April 8, 1930. C. H. DRAPER 1,754,196

LET-OFF MECHANISM FOR LOOMS

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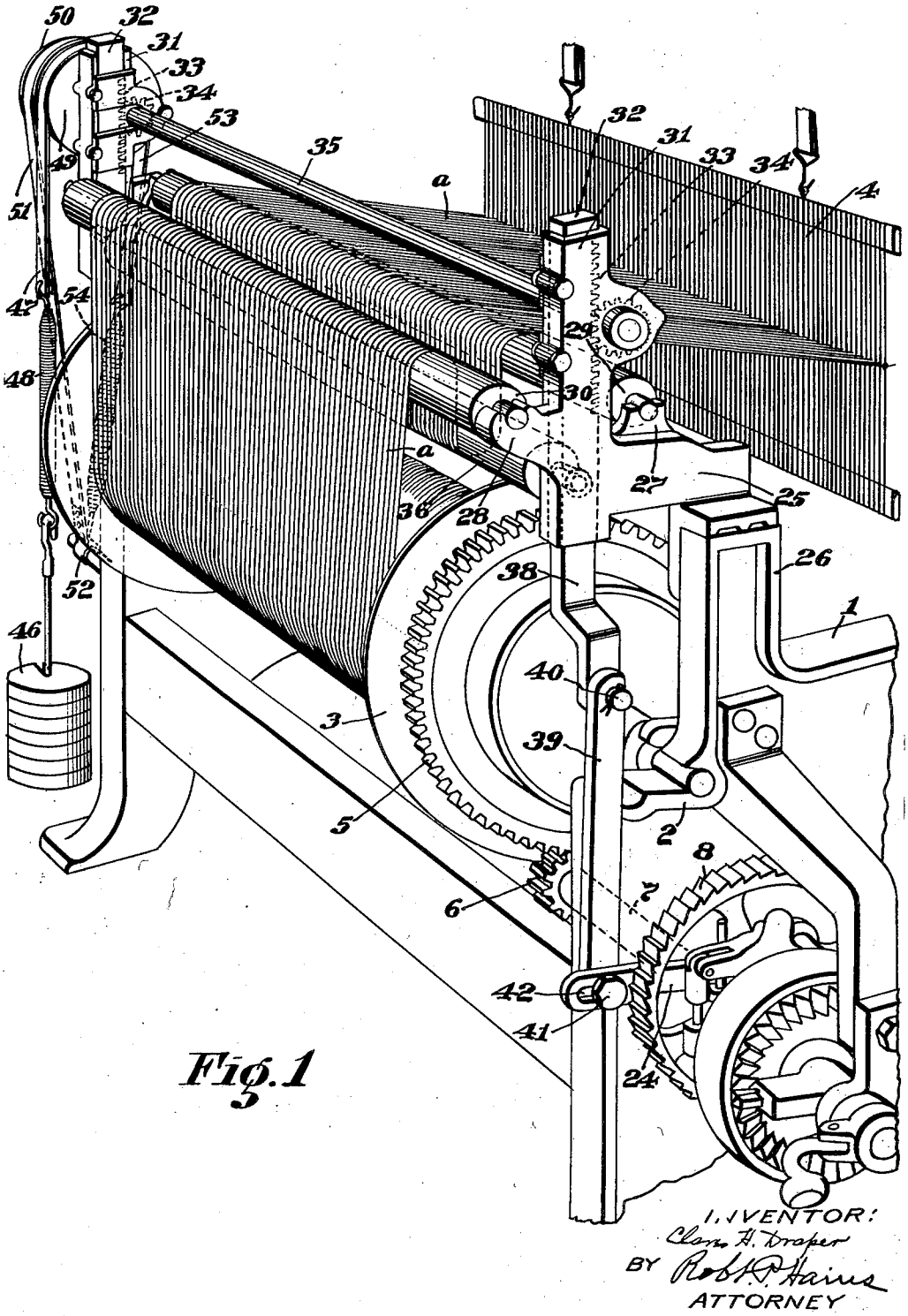


Fig. 1

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Fig. 2

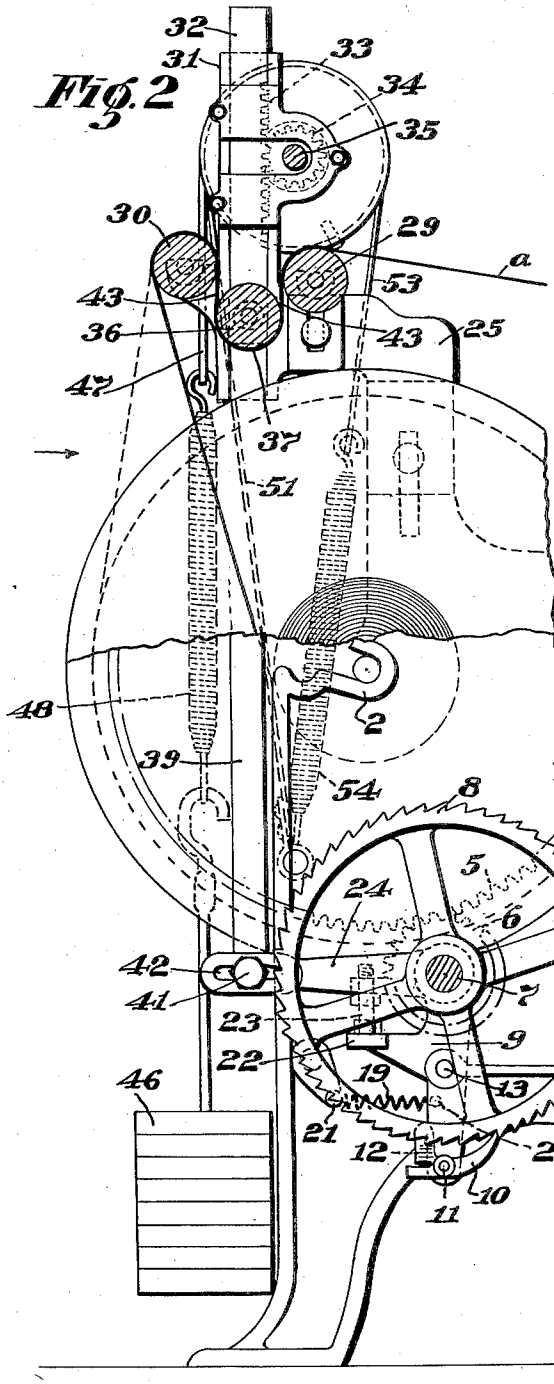
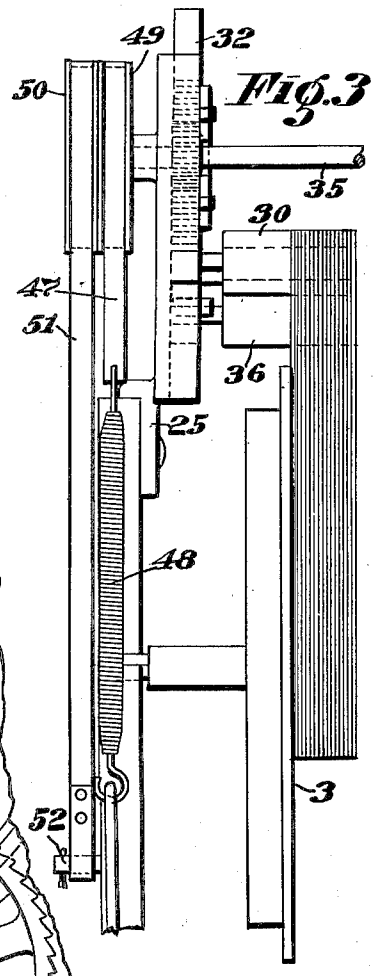
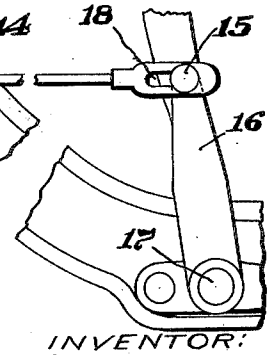


Fig. 3





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UNITED STATES PATENT OFFICE

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LET-OFF MECHANISM FOR LOOMS

Application filed November 17, 1928. Serial No. 320,142.

This invention relates to looms and is more particularly directed to improvements in the let-off mechanism, whereby more uniform and perfect cloth may be woven.

It is now the ordinary practice to provide looms with a let-off mechanism, either of the automatic or friction type, to supply warp to the weaving instrumentalities during the loom operation and to control the supply in accordance with variations in tension manifested in the warp itself through an indicating device, such as a whip roll or the like. In such prior let-off mechanism it has also been proposed to rotate the warp beam gradually faster from full to empty beam by compensating devices in an attempt to provide a proper amount of warp in a given time as the weaving proceeds, but these devices have not remedied the fundamental difficulty incident to the control of the let-off through variations in the warp tension.

Such prior practice has been reflected by imperfections in the woven cloth due to the recurring changes in warp tension during the weaving operation, and thin places have frequently resulted which become particularly manifested when, as frequently happens, filling fails to be laid in the shed. For instance, should a loom having an automatic let-off be run for several picks without laying filling in the shed, the usual let-off pawl will act and let off the warp to some extent, with the result that the warp tension will be varied and the warp slackened, thus emphasizing the width of the thin place in the cloth primarily caused by the absence of filling.

One of the objects of the present invention is to overcome the above well-known conditions and to provide means whereby more uniform and perfect cloth may be woven throughout the loom operation. In accordance with the present invention, a let-off mechanism is provided which while furnishing the necessary amount of warp for weaving, maintains a constant, uniform and unvarying tension on the warp regardless of the amount of warp let-off from the warp beam and regardless of whether filling is or is not laid in the shed during one or more picks, thus eliminating the formation of thin places in the resulting product.

The invention and novel features thereof will best be made clear from the following description and the accompanying drawings showing one good and practical form thereof.

In the drawings:

Fig. 1 is a perspective view of the rear portion of a loom provided with the present invention;

Fig. 2 is a side elevation with parts in section and the upper portion of parts at the right side of the loom as shown in Fig. 1 being broken away, showing the let-off mechanism of the present invention; and

Fig. 3 is a rear elevation of one end of the let-off, looking in the direction of the arrow, Fig. 2.

The loom frame 1 may be of usual construction and at the rear portion thereof is provided with supports or bearings 2 for a warp beam 3 on which the warp *a* is wound and from which it leads towards the front of the loom to any usual form of shedding mechanism, typified in the present instance of the invention at 4.

At one end the warp beam 3 is provided with a toothed wheel or gear 5 which meshes with a pinion 6 secured to a shaft 7 on which is loosely mounted the ratchet wheel 8 having driving connection with the shaft through a manual resetter of the same general character as that disclosed in the Roper Patent, No. 843,181, dated February 5, 1907, or otherwise. Loosely mounted on the shaft 7 or on a support concentric therewith is a pawl carrying arm 9, Fig. 2, having a pawl 10 pivoted thereto at 11 and normally under the influence of a spring 12 to retain the pawl in operative engagement with the ratchet. Connected to the pawl carrying arm 9 at 13 is an actuating rod 14 which may be reciprocated from any going part of the loom and, as shown in the present instance, is given its reciprocating movements through a pin 15 connected to one of the lay swords, as, for instance, by a riser 16 secured to the lay rock shaft 17. The actuator 14 is provided with a slot 18 which engages the pin 15 so that it is susceptible of lost motion, as will hereinafter

appear. The pawl carrying arm 9 is normally under the influence of a retractable spring 19, one end of which is connected to the pawl carrier at 20 and the other to a fixed part 21, the construction being such that during its idle stroke the pawl will be moved by the spring 19 and on its frontward or active stroke will be positively actuated by the means hereinbefore described.

The pawl carrier 9 is provided with a stop 22, Fig. 2, which is adapted to engage a cooperating stop 23 adjustably supported on an arm 24 which may be loosely mounted on the shaft 7 or a part concentric therewith. From the construction thus far described it will be apparent that should the arm 24 be raised or lowered, it will alter the position of the stop 23 and consequently govern or control the idle or retracting stroke of the pawl carrier 9 to thereby vary the amount of warp let off from the warp beam.

Secured to the loom frame at each side thereof is a bracket 25 preferably supported upon a riser 26 and provided with front and rear bearings 27 and 28 for the warp guides 29 and 30 which are in spaced relation. The warp guides 29 and 30 are preferably formed as rolls which may freely rotate in their bearing supports 27 and 28 at opposite sides of the loom.

Each of the brackets 25 is provided with an upwardly extending guide 31 which may be approximately of box-like character, as indicated, although the construction in this respect may be varied, and extending upwardly in the guides 31, one at each side of the loom, are the rack bars 32 having teeth 33 which are engaged by toothed wheels or gears 34 at each side of the loom. The gears 34 are connected for rotative movement in unison in the present instance by a transversely extending shaft 35, with the result that any rising or falling movement of the rack bars 32 will be uniform in extent as to each.

Mounted in the rack bars 32 and extending transversely of the warp is the warp tension equalizer 36 which is supported in a loop 37 of the warp between the warp guides 29 and 30, the construction being such that any rise or fall of the warp tension equalizer 36 due to variations in the depth of the warp loop will be transmitted to the rack bars 32 and effect simultaneous and equal movement of the rack bars in the rise and fall of the equalizer.

One of the rack bars 32 is provided with a downward extension 38 the lower end of which is connected to the link 39 preferably pivoted to the extension 38 at 40, and the lower end of the link 39 is connected to the arm 24 preferably by a pin 41 and a slot 42 formed in the arm 24, the construction being such that any rise or fall of the warp tension equalizer 36 will be transmitted to the arm 24 thereby varying the position of the stop 23 secured to the arm 24 and perforce defining the idle or backward stroke of the actuating pawl 10. Any rising or upward movement of the warp tension equalizer 36 will lift the stop 23 and permit the idle stroke of the pawl greater amplitude of movement that it may let-off more warp under the operation of its actuator 14, and conversely, should the warp tension equalizer 36 fall by reason of the elongation of a warp loop, the stop 23 will be correspondingly controlled and lowered to cause the pawl 10 to click over fewer teeth of the ratchet and let-off less warp.

The warp *a* leading from the warp beam passes over the warp guide or roll 30 and then downwardly into a loop 37 in which is supported the warp tension equalizer 36 and then upwardly therefrom over the warp guide or roll 29 on its travel to the weaving instrumentalities.

The relation of the warp guides or rolls 29 and 30 and the warp tension equalizer 36 is such that both runs 43 of the warp loop are parallel and extend in parallel vertical planes, the effect being that regardless of the position of the warp tension equalizer 36 the tension on the warp under the weight of the equalizer and its associated rack bars 32 will always be uniform, and such uniformity of tension will remain regardless of the amount of warp let-off from the warp beam through the positive let-off.

The warp tension equalizer 36 and the warp guides or rolls 29, 30, are shown in the present instance of the invention as being of substantially the same diameter, so that the warp guides or rolls 29 and 30 are positioned a distance apart substantially equal to the diameter of the warp tension equalizer which, as hereinbefore stated, is mounted in bearings carried by the rack bars 32, as indicated more clearly in Fig. 2, so that the equalizer and the rack bars move as a unit under variations in depth in the warp loop, the effect being that the stress of the warp tension equalizer in the warp loop is augmented or increased, in this form or embodiment of the invention, by the rack bars and their associated parts which contribute in this case to the degree of warp tension without, at the same time, causing any variation in the uniform tension which remains constant.

From the construction described as one practical embodiment of the invention it will be noted that the tension of the warp is always dependent upon the stress or weight of the warp tension equalizer and its associated parts, and since such stress or weight remains constant throughout the weaving operation the tension on the warp remains uniform and constant throughout the weaving operation regardless of the amount of warp let off from the warp beam.

In the ordinary let-off whether of the automatic or friction type, and even though

the take-up is stopped, or the cloth is let back, there is variation of tension either on the whip roll or the warp beam itself when no filling is laid in the shed, and this results in variation of warp tension, thus increasing the width of any thin place resulting from absence of filling. In former types of automatic let-off, when no filling is laid in the shed, there is not only variation of warp tension due to the non-sinuous course of the warp back of the fell of the cloth, but an actual slackening of the warp by the action of the automatic let-off on each beat of the lay, and while this may become gradually less as the slack increases, it is an important factor in causing greater width of thin places when filling is not laid in the shed. In the present invention, however, the tension on the warp remains constant and uniform throughout the weaving operation regardless of the amount let off, by virtue of the constant and uniform stress or weight of the warp tension equalizer and its associated parts, which obviously remains constant, and consequently eliminates or greatly lessens thin places caused either by (1) turning the loom over by hand, (2) having a trailing end from the shuttle lift the fork, (3) temporary lifting of the fork by the filling grate or otherwise when no filling is present, (4) real misthreads, and (5) defects in the cloth which usually result by breakage of the warp.

The construction described constitutes a complete organization for maintaining uniform and equal tension on the warp throughout the weaving operation regardless of the amount of warp let off from the warp beam and regardless of whether filling is laid in the shed or not, but it may be desirable at times to increase the stress or weight of the warp tension equalizer resting in the loop of the warp, and in the present instance of the invention this is accomplished by a weight 46 connected to a strap 47 through the spring 48, the strap itself being secured to a roll or sheave 49 secured for rotative movement with the transversely extending shaft 35 carrying the gears 34. The effect of the weight 46 and its connection with the shaft 35 adds stress or weight to the warp tension equalizer 36 in a downward direction as will be apparent from the illustration of Fig. 1.

When the lay beats up the filling to the fell of the cloth there is usually a "bump" and to compensate for this and as an addition to the main features of the present invention, the shaft 35 has secured thereto a second pulley 50 about which passes a strap 51, the rear run of which extends downwardly and is secured to a fixed point, as at 52, of the loom frame, or a pin extending therefrom. The opposite or front run 53 of the belt 51 is connected to a fixed point or pin 52 through the intermediacy of a spring 54, the result being that at the moment of beat-up or "bump" the fixed run 51 of the belt will act through the sheave 50 to prevent any substantial jump of the warp tension equalizer and on the retreat of the lay from the fell of the cloth the spring 54 will act to permit any slight movement that may have been given to the pulley 50 a yielding return. While the "bump" control device hereinbefore described may be utilized to advantage, nevertheless the unit system of uniform tension of the warp throughout the weaving operation afforded by the warp tension equalizer and its associated parts supported in the loop of the warp will operate effectively either with or without the "bump" mechanism.

The construction heretofore described constitutes a good practical embodiment of the invention, wherein, as shown, the warp tension equalizer is contained in a loop of the warp, the runs of which are in parallel vertical planes, but obviously changes may be made in the disposition of parts within the true scope of the invention as defined in the claims and the parallel runs of the warp loop be differently disposed, the essential in these respects being that the warp tension equalizer exert a constant and uniform stress upon the warp loop regardless of the amount of warp let-off from the warp beam.

What is claimed is:

1. In a let-off mechanism for looms, the combination of a warp beam on which the warp is wound, a train of mechanism for positively rotating the warp beam to let-off the warp, a warp tension equalizer supported in a loop of the warp in its travel between the warp beam and front of the loom to maintain a uniform tension on the warp throughout the weaving operation independent of the amount of let-off, and means governed by the movement of the equalizer while its tension on the warp remains constant to vary the operation of said train of mechanism and thus increase or decrease the amount of warp let-off from the warp beam without changing the uniform warp tension.

2. In a let-off mechanism for looms, the combination of a warp beam on which the warp is wound, a train of positively acting mechanism for rotating the warp beam to let-off the warp, a warp tension equalizer supported in a loop of the warp in its travel between the warp beam and front of the loom to maintain a uniform and unvarying tension on the warp throughout the weaving operation independent of the amount of let-off, means acting through variations in the depth of the warp loop to cause the equalizer to move uniformly throughout its length, and means governed by the movement of the equalizer while its tension on the warp remains constant to vary the positive rotative movement of the warp beam and consequently the amount of warp let-off from the warp

beam without changing the uniform warp tension.

3. In a let-off mechanism for looms, the combination of a warp beam on which the warp is wound, positively acting mechanism for rotating the warp beam to supply warp during weaving, a warp tension equalizer supported in a loop of the warp, the side runs of which are parallel, that the equalizer may maintain the warp under uniform tension throughout the weaving operation independent of the amount of let-off and filling in the shed, and means governed by the movement of the equalizer while its tension on the warp remains constant to vary the positive rotative movement of the warp beam and consequently the amount of warp let-off from the warp beam while the warp tension remains unchanged.

4. In a let-off mechanism for looms, the combination of a warp beam on which the warp is wound, and positively acting mechanism for rotating the warp beam to supply warp during weaving, a warp tension equalizer supported in a loop of the warp, the side runs of which are parallel, that the equalizer may maintain the warp under uniform tension throughout the weaving operation independent of the amount of let-off and filling in the shed, means for causing the equalizer to rise and fall uniformly throughout its length, and means governed by any rise and fall of the equalizer while its tension on the warp remains constant to vary the positive rotative movement of the warp beam and the amount of warp let-off from the warp beam while the warp tension remains unchanged.

5. In a loom, the combination of a warp beam on which the warp is wound, a positive let-off for actuating the warp beam to let-off the warp, a warp tension equalizer mounted in a loop of the warp in its travel between the warp beam and front of the loom to maintain the warp under uniform tension irrespective of the amount of let-off, and means governed by any bodily movement of the equalizer while its tension upon the warp remains constant for controlling the action of the positive let-off and consequent rotative movement of the warp beam to vary the amount of warp let-off from the warp beam without changing the tension on the warp during the weaving operation.

6. In a loom, the combination of a warp beam on which the warp is wound, a positive let-off for rotating the warp beam to let-off the warp, a warp tension equalizer contained in a loop of the warp the side runs of which are parallel to maintain a constant and uniform tension on the warp regardless of the position of the equalizer during the loom operation, and means governed by the rise and fall of the equalizer while its tension upon the warp remains constant for controlling the positive rotative movement of the warp beam and the amount of warp let-off from the warp beam while the tension on the warp remains unaltered.

7. In a loom, the combination of a warp beam on which the warp is wound, a positive let-off for rotating the warp beam to let-off the warp, a warp tension equalizer supported in a loop of the warp the side runs of which are parallel to maintain a constant and uniform tension on the warp regardless of the position of the equalizer during the loom operation, means for guiding the equalizer in its movements, and means governed by the movement of the equalizer for controlling positive rotative movement of the warp beam and the amount of warp, let-off from the warp beam while the tension on the warp remains unaltered.

8. In a loom, the combination of a warp beam on which the warp is wound, a positive let-off for rotating the warp beam to let-off the warp, a warp tension equalizer supported in a loop of the warp the side runs of which are parallel to maintain a constant and uniform tension on the warp regardless of the position of the equalizer during the loom operation, means normally acting to depress the equalizer in the warp loop, and means governed by the movement of the equalizer while its tension upon the warp remains constant for controlling the positive rotative movement of the warp beam and amount of warp let-off from the warp beam while the tension on the warp remains unaltered.

9. In a loom, the combination of a warp beam on which the warp is wound, a ratchet and pawl mechanism for actuating the warp beam to let-off the warp, a warp tension equalizer contained in a loop of the warp the side runs of which loop are parallel to maintain a constant and unvarying tension on the warp regardless of the position of the equalizer during the loom operation, and means governed by the bodily movement of the equalizer while its tension upon the warp remains constant for controlling the amplitude of operative movement of the ratchet and pawl mechanism while the tension on the warp remains constant.

10. In a positive let-off mechanism for looms, the combination of the warp beam on which the warp is wound positively acting means for rotating the warp beam, a warp tension equalizer supported in a loop of the warp, the side runs of the loop being parallel to maintain uniform tension on the warp, a retarder to check sudden rise of the equalizer at the bump of the beat up, and means governed by the movement of the equalizer while its tension upon the warp remains constant during weaving to vary the operation of the positively acting means and consequently increase or decrease the amount of warp let-off from the warp beam while

the tension on the warp remains uniformly constant.

11. In a loom, the combination of the warp beam on which the warp is wound, a positive let-off mechanism for the warp beam, a warp tension equalizing roll supported in a loop of the warp having parallel side runs, a rack connected to the ends of the equalizing roll at each side of the loom and movable with the roll, a pinion engaging each rack, a connection between the pinions for their rotation by the racks in unison that the movement of the equalizing roll may be uniform throughout its length, and means governed by the movement of the equalizer roll to vary the action of the positive let-off mechanism and the amount of warp let-off from the warp beam while the uniform tension on the warp under the action of the equalizing roll remains unchanged.

12. In a loom, the combination of the warp beam on which the warp is wound, a positive let-off mechanism for the warp beam, a warp tension equalizing roll supported in a loop of the warp having parallel side runs, a sliding rack connected to the ends of the equalizing roll at each side of the loom for movement therewith, a pinion engaging each rack, a connection between the pinions for their rotation by the racks in unison that the movement of the equalizing roll may be uniform throughout its length, a weight acting through the racks to normally force the equalizer in a direction toward the turn of the warp loop, and means governed by the movement of the equalizer roll to vary the positive movement of the warp beam and the amount of warp let-off from the warp beam while the uniform tension on the warp under the action of the equalizing roll remains unchanged.

13. In a positive left-off mechanism for looms, the combination of the warp beam on which the warp is wound, a warp tension equalizer supported in a loop of the warp having parallel runs to maintain the warp under uniform tension throughout the weaving operation, and means governed independent of the warp tension to positively rotate the warp beam and thus vary the amount of warp let off from the warp beam without changing the warp tension.

14. In a positive let-off mechanism for looms, the combination of the warp beam on which the warp is wound, a warp tension equalizer supported in a loop of the warp between the warp beam and front of the loom to maintain a uniform tension on the warp from full to empty beam, and means governed by changing position of the equalizer while its tension on the warp remains constant for controlling the positive rotative movement of the warp beam to supply warp under uniform tension throughout the weaving operation.

15. In a positive let-off mechanism for looms, the combination of the warp beam on which the warp is wound, means for positively rotating the warp beam to let-off the warp, a warp tension equalizer supported in a loop of the warp between the warp beam and front of the loom to maintain uniform tension on the warp from full to empty beam, and means continuously effective and controlled by changing position of the equalizer while its tension on the warp remains constant to govern the positive rotative movement of the beam to supply the warp under uniform tension.

16. In a positive let-off mechanism for looms, the combination of the warp beam on which the warp is wound, means for positively controlling the rotation of the warp beam to let-off the warp, comprising a warp tension equalizer supported in weaving position by a loop of the warp between the warp beam and front of the loom to maintain uniform tension on the warp regardless of variations in the depth of the loop, and means continuously effective and controlled by the changing positions of the equalizer to vary the positive rotative movement of the warp beam to supply the warp under uniform tension and return the equalizer to weaving position.

17. In a positive let-off mechanism for looms, the combination of the warp beam on which the warp is wound, a warp tension equalizer resting in a loop of the warp the side runs of which are parallel that the equalizer may maintain the warp under uniform and unvarying tension during the weaving operation, positive acting mechanism for turning the warp beam to let-off the warp, and a stop positioned by bodily movement of the equalizer to vary the operation of the positive acting mechanism to let-off the warp without variation in the uniform warp tension.

18. In a positive let-off mechanism for looms, the combination of the warp beam on which the warp is wound, means for positively turning the warp beam to let-off the warp, a warp tension equalizer contained in a loop of the warp the side runs of which are parallel, a retarder for checking frontward movement of the warp at the bump of the beat-up, comprising a rotary member, operating connection between the rotary member and warp tension equalizer to cause bodily movement of the equalizer to impart turning movement to the rotary member, and a friction device acting on the rotary member to frictionally oppose turning movement of the rotary member and through its operating connection with the warp tension equalizer to prevent any sudden movement of the equalizer.

19. In a positive let-off mechanism for looms, the combination of the warp beam

on which the warp is wound, means for positively turning the warp beam to let-off the warp, a warp tension equalizer contained in a loop of the warp the side runs of which are parallel, a retarder for checking frontward movement of the warp at the bump of the beat-up, comprising a rotary member, operating connection between the rotary member and warp tension equalizer to cause bodily movement of the equalizer to impart turning movement to the rotary member, and a strap having a fixed run engaging said rotary member to oppose turning movement of the rotary member and through its operating connection with the warp tension equalizer to prevent sudden movement of the equalizer at the bump of the beat-up.

In testimony whereof, I have signed my name to this specification.

CLARE H. DRAPER.