

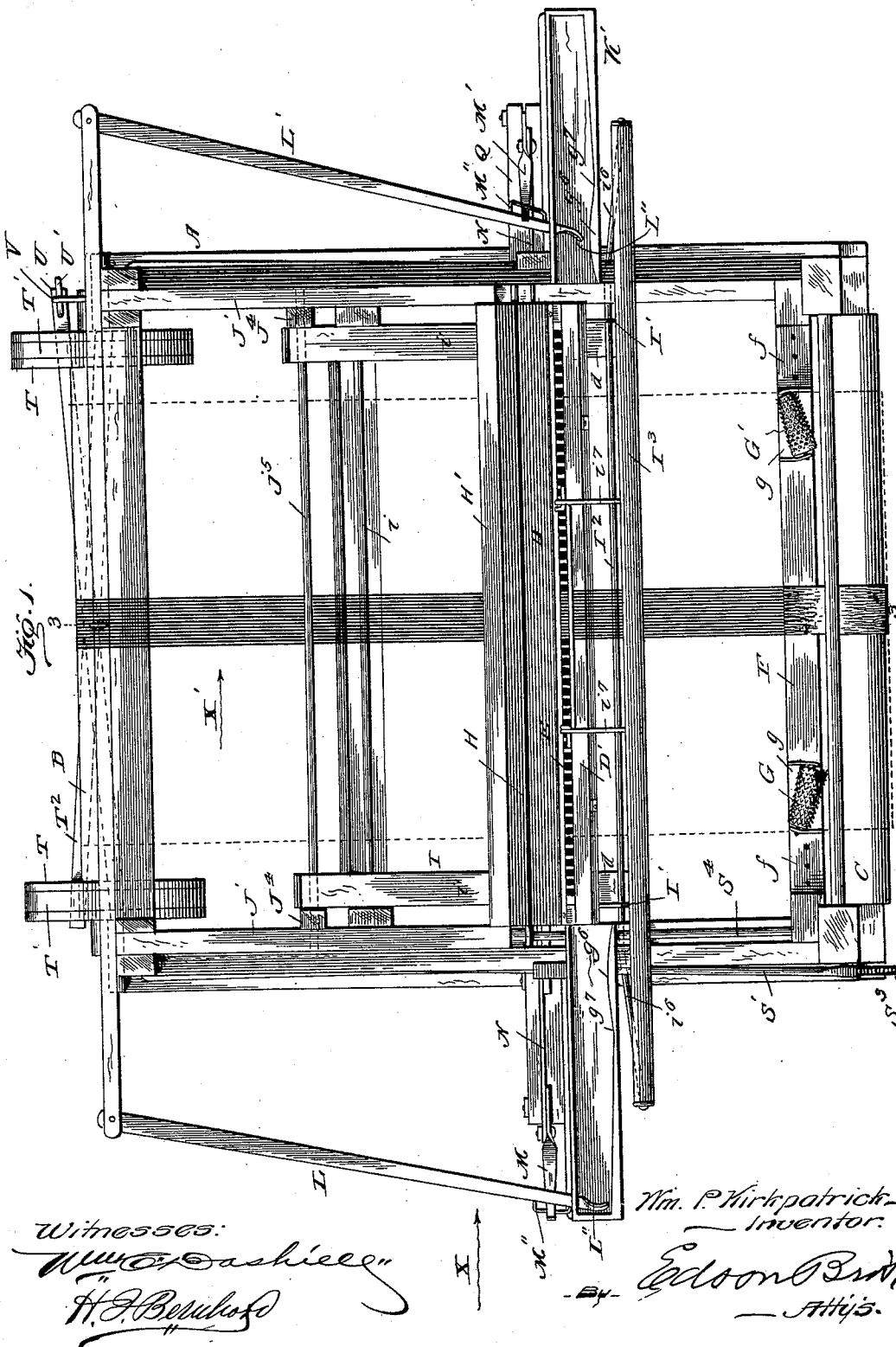
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5 Sheets—Sheet 1.

W. P. KIRKPATRICK.
LOOM.

No. 586,904.

Patented July 20, 1897.



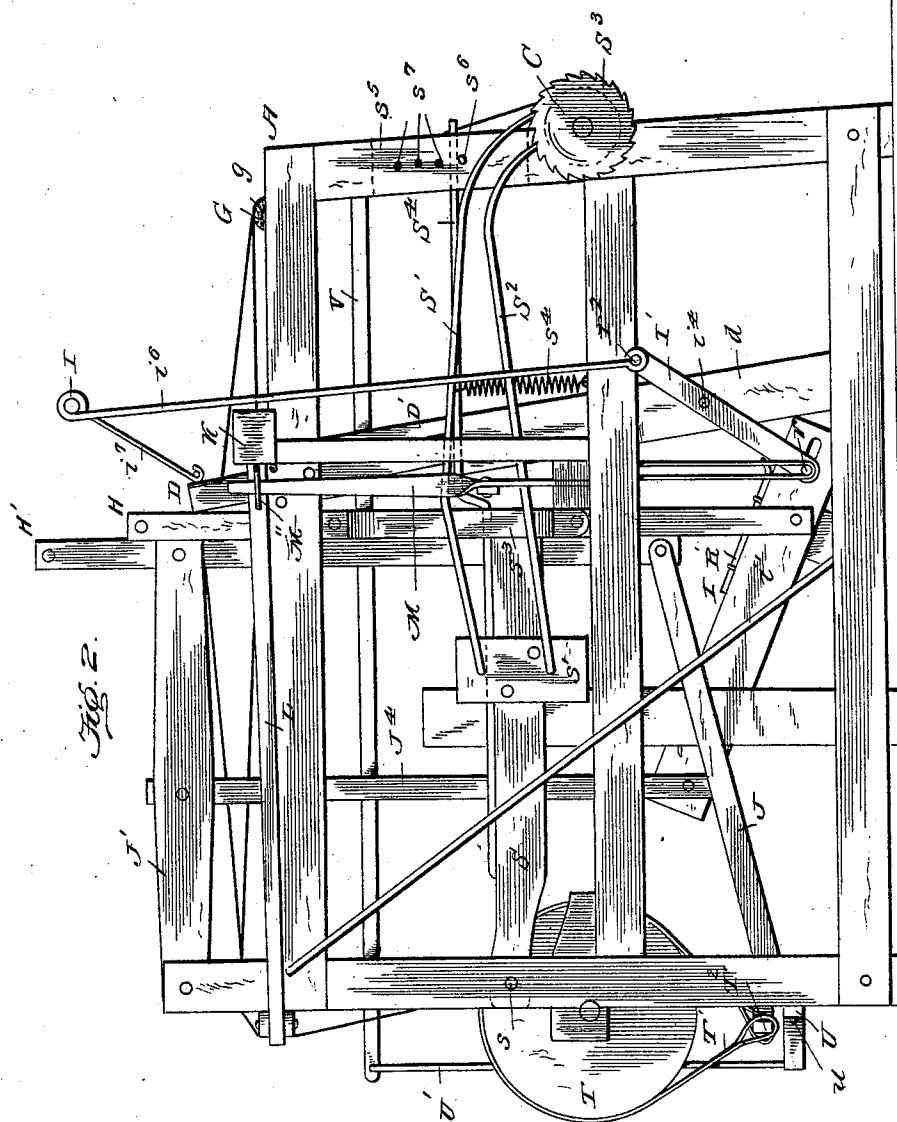
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5 Sheets—Sheet 2.

W. P. KIRKPATRICK.
LOOM.

No. 586,904.

Patented July 20, 1897.



Witnesses:

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Wm. P. Kirkpatrick.
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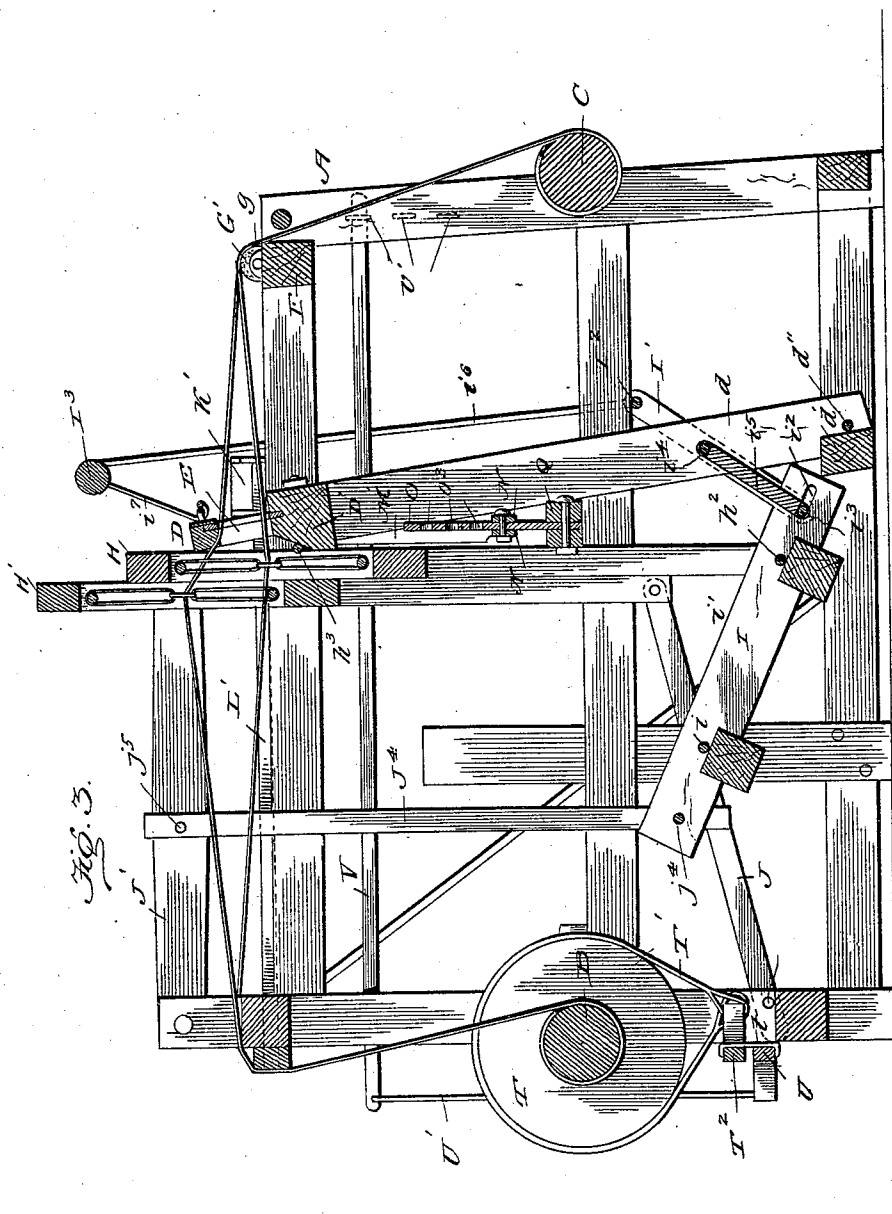
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W. P. KIRKPATRICK.
LOOM.

No. 586,904.

Patented July 20, 1897.



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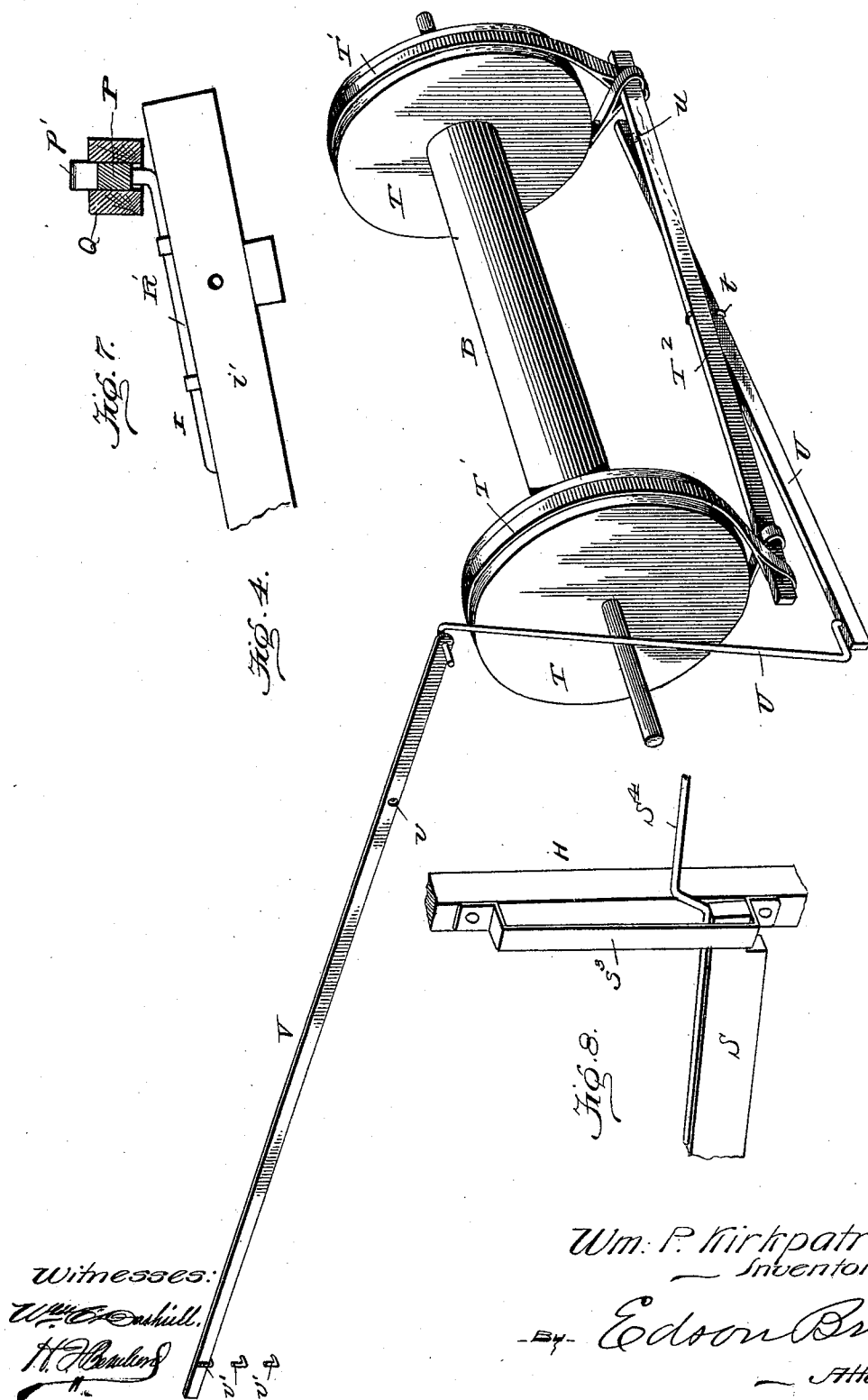
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— By — *Edoon Bros.*
— Attys.

5 Sheets—Sheet 4.

No. 586,904.

Patented July 20, 1897.



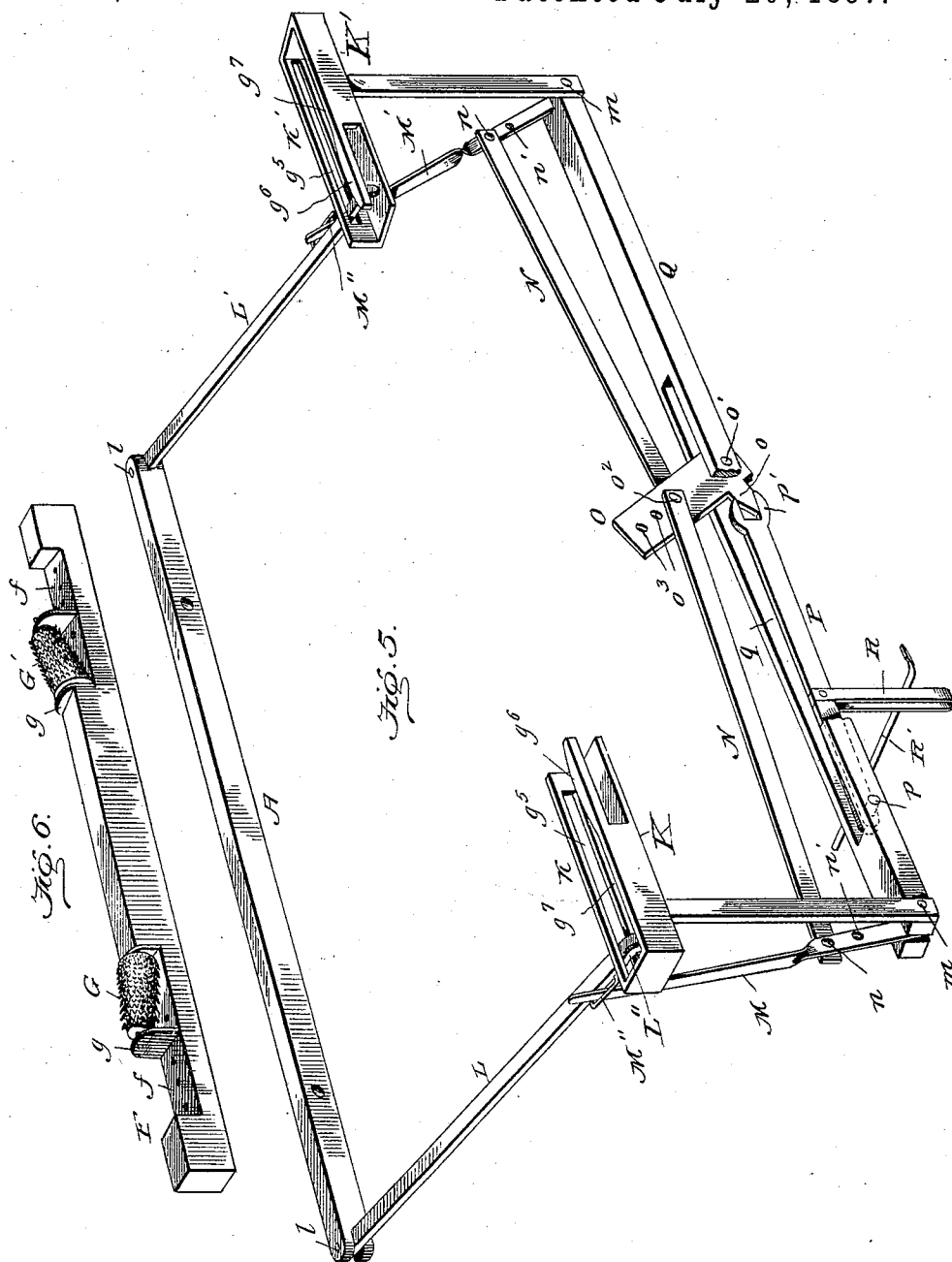
(No Model.)

5 Sheets—Sheet 5.

W. P. KIRKPATRICK.
LOOM.

No. 586,904.

Patented July 20, 1897.



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UNITED STATES PATENT OFFICE.

WILLIAM P. KIRKPATRICK, OF ARROWSMITH, ILLINOIS.

LOOM.

SPECIFICATION forming part of Letters Patent No. 586,904, dated July 20, 1897.

Application filed April 25, 1896. Serial No. 589,122. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM P. KIRKPATRICK, a citizen of the United States, residing at Arrowsmith, in the county of McLean and State of Illinois, have invented certain new and useful Improvements in Looms; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in looms which may be operated by hand for the weaving of carpets advantageously, although the loom may be used for other purposes than for weaving carpets.

One object of my invention is to dispense with the temples usually employed in weaving fabrics by the substitution of novel devices on the breast-beam for stretching and spreading the fabric transversely and keeping it from shrinking as it passes over the breast-beam and to the cloth-roller on which it is to be wound, which holding and retaining devices are arranged to be adjusted according to the width of the fabric.

A further object of my invention is to combine a shiftable lay with the heddle-frames and with suitable intermediate connectors or devices in a manner to insure proper opening of the shed when the lay is moved in one direction, but when the movement forward is made to beat the fabric the harness is brought to a level. One device or part of the connector between the shiftable lay and the harness is formed with a slideway or loose joint, which allows the lay to be operated independently of the opening of the heddle-frames in case the filling or weft is heavier than desired or is in excess of the proper uniform filling, and this slideway or looseness in the play or movement of the lay also allows the beater or reed to stop or be arrested at different points as the filling may allow, or according as the operator desires to beat up the filling more or less.

A further object of my invention is to provide an improved shuttle-throwing mechanism which shall be certain in its action on the shuttle and which shall be so combined with the lay as to operate at proper times or in synchronism with the play or to-and-fro movement of the lay. My shuttle-throwers are ar-

ranged to describe or move in arc-shaped paths and in horizontal planes in the shuttle-boxes, and they operate in a way to strike the shuttle so as to incline the point thereof as the shuttle starts to leave the shuttle-box toward the reed, and when the shuttle emerges from the shuttle-box on one side of the loom it travels properly along the lay-beam, so it will enter the opposite shuttle-box with certainty and precision. The length or stroke of the shuttle-throwing devices is capable of regulation in an easy manner, and the devices which operate the picker-staffs are so constructed that the leverage may be varied, so that the speed of the picker-staffs may be increased or diminished, as desired.

A further object of my invention is to provide an improved feed mechanism for rotating the cloth-roller automatically, which feed mechanism may be adjusted manually to rotate the cloth-roller according to the filling and the tension on the warp, also to rotate the cloth-roller at slower rate of speed as the diameter of the roll of cloth on the cloth-roller is increased.

A further object of the invention is to provide an improved brake mechanism for the warp-roller for the purpose of securing more or less tension on the warp-threads according as it is desired to have the fabric tight or loose, which brake mechanism may be operated by a lever within convenient reach of the operator stationed in front of the breast-beam of the loom.

By my improved feed mechanism for the cloth-roller and the brake mechanism for the warp-roller, either of which mechanisms may be regulated by the operator in front of the breast-beam, the proper degree of strain or tension may be secured on the warp. In most looms this is not readily obtainable and is prevented by the mechanisms embodied in the loom, but my improvements overcome the objections existing in prior structures in the particulars recited.

To the accomplishment of the hereinbefore-mentioned purposes my invention consists in the novel combinations of devices and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand my inven-

tion, I have illustrated the preferred embodiment thereof in the accompanying drawings, forming a part of this specification, in which—

Figure 1 is a plan view of my loom. Fig. 2 is an elevation looking at the left-hand side of the loom in the direction indicated by the arrow X and showing the feed mechanism for the cloth-roller. Fig. 3 is a sectional elevation on the plane indicated by the dotted line 3 3 of Fig. 1, looking in the direction indicated by the arrow X'. Fig. 4 is a perspective view illustrating the warp-roller and the brake mechanism therefor. Fig. 5 is a perspective view of the shuttle-throwing devices. Fig. 6 is a detached view of the breast-beam with the adjustable rolls mounted thereon for the purpose of spreading and stretching the fabric transversely as it passes to the cloth-roller. Fig. 7 is a fragmentary view of part of the tiltable frame I and the cross-beam Q, illustrating said frame and the shoe R' thereon in a raised position for the shoe to lift the lever P. Fig. 8 is a fragmentary view of one of the heddle-frames II and the lever S, showing the keeper on the heddle-frame that lifts said lever, also showing the handpiece by which the lever may be controlled.

Like letters of reference denote corresponding parts in all the figures of the drawings.

The frame A of the loom is of ordinary construction except in such respects as is necessary to embody my improvements in the machine, and at the rear and front ends of this frame are provided the journal-bearings which receive the shafts or trunnions of the warp-roller B and the cloth-roller C, which rollers are situated at opposite ends of the loom-frame.

D is the shiftable lay, the swords d d of which are joined at their lower ends by a tie-bar d' and are mounted or supported by a pivotal rod d'' , suitably fitted in the base-sills of the main frame A. On the lay-swords is secured the lay-beam D', and the lay carries the reed E, which lies parallel to and extends a suitable distance above the lay-beam D', said lay-beam and reed being of the usual or any preferred construction.

On the main frame A is the breast-beam F, the top side of which is recessed at f to receive the rolls G G', which serve the twofold purpose of guiding the fabric over the breast-beam and of straining and stretching the fabric transversely as it is delivered to the cloth-roller C. These rollers G G' are preferably journaled in brackets g , which rest upon the breast-beam F within the recesses thereof, and the brackets g are adjustably fastened to the breast-beam in any suitable way—as, for instance, by bolts which may be passed through any desired apertures of the series of apertures formed in the breast-beam, whereby the brackets may be adjusted toward or from each other on the breast-beam to accommodate the rollers to fabrics of different widths. The rollers G G' are con-

structed and arranged in diagonal positions across the breast-beam to adapt them to the work of preventing the fabric from shrinking as it passes over the breast-beam and to stretch or strain the fabric transversely on its way to the cloth-roller. Said rollers are made conical in shape, so that they taper from end to end instead of being uniform in diameter throughout their length, and they are placed in reverse positions relative to each other, thus making the larger ends or the bases of the conical rolls face each other, as shown. These rolls have roughened or toothed surfaces to enable them to properly engage with the carpet at and near the selvage thereof, and I prefer to provide the outer or smaller end of each roll with spurs which project decidedly beyond the surface of the roll, while the teeth on the body of the roll do not project quite so far as the teeth at the smaller end thereof. These teeth or spurs are inclined toward the small outer end of the roll. By the described arrangement of the rolls, the peculiar arrangement of the teeth on the working faces thereof, and the employment of conical rolls arranged with their large ends toward each other the rolls G G' are caused to engage with the fabric at and near the selvage, so as to stretch and strain the fabric transversely as it passes over the rolls and breast-beam on its way to the revolvable cloth-roller.

The harness of the loom consists of the heddle-frames II II', a tiltable frame I, to which one heddle-frame is pivotally and directly attached, a series of pivoted arms J J', connected to the other heddle-frame, and connectors between the lay and the tiltable frame I, whereby the heddle-frames are given the required vertical movement in opposite directions simultaneously, so as to effect the opening of the shed at proper intervals. These heddle-frames are solid at the sides next to the loom-frame, as is most desired by weavers, and the frames carry the usual warp-receiving eyes or heddles h h' , which are hung by the usual cords or other suitable devices within the frames.

In the embodiment of the harness shown in the accompanying drawings the heddle-frame II is open at the lower end, so as to embrace or fit closely against the side rails of the tiltable frame I, and the heddle-frame II and tiltable frame are directly and pivotally attached together by means of the tie or pivotal rod h^2 . The heddle-frame II rests against its companion frame II' on one side, and at its opposite side it bears against a transverse beam Q, provided for a part of the shuttle-thrower mechanism, and against a rod or bar h^3 , the heddle-frame II being guided by said parts in its vertical play or movement, although other devices may be employed for guiding said frame II. The other heddle-frame II' is carried by the horizontal pivotal arms J J'. Two of these arms, J' J', are pivoted to the upper part of the loom-frame and

to the upper part of the heddle-frame H', and the other pair of arms, J J, are pivoted to the lower part of the loom-frame and the lower part of the heddle-frame H', whereby the two pairs of arms serve to carry and guide the heddle-frame H' in its vertical play. The tiltable frame I lies in a substantially horizontal position in the lower end of the loom-frame, and said tiltable frame is hung at an intermediate point of its width on a suitable pivotal rod i^2 , although other devices may be used for pivotally connecting the tiltable frame to the loom-frame. In the embodiment of my invention in a hand-loom as shown in the accompanying drawings the end rails i' of the tiltable frame are projected beyond the side rails of said frame I and beyond the points where the heddle-frame is attached to the tiltable frame, and in these extended ends of the end rails i' are formed the longitudinal slots i^2 . In said slots i^2 at the extended front end of this tiltable frame I are fitted the ends of a transverse rod i^3 , which rod is supported in the rear ends of a pair of levers I' I', arranged to fit against the sides of the lay-swords d . The pair of levers I' I' are fulcrumed at intermediate points of their length on the lay-swords preferably by the employment of a pivotal rod i^4 , which passes through the levers and the lay-swords, and between the rods i^3 i^4 is arranged the leaf-board i^5 , which is loosely attached to the two rods and which prevents them from bending. In the opposite or front ends of the pair of levers I' I' is journaled a horizontal rod or shaft I², to the ends of which are loosely attached the upright links i^6 , the upper ends of said links being connected with the hand-beam I³, which in turn is pivotally attached to the lay by means of the bail i^7 , rigidly fastened to the beam I³ and pivotally connected to the upper rail of the reed-frame. It will be seen that the hand-beam I³ affords a convenient grasp for the attendant or weaver to force the lay and reed toward or from the harness, and at the same time the attendant is able, by pressing down or upward against the hand-beam, to rock or turn the levers I' I', which are loosely and pivotally connected with the tiltable frame I by the pivotal rod i^3 , fitting in the slotted ends of the frame I.

When the hand-beam I³ is depressed, the levers I' are turned to cause the rod i^3 to press upwardly against the slotted frame I, so as to tilt or incline the same in one direction, but as the hand-beam I³ is raised the levers I' are turned in the opposite direction to press the rod i^3 against the lower slotted sides of the tiltable frame I, and thus the frame I is tilted or inclined in the reverse direction. At the same time the attendant is able to swing the lay back and forth independently of and without operating the tiltable frame, because he need not raise or lower the hand-beam I³ when applying force thereto to swing the lay and reed, and in this contingency the levers I' swing or play with the lay-swords, and rod i^3

moves idly back and forth in the slotted ends i^2 of the tiltable frame I. This construction of the tiltable frame I, the rod i^3 , the levers I', and the hand-beam I³ provides the sliding or loose joint in the connectors between the hand-beam or lay and the harness hereinbefore mentioned, by which the operator is able to give the to-and-fro movement to the lay and reed independently of the opening of the harness and shed and without disturbing the same, and this operation of the lay and reed independently of the harness is advantageous and desirable in case the filling or weft used at one time being heavier than the regular filling, also enabling the operator to bring the reed with more or less force against the filling and thereby beat the same with required force, and also to stop or arrest the reed and lay at any desired point in their travel toward the filling, according to the thickness of the filling in the fabric. This construction also gives room or opportunity for the heddle-frames to open in case the reed and lay do not travel so far over toward the filling at one time as at another beat of the reed and lay.

It is to be noted that the heddle-frame H is attached directly to the front end of the tiltable frame I, at one side of the fulcrum thereof, which connection insures the proper vertical play of one heddle-frame with the frame I as it is tilted by the described connection with the hand-beam pivoted on the lay, and in order to give the other heddle-frame H' a vertical play in a reverse direction simultaneously with the play of the heddle-frame H I have provided the upright pitmen J⁴, which have their lower ends pivotally attached to the rear end of the tiltable frame I or on the opposite side of the fulcrum of the frame I from the pivotal attachment of the heddle-frame H to the tiltable frame. The lower ends of said pitmen J⁴ are connected to the frame I by means of the pivotal rod j^4 , and the upper ends of the pitmen J⁴ are pivotally attached to the pivotal arms J' J' by means of the pivotal rod j^5 , the ends of which are attached to the arms J' at points midway between the pivots which attach the arms J' to the loom-frame and the heddle-frame H'. It is clear that as the frame I is tilted or inclined in one direction the heddle-frame H is moved upward and the other heddle-frame H' is moved downward to open the shed, and that when the tiltable frame I is inclined or tilted in the reverse direction the frame H is moved downward and frame H' moved upward, the movements of the frames H H' taking place simultaneously and in opposite directions, according to the working of the hand-beam I³ by the operator. The devices are so arranged and constructed that when the lay and reed are swung forward to beat the filling in the fabric the frames H H' are brought in alignment, so that the warp-carrying loops or eyes in the two frames lie practically in the same level.

I will now proceed to describe my improved shuttle-throwing mechanism, which is automatically operated in synchronism with the movements of the heddle-frames.

5 K K' are the shuttle-boxes, supported on opposite sides of the loom-frame A and in alinement with each other, and these shuttle-boxes are so placed that when the lay and reed are at the limit of their rear movement the lay-
10 beam D' is in alinement with the shuttle-boxes for the shuttle to ride on said beam in pursuing its course through the shed from one shuttle-box to the other.

The picker-staffs L L' proper of my im-
15 proved shuttle-throwing devices are arranged in horizontal positions and preferably between the rear end of the loom-frame and the shuttle-boxes and outside of the loom-frame proper. Each horizontal picker-staff is piv-
20 oted at the rear end of the loom-frame, preferably by means of a pivotal bolt or pin l , which is supported in an extension of a rail or bar of the loom-frame A, and the free forward end of each picker-staff passes through
25 a slot g^5 in the rear side of the shuttle-box. The horizontal picker-staffs are thus hung or pivoted at their rear ends so as to enable the free forward ends thereof to move in an arc of a circle and in horizontal paths within the
30 shuttle-boxes, and this mode of operation of the picker-sticks causes the sticks to strike and impel the shuttle in a manner to incline the point of the shuttle toward the reed as the shuttle starts to leave the shuttle-box,
35 which object is further aided by the swells g^6 on the inner faces of the front sides of the shuttle-boxes. (See Fig. 1.) The front walls of the shuttle-boxes have slightly-concave faces g^7 outside of the swells g^6 to enable the
40 picker-sticks to play therein without hindrance. The picker-sticks are arranged in a novel way to strike the shuttle in order to drive it out of the shuttle-boxes to properly pass through the shed and to enter the opposite
45 shuttle-box with precision and certainty. The free ends of the picker-sticks are lined with cupped leather, (indicated at L'' in Figs. 1 and 5,) so as to strike the point of the shuttle properly and prevent it from slipping off
50 the picker-stick. The horizontal picker-sticks are actuated by the upright swinging swords M M', which are connected by the links N to a central lever O, which is common to both of the links N, and this lever O is vibrated back
55 and forth by an actuator P, hung to be moved up and down by suitable devices actuated by the tiltable frame I. Said swords, lever, and actuator are supported on and carried by a single transverse beam Q, which is rigidly fast-
60 ened to the loom-frame and has its ends projected beyond said loom-frame to lie below the shuttle-boxes. This beam Q has a longitudinal slot q , in which is fitted the horizontal actuator P, which is in the form of a lever, having its outer end fulcrumed to the beam
65 Q, as at p , while the inner end of said actuator-lever P is forked or recessed, as at p' , to

form a head which embraces a laterally-projecting foot o on the lever O, the latter being arranged in an upright position and pivotally supported in the recess q of the beam Q on a horizontal bolt or pin o' . The actuator-lever P and the upright lever O are operatively connected together by the head p' , engaging with the foot o , so that as the actuator is raised or lowered it moves the upright lever O back and forth transversely of the loom, and as the picker-swords M are linked to the vibrating upright lever the swords are moved back and forth to properly throw the picker-sticks in the shuttle-boxes. I prefer to connect the inner ends of both links N to the common lever O by means of the single bolt o^2 , which passes through both links and the lever, and the points of attachment of the links to the lever O may be changed or shifted toward or from the fulcrum o' of the lever O by placing the pivotal bolt o^2 in any one of the apertures o^3 , provided in said upright lever O. The outer ends of the links N are pivotally attached to the picker-swords M by means of bolts or pins n , and the points of attachment between the links and swords may be shifted by placing the bolts or pins n in any desired aperture n' in the series of apertures provided in the swords M. These swords M are made, preferably, of upright pieces of inherently elastic or spring bar metal, pivotally attached at their lower ends to the extended ends of the beam Q, as at m , and the upper ends of said elastic or spring swords are slidably or loosely attached to the picker-sticks L L', near the free ends thereof, in order that the upright swords may be attached to the horizontally-swinging picker-sticks in a manner not to interfere with the swinging motion of the picker-sticks, while at the same time said parts are properly connected to insure proper operation of the picker-sticks by the swords. The slidable joint or connection between the swords and the picker-sticks is effected by means of the keepers M'', which are fastened to the picker-sticks, and the upper free ends of the swords are loosely confined between the keepers and the picker-sticks, whereby the swords are adapted to swing alongside of the shuttle-boxes when the upright lever O is moved by the actuator and the picker-sticks are free to swing in horizontal paths without hindrance from the means employed to operatively connect the swords and picker-sticks.

It is to be observed that the connection between the actuator-lever P and the upright lever O is at a point some distance from the fulcrum of the actuator-lever P, so that the leverage and power of the actuator are employed to the best advantage, and by adjustably connecting the links N to the upright lever O and the swords the throw and speed of the swords can be varied, as desired, to give the proper stroke and speed to the picker-sticks.

The friction and wear on the parts of my

shuttle-throwing mechanism are reduced to a minimum, and this is especially so with respect to the connection between the picker-sticks and the swords, because in the movement of said parts the points of contact between the swords and sticks are shifted during the strokes of the picker-sticks.

The employment of inherently elastic or spring swords M, having their free ends connected by a loose joint to the picker-sticks, enables me to dispense with the springs usually employed in shuttle-throwers, because the inherent elasticity of the swords takes up and compensates for the jar due to the impact of the picker-sticks on the points of the shuttle, but while I prefer to employ the elastic swords I do not strictly confine myself to this type of swords, as rigid bars may be employed in lieu of elastic swords.

The actuator-lever P, which imparts motion to the upright lever O, the links, the swords, and the picker-sticks, is itself moved or vibrated by connections with the lay and the tiltable frame I. To this actuator-lever P is connected the stirrup R, which is of loop form and which depends a suitable distance below the beam Q, in which the actuator is hung, and in this looped stirrup is fitted a finger *r* on one of the levers I', which, it will be remembered, is carried by a lay-sword and is operatively connected to the hand-beam I³. This finger *r* is preferably formed by extending one end of the pivotal rod *i*² through a slotted end rail *i*² of the tiltable frame, and said finger *r* is fitted in the looped stirrup to abut or strike against the closed lower end thereof at the proper time to pull down on the stirrup and depress the actuator-lever so as to throw the lever O in one direction to move the picker-sticks through the described connections. The stirrup and finger *r* thus operate to positively throw the actuator and upright levers P.O in one direction, in which position the actuator-lever P has its lower edge extended and exposed below the lower edge of the slotted beam Q, and this actuator P is positively lifted to throw the lever O in the reverse direction by means of a shoe R', which is attached to and carried by the front end of the tiltable frame I, so that the shoe is adapted to bear against the actuator-lever and positively raise the same when the frame I is tilted in a direction to raise its front end. (See Fig. 7.) As the lay is swung toward the heddle-frames to bring the lay-beam D' into alinement with the shuttle-boxes and as the hand-beam I³ is depressed to cause the tiltable frame to swing upward at its front end and shift the heddles to open the shed the shoe R' comes in contact with the actuator P to throw the upright lever and move the picker-sticks in one direction at the proper time, so as to cause one picker-stick to impel the shuttle in one direction and from one shuttle-box to the other. As the lay is reversed and the lick forward is made to cause the reed to beat the filling

the tiltable frame I and the heddle-frames are moved to a horizontal position, but the actuator-bar is not affected, because the shoe R' is lowered with the tiltable frame I and the finger *r* rides idly in the looped stirrup. On the next movement of the lay toward the heddle-frames to bring the lay-beam D' into line with the shuttle-boxes the hand-beam I³ is raised to operate the described connections I' *i*³ and turn the tiltable frame to a reverse inclined position to again shift the heddle-frames and open the shed, and at the proper time the finger *r* depresses the stirrup R to pull down the actuator-lever P and throw the picker-sticks in the reverse direction; thereby impelling the shuttle through the shed from one shuttle-box to the other. On the next forward lick of the lay and reed the frame I is again moved to a horizontal position to bring the heddles to a level and the finger *r* rises idly in the stirrup R; but the actuator-lever P is not moved until the next swing of the lay, when the shoe R' again lifts the actuator-lever P.

In connection with the cloth-roller C an automatic feed mechanism is employed to rotate the same and wind the fabric thereon, and this feed mechanism is so constructed that it may be adjusted manually to give variable speed or rotation to the cloth-roller according to the tension on the warp-thread and to the diameter of the roll of fabric coiled on said cloth-roller. Obviously as the diameter of the cloth-roll is increased by the layers of fabric wound successively thereon the peripheral speed of the cloth-roller should be progressively decreased, and to adapt the feed mechanism to meet these requirements I have provided means for manually adjusting the play of the feed-pawls to vary the speed of the cloth-roller. My feed mechanism consists of a lever S, the pawls S' S², arranged to engage with the ratchet S³, and the handle S⁴. These parts are all arranged on one side of the loom-frame, preferably at the left-hand side thereof, and the handle S⁴ extends forward to the front of the loom, so as to be within convenient reach of the operator stationed to operate the hand-beam I³. The lever S is fulcrumed at its rear end to the rear portion of the loom-frame A, as at *s*, and this lever carries near its free end the transverse plate *s'*, which projects above and below the lever. (See Fig. 2.) The ratchet S³ is fastened to the shaft or trunnion of the cloth-roller C, and the free ends of the pawls S' S² rest and engage with the teeth of the ratchet, the longer pawl S' being pivoted to the upper end of the plate *s'* on a line above the fulcrum *s* and the short pawl S² pivoted to the lower end of the plate *s'* on a line below the fulcrum *s*. The free end of the lever S fits in a keeper *s*³, fastened to the heddle-frame H, and this keeper *s*³ plays up and down with the frame H, so as to lift the lever S when the heddle-frame is raised, said feed-lever being positively depressed by the action of a

spring or weight. A spring s^4 is shown in the drawings, one end of which is attached to the loom-frame A, and its other end is attached to the handle S^1 . This handle consists, preferably, of a rod or bar rigidly attached to the lever S, and it is adapted to be confined in a suitable guide on the loom-frame and to rest upon an adjustable stop which serves to limit the descent of the lever under the influence of the spring s^4 . The guide for the handle S^1 is shown in the drawings as a slot s^5 in one of the uprights of the frame, and the adjustable stop device is shown as a pin s^6 , adapted to be placed in any one of a vertical series of horizontal apertures s^7 , formed in the slotted upright; but other forms of guide and stop devices for the lever S and its handle may be used without departing from my invention. As the heddle-frame H is raised the keeper s^3 lifts the free end of the lever S and the long pawl S^1 is drawn back and the short pawl S^2 is moved forward, but when the heddle-frame H is depressed the lever S and its handle S^1 are pulled down by the spring, so as to move the long pawl S^1 forward and draw back the short pawl S^2 .

It will be seen that the pawls S^1 S^2 alternately serve as feed-pawls and as check-pawls, one being engaged to feed ratchet and cloth-roller in the proper direction, while the other pawl is drawn backward to take a new hold or position. When the loom is first started, the stop device s^6 is adjusted to its lowest position to allow full play or movement to the feed-lever and the pawls in order to rotate the cloth-roller C at a speed proper to wind the fabric thereon as fast as it is woven and to keep the warp-strands under proper tension, but as the cloth is wound thereon and the roll thereby enlarged the stop device s^6 is shifted to shorten the stroke or throw of the lever and the feed-pawls, such adjustment of the stop device being effected from time to time as the roll of cloth increases in size, whereby the feed of the cloth-roller may be regulated according to necessity and the warp-threads may be kept under proper tension at all times and by devices which are within reach of the operator without requiring him to change his station, and which devices do not in any way interfere with the proper automatic feeding of the cloth-roller.

I have also provided an improved brake mechanism arranged at the rear end of the loom to engage with the warp-roller B and which operates to prevent the same from too rapid rotation under the pull or strain on the warp-threads by the take-up or cloth roll C and which aids in keeping the warp-threads under proper strain or tension. My brake mechanism contemplates the employment of disks and bands engaging with both ends of the warp-roller to apply uniform braking action thereto and insure proper tension on all the warp-threads passing through the loom. To this end two brake-disks T T are provided

on the warp-roller B at or near the ends thereof, and in grooves or between flanges on these disks are fitted the straps or bands T^1 T^2 , the ends of which are looped or otherwise attached to an equalizer-bar T^3 , arranged to extend from one brake-disk to the other. This equalizer-bar T^3 is attached centrally to a brake-lever U by means of a clip t , and said brake-lever is arranged below the equalizer-bar, as shown. One end of the brake-lever is hung in a suitable way to the loom-frame, as at u , and the other end of the brake-lever is projected beyond the equalizer-bar T^3 for the proper attachment thereto of an upright link U^1 , the upper end of which is pivoted to the rear end of a controlling-lever V. This controlling-lever V is arranged to extend along the right-hand side of the loom-frame, from front to rear thereof, and the controlling-lever is fulcrumed near its rear end to the loom-frame, as at v . The short arm of said lever V is connected to the link U^1 , which leads to the brake-lever T^2 , and the long free arm of the lever V is arranged to engage with any desired one of a series of stops v^1 , fastened to the loom-frame at or near the front thereof. This controlling-lever is within convenient reach of the operator stationed in front of the hand-beam I^3 , and the operator is thus able to move the controlling-lever V to depress the brake-lever T^2 more or less, according to the pressure it is desired to apply to the bands and disks of the warp-roller.

It is thought that the operation and advantages of my improvements will be readily understood and appreciated by those skilled in the art from the foregoing description, taken in connection with the drawings.

Although I have shown and described my improved loom as constructed for operation by hand and with the connector between the lay and the tiltable frame as adapted to permit the lay and reed to swing to and from the harness without opening the shed, for the purposes described, yet I do not strictly limit myself to the embodiment of my invention in a hand-loom.

I desire to state that the means for feeding and varying the cloth-roller and the brake mechanism for retarding the warp-roller, either of which may be adjusted or controlled by manually-operative levers, enables me to control the tension or strain on the warp-threads.

My construction also enables the operator to grade the filling or weft as desired.

Changes in the form and proportion of parts and in the details of construction of the devices herein shown and described as the preferred embodiment of my invention may be made by a skilled mechanic without departing from the spirit or sacrificing the advantages thereof, and I therefore reserve the right to make such modifications and alterations as fairly fall within the scope of my invention.

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

1. In a loom, the combination with a lay, a breast-beam, provided in its upper side with the notches or recesses *f*, the brackets adjustably fastened to the breast-beam and lying within the notches or recesses thereof, and a cloth-roller, of the conical stretching-rolls *G, G'* supported on the brackets on the breast-beam in reversed positions diagonally to the longitudinal axis thereof, said stretching-rolls provided with teeth of which those at the outer smallest ends of the rolls are longer than the teeth at the larger ends of said rolls, as and for the purposes described.

2. In a loom, the combination with a lay, a breast-beam, provided in its upper side with notches or recesses, *f*, the brackets adjustably fastened to the breast-beam and lying within the notches or recesses thereof, and a cloth-roller, of the conical stretching-rolls *G, G'* supported on said brackets, with their conicity reversed to each other and arranged in reversed positions diagonally to the longitudinal axis of said beam, each stretching-roll having teeth of different length inclined in a general direction toward the smaller, outer end thereof, as and for the purposes described.

3. In a loom, the combination with a lay, and heddle-frames, of connectors having a loose or slidable joint between the lay and heddle-frames, whereby the lay may be moved to and fro independently of vertical play of the heddle-frames, as and for the purposes described.

4. In a loom, the combination with a lay and the heddle-frames, of a tiltable frame connected to the heddle-frames to actuate the same, a hand-beam mounted on the lay, and connectors between said hand-beam and the tiltable frame, said connectors having a loose or slidable joint with said tiltable frame, as and for the purposes described.

5. In a loom, the combination with a lay and the heddle-frames, of a slotted tiltable frame connected with said heddle-frames, levers fulcrumed on the lay and loosely connected with the tiltable frame, and a hand-beam connected to the lay and to the levers, as and for the purposes described.

6. In a loom, the combination with a lay and the heddle-frames, of a tiltable frame connected with the heddle-frames and having the slotted front end, the levers fulcrumed on the lay-swords and carrying a pin or rod which fits in the slotted tiltable frame, a hand-beam pivotally attached to the lay, and connections between the hand-beam and the levers, as and for the purposes described.

7. In a loom, the combination with a lay, of a tiltable frame hung within the machine-frame, a heddle-frame pivotally and directly attached to the tiltable frame at one side of its pivot, the pivoted arms *J, J'* linked to the tiltable frame on the opposite side of its pivot

from the heddle-frame, another heddle-frame pivoted to and carried by said pivoted arms, a hand-beam carried by the lay, and connections between the hand-beam and the tiltable frame, as and for the purposes described.

8. In a loom, the combination with shuttle-boxes, a tiltable frame, and means for operating said frame, of pivoted, horizontal, picker-sticks fitted in said shuttle-boxes to travel in horizontal paths therein, upright swords operatively connected with said picker-sticks, an actuator mechanism situated between said upright swords and operatively connected therewith, and means actuated by the tiltable frame and the operating devices to control the actuator device for moving the swords and picker-sticks, as and for the purposes described.

9. In a loom, the combination with shuttle-boxes and horizontal picker-sticks having free ends fitted to travel in arc-shaped horizontal paths, of a picker-throwing mechanism comprising a positively-actuated lever, as *P*, swords connected with said picker-sticks, and adjustable connections between said lever and said swords, as and for the purposes described.

10. In a loom, the combination with shuttle-boxes, and horizontal picker-sticks having free ends fitted in said shuttle-boxes to travel in a horizontal arc-shaped path therein, of a picker-throwing mechanism comprising picker-swords operatively connected with said picker-sticks, two levers, as *P, O*, connected together, and connections as *N* between the picker-swords and one of said levers, as and for the purposes described.

11. In a loom, a picker-throwing mechanism comprising a horizontal actuator-lever *P*, an upright vibrator operatively connected to said actuator-lever, and swords linked to said upright vibrator, in combination with shuttle-boxes, horizontal picker-sticks operating in said shuttle-boxes, and means to raise and lower the actuator-lever *P*, as and for the purposes described.

12. In a loom, the picker-throwing mechanism comprising a horizontal actuator-lever *P* having a forked end, an upright vibrator-lever provided with a foot fitted in said forked end of the actuator-lever, the upright swords, and connections between said upright swords and the upright vibrator-lever, in combination with shuttle-boxes, horizontal picker-sticks, and means to move the actuator-lever *P*, as and for the purposes described.

13. In a loom, the combination with horizontal picker-sticks, of upright swords having slidable connections at their free ends with said picker-sticks, and means, substantially as described, to vibrate the upright swords and cause their free ends to slide along the picker-sticks while moving the latter in horizontal directions, as and for the purposes described.

14. In a loom, the combination with horizontal picker-sticks, of inherently-elastic upright swords operatively connected to said

picker-sticks, and means substantially as described to move said swords and throw the picker-sticks, as and for the purposes described.

5 15. In a loom, the combination with shuttle-boxes, and horizontal picker-sticks pivoted at one end and fitted, at their other free ends, in said shuttle-boxes, of upright inherently-elastic swords pivoted at their lower
10 ends and having their free upper ends connected with said picker-sticks to have shiftable contact therewith, and means, substantially as described, for impelling said upright swords and the picker-sticks, as and for the
15 purposes described.

16. In a loom, the combination with shuttle-boxes, and horizontal picker-sticks, of the upright swords pivoted at their lower ends, keepers carried by the picker-sticks and embracing the free upper ends of the swords to
20 confine the picker-sticks and swords in operative relation and provide shiftable contact between said parts, and means, substantially as described, to impel the picker-sticks, as
25 and for the purposes described.

17. In a loom, the combination with horizontal picker-sticks, an actuator-lever, and connections between said sticks and the actuator-lever, of a stirrup, a finger fitted in said
30 stirrup to depress the same, and a shoe arranged to lift said actuator-lever, as and for the purposes described.

18. In a loom, the combination with a lay, a tiltable frame, of a horizontal actuator-lever P provided with a pendent stirrup R, a
35 hand-beam, levers I' operatively connected with said hand-beam and having a pin r connected to said stirrup R, means carried by said tiltable frame to lift the actuator-lever,
40 an upright vibrator-lever O connected to said actuator-lever, the horizontal picker-sticks, and upright swords linked to the actuator-lever and connected to the picker-sticks, as and for the purposes described.

45 19. In a loom, the combination with a frame

having a slotted beam Q, shuttle-boxes, and horizontal picker-sticks fitted therein, of the horizontal lever P fulcrumed in said slotted beam, means to positively raise and lower said lever P, an upright lever O fulcrumed to the
50 beam and connected to the free end of the lever P, the swords M fulcrumed on the beam and having their upper ends connected by shiftable joints with the picker-sticks, and links N pivoted to the lever O and to the
55 swords M, as and for the purposes described.

20. In a loom, the combination with a cloth-roller having a ratchet, of an automatic feed mechanism variable under manual adjustment and comprising the feed-lever S, pawls
60 S', S² pivoted to said lever on opposite sides of its fulcrum, a handle attached to the feed-lever and extending to the front of the loom-frame, and an adjustable stop to limit the play of the feed-lever, as and for the purposes
65 described.

21. The combination with a cloth-roller having a ratchet and a heddle-frame, of the loop-shaped pawl-lifter carried by said heddle-frame, a feed-lever slidably fitted in the loop
70 of said pawl-lifter, a retractor connected with said feed-lever to depress the same, feed-pawls connected with said feed-lever, and an adjustable stop to limit the play of the feed-lever, as set forth.

22. In a loom, the combination with a warp-roller having brake-disks, and an equalizer-bar T² having straps to engage said disks, of a lever U connected to said equalizer-bar, the
80 hand-lever V extending to the front of the loom-frame, the pitman U' between said levers U, V, and stops with which the front end of the lever V may be adjusted to engage, substantially as described.

In testimony whereof I affix my signature 85 in presence of two witnesses.

WILLIAM P. KIRKPATRICK.

Witnesses:

DAVID SNODDY,

A. J. PAYNE.