same time the needle-carriers C C' are swung by their actuating mechanism into the position Fig. 3 to draw the ornamental threads into the fabric, so that as the filling is beat up the ornamental threads will be properly interwoven into the fabric. As the lay moves back and the warps open for another shed the needle-carriers are moved to again insert their needles through the shed, as before; but before they are again inserted, and preferably during the movement of the needle-carriers from the positions Fig. 3 back to their positions Fig. 2, the vertical shaft f is rotated to vibrate the levers e e', as described, and therefore separate the needle-carriers, so that the second time the needles are inserted they pass down through the warp at points separated from the threads where they were first inserted by distances represented by the vibrations of the needle-carriers therefor, laying their respective threads across the tops of several of the warp-threads in the upper plane of the shed, said needles carrying their threads again below the filling, which are then beat up, as previously described. Another overstitch ornamental thread is laid by each needle upon the surface of the fabric, as indicated at s s', Fig. 9. As the lay moves back for a thread filling the needle-carriers are returned toward but not quite to their first po-

sitions, the rotation of the cams e^7 e^8 stopping them slightly short of said first positions, the needles are again inserted through the warps, as described, and the third filling beat up, after which, as the lay moves back for a shot of filling, the needle-carriers are again separated, but this time, by reason of the partial rotation of the cams e^7 e^8, somewhat farther than before, so that the second series of stitches s s' laid upon the face of the fabric are somewhat farther separated than the first series, this process continuing, as described, to form the desired figures upon the face of the fabric.

It is evident that by adjustment of the set-screws e^{10} e^{11} in the forked ends of the levers e e' the length of the stitches may be varied as desired, and by changing the contour or separation of the cams e^7 e^8 or either of them the relative positions of the several stitches laid by any single needle may be varied as desired for obtaining different figures or designs.

It will be noticed that all the actuating mechanism for the needles is mounted upon the loom-frames, and hence may be made extremely simple, and in any event much simpler than is possible where the needles are mounted upon the reciprocating lay.

It will also be noticed that when the needles are in their positions Fig. 2 the length of threads from the spools through the needle to the fell of the fabric is practically the same as when the needles are in the positions Fig. 3, so that no auxiliary take-up is required, the threads being held taut in either of the two extreme positions of the needles, thereby further simplifying the mechanism.

In Fig. 8 I have shown a modification wherein the needle-carriers C C′ are not made to swing, as in the construction Figs. 1 to 7, inclusive, but are fixedly connected with the levers b^4, which are caused to rise and fall and also move forward and back by the rods d^3, adjustably connected with the said levers b^4 at the slots $b^\times$ and rigidly connected at their lower ends with the cam-actuated levers $d^{3\times}$, which as they rise and fall cause the levers b^4 to not only have a vertical movement, but also a forward-and-back movement, due to the changing angle of the said cam-levers and the rods d^3, rigidly connected thereto, the supports b^{20} being loosely mounted to permit this forward-and-back movement, as indicated in dotted lines. The cam e^8 has its ratchet e^{12} arranged to be actuated by a pawl b^{13}, mounted on the bracket, said ratchet being brought in contact with the pawl and moved by the latter at each forward movement of the lever b^4, as indicated in dotted lines, the carriers being vibrated by the shaft f, as in the first construction described, said shaft being mounted at its lower end in a swivel-bearing $m^\times$. This one modification will serve as an illustration of the variations which may be made in the mechanism for imparting to the needle-carriers the desired movement.

In my invention I preferably employ the usual shuttle-guiding pins m to guide the shuttle in its travel along the raceway of the lay in front of the needles n n', which of course must be inserted between the path of the shuttle and the reed, said guiding-pins m being mounted on a suitable carrier m' and caused to rise and fall during the movements of the lay by links m^2, swinging about the fulcrum m^3, which is eccentric with relation to the fulcrum of the lay.

In my invention, as herein shown, by mounting the spool or spools for the ornamental threads on the carrier for the needle supplied by that spool or spools and mounting said carrier on a suitable support, with means for moving it forward and back, following the lay, there is no necessity for any take-up between the needles and the thread-supply.

My invention is not limited to the particular construction herein shown, for the same may be varied without departing from the spirit and scope of my invention.

What I claim is—

1. A lay, one or more needle-carriers, needles thereon arranged in front of the lay and supported independently of and from behind said lay, and means for imparting rising and falling movements to said needles, substantially as described.

2. A loom containing the following instrumentalities, viz: a lay provided with a reed, shedding mechanism, one or more needle-carriers arranged in front of the lay and supported independently of the latter, a needle or needles on the respective carriers, and means to impart to said carriers vertical, forward-and-back, and laterally-progressive movements, substantially as described.

3. A loom containing the following instrumentalities, viz: a lay provided with a reed, shedding mechanism, one or more needle-carriers and a needle or needles on the respective carriers, a swinging support in which said carrier or carriers is or are swingingly mounted, means to move said carrier or carriers in their respective supports, and a source of thread-supply mounted upon said carriers, substantially as described.

4. In a loom, a combination with the frame, a lay provided with a reed, shedding mechanism, one or more needle-carriers arranged in front of said reed and supported from the back of said lay and independent of the latter, needles on the said carriers, means to impart to said needle-carriers rising and falling movements, and also a forward-and-back movement, following the movements of the lay, and the rising and falling shuttle-guide pins mounted on said lay, substantially as described.

5. In a loom, a frame, a lay provided with a reed, and a shedding mechanism, combined with one or more needle-carriers, and needles for the same, swinging needle-carrier supports fulcrumed above and independent of said lay and in which the said carriers are

swingingly mounted, and means to actuate the said carriers, substantially as described.

6. In a loom, the combination with the frame, a lay provided with a reed and the shedding mechanism, of one or more depending needle-carriers fulcrumed above and behind said lay and means to swing said carriers forward and back to clear said lay, needles on the said carriers, and means for actuating the same and their carriers, substantially as described.

7. In a loom, a frame, a lay having a reed and shedding mechanism, combined with one or more needle-carriers mounted independently of the lay and in front of the reed thereon, needles on the said carrier or carriers, a cam for determining the movements of the said carrier or carriers, and means to move the said carrier or carriers independently of said cam, substantially as described.

8. In a loom, a frame, a lay provided with a reed and shedding mechanism, combined with a needle-carrier arranged in front of said reed, a needle-carrier support fulcrumed above and at the back of said lay, a cam determining the movements of said carrier, and means to vibrate the said carrier independently of and within limits fixed by said cam, substantially as described.

9. In a loom, a frame, and a lay provided with a reed, combined with one or more needle-carriers and needles thereon, swinging supports independent of the lay, and means both to rotate and slide said needle-carriers therein, substantially as described.

10. In a loom, a frame, a lay provided with a reed, and a shedding mechanism, combined with one or more needle-carriers and needles on the same, swinging supports in which the said needle-carriers are mounted to vibrate, one or more cams on the said swinging supports and connected with and to determine the movements of the said carrier or carriers, and means on the said swinging supports to move said carrier or carriers independently of said cam or cams, substantially as described.

11. In a loom, a frame, a lay provided with a reed, and a shedding mechanism, combined with a needle-carrier, mounted independently of the lay, and having a swinging movement following the movements of said lay and such that the length of thread from the needle to the fell of the fabric, when the needle is in each of its extreme positions, shall be substantially the same, substantially as described.

12. In a loom, a frame, a lay provided with a reed, and a shedding mechanism, combined with a needle-carrier, one or more needles mounted thereupon, means to vibrate said needle-carrier, a cam, and a lever straddling said cam, and coöperating therewith to determine the movement of the said carrier and the pattern produced by the said needles, and means to move said carrier in opposite directions independent of and within limits fixed by said cam, substantially as described.

13. In a loom, a frame, a lay provided with a reed, and a shedding mechanism, combined with a needle-carrier, one or more needles mounted thereupon, a cam, a lever to vibrate said carrier forked at one end to straddle said cam, means to vibrate said lever within limits determined by said cam, and means to vary the said vibratory movement relatively to the said cam, substantially as described.

14. In a loom, a frame, a lay and a harness mechanism, combined with a plurality of needle-carriers, needles arranged thereon, and cams for the respective carriers, and actuating-levers for the respective carriers having forked ends straddling the cams therefor, and means to vibrate said levers within the limits determined by said cams, substantially as described.

15. In a lappet-loom, lappet-needles, carriers therefor, and means to move the said needles such that the length of thread from the needles to the fell of the fabric during the insertion of the weft and during the beating up of the lay is substantially the same to obviate slackening of the thread, substantially as described.

16. In a lappet-loom, the needles, carriers therefor, thread-guides to conduct the threads to the needles, and means to move said needles such that the threads conducted thereto by said thread-guides shall be held under suitable tension during the laying in of said threads and during the beating up of the same.

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

HORACE WYMAN.

Witnesses:

JUSTIN A. WARE,

SAMUEL B. SCHOFIELD.