No. 710,458. Patented Oct. 7, 1902.

# A. S. HORLACHER.

## LOOM.

(Application filed Sept. 12, 1901.)

(No Model.) 3 Sheets—Sheet 1.

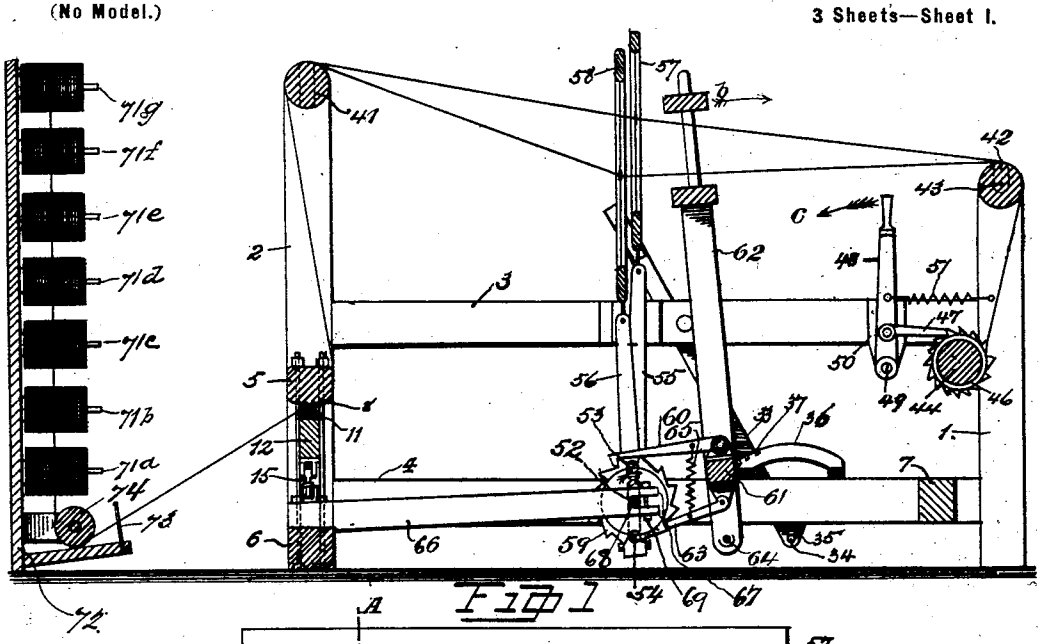


Fig 1

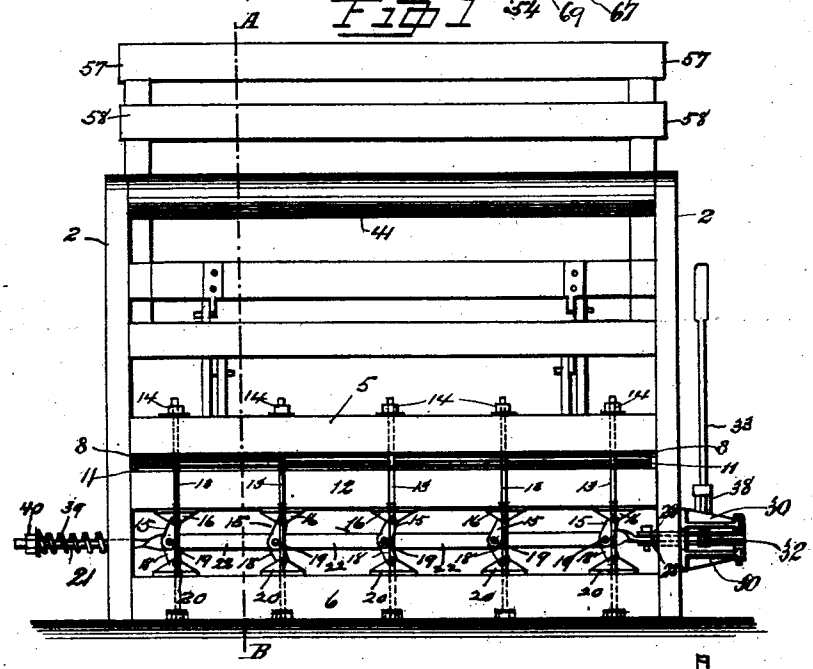


Fig 2

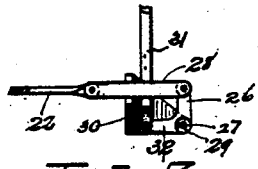


Fig 3

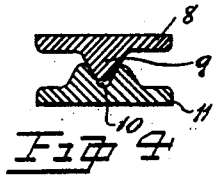


Fig 4

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## LOOM.

(Application filed Sept. 12, 1901.)

(No Model.) 3 Sheets—Sheet 2.

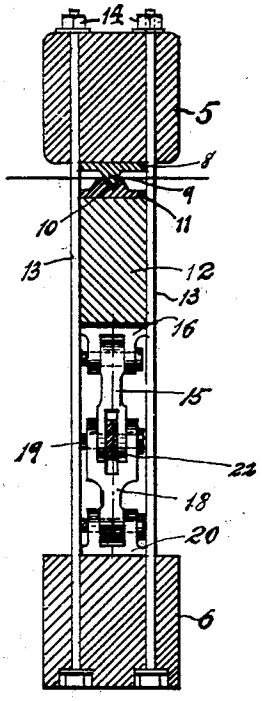



Fig 5

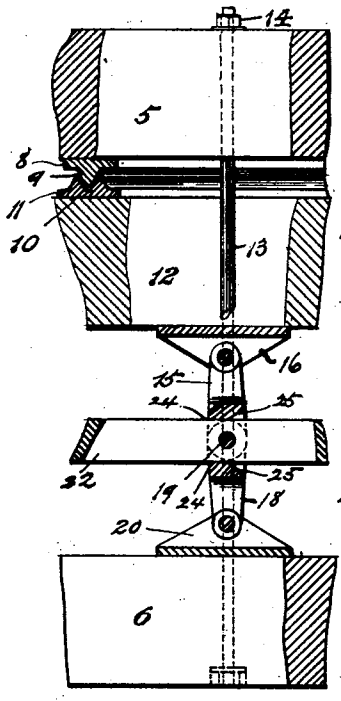



Fig 6

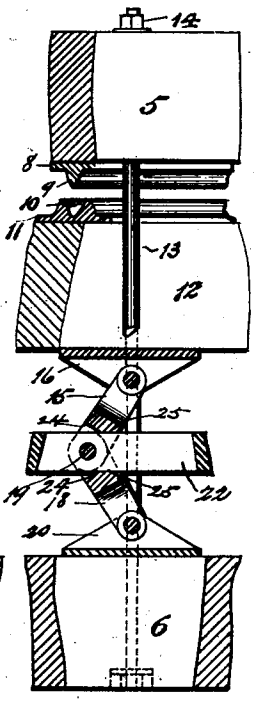



Fig 7

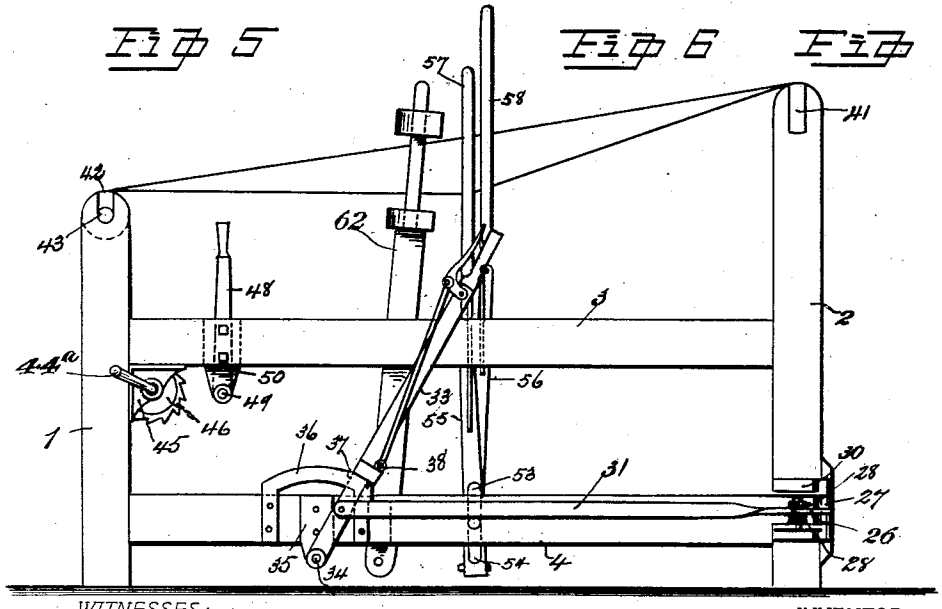



Fig 8

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No. 710,458. Patented Oct. 7, 1902.

# A. S. HORLACHER.

## LOOM.

(Application filed Sept. 12, 1901.)

(No Model.) 3 Sheets—Sheet 3.

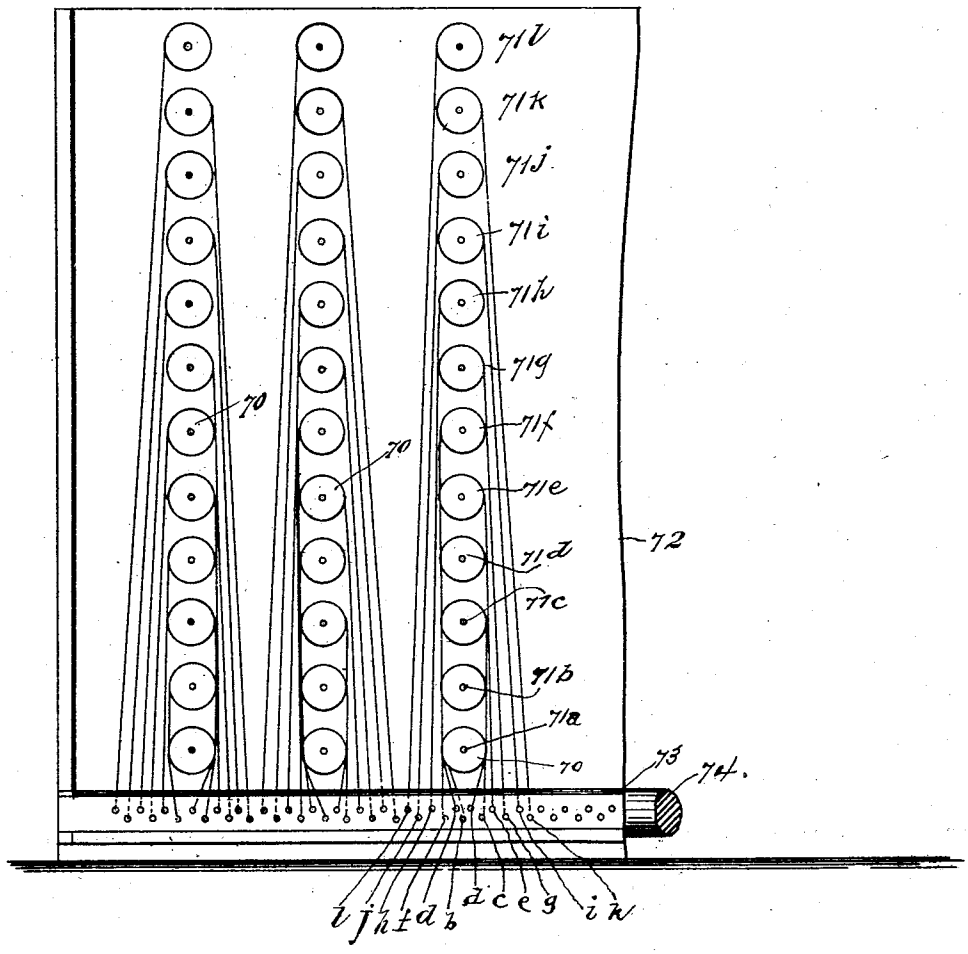



Fig 9

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# UNITED STATES PATENT OFFICE.

ADAM S. HORLACHER, OF INDIANAPOLIS, INDIANA.

## LOOM.

SPECIFICATION forming part of Letters Patent No. 710,458, dated October 7, 1902.

Application filed September 12, 1901. Serial No. 75,175. (No model.)

*To all whom it may concern:*

Be it known that I, ADAM S. HORLACHER, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented new and useful Improvements in Looms, of which the following is a specification.

My invention relates to certain new and useful improvements in looms, and it applies particularly to looms for weaving rugs, rag-carpet, &c.; and it consists in means for clamping the warp, equalizing the tension thereof, and manipulating the heddle-frames, all hereinafter more fully set forth, and particularly pointed out in the claims.

The object of my invention is, first, to provide an effective means for clamping and holding the warp, and whereby each of the warp-threads of the series in use will be subjected to an equal clamping-pressure; second, to provide means for equalizing the tension of the warp irrespective of the relative positions of the heddles through which they are passed, so that no undue pressure or stress will be imparted to either the upper or the lower series of warp-threads when said heddles are moved to their extreme distances apart, and, third, to provide a brake or tension means on the crank-shaft to prevent any movement of rotation being imparted to it other than that produced by the driving-pawl of said shaft. I attain these objects by means of the apparatus illustrated in the accompanying drawings, in which similar numerals of reference designate like parts throughout the several views.

Figure 1 is a side elevational view of my invention of a loom and taken through the line A B. (See Fig. 2.) Fig. 2 is an end elevational view of the same, showing the means for clamping the warp. Fig. 3 is a detail broken plan view of the bell-crank lever, its fulcrum-bracket, and connecting-rods for connecting with the clamping mechanism of the loom. Fig. 4 is an enlarged detail transverse sectional view of the grip-bars. Fig. 5 is an enlarged detail transverse sectional view of the toggle mechanism for operating the grip-bars. Fig. 6 is a broken side elevational view of the same. Fig. 7 is a similar view showing the toggle mechanism in position to separate the gripping-bars to release the warp. Fig. 8 is a side elevational view of the loom, showing the latch-lever by which the toggle mechanism of the gripping-bars is operated; and Fig. 9 is a front broken elevational view of the spool-rack, showing the method of arranging the warp-spools thereon.

The front corner-posts 1, the back corner-posts 2, the horizontally-extending rails 3 and 4, which are secured at their ends to said front and back posts 1 and 2, and the transversely-extending beams 5, 6, and 7 constitute the main frame of the loom.

The upper rear transverse beam 5 and the lower rear transverse beam 6 are each firmly secured at their ends to the inner sides of the back corner-posts 2 in position thereon, so that the lower trued surface of the said top beam 5 will be parallel with the upper trued surface of the lower beam 6.

The top clamping-bar 8 is preferably constructed of metal and is provided with a V-formed longitudinally-extending clamping-strip 9, which latter has its outer tapered sides planed or otherwise trued throughout its entire length to accurately fit the similarly-finished sides of the lower V-formed groove 10 of the bottom clamping-bar 11. The upper clamping-bar 8 is firmly secured to the lower trued surface of the beam 5 to extend longitudinally thereon, so that the V-formed strip 9 will be situated directly over the V-groove 10 of the clamping-bar 11, which latter is also secured to extend longitudinally on the beam 12. The strip 11 is firmly secured to the upper trued surface of the clamping-beam 12 by suitable screws or spikes. The beams 5 and 6 are maintained in their relative positions parallel with each other by the tie-rods 13, which are arranged in pairs in parallel rows at intervals along said beams and at a uniform distance apart transversely to prevent said beams yielding or spreading apart when the force imparted by the toggle mechanism is applied to the clamping-beam 12, thereby relieving the end joints of said beams 5 and 6 of undue stress, and the said bolts 13 form a guiding means for the movable clamping-beam 12, which latter is adapted to be moved upwardly and downwardly between them, and the said tie-rods 13 are provided with the screw-adjusting nuts 14, by means of which the beams 5 and 6 may be ad-

justed into parallel position when said beams are out of adjustment or position due to unequal expansion or contraction occasioned by atmospheric conditions.

A series of toggles 15 are situated between the beams 12 and 6 and are arranged at regular intervals apart along said beams so as to cause a toggle to be situated between each of the pairs of tie-rods 13 in order that the force exerted by said toggles 15 against the beam 6 will be taken up and transmitted to the upper beam 5 through said tie-rods 13, thereby forming a counter resistance and effectually preventing a spreading or yielding of said beams 5 and 6 and preserving their parallelism.

The toggles 15 are each composed of the upper toggle member 15, which is hinged at its top end in a bearing-shoe 16, and said top member has its lower forked end fitted into the upper forked end of the lower toggle member 18 and hinged on the joint-pin 19, and the lower end of said toggle 18 is jointed in the shoe 20. The upper shoes 16 are firmly secured to the beam 12, and the lower shoes 20 are secured on the top sides of the beam 6 and directly underneath the upper toggle-shoes 16 and in alinement therewith. A toggle-connecting rod 22 extends transversely with the machine through and between the bifurcations formed on the bottom ends of the toggle members 15 and the bifurcations formed on the top ends of the toggle members 18, and the said connecting-rod is provided with toggle-pin-receiving holes arranged along said connecting-rod 22 at distances apart equal to the distances apart or centers of said toggles 15, and the said toggle-pin holes are adapted to receive the center toggle hinge-pins 19 to connect each of said toggles 15 to operate them simultaneously. The toggles 15 are each provided with a locking-joint or stop-bearing 24 and a stop-bearing 25, which stops are so formed that when said toggles 15 are moved to either of their extreme positions the stop-bearings 24 and 25 will contact with the top and bottom edges of the connecting-rod 22 and prevent any further longitudinal movement of said rod. (See particularly Figs. 6 and 7.) The tension or pulling end of the connecting-rod 22 is connected to the arm 26 of the bell-crank lever 27 by the links 28, and the said bell-crank lever 27 is fulcrumed on the fulcrum-pin 29 of the bracket 30, which latter is firmly bolted to the outer side of the corner-post 2. A connecting-rod 31 is connected at one end to the arm 32 of said bell-crank lever 27 and extends between the links 28 to the latch-lever 33, to which it is connected, as shown in Fig. 8. The latch-lever 33 swings on the fulcrum-pin 34, secured on the fulcrum-bracket 35, which latter is secured firmly to the rail 4 of the frame of the loom. A suitable segment 36, provided with the latch-notches 37, is firmly secured in position on said rail 4, so that the latch 38 of said latch-lever 33 may freely enter the latch-notches 37. The opposite end 21 of the connecting-rod 22 is prolonged beyond the end frame of the loom, and the said prolonged end 21 is encircled by a coil-spring 39, the tension of which latter is regulated and adjusted by the screw-nut 40, and the said spring 39 is provided for the purpose of moving the toggles 15 in the direction to cause the clamping-beam 12 to move into the position shown in Fig. 2—that is, in position to separate the clamping-bars 8 and 11 to release the warp when the latch-lever 33 is released.

A rear non-rotatable warp-roller 41 is mounted in suitable retaining-bearings formed in the top ends of the end posts 2, and a forward rotatable roller 42, over which the fabric as it is woven passes, is mounted in suitable journal-bearings 43, formed in the top ends of the posts 1.

The winding or tension roller 44, upon which the fabric is wound as it is woven, is yieldingly mounted to rotate a limited amount in its bearings 45 when engaged by the tension mechanism, hereinafter described, and the said bearings 45 are firmly secured to the rails 3 and the posts 1 of the end frames, and the said roller is provided with the ratchet-wheel 46, the teeth of which are adapted to be engaged by the pawl 47. The pawl 47 is pivoted on the lever 48 at one end and has its engaging end adapted to engage the detents of said ratchet-wheel 46, and said lever 48 is fulcrumed at its lower end on a suitable fulcrum-pin 49, secured on the supporting-bracket 50. The lever 48 is yieldingly retained in position by its retaining-spring 51, which latter is secured at one end to said lever above the pawl 47 thereof and at its other end to the fixed post 1.

A crank or heddle shaft 52, having the opposing cranks 53 and 54, is journaled at its ends in the rails 4, and suitable connecting-rods 55 and 56 extend from each of said cranks to the heddle-frames 57 and 58 to connect them in such a manner that when the forward heddle-frame 57 is ascending from its lower to its higher position the rear heddle-frame 58 will be descending from its higher to its lower position, and vice versa, to separate and alternately elevate and lower each of the two series of warp-threads between which the weft is passed.

A ratchet-wheel 59 is keyed or otherwise secured on the crank or heddle shaft 52, and a pawl 60 is pivotally mounted on the bottom rail 61 of the batten 62, in position thereon to engage the detents of said ratchet-wheel 59, and the said pawl 60 is adapted to rotate said ratchet-wheel 59 in the direction of the arrow *a* when the batten 62 is moved manually in the direction of the arrow *b*. A lower stop or retaining pawl 63 is pivotally mounted on the under side of said batten-rail 61, directly underneath the pawl 60 and at a point sufficiently near the oscillating center 64 of the batten-frame 62 that the movement imparted to said pawl 63 will not be sufficient to cause

any appreciable rotation, but will simply act as a stop to prevent lost motion or a reverse motion of rotation of said ratchet-wheel and the heddle-shaft upon which it is secured. A retaining-spring 65 extends from the upper or driving pawl 63, and said spring is provided for the purpose of retaining the said lower pawl in engagement with the ratchet-wheel 59 and for preventing the top pawl from becoming disengaged from said ratchet-wheel.

The break or tension lever 66 is secured at one end to the beam 6, and at its free end 67 is formed a split bearing 68, which latter is adapted to receive the heddle-shaft 52, and said lever is split longitudinally to a point sufficient from said bearings 68 to obtain the required elasticity of the upper and lower jaws of said bearing 68, so that said jaws may be readily drawn together by the clamping or binding bolt 69 to impart the necessary frictional resistance to said heddle-shaft 52 to prevent its voluntary rotation.

The spools 70, upon which the warp is wound, are mounted on the rack-pins $71^a$ $71^b$, &c., and arranged in vertically-extending rows on the spool-rack 72, and in such a manner that no matter which thread of the series of warp-threads breaks the broken thread may be immediately traced to its spool and the break located without loss of time. The spool on the lower or first rack-pin $71^a$ will rotate to unwind the warp in a direction the reverse of that on the next spool $71^b$, and thus along the row, so that, for example, if the warp-thread extending from the spool $71^d$ breaks or parts the warp-thread of the next adjacent spool $71^e$ would when it contacted with the peripheral surface of the warp wound upon said spool on the rack-pin $71^e$ revolve the latter in a direction to wind the warp upon itself, and thus prevent any further unwinding of the warp on the latter spool and avoid its becoming tangled with the other warp-threads in the series. The arrangement of the warp-spools will be the more readily understood after an inspection of the drawings, (see Fig. 9,) in which the warp-threads of the spools on the alternate rack-pins $71^a$ $71^c$ $71^e$ $71^g$ $71^i$ $71^k$ are arranged to unwind from their right sides, and each of said threads after passing under the roller 74 pass through their respective conducting-ways *a c e g i k*, formed in the conductor 73, to the right of said row. Similarly the spools on the alternate rack-pins $71^b$ $71^d$ $71^f$ $71^h$ $71^j$ $71^l$ are passed under said roller 74 through the conducting-ways *b d f h j l*, formed in the conductor 73 to the left of said row, and thus when it is discovered that one of the threads of the series is broken or parted the conducting-way through which said thread should pass is first observed, after which the spool upon which the parted thread is wound is immediately located.

The warp-threads after leaving the conductor 73 extend in parallel relation to and between the clamping-bars 8 and 11, over the non-rotatable roller 41, through the heddles of the heddle-frames 57 and 58, through the batten-frame 62, over the roller 42, and finally to the winding-roller 44, where said threads are secured in the usual manner.

The warp-threads after being arranged in the manner above described are clamped firmly between the clamping-bars 8 and 11 to prevent them from drawing when tension is applied to them by means of the winding-roller 44, upon which the woven fabric is wound. The roller 44 is rotated manually by any suitable crank or lever, as $44^a$, Fig. 8, to wind the fabric as it is woven thereon, and when a sufficient tension is imparted to the extended warp-threads the pawl 47 is dropped into engagement with the detents of the ratchet-wheel 46 and the operation of weaving the fabric is resumed. When the heddle-frames 57 and 58 are moved into their opposing extreme upper and lower positions, as shown in Fig. 1, the yielding lever 48 will move in the direction of the arrow *c* to permit the pawl 47 to recede and permit a slight rotation or yielding of the roller 44 to unwind the woven fabric an extent to equalize the tension of the warp-threads. When the said heddle-frames have been moved into their central positions—that is, into positions intermediate between their extreme upper and lower positions—the tension-spring 51 reacts to move the lever 48 in a direction opposed to the arrow *c* to wind the fabric upon the said roller 44, and thus throughout the entire changes of positions of the heddles an equal tension of the warp-threads is maintained.

Having thus fully described this my invention, what I claim as new and useful, and desire to cover by Letters Patent of the United States therefor, is—

1. In a loom, the combination with a pair of reciprocating heddle-frames, suitable means for retaining the warp-threads in position relative to said heddle-frames, and a yielding winding-roller upon which the fabric, as it is woven, is wound and whereby the tension of the warp is equalized.

2. In a loom, the combination with a rotatable warp winding tension roller and a supporting-frame, of means yieldingly mounted on said frame and engaging said roller whereby the latter is permitted to rotate a limited amount to equalize the tension of the warp.

3. In a loom, the combination with a rotatable warp winding or tension roller and a supporting-frame, of a ratchet-wheel on said roller adapted to turn therewith, and a pawl yieldingly secured and mounted on said frame, and adapted to engage said ratchet-wheel.

4. In a loom, the combination with a rotatable warp winding or tension roller, and a supporting-frame, of a ratchet-wheel mounted on said roller to turn therewith, a lever yieldingly mounted on said frame, and a pawl pivoted on said lever in position thereon to

engage and yieldingly retain said winding or tension roller.

5. In a loom, the combination with the frame thereof, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a fixed clamping-bar arranged upon the frame, a movable clamping-bar arranged adjacent to said fixed bar and coacting therewith to clamp the warp, and means for moving the movable clamping-bar toward and away from the fixed bar.

6. In a loom, the combination with the frame thereof, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a fixed clamping-bar arranged upon the frame and provided with a V-shaped tongue at its under side, a movable clamping-bar arranged adjacent to said fixed bar and provided with a V-shaped groove to receive said tongue to clamp the warp, and means for moving the movable clamping-bar toward and away from the fixed bar.

7. In a loom, the combination with the frame thereof, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a fixed clamping-bar arranged upon the frame, a movable clamping-bar arranged adjacent to said fixed bar and coacting therewith to clamp the warp, and toggle mechanism for moving the movable clamping-bar toward and away from the fixed bar.

8. In a loom, the combination with the frame thereof, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a fixed clamping-bar arranged upon the frame and provided with a V-shaped tongue at its under side, a movable clamping-bar arranged adjacent to said fixed bar and provided with a V-shaped groove to receive said tongue to clamp the warp, and toggle mechanism for moving the movable clamping-bar toward and away from the fixed bar.

9. In a loom, the combination with the frame thereof, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a fixed clamping-bar arranged upon the frame, a movable clamping-bar arranged adjacent to said fixed bar and coacting therewith to clamp the warp, means for moving the movable clamping-bar toward and away from the fixed bar, and means for guiding the movable clamping-bar in its movements toward and away from the fixed bar.

10. In a loom, the combination with the frame thereof having at one of its ends fixed beams one of which is arranged above the other, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a movable clamping-bar arranged between said fixed beams and coacting with one of the latter for clamping the warp, means for moving said movable bar toward and away from said fixed beam, and reinforcing means connecting the fixed beams at points intermediate their ends, whereby the parallelism of said beams is maintained and the movable clamping-bar is guided in its operation.

11. In a loom, the combination with the frame thereof having at one of its ends fixed beams one of which is arranged above the other, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a movable clamping-bar arranged between said fixed beams and coacting with one of the latter for clamping the warp, means for moving said movable bar toward and away from said fixed beam, and adjustable tie-rods connecting the fixed beams at points intermediate their ends, whereby the parallelism of said beams is maintained and the movable clamping-bar is guided in its operation.

12. In a loom, the combination with the frame thereof having at one of its ends fixed beams one of which is arranged above the other, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a movable clamping-bar arranged between said fixed beams and coacting with one of the latter for clamping the warp, toggle mechanism interposed between the movable clamping-bar and the lower fixed beam for operating the movable beam, and reinforcing means connecting the fixed beams at points intermediate their ends, whereby the parallelism of said beams is maintained and the movable clamping-bar is guided in its operation.

13. In a loom, the combination with the frame thereof, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a fixed clamping-bar arranged upon the frame, a movable clamping-bar arranged adjacent to said fixed bar and coacting therewith to clamp the warp, toggle mechanism for operating said movable bar, means for operating said toggle mechanism to close the clamping-bars, and means for automatically actuating the toggle mechanism to open said bars when the operating means have been released.

14. In a loom, the combination with the frame thereof, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a crank-shaft, means for connecting said crank-shaft to said heddles for reciprocating the latter, a swinging batten, means for connecting the batten with said crank-shaft for rotating the latter when said batten is operated, and a brake or tension device carried by the frame and en-

gaging the crank-shaft to prevent rotation of said shaft except when operated by the batten.

15. In a loom, the combination with the frame thereof, of heddles carried by said frame, a winding-roller or take-up yieldingly mounted upon said frame, whereby the tension of the warp is equalized, a crank-shaft, means for connecting said crank-shaft to said heddles for reciprocating the latter, a swinging batten, means for connecting the latter with said crank-shaft for rotating the latter when said batten is operated, a brake or tension device carried by the frame and provided with a slot which receives the crank-shaft, and means for binding the slotted portion of the brake or tension device upon said crank-shaft to prevent rotation of said shaft except when operated by the batten.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

ADAM S. HORLACHER.

Witnesses:
THOMPSON R. BELL,
C. W. DOLL.