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C. F. ROPER.

MEANS FOR PREVENTING WARP BREAKAGE IN LOOMS.

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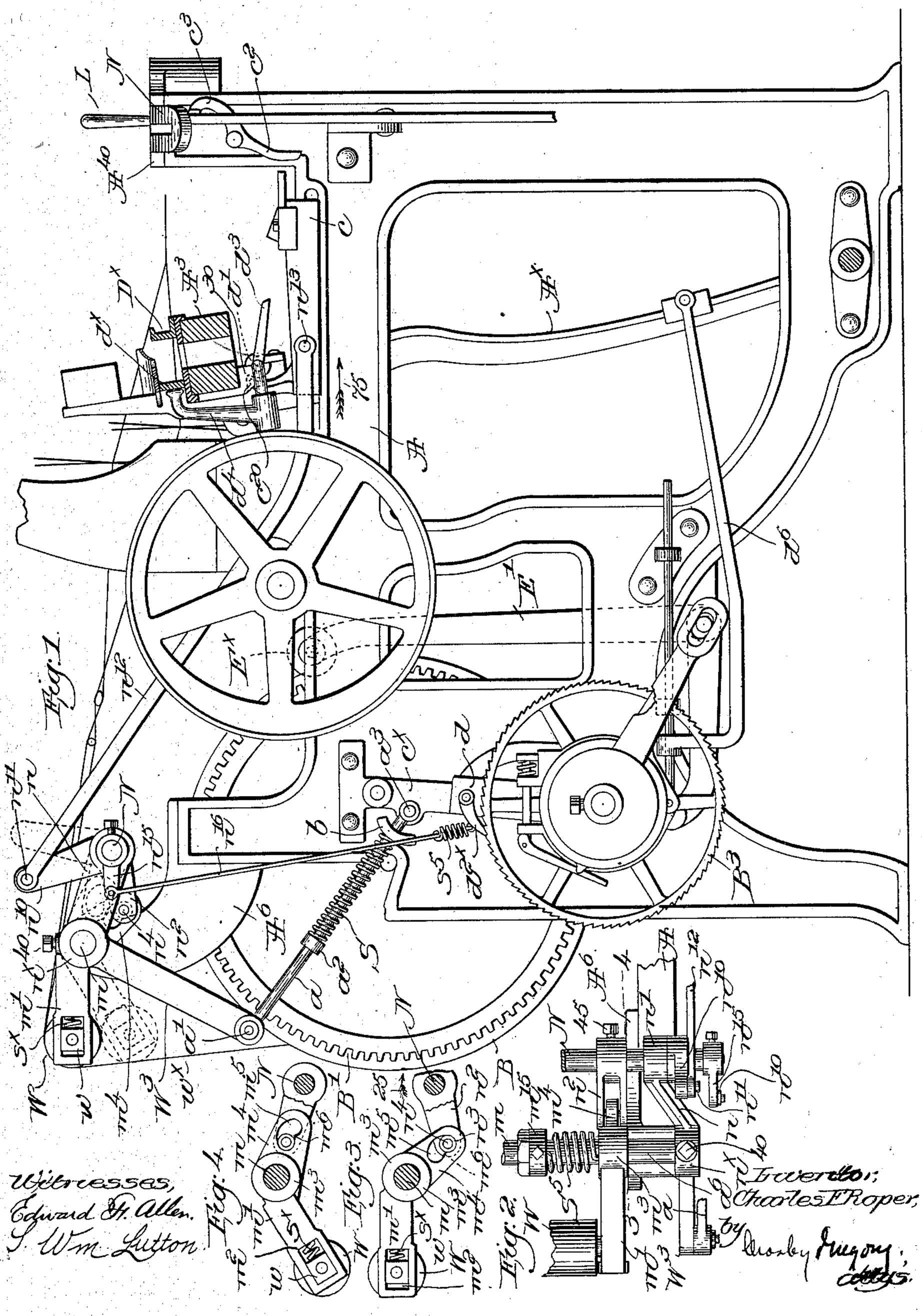
NO MODEL.



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UNITED STATES PATENT OFFICE.

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MEANS FOR PREVENTING WARP BREAKAGE IN LOOMS.

SPECIFICATION forming part of Letters Patent No. 731,622, dated June 23, 1903.

Application filed December 8, 1902. Serial No. 134,234. (No model.)

To all whom it may concern:

Be it known that I, CHARLES F. ROPER, a citizen of the United States, and a resident of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Means for Preventing Warp Breakage in Looms, of which the following description, in connection with the accompanying drawings, is a specification, like characters on the drawings representing like parts.

This invention has for its object the production of novel and effective means in a loom to positively slacken the warps to an abnormal extent if the shuttle is improperly boxed—as, for instance, when the loom "bangs off"—so that warp breakage will be obviated, means being also provided to restore automatically and positively the proper working tension of the warps when the loom is again started. I have also provided means for positively locking the whip roll or bar in operative position while the loom is running properly, the said roll or bar being unlocked and moved positively into abnormal position to slacken the warps, and I have also made provision for arresting let-off contemporaneously with warp slackening. By so doing the warps are under proper working tension when the whip roll or bar is restored to normal or operative condition. These and other novel features of my invention will be fully described in the subjoined specification, and particularly pointed out in the following claims.

Figure 1 is a left-hand side elevation of a loom embodying one form of my invention, the nearer end of the lay and the shuttle-box being shown in section, and the means for controlling the warps is shown in operative position in full lines. Fig. 2 is a top or plan view of a portion of the apparatus shown in Fig. 1 to more clearly illustrate certain portions of the warp-controlling instrumentality. Fig. 3 is a sectional detail on the line 3 4, Fig. 2, showing the whip roll or bar locked in operative position; and Fig. 4 is a similar sectional detail, but with the whip roll or bar unlocked and held in inoperative position.

The lay A^3, breast-beam A^{40}, having the usual notched holding-plate N for the shipper L, the knock-off lever c^2 c^3, the protector mechanism, comprising, essentially, a frog c, slidably mounted on the loom side A, the dagger d^3, and the upturned binder-finger d^4, secured to the rock-shaft d' and coöperating with the binder $d^\times$ of the shuttle-box $D^\times$ to lift the dagger when the shuttle is boxed properly, are and may be all substantially as in United States Patent No. 591,979, dated October 19, 1897.

In my present invention the lay is not instantly checked upon the operation of the protector mechanism; but when the loom bangs off the lay is permitted to come to rest gradually without shock or strain upon the various parts of the loom, the tearing out or breakage of the warp being prevented by the slackening of the warps referred to. The frog is mounted to slide freely upon a part of the loom side when moved forward by the dagger, so that there is no sudden stoppage of the lay as it reaches front center. Usually the frog is made hook-like at its rear end to engage a fixed lug or stop forming a part of the loom side, such engagement taking place after release of the shipper and before the lay has reached front center; but herein this construction is changed by merely shortening the stop or lug or omitting it altogether, so that it does not act upon the frog. The lay is thus free to swing forward to and past front center if the momentum be great enough upon operation of the protector mechanism; but as the warps are made abnormally slack they cannot be damaged.

The warp-beam B, having an attached gear B', the actuating mechanism therefor, only a portion of which is fully illustrated, including a ratchet-wheel B^3, a coöperating let-off pawl $d^{2\times}$, compound pawl-carrier $c^\times$ d, link d^6, connected with the lay-sword $A^\times$, and the arm E', having a roll $E^\times$ to engage the periphery of the yarn mass on the beam, constitute substantially the let-off mechanism forming the subject-matter of United States Patent No. 647,815, dated April 17, 1900, though any other form of let-off mechanism may be employed so far as my present invention is concerned.

Upturned stands A^6 on the loom sides are

provided each with a laterally-extended bearing a^6 (see Fig. 2) for a rock-shaft m, the ends of the same extending beyond the bearings, as seen Fig. 2, wherein one of such bearings is shown in plan view. On each extended end of the rock-shaft is secured a hub $n^\times$ by a set-screw 40, each hub having fast upon it a forwardly-extended and inwardly-inclined arm n, terminating in a bearing n', (see Fig. 2,) the bearings, which are parallel to each other, supporting a controlling or actuating rock-shaft N, extended across the loom. A whip roll or bar W, over which the warps $w^\times$ pass, is journaled in slide-blocks w, the latter being mounted in longitudinal slots m^2, Figs. 1, 3, and 4, in swinging or rocking supports, shown as rearwardly-extended arms m', loosely fulcrumed on the shaft m inside and adjacent the bearings a^6, one of such arms being shown in Fig. 2. A spring $s^\times$ is interposed between the inner end of each slot and the adjacent end of the block w to yieldingly force the latter toward the outer end of the arm m', substantially as shown in United States Patent No. 381,617, the pull of the warps acting upon the whip-roll in opposition to the springs. The hub m^3 of each supporting-arm has a forwardly-extended arm m^4 fast upon it and having a cam-slot m^5 therein, (see Figs. 3 and 4,) said arms constituting members of a locking device for the whip-roll. The lower side of each cam-slot has two depressions or concavities, separated by a high point m^6, for a purpose to be described.

One of the hubs $n^\times$, herein shown as the one at the left-hand side of the loom, has a depending rearwardly-extended arm W^3, pivotally connected at its lower end at a' with one end of a rod a, having a collar a^2 fast upon it, against which bears one end of a tension-spring S, coiled around the rod, the other end of the spring bearing against an ear b on the loom side, the rod passing loosely through the ear and being pivotally connected at a^3 with the member $c^\times$ of the compound pawl-carrier, as in Patent No. 647,815, referred to. As in said patent, the greater the tension of the warps the greater will be the depression of the whip-roll at each pick, and consequently the greater will be the arc through which the rod a swings the pawl-carrier, determining the starting-point of the let-off pawl $d^{2\times}$, the termination of its stroke being always at the same point. The springs $s^\times$ act constantly upon the warps through the whip-roll and maintain them properly taut at other times, while the tension of the spring S regulates the intermittent movement which the warps impart to the pawl-carrier, as will be manifest to those skilled in the art.

Inasmuch as the supporting-arms m' are loosely mounted on the rock-shaft m, it is necessary to provide some connection between said arms and the depending arm W^3, so that the latter can be swung by the movement of the whip-roll, and such connection will now be described. The controlling rock-shaft N has rigidly secured to it, as by set-screws 45, the hubs of two forked or bifurcated arms n^2 opposite the arms m^4, as shown in Fig. 2, each of the latter entering between the forks of the opposite arm n^2. A roll n^3 is inserted in the cam-slot m^5 and mounted on a pin n^4, extended through the forks of the opposite arm n^2, the diameter of the roll being such that it can rest in either concave portion of the slot and pass from one to the other over the high point m^6. Referring to Fig. 3, which shows the whip-roll in operative or normal position, and also shown in full lines, Fig. 1, it will be seen that the roll n^3 is in the depression nearest the outer end of the cam-slot m^5, the angle between the arms m^5 and n^2 being such that downward pressure on the whip-roll tends to lift the arms m^4; but the high part m^6 of each cam-slot pushes on the roll n^3 above the line passing through the centers of the roll and the rock-shaft N. Consequently the relative position of the arms $m^4\,n^2$ cannot be changed by any downward pressure on the whip-roll, as by the pull of the warps, and the whip-roll is accordingly locked in operative position—that is, it is locked from any movement relatively to the fulcrum-shaft m, and necessarily the whip-roll is fixed relatively to the depending arm W^3 and the controlling rock-shaft N, the latter, it being remembered, being supported on the arms n, fast on the shaft m. While the whip-roll is thus locked by the described coöperation of the pairs of locking members or arms $m^4\,n^2$, the variations of warp tension will act through the arm W^3 and connecting device to set the let-off pawl $d^{2\times}$. If now the rock-shaft N be turned in the direction of arrow 25, Fig. 3, into the position shown in Fig. 4, the roll n^3 will be caused to travel from the outer to the inner end of the cam-slot m^5, passing over the high point m^6 and into the inner end of the slot. This operation causes the whip-roll to be unlocked, and by swinging the arms m^4 upward the supporting-arms m' and the whip-roll will be depressed into dotted-line position, Fig. 1, so that the warps will be abnormally slackened, and the whip-roll is retained in such inoperative position until it is positively returned to operative position and locked.

I have provided means herein to unlock and to move positively the whip-roll into inoperative position to slacken the warps by or through the operation of the protector mechanism, and means are also provided to effect positively and automatically the return or restoration of the whip-roll to operative position and control of the warps.

At one side of the loom, herein shown at the left-hand side, the rock-shaft N has an attached upturned arm n^{10}, pivotally connected at n^{11} with one end of a link n^{12}, the other end of the latter being connected at n^{13} with the frog, (see Fig. 1,) the forward movement of the frog by operation of the protector mechanism moving the link n^{12} in the direction of arrow 75, Fig. 1. This movement

turns the rock-shaft N in the direction of arrow 25, Fig. 3, and, as has been described, the whip-roll is unlocked and moved positively into dotted-line position, Fig. 1, and as shown in Fig. 4, slackening the warps, so that as the lay beats up the shuttle cannot tear or strain the warps, the pull of the warps also acting to drop or lower the whip-roll as soon as it is unlocked.

The lay may move by its momentum up to and even beyond front center—*i. e.*, it may swing part way back—before it comes to a stop, but without any damage ensuing. Shock or strain upon the lay and other parts of the loom is thus obviated.

It will be manifest that very slight forward movement of the frog acts to release the shipper.

When the warps are slackened, as has been described, the let-off should be arrested contemporaneously, and to effect this an arm n^{15} is secured to the shaft N on the pawl side of the loom, said arm having connected with it a rod n^{16}. A spring s^5 is attached at one end to the lower end of the said rod and at its other end to the let-off pawl $d^{2\times}$, as clearly shown in Fig. 1. When, however, the rock-shaft N is turned to slacken the warps, the arm n^{15} lifts the rod n^{16} and pulls the spring up, thereby lifting the pawl from engagement with the ratchet, arresting the let-off. The rear end of the frog *c* has erected upon it an upturned bunter c^{20}, Fig. 1, which is located behind a part moving with the lay as one of the bearings 30 for the protector rock-shaft, said bunter being back of such bearing when the lay swings back, provided the loom is running properly. When the frog is moved forward, however, by the forward beat of the lay, the bunter is moved forward into position to be engaged by the part 30 as the lay swings back. Supposing now that the loom bangs off and the warps have been slackened, when the lay makes its next backward stroke thereafter, as when starting up again, the part 30 strikes the bunter c^{20} and slides the frog back to normal position, and the latter moves the link n^{12} oppositely to the arrow 75 to swing the arm n^{10} from dotted to full line position, Fig. 1. This rocks the shaft N and the parts carried thereby from the position shown in Fig. 4 to the position shown in Fig. 3 and full lines, Fig. 1, returning the whip-roll to normal position and locking it and tightening the warps properly. The whip-roll is thus restored positively and automatically to operative position and control of the warps. At the same time the rod n^{16} descends and returns the let-off pawl to operative position, permitting resumption of let-off.

It is to be noted that when the rocking of the shaft N is effected to raise or lower the whip-roll the rock-shaft *m* remains substantially inert, the supporting-arms *m'* rocking thereupon.

To assist in restoring the whip-roll to operative position, I have provided springs, as S^5, Fig. 2, coiled about the rock-shaft *m*, each spring having its outer end attached to the adjacent arm *m'* and its other end secured to a collar m^{15}, fast on the rock-shaft. The springs are so wound that they are compressed or tightened when the whip-roll is unlocked and lowered, so that when the return of the frog to normal position operates to lift the whip-roll and restore it to operative position the springs S^5 expand and assist in such operation.

When the whip-roll is unlocked, as described, the pull of the warps upon the whip-roll tends to depress it very suddenly; but the springs S^5 are then being wound or set, and they prevent too sudden or rapid movement of the whip-roll to inoperative position.

A slight rise and fall of the controlling rock-shaft N on each pick, due to rocking of the shaft *m* by or through the strain on the warps on the beat-up, is permitted, because the frog is loosely mounted on the loom side, and when the shaft N moves upward the link n^{12} will draw the frog rearwardly to a slight extent.

I have herein shown and described in detail one practical embodiment of my invention; but the same may be changed or altered in various particulars by those skilled in the art without departing from the spirit and scope of my invention.

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

1. In a loom, a warp-tension-controlling instrumentality, positively acting means operated by or through improper boxing of the shuttle to cause said instrumentality to slacken the warps; and means to restore the tension of the warps positively and automatically through said instrumentality.

2. In a loom, a movable whip roll or bar over which the warps pass, means operating automatically upon improper boxing of the shuttle to move positively the whip roll or bar to slacken the warps, and means to restore positively and automatically the whip roll or bar to operative position.

3. In a loom, a spring-controlled whip-roll, positively-acting means operative by or through improper boxing of the shuttle to move the whip-roll bodily to slacken the warps, and means to effect positively and automatically the restoration of the whip-roll to operative control of the warps.

4. In a loom, a movable whip-roll, a lay, means operated thereby on its forward beat, upon improper boxing of the shuttle, to move positively the whip-roll to slacken the warps, and means actuated by the lay on a subsequent backward beat to restore positively the whip-roll to operative condition and control of the warps.

5. In a loom, a movable whip-roll, locking means to retain it positively in operative con-

trol of the warps, means operated by or through improper boxing of the shuttle to release the locking means and cause the whip-roll to slacken the warps, and positively-acting means to return the whip-roll to the control of the locking means and operatively tighten the warps.

6. In a loom, let-off mechanism, a warp-tension-controlling instrumentality, positively-acting means operative by or through improper boxing of the shuttle to cause said instrumentality to slacken the warps and to arrest let-off, and means to tighten the warps positively and automatically through said instrumentality and to render the let-off mechanism operative.

7. In a loom, let-off mechanism, means operating automatically and positively by or through improper boxing of the shuttle to slacken the warps and to arrest let-off contemporaneously, and means to thereafter tighten the warps positively and automatically.

8. In a loom, a movable whip-roll, protector mechanism, including a frog, a connection between it and the whip-roll to positively move the latter to slacken the warps upon operation of the protector mechanism, and means to restore the whip-roll positively and automatically to operative position.

9. In a loom, a movable whip-roll, protector mechanism, means actuated by operation of the latter to move the whip-roll positively to slacken the warps, means to return the whip-roll positively and automatically to operative position, and a device to lock the whip-roll in such position.

10. In a loom, a movable whip-roll, protector mechanism, means actuated by operation of the latter to move the whip-roll positively to slacken the warps, a lay, and means actuated thereby on its backward beat to return the whip-roll positively and automatically to operative position.

11. In a loom, let-off mechanism, a whip-roll, protector mechanism, means actuated by operation of the latter to move the whip-roll positively to slacken the warps and to simultaneously arrest let-off, and means to return the whip-roll positively to normal position and restore the let-off mechanism to operative condition.

12. In a loom, a movable whip-roll, protector mechanism, including a frog, a connection between it and the whip-roll to positively move the latter to slacken the warps upon operation of the protector mechanism, a lay, and means operated upon the backward beat thereof to act through said connection and restore positively the whip-roll to normal operative position.

13. In a loom, a rocking, spring-controlled whip-roll, protector mechanism, means actuated by or through the operation of said mechanism to move the whip-roll positively to slacken the warps upon the forward beat of the lay, and means to return the whip-roll positively and automatically to normal, operative position independently of its spring, upon a subsequent backward beat of the lay.

14. In a loom, a shipper, protector mechanism to release the shipper upon improper boxing of the shuttle, a movable whip-roll, means actuated by or through operation of the protector mechanism to move the whip-roll positively to slacken the warps, and means operated automatically by or through the starting of the loom to return the whip-roll positively to operative position.

15. In a loom, a whip-roll, rocking supports in which it is mounted, a locking device to retain the whip-roll supports in operative position, means operated by or through improper boxing of the shuttle to unlock said device and swing the supports positively to inoperative position, to slacken the warps, and means to restore the supports automatically and positively to operative position and lock them in such position.

16. In a loom, pivotally-mounted supports provided with one member of a locking device, a whip-roll mounted yieldingly on said supports, a rock-shaft, arms fast thereon having members to coöperate with the locking members of the said supports, means to rock said shaft upon improper boxing of the shuttle, to unlock the supports and swing them on their fulcra, to slacken the warps, and automatic means to rock said shaft oppositely to return the supports to operative position and effect locking coöperation between their locking members and the locking members carried by the rocker-arms.

17. In a loom, a spring-controlled whip-roll, means to lock it in operative position, protector mechanism, means actuated by or through operation thereof to unlock and move the whip-roll positively, to slacken the warps, and independently-actuated means to return the whip-roll positively to operative position and automatically relock it in such position.

18. In a loom, a lay, let-off mechanism, means to arrest let-off, protector mechanism, including a frog, a movable whip-roll, a connection between it and the frog, to move the whip-roll positively upon operative movement of the frog, to slacken the warps on the forward beat of the lay and arrest let-off, and means movable with the lay to retract the frog automatically and positively and through said connection return the whip-roll positively to operative position and also to restore the let-off mechanism to operative condition.

19. In a loom, a whip-roll, rocking supports in which it is mounted, protector mechanism, means actuated by or through operation thereof to rock the supports and move the whip-roll into inoperative position, slackening the warps, means to rock the supports oppositely and positively to restore the whip-roll to operative position, and springs to assist in such return of the whip-roll to operative position.

20. In a loom, a shipper, a lay, protector mechanism, including a dagger, and a frog to be engaged and moved thereby on the forward beat of the lay to release the shipper upon improper boxing of the shuttle, the frog being free to move forward when the lay reaches front center, a whip-roll, means actuated by operative movement of the frog to move the whip-roll positively to slacken the warps, and means to return the whip-roll positively to operative position.

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

CHARLES F. ROPER.

Witnesses:
GEORGE OTIS DRAPER,
ERNEST W. WOOD.