Dec. 19, 1939. O. V. PAYNE 2,184,059

LET-OFF FOR LOOMS

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FIG. 1

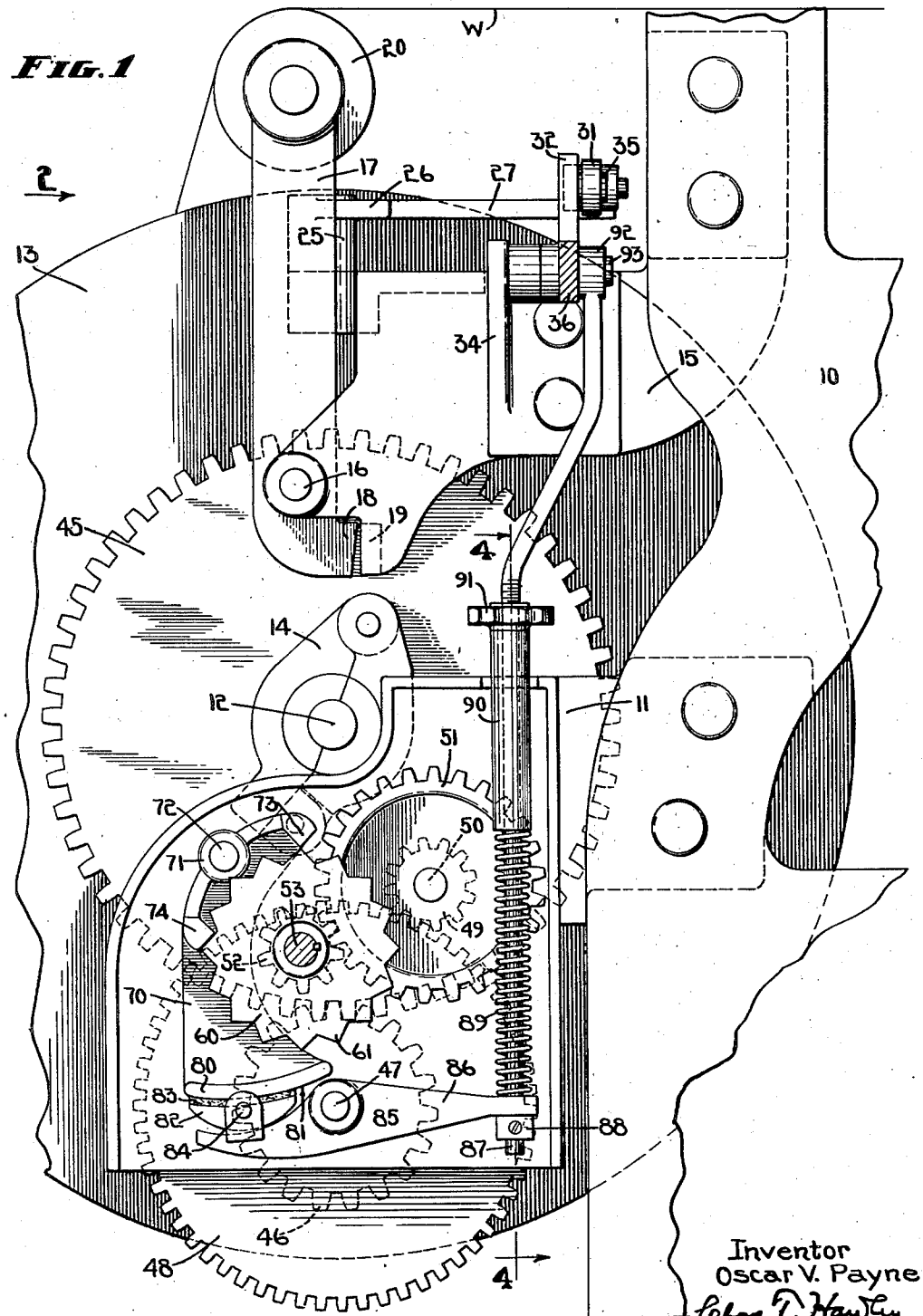

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FIG. 2

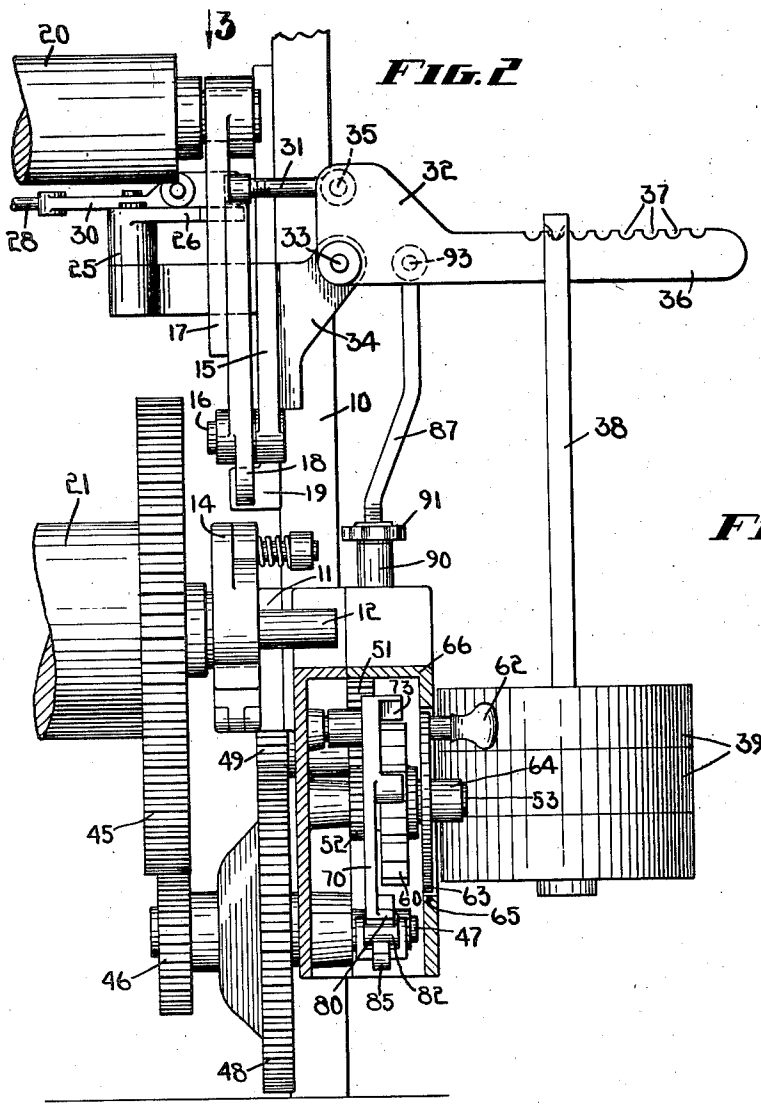


FIG. 4

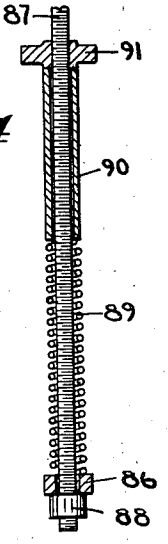
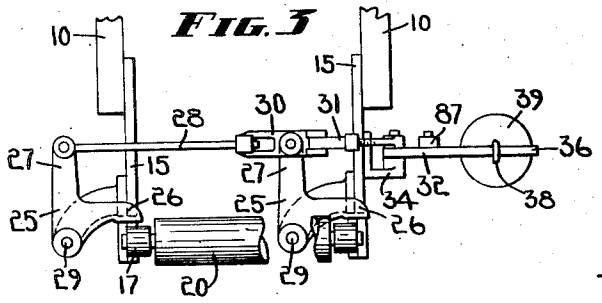


FIG. 3



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2,184,059

LET-OFF FOR LOOMS

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Application February 3, 1939, Serial No. 254,441

11 Claims. (Cl. 139—100)

This invention relates to improvements in let-offs for looms and it is the general object of the invention to provide a let-off motion employing a warp tensioning weight which is lowered from time to time by the increasing pressure of the warp threads on a whip roll.

The warp threads of a loom ordinarily rise from a warp beam and extend over and forwardly from a whip roll to pass through the harnesses of the loom. As weaving continues the beam must be rotated to let off enough warp to compensate for that which is incorporated into the fabric. It is desirable to maintain a uniform tension on the warp throughout the weaving operation and this result can advantageously be obtained by the use of a weight which is raised as the increasing warp tension moves the whip roll forwardly. Normally locked mechanism for preventing rotation of the warp beam can then be temporarily unlocked and the weight permitted to descend gradualy with a corresponding rearward movement of the whip roll without disturbing materially the tension on the warp threads.

It is an important object of my present invention to provide improved means for holding the warp beam normally locked in such a way as to allow the weight to be used to tension the warp threads without interference by the lock.

It is a further object of my present invention to subject the locking of the warp beam and its escapement mechanism by a force derived from the weight but transmitted through a yielding device capable of exerting considerably less weight on the locking device than would exist if the force of the weight were applied directly to the lock.

I find in the practice of my invention that the spring will exert a lifting force on the weight when the lock has been moved to holding position, and because of this fact the net pressure exerted on the whip roll is the difference between the weight and force. Since there is considerable variation in the amount of force which can be applied to the lock, provided the force is sufficient to retain the lock in holding position, I am enabled to vary the net pressure exerted on the whip roll by altering the counterforce derived from the spring and thereby establish the desired tension in the warp threads. It is accordingly a further object of my present invention to provide a spring or other yielding device to exert a counter force on the weight while maintaining the lock in holding position, together with means for varying the pressure of the spring so that the proper net force can be transmitted to the warp through the whip roll.

It is a further object of my present invention to provide an escapement device between the warp beam and the weight which shall be unlocked when the whip roll, acting in response to increasing consumption of the warp thread, lifts the weight to a point which will release the effect of the spring on the lock for the escapement. The escapement device being thereby rendered free to move under a force derived from the warp thread will permit turning of the warp beam until the weight has descended sufficiently to cause the spring to reestablish locking relation with the escapement device.

With these and other objects in view which will appear as the description proceeds, my invention resides in the combination and arrangement of parts hereinafter described and set forth.

In the accompanying drawings, wherein a convenient embodiment of my invention is set forth,

Fig. 1 is a side elevation of the lower rear part of a loom showing my invention in position to lock the warp beam, parts being in section and the weight being removed for the sake of clearness,

Fig. 2 is a rear elevation taken in the direction of arrow 2, Fig. 1,

Fig. 3 is a diagrammatic plan view taken in the direction of arrow 3, Fig. 2 on a reduced scale, and

Fig. 4 is a detail vertical section through the spring and rod associated therewith on line 4—4, Fig. 1.

The loom frame 10 has a bracket 11 at each side thereof to support a gudgeon 12 on the warp beam 13. The gudgeons rotate in bearings 14 mounted on bracket 11 when the beam turns to pay off warp.

A second bracket 15 projecting rearwardly from each side of the loom carries a stud 16 on which is mounted for limited angular motion an upstanding arm 17. The lower end of the arm has a stop finger 18 to abut part 19 of the bracket 15 to limit rearward motion, or motion to the left as viewed in Fig. 1, of the arm 17. Each side of the loom is provided with one of the arms 17 and together they support for rotation a whip roll 20 over which the warp W passes from the warp beam barrel 21 to the harness frames not shown.

Each bracket 15 has pivotally mounted thereon a lever 25 with an arm 26 which extends in front of the corresponding upright arm 17, while a second arm 27 extends forwardly to have a connection with a link designated generally at 28 in

Fig. 3. Each lever 25 turns around a pivot stud 29 supported by the corresponding bracket 15. As shown in Fig. 3 levers 25 will be acted upon by the upright arms 17 to rock said levers in a counter-clockwise direction about their pivots when the warp beam 20 moves forwardly by a force derived from the warp, thereby moving link 28 to the left as viewed in Fig. 3.

Link 28 has a rod head 30 attached by an adjustable connector 31 to a pressure lever 32 located at one side of the loom and pivoted as at 33 to a small stand 34 bolted to adjacent bracket 15. The connector is pivoted as at 35 to lever 32 at a point above the pivot 33, and a horizontal arm 36 of the pressure lever is provided with a series of notches 37 to receive a rod 38 the lower end of which carries a series of weights 39. The number of weights and the point at which their force is applied to arm 36 may be varied to meet different warp conditions.

In the matter thus far described, assuming for the moment that the warp beam 13 is locked against rotation, the weights 39 acting through lever 32, connector 31, link 28 and levers 25 will exert a rearward force on the arms 17, thereby tending to hold the whip roll 20 rearwardly. As weaving continues and the warp thread is consumed, the whip roll 20 will move forwardly and in doing so will rock levers 25 in a direction to exert a pull on connector 31 to the left as viewed in Fig. 2, thereby lifting arm 36 to raise the weights. The weights therefore rise as weaving continues with the warp beam locked against rotation. When the beam is unlocked by mechanism to be described it can turn to feed warp, at which time the weights descend to move the whip roll rearwardly and maintain warp tension substantially undiminished.

The locking mechanism for the warp beam includes reduction gearing and an escapement device together with a lock for the latter. As shown in Fig. 2 a relatively large gear 45 is rigid with the warp beam and meshes with a pinion 46 fastened to a shaft 47 rotatably mounted in the lower part of bracket 11. A larger gear 48 fast on shaft 47 meshes with a small pinion 49 rotating about a stud 50 also supported by the bracket 11. Fast with the pinion 49 is a gear 51 which meshes with a small pinion 52 rotatable on a stud 53 carried by the bracket 11. By the gearing just described the desired ratio can be obtained between pinion 52 and the warp beam.

By means of the gearing just described pinion 52 would rotate and permit gradual turning of the warp beam with loss of tension unless some provision were made for temporarily locking the pinion 52 and providing for its periodic release as required by the demands on the warp. This temporary locking I provide in the present instance by means of an escapement device including a star wheel 60 fast with pinion 52 and having triangular teeth 61 the sides of which are straight and may be disposed at equal angles with respect to a radius from stud 53 passing through the point of the tooth. I do not wish to be held to the particular shape of tooth shown in Fig. 1, but have found that teeth of the shape shown therein operate satisfactorily.

The escapement comprises a rocking plate 70 having a hub 71 mounted on a stud 72 supported by the bracket 11. Secured to the plate 70 are upper and lower escapement teeth 73 and 74, respectively, which rock about stud 72 and have such relation with respect to the star wheel that when the plate 70 is unlocked and rocks in one direction, for instance to the left, Fig. 1, the top tooth 73 will pass down into the notch between two adjacent teeth while the tooth 74 will move out of the notch it previously occupied and permit the star wheel to turn. When tooth 73 reaches the bottom of its notch the inclined surface of the next tooth, being urged toward tooth 73 by beam pressure, will reverse the motion of plate 70 to permit continued turning of the star wheel. This will continue so long as plate 70 is unlocked and the warp beam exerts a force on the star wheel. Each complete back and forth motion of plate 70 permits an angular motion of the starwheel equal to the angular distance between adjacent teeth 61, and during this period the warp beam turns in a direction to feed warp.

As previously stated it is necessary to lock and release the escapement alternately and to accomplish this result I provide the bottom of plate 70 with an arcuate rib 80 having a surface 81 concentric with stud 72. A shoe 82 faced with an anti-friction material 83 is pivoted as at 84 to a lever 85 free to swing on shaft 47. Arm 86 of lever 85 extends to the right, Fig. 1, and has extended therethrough the lower end of a vertical rod 87 to which is secured an adjustable stop collar 88 under arm 86. The lower end of a compression spring 89 pushes down on arm 86 while its upper end presses against a sleeve 90 surrounding the rod 87. Upward motion of the sleeve is limited by a thumb nut 91 threaded on the rod for vertical adjustment. The top of the rod has a head 92 pivoted on a stud 93 supported in the pressure lever 32. By this latter connection the weights 39 and the rod move vertically together when arm 36 moves.

In operation, assuming that the whip roll is in rearmost position, the weights 39 and rod 87 will be down and spring 89 will exert a yielding force on arm 86 to force the shoe 82 against arcuate face 81, thereby holding the plate 70 against oscillation about its pivot, thereby locking star wheel 60 against rotation. Collar 88 will be out of contact with and below arm 86. The warp beam is therefore held against rotation for reasons already described. Under this condition, as weaving continues, the warp is consumed and since the warp beam is stationary the whip roll will advance or move to the right as viewed in Fig. 1. During this advance of the whip roll arm 36 will rise to lift the weights and rod 87. As the lever 36 continues to rise collar 88 will ultimately engage the arm 86 and lift the latter with resultant lowering of the shoe 82. The plate 70 is thus released and the pressure exerted by the tendency of the warp beam to rotate and transmitted through the inclined sides of the star wheel teeth will rock the plate 70 back and forth as already described.

During the step by step angular motion of the star wheel the warp beam will move forwardly or rotate in a right hand direction as viewed in Fig. 1. The resultant slackening of the warp thread permits the whip roll to move rearwardly. The weights 39 act constantly to cause a backward motion of the whip roll and there is no appreciable lessening of warp tension. As the whip roll moves back the weights and rod 87 descend and plate 70 continues to oscillate until the descending rod 87, acting through spring 89, lifts the shoe 82 against the arcuate face 81, whereupon the plate 70 is arrested and further turning of the star wheel and warp beam is prevented.

If there were a positive connection between the shoe 82 and the weights 39, descent of the

latter would stop with engagement of the shoe with the rib 80. Under these conditions, however, there might still remain a slight slackness in the warp threads and since the whip roll moves with the weights it would not be able to move back far enough to take up such slackness. It would then be necessary for the loom to weave several picks before the proper warp tension was again established. By having the yielding connections provided by the spring 89 interposed between the shoe 82 and the weights, however, the latter are free to continue their downward motion after the escapement is locked to produce as much additional rearward motion of the whip roll as may be needed to maintain the desired warp tension. The fact that the whip roll can thus continue its rearward motion and thereby influence warp tension after the warp beam has been locked is an important feature of my present invention.

Another feature of my invention relates to the adjustment of pressure exerted by the weight against the whip roll. The rib 80 serves as a fixed point against which the spring 89 exerts an upward pressure in a direction opposite to the downward pull of the weights. The arm 36 is therefore subjected to a downward force which is the difference between the downward pull of the weights and the upward thrust of the spring. It is important to maintain the tension of the warp uniform, but this tension may lie between that exerted by two weights and three weights, for instance. Adjustment of the spring by the thumb nut 91 provides means for lessening the force of the three weights to a value lying between pressures corresponding to two and three weights, respectively. If the pressure is desired to be relatively light the thumb screw 91 will be turned so as to descend along the rod 87 and therefore increase the upward pressure of the spring, the resultant net downward pull on arm 36 under these conditions being reduced to provide the desired lessened tension of the warp. If, one the other hand, it is desired that the warp tension be relatively high the compression of the spring will be reduced so that the amount by which it counteracts the downward pull of the weights may be reduced to a minimum.

In the usual operation of a loom the tension on the warp will be varied by changing the number of weights on the rod 38. This change, however, is not smooth but varies by steps depending upon the size of the weights 39. These steps may be too great to afford the requisite nicety of adjustment in the tension of the warp threads, but the spring can be altered so that the desired pressure can be attained.

In some settings of the mechanism I have observed that the arm 36 is inclined, the outer end being down. When in this position the bell crank lever 32 and the weights do not operate to their best advantage, since arm 36 should preferably be horizontal. The condition just described grows out of the fact that the whip roll is back too far. To correct this condition I find that by increasing the pressure on the spring a greater counteracting force can be opposed to the weights and the latter can be raised until the lever 36 is substantially horizontal.

In order to provide for manual operation of the let-off in the event of a pickout I provide a knob 62 on a disk 63 having a hub 64 secured to shaft 53. The disk closes an opening 65 in a housing 66 carried by the bracket 11. By manually releasing the lock shoe 82, as by raising weights 39, the user can turn the star wheel in either direction to cause backward or forward turning of the warp beam.

From the foregoing it will be seen that I have provided a whip roll controlled let-off having an escapement which normally locks the warp beam against rotation, but which is periodically released by forward motion of the whip roll to permit partial rotation of the warp beam, after which the escapement device is again locked. It will further be seen that the pressure on the warp threads is derived from the weights acting on lever 36 so that I am able to use the constant downward pull of gravity to maintain warp tension. It will also be seen that the shoe 82 is not subjected to the whole downward force of the weights but only to such force as can be transmitted through the spring 89. Furthermore, the net downward force exerted on lever 36 and therefore on the warp threads can be varied by adjustment of the thumb screw 91 on the rod 87, an increase in compression of the spring resulting in a reduction in the net pressure exerted on the warp threads. Because of the continuous adjustment of spring pressure it is possible to adjust the pressure of the whip roll on the warp threads to any desired amount despite the fact that the downward pull on rod 38 varies in relatively large steps dependent upon the magnitude of weight 39.

Having thus described my invention it will be seen that changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and I do not wish to be limited to the details herein disclosed, but what I claim is:

1. In a let-off for a loom, a warp beam to supply warp threads, a movably mounted whip roll over which the warp threads pass and the position of which determines the tension of the warp threads, the warp threads tending by their tension to turn the warp beam, an escapement mechanism connected to the warp beam which when unlocked permits the warp to turn the beam, a brake to arrest the escapement mechanism to prevent turning of the warp beam and to release the escapement mechanism, a weight connected to the whip roll to resist motion of the whip roll in a direction to lower warp tension, and a controller for the brake moving with the weight and including a member to transmit a yielding force derived from the weight to the brake.

2. In a let-off for a loom, a warp beam to supply warp threads, a whip roll over which the warp threads pass, means to mount the whip roll for movement to vary the tension of the warp threads, the latter by their tension tending to turn the warp beam, an escapement mechanism connected to the warp beam which when unlocked permits the warp to turn the beam, a brake for the escapement mechanism movable to release the escapement mechanism, and movable to arrest the escapement mechanism to prevent turning of the warp beam, an element movable with the whip roll, a weight connected to the element and resisting movement of the whip roll in a direction to lower warp tension, and a yielding connection between said element and the brake operative when the weight reaches a given position to apply a force derived from the weight yieldingly to the brake to cause the latter to arrest the escapement mechanism, the weight being movable beyond said given position to act on the whip roll through said element to subject

warp threads to tension by movement of the whip roll subsequent to arresting of the escapement mechanism.

3. In a let-off for a loom, a warp beam to supply warp threads, a whip roll over which the warp threads pass, said roll movable to vary the tension of the warp threads and movable in response to an increasing tension in the warp threads, an element connected to and moving with the whip roll, a weight connected to the element and resisting motion of the whip roll through said element in a direction to lessen warp tension, an escapement mechanism connected to the warp beam which when unlocked permits the warp to turn the beam, a controller for the escapement mechanism movable to release said escapement mechanism to permit turning of the beam under the tension of the warp threads and movable to a position to arrest the escapemtnt mechanism to hold the warp beam stationary, and means to operate the controller, said means connected to the element and the controller and including a yieldable member to transmit a force derived from the weight to the controller to move the latter to escapement mechanism arresting position when the weight reaches a given position in its movement, said weight movable beyond said given position and subjecting said yielding member to further yielding, movement of said weight beyond said given position acting through the element to move the whip roll in a direction to tension the warp threads.

4. In a let-off for a loom, a warp beam to supply warp threads, a whip roll over which the warp threads pass, said roll movable to vary the tension of the warp threads and movable in response to an increasing tension in the warp threads, an element connected to and moving with the whip roll, a weight connected to the element and resisting motion of the whip roll through said element in a direction to lessen warp tension, an escapement mechanism connected to the warp beam, a controller for the escapement mechanism movable to release said escapement mechanism to permit turning of the beam under the tension of the warp threads and movable to a position to arrest the escapement mechanism to hold the warp beam stationary, a spring interposed between the element and controller to transmit a force derived from the weight to said controller to move the latter to escapement mechanism arresting position as the weight descends, said weight capable of further descent after the escapement mechanism has been arrested to move the whip roll in a direction to tension the warp, and the spring yielding during said further descent of the weight to maintain the lock in escapement mechanism arresting position.

5. In a let-off for a loom, a warp beam to supply warp threads, a whip roll over which the warp threads pass, said roll movable to vary the tension of the warp threads and movable in response to an increasing tension of the warp threads in a direction to lessen warp tension, an element connected to and moving with the whip roll, a weight connected to the element and resisting motion of the whip roll through said element in a direction to lessen warp tension, an escapement mechanism connected to the warp beam, a controller for the escapement mechanism movable to release said escapement mechanism to permit turning of the beam under the tension of the warp threads and movable to a position to arrest the escapement mechanism to hold the warp beam stationary, connections between the element and the controller including a compression spring to transmit a force rrom the element to the controller, the weight when reaching a given point in its descent compressing the spring by a force transmitted through the element to move the controller to escapement mechanism arresting position, the weight to continue descent below said given position and act through the element to move the whip roll in a direction to increase warp tension and subjecting the compression spring to further compression during which the controller is held in arresting position.

6. In a let-off for a loom, a warp beam to supply warp threads, a whip roll over which the warp threads pass, said roll movable to vary the tension of the warp threads and movable in response to an increasing tension of the warp threads in a direction to lessen warp tension, an element connected to and moving with the whip roll, a weight connected to the element and resisting motion of the whip roll through said element in a direction to lessen warp tension, an escapement mechanism connected to the warp beam, a controller for the escapement mechanism movable to release said escapement mechanism to permit turning of the beam under the tension of the warp threads and movable to a position to arrest the escapement mechanism to hold the warp beam stationary, connections between the element and the controller including a compression spring to transmit a force from the element to the controller, the weight when reaching a given point in its descent compressing the spring by a force transmitted through the element to move the controller to escapement mechanism arresting position, the weight to descend below said given position and act through the element to move the whip roll in a direction to increase warp tension and subjecting the compression spring to further compression during which the controller is held in arresting position, and means to adjust said connections to vary the amount of compression of the spring derived from the weight.

7. In a let-off for a loom, a warp beam to supply warp threads rotatable by a force derived from the warp, a whip roll over which the warp threads pass, said roll movable to vary the tension of the warp threads and movable in response to an increasing tension in the warp threads in a direction to lessen warp tension, an element connected to and moving with the whip roll, a weight connected to the element and resisting motion of the whip roll, a weight connected to the element and resisting motion of the whip roll through said element in a direction to lessen warp tension, an escapement mechanism connected to the warp beam, a controller for the escapement mechanism movable to release said escapement mechanism to permit turning of the beam under the tension of the warp threads and movable to a position to arrest the escapement mechanism to hold the warp beam stat.onary, connections between the element and the controller to transmit a force derived from the element to the controller to move the latter to escapement mechanism arresting position, said connections including an adjustable yielding element to oppose and be less than the force exerted by the weight when the controller is in arresting pos.tion, the downward force acting on the element by reason of the weight being lessened by the opposing force of the yielding member to the end that the force exerted on the warp by the

weight may be varied while the weight remains constant.

8. In a let-off for a loom, a warp beam to supply warp threads, rotatable by a force derived from the warp, a whip roll over which the warp threads pass, an element connected to and moving with the whip roll, a weight connected to the element and resisting motion of the whip roll through said element in a direction to lessen warp tension, an escapement mechanism connected to the warp beam, a controller for the escapement mechanism movable to release said escapement mechanism to permit turning of the beam under the tension of the warp threads and movable to a position to arrest the escapement mechanism to hold the warp beam stationary, connections between the element and the controller to transmit a force derived from the element to the controller to move the latter to escapement mechanism arresting position, said connection including a yielding element to oppose and be less than the force exerted by the weight when the controller is in arresting position, the downward force acting on the element by reason of the weight being lessened by the opposing force of the yielding element, and means to vary the amount of resistance offered by the yielding element to the weight, to the end that the downward force acting on the element and tending to move the whip roll in a position to tension the warp thread may be varied without change in the weight.

9. In a let-off for a loom having a warp beam rotatable by a force derived from the warp to feed warp, a whip roll movable forwardly by the warp when the warp beam is stationary, a member movable with the whip roll, a weight connected to the member and acting through the latter to resist forward motion of the whip roll and being raised as the whip roll moves forwardly, an escapement mechanism connected to the warp beam and movable therewith, a controller for the escapement mechanism movable to arrest the latter and prevent turning of the wrap beam and movable to release the escapement mechanism to permit turning of the warp beam by the warp, and an adjustable yieldable connection between the member and the controller movable by the weight as the latter descends to cause the controller to arrest the escapement mechanism, said yieldable connection acting when motion of the controller is arrested by the escapement mechanism to exert an opposing force on the member and offer resistance to descent of the weight, the resistance to be variabe by reason of the adjustable connection to the end that the net force exerted on the whip roll by the weight acting through the member when the escapement is arrested may be varied without changing the mass of the weights.

10. In a let-off for a loom having a warp beam rotatable by a force derived from the warp to feed warp, a whip roll movable forwardly by the warp when the warp beam is stationary, a member movable with the whip roll, a weight connected to the member and acting through the latter to resist forward motion of the whip roll and being raised as the whip roll moves forwardly, an escapement mechanism connected to the warp beam and movable therewith, a controller for the escapement mechanism movable to arrest the latter and prevent turning of the warp beam and movable to release the escapement mechanism to permit turning of the warp beam by the warp, a rod connected to the member, a compression spring around the rod positioned to exert a yielding force on the controller when the member moves toward the controller, and adjustable means to vary the force exerted by the spring on the controller, the controller when in escapement mechanism arresting position causing the spring to resist movement of the weight by a force transmitted through the member and said adjustable means to vary the resistance offered by the spring to the weight, whereby the effective force of the weight acting on the whip roll may be altered while the mass of the weight remains constant.

11. In a let-off for a loom, a warp beam to supply warp threads and be turned by a force exerted by the warp threads, a whip roll over which the warp threads pass, said whip roll mounted to move forwardly by a force derived from the warp threads and mounted to move rearwardly when tension of the warp threads is temporarily slackened by rotation of the warp beam, an escapement mechanism connected to the wrap beam, a brake capable of arresting movement of the escapement mechanism to prevent rotation of the beam and capable of releasing the escapement mechanism to permit the beam to turn by a force derived from the warp threads, a member moving with the whip roll, a weight supported by the member and exerting a force on the latter in a direction tending to move the whip roll in a direction to increase warp tension, said weight to be raised by a force transmitted through the member from the whip roll when the latter is moved forwardly by warp tension, a rod connecting the member and brake and extending through a part of the latter, means on the rod to engage a portion of the brake remote from the member, a compression spring around the rod between the member and the brake to exert a force on the brake and normally hold said means in contact with said part of the brake and means carried by the rod to vary the pressure exerted by the spring on said brake, the whip roll when moving forwardly by tension of the warp moving the member in a direction to cause said means on the rod to move the brake to a position to release the escapement mechanism, whereupon the warp beam turns to effect temporary slackening of the warp and the weight descends to move the whip roll in a warp tightening direction, the descending weight causing movement of the member in a direction to move the rod and cause the spring therearound to move the brake to a position to arrest the escapement mechanism, the weight being free to continue its descent after arresting of the escapement mechanism to move the whip roll in a direction to tension the warp subsequent to the arresting of rotation of the warp beam and escapement mechanism because of the resilience of the spring.

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