No. 693,677. Patented Feb. 18, 1902.

J. WILLIS.

LOOM.

(Application filed May 28, 1901.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

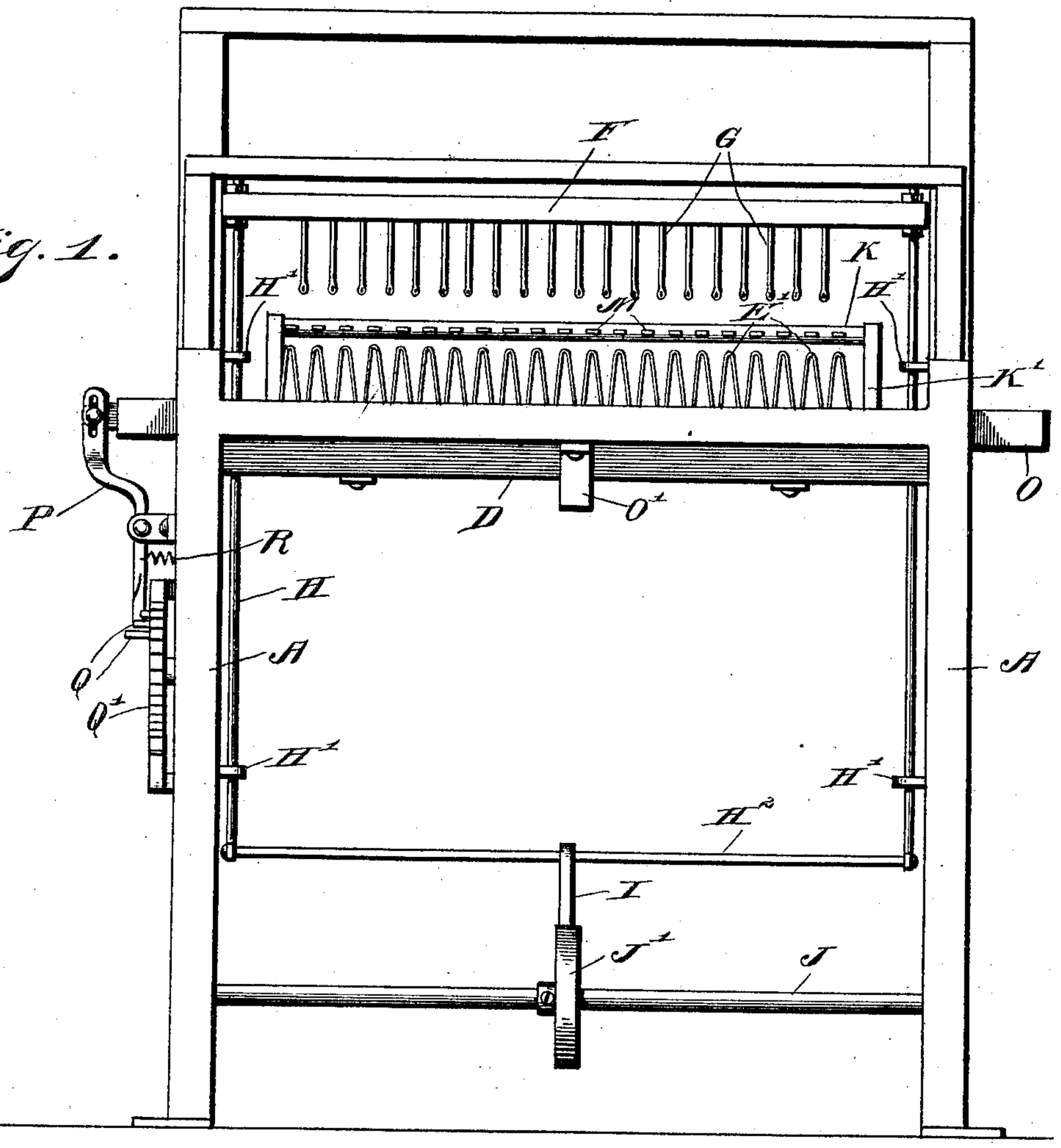
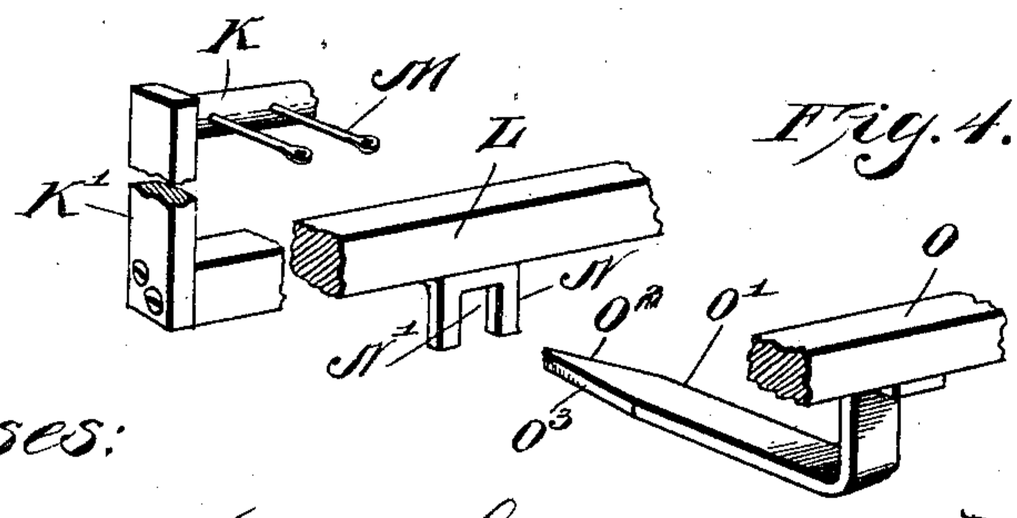


Fig. 4.



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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

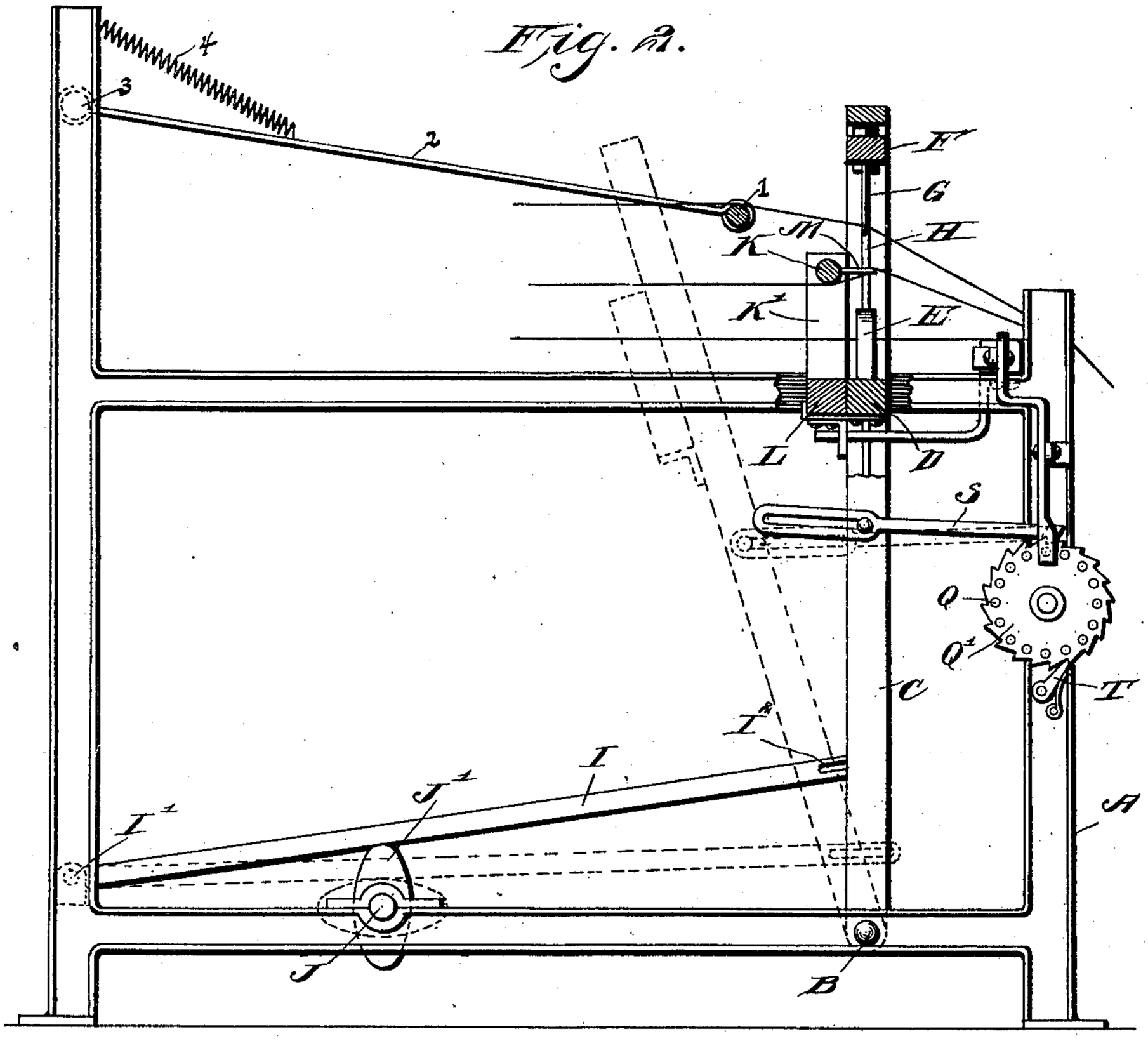


Fig. 3.

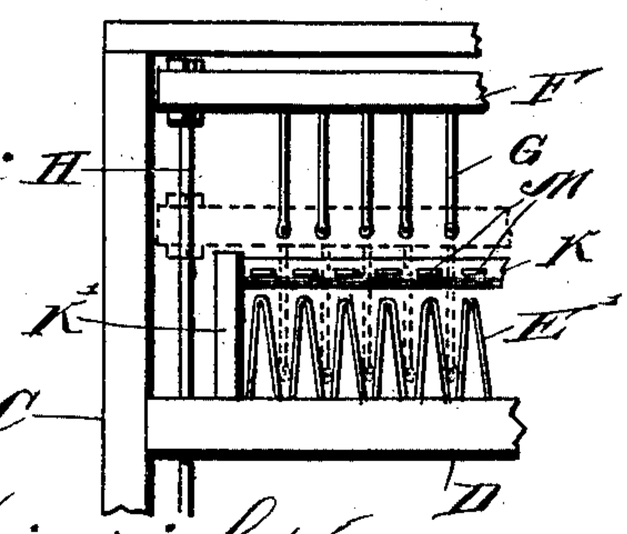
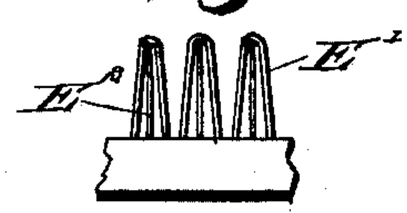


Fig. 10.



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(No Model.) 3 Sheets—Sheet 3.

Fig. 5.

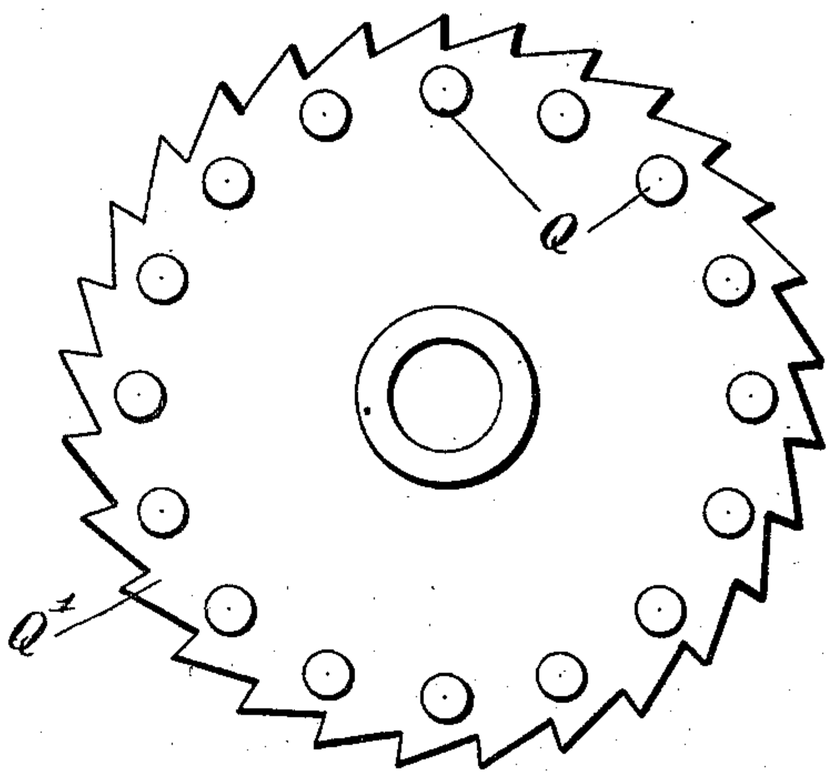


Fig. 6.

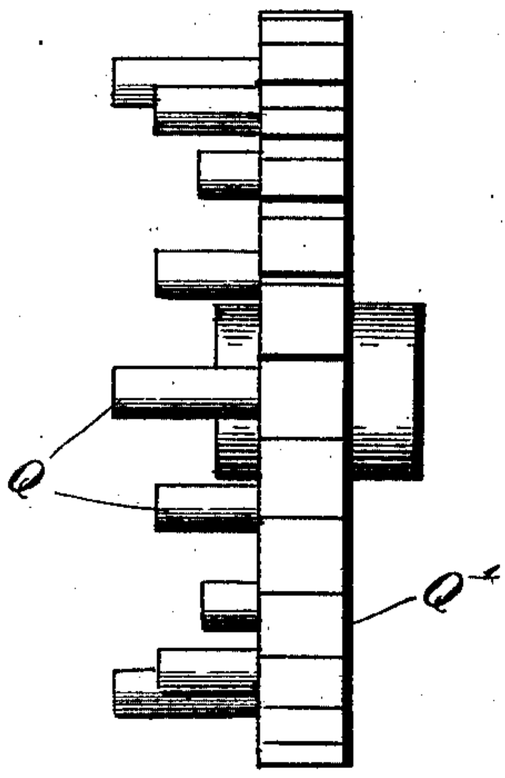


Fig. 7.

Fig. 8.

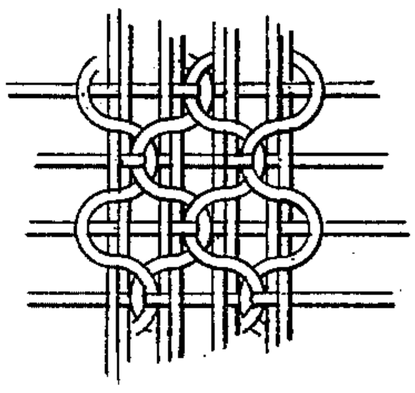
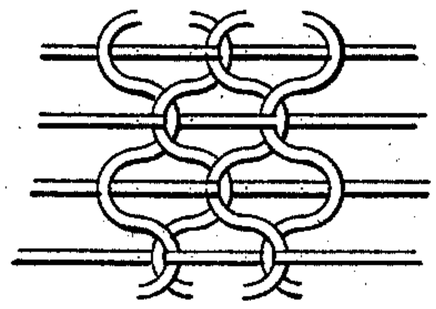


Fig. 9.



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LOOM.

SPECIFICATION forming part of Letters Patent No. 693,677, dated February 18, 1902.

Application filed May 28, 1901. Serial No. 62,244. (No model.)

To all whom it may concern:

Be it known that I, JOHN WILLIS, a citizen of the United States, residing at Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a certain new and useful Improvement in Looms, of which the following is a specification.

My invention relates to new and useful improvements in looms for cross-weaving, and has for its object to construct a loom in which auxiliary warp-threads will be woven into the fabric and each of the warp-threads will be made to assume irregular lines, so as to make a geometrical pattern in the fabric when woven, and the mechanism for bringing this about will consist of a series of vertical needles through the eyes of which one set of the auxiliary warp-threads are threaded and a series of horizontal needles through the eyes of which the other set of auxiliary warp-threads are threaded. Both sets of the needles are carried by the lathe and rocked therewith, the vertical needles having a vertical movement and adapted to pass between the horizontal needles, so as to form a shed of the auxiliary warp-threads for the passage of the shuttle. The horizontal needles have a lateral motion for the purpose of bringing about the irregular line of the auxiliary threads.

Another feature of my invention is in the peculiar construction of the reed, in which the usual top cross-bar is dispensed with, so that the vertical needles can pass between the reed.

With these ends in view this invention consists in the details of construction and combination of elements hereinafter set forth and then specifically designated by the claims.

In order that those skilled in the art to which this invention appertains may understand how to make and use the same, the construction and operation will now be described in detail, referring to the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a front view of the loom having my improvement applied thereto. Fig. 2 is a sectional view of a loom, showing my improvements applied thereto, the balance of the loom, which forms no part of my invention, being omitted. Fig. 3 is a detail view showing a front elevation of the reed and needle-bars, showing the vertical needles in their lowest position in dotted lines. Fig. 4 is a detail perspective view of a portion of the horizontal needle-bar and the mechanism for shifting the same laterally. Fig. 5 is a side elevation of the wheel which regulates the movement to be given to the horizontal needle. Fig. 6 is an edge elevation of the same. Fig. 7 is a cross-sectional view of the end of the lever which engages the pin upon the regulating-wheel shown in Figs. 5 and 6. Fig. 8 is a diagram showing the way the stitches are formed in the fabric. Fig. 9 is a diagrammatical view showing how the fabric would be held together by the auxiliary warp-threads even without the main warp-threads, and Fig. 10 is a modification showing how the reeds could be partitioned off for the purpose of more evenly dividing the main warp-threads.

In carrying out my invention as here embodied, A represents the side frames of the loom, to which is pivoted at the point B the lathe C. This lathe C carries a cross-bar D, to the upper side of which is secured the rod E. This rod consists of a series of arches E′, the ends of said arches being secured in a cross-bar D. Through these arches are adapted to pass the main warp-threads, and these arches are of sufficient height to allow the main warp-threads to be formed into a shed without said warp-threads coming in contact with either the top of the arches or cross-bar D. These main warp-threads pass through either a harness or heddle, which is not illustrated in the drawings, and the shed is formed in any of the well-known ways.

F is a cross-bar from which depends a series of needles G, having eyes formed in their lower ends. One set of auxiliary warp-threads pass from a suitable source of supply through the eyes of the needles G. These needles are adapted to have a vertical movement within the lathe C, and when these descend they pass between the arches E′ of the reed E. The cross-bar F, which carries the needles G, is guided in its vertical movement by means of the rods H, which are secured to each end of the cross-bar, and extend downward and pass through the guides H′, secured to the side bars of the lathe C. The

lower ends of the rods H are connected by a cross-rod H^2. Any suitable means can be employed to bring about this vertical movement of the cross-bar F and needles G. In the drawings I have illustrated a simple method in which a lever I is pivoted at the point I′ to the frame of the loom, the forward end of the lever being slotted at the point I^2, through which slot passes the cross-rod H^2.

J is a shaft which is journaled in the frame of the machine, and secured to this shaft and adapted to revolve therewith is a cam J′. The lever I rests upon this cam and is raised by the same, the weight of the cross-bar F and needles G being sufficient to cause the same to descend by gravity.

K is a horizontal needle-bar which is secured at one end in the uprights K′, which project upward from a cross-bar L. This cross-bar L is adapted for a lateral reciprocating movement for the purpose hereinafter described and is held and guided in suitable guideways extending outward from the cross-bar D of the lathe. Extending forward from the needle-bar K is a series of horizontal needles M, which have eyes formed through their forward ends, through which are threaded the other set of auxiliary warp-threads. The needles M lie in a position directly over the crown of the reeds E′, and therefore in a line directly between the vertical needles G. Therefore it is obvious that as one set of the auxiliary warp-threads are carried by the vertical needles the other set of auxiliary warp-threads are carried by the horizontal needles, which horizontal needles are stationary as regards vertical movement. When the vertical needles are forced downward to the position shown in dotted lines in Fig. 3, a shed will be formed through which the shuttle will pass, carrying the weft between the auxiliary warp-threads as well as between the main warp-threads.

After the needles G have passed down between the horizontal needles M and the reeds E′ and the lathe has again traveled forward and the vertical needles raised then the needle-bar K, carrying the horizontal needles M, is caused to shift sidewise, so that each individual needle will lie over a different arch and between a different set of vertical needles than it did previously. Then as the lathe travels backward and the vertical needles again descend the auxiliary warp-threads carried by the vertical needles will then be caused to pass down the other set of auxiliary warp-threads upon the side opposite from what they did previously. The fact of the horizontal needles shifting so that the auxiliary warp-threads carried by the vertical needles will pass downward first to one side then to the other of the horizontal needles is what causes the auxiliary warp-threads to represent an irregular line. The auxiliary warp-threads carried by the horizontal needles will thus always overlie the weft, while the auxiliary warp-threads carried by the vertical needles will overlie the warp-threads carried by the horizontal needles, but will pass underneath the weft. This will form a descent of the auxiliary warp-threads overlying the main weave and will have the appearance of crocheted fabric.

Any suitable means can be employed to automatically shift the needle-bar K first in one direction and then in the other as the lathe travels forward; but in the drawings I have illustrated a very simple mechanism which I prefer to use. This consists in providing the reciprocating cross-bar L with a downwardly-projecting plate N, which has formed in it the notch N′, and also providing a reciprocating cross-bar O, which extends across the front of the machine and is guided in suitable guideways. Extending forward from this slide-bar O is an arm O′, which is pointed at its forward end, and thus has two bevels O^2 and O^3, formed upon each side thereof. These bevels act as cam-surfaces against the edges of the notch N′ when the lathe is passed forward. One edge or the other of the notch N′ will engage one of the bevel-surfaces O^2 or O^3, depending upon the position in which the arm O′ is placed, and these bevel-surfaces acting against the edges of the notch will force the slide-bar L in one or the other direction. This direction depends upon the position of the slide-bar O, which carries the arm O′. In an ordinary weave, such as shown in Fig. 8, the horizontal needles are moved backward and forward the distance equal to the space between the arches of the reed. This will cause each of the auxiliary warp-threads to assume a wavy line, as shown in Fig. 8; but of course this is only one form of a weave which can be made with this loom, as it is obvious that the horizontal needles can be made to travel two or more spaces in one direction before returning, and thus in returning travel back two or more spaces, or the horizontal needles could travel step by step two or three spaces in one direction and then in returning jump the full distance at once. This, as I said, will depend entirely upon the position of the arm O′, and for the purpose of shifting the bar O automatically I pivot to one end of the same the lever P, which lever is pivoted at the point *p* to one of the side frames of the machine. The lower end of this lever projects downward and is adapted to be engaged by pins Q, extending out from the face of a ratchet-wheel Q′, also pivoted to the side frame of the machine. The lower end of the lever P is beveled, as illustrated in Fig. 7. The ratchet-wheel Q′ is caused to revolve one space each time the lathe travels rearward by means hereinafter described. As the ratchet-wheel is revolved in this manner the pins Q will strike the bevel-surfaces P′ upon the end of the lever P, and thereby cause the slide-bar O to travel in one direction. Then if at the next step a shorter pin is encountered, or no pin at all, a spring R will pull upon the lower end of the lever, and

thus move the slide-bar O in the opposite direction.

It is obvious that by forming the pins Q of different lengths and by placing the pins in different positions I cause the slide-bar O to travel in one direction step by step one, two, or three spaces and return in the same manner, or I can cause the bar to travel two or three spaces at a jump and step the same back, or allow it to return in the same manner. All of these different movements will permit a different pattern of the auxiliary warp-threads, as before described.

For the purpose of revolving the ratchet-wheel Q′, I pivot a pawl S to one side of the lathe C, and the nose of this pawl is adapted to engage the teeth of the ratchet-wheel when the lathe is in its forward position, and as the lathe is forced rearward it will thus revolve the ratchet-wheel one step. A spring-pawl T, pivoted to the side frame of the loom and engaging the teeth of the ratchet-wheel, will serve to hold the said ratchet-wheel against retrograde movement.

In Fig. 10 I have illustrated a modification wherein the arches E′ of the reed E are divided by partitions E^2. This is for the purpose of evenly dividing the main warp-threads, so that the pattern of the weave will be more symmetrical.

While I have shown one partition in the arches, any number of partitions could be employed by widening the arches.

1 is a bar which extends transversely across the loom behind the lathe, and to each end of this bar is secured the link 2, which is pivoted at the point 3 to the rear part of the loom-frame. This bar is adapted to be held in its normal position by means of the spring 4. The upper auxiliary warp-threads which pass over the vertical needles are adapted to pass over this tension-bar 1, and thus be supported to prevent them from becoming entangled when the vertical needles descend.

Of course I do not wish to be limited to the exact construction here shown, as slight modifications could be made without departing from the spirit of my invention.

Having thus fully described my invention, what I claim as new and useful is—

1. In a loom, the combination with a heddle or harness of ordinary construction, an open-top reed carried by the lathe, said reed being composed of a series of arches through which the main warp-threads are threaded, a series of vertically-reciprocating needles through which one set of the auxiliary warp-threads are threaded, a series of laterally-reciprocating needles through which the other set of auxiliary warp-threads are threaded, both of said sets of needles being carried by the lathe, substantially as described and for the purpose specified.

2. In a loom, an open-top reed consisting of a series of arches through which the main warp-threads are threaded, a series of vertically-reciprocating needles adapted in their reciprocating movement to pass between the arches of the reed, a series of horizontally-disposed needles, laterally-reciprocating needles, eyes formed in the ends of both sets of needles through which are adapted to be threaded certain auxiliary warp-threads, both sets of needles and reed adapted to be carried by the lathe, as and for the purpose specified.

3. In a loom, an open-top reed carried by the lathe, said reed consisting of a series of arches secured in the cross-bar, the main warp-threads adapted to be threaded through said arches, a series of vertically-reciprocating needles through the eyes of which are adapted to be threaded one set of auxiliary warp-threads, said vertical needles arranged directly above the reed and adapted in their downward movement to enter between the arches of the reed, a series of laterally-reciprocating horizontal needles, through the eyes of which are threaded the other set of auxiliary warp-threads, said horizontal needles adapted to lie directly over the arches of the reed and pass between the vertical needles as said vertical needles descend, both sets of needles adapted to be carried by the lathe, means for causing the vertical needles to reciprocate, means actuated by the motion of the lathe for causing the horizontal needles to reciprocate laterally, substantially as described and for the purpose specified.

4. In a loom, the combination of an open-top reed, substantially as shown and described, carried by the lathe, a series of vertically-reciprocating needles also carried by the lathe with a series of laterally-reciprocating needles carried by the lathe, said laterally-reciprocating needles adapted to be reciprocated in one direction a predetermined distance and back again to their previous position, means actuated by the movement of the lathe for reciprocating the horizontal needles, interchangeable means for controlling and regulating the distance the said needles are to reciprocate, substantially as described and for the purpose specified.

In testimony whereof I have hereunto affixed my signature in the presence of two subscribing witnesses.

JOHN WILLIS.

Witnesses:
MARY E. HAMER,
L. W. MORRISON.