

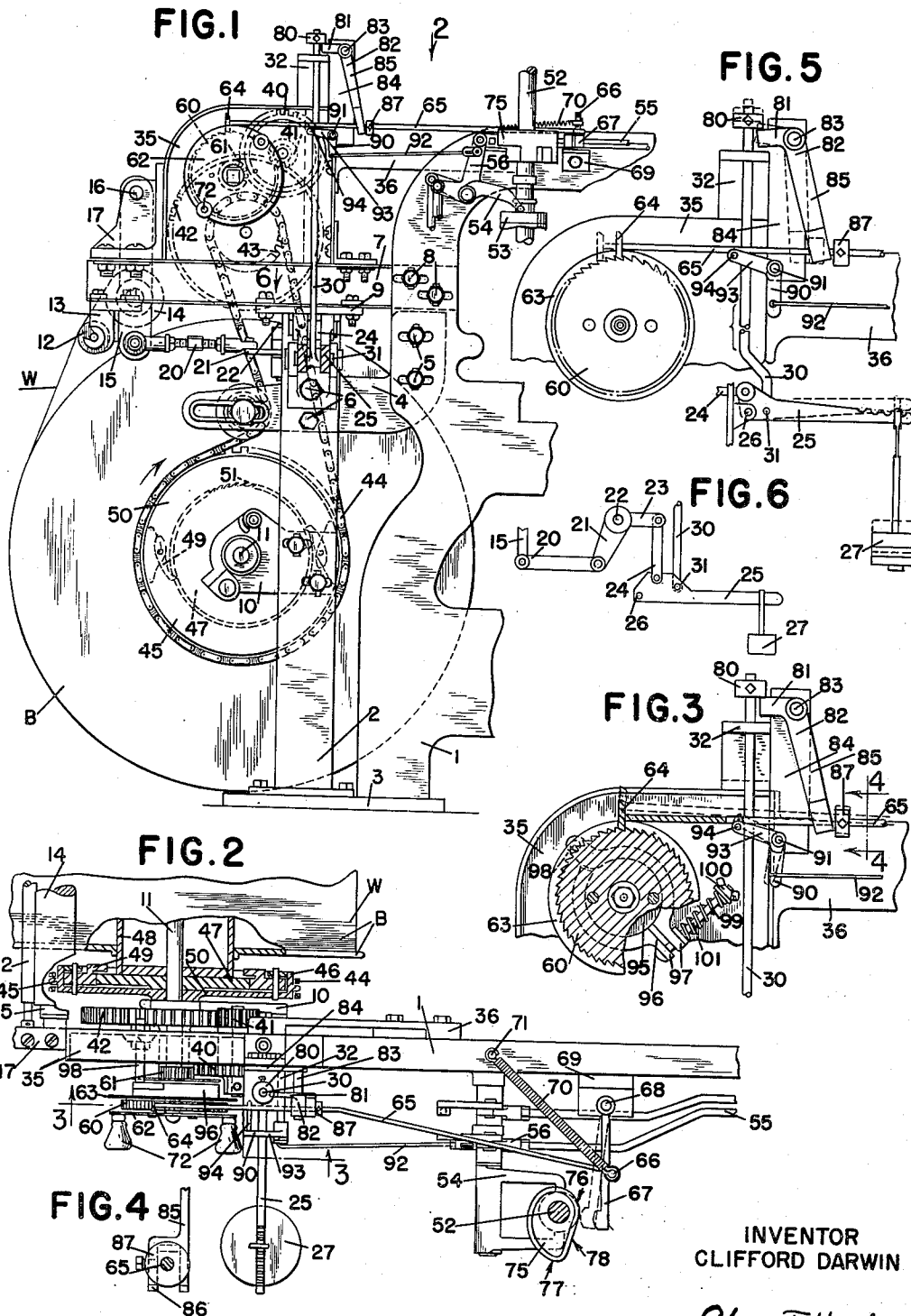
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WARP LETOFF FOR LOOMS

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WARP LETOFF FOR LOOMS

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1

This invention relates to improvements in let-off mechanisms for looms and it is the general object of the invention to provide a control which will enable the letoff to respond to variations in warp tension and adapt it to the weaving of light weight fabrics.

A type of letoff which has gone into extensive use for the weaving of heavier fabrics employs a train of mechanism including an escapement lever operatively connected to the warp beam. The whip roll is mounted for back and forth movement and when moved forwardly by an increase in warp tension a brake normally restraining the escapement lever is moved to non-restraining position, thereby releasing the mechanism so that the warp can turn it and the beam. In such a letoff however the tension of the warp must not only be sufficient to turn the beam but must also turn the gears of the train of mechanism, and when light weight fabrics are being woven difficulty is occasionally experienced by inability of the warp to turn the mechanism without being placed under excessive tension.

It is an important object of the present invention to provide a letoff mechanism including a train of gearing or the like operatively connected to and controlling the warp beam but wherein the train is moved positively by the loom from time to time so that the warp threads are required to move only the beam and not the train.

It is a further object of the invention to provide means which will normally present turning of the train of gearing by the warp threads and periodically effect positive feed of the train by loom operated means controlled by a part, such as a whip roll, responsive to variations in warp tension. The train may for instance include a brake drum and clamp which frictionally prevents turning of the beam and train by the warp and include also a ratchet wheel which is turned by a loom operated pawl mechanism the position of which with respect to an actuator is determined by the whip roll. When the whip roll moves forwardly it enables the pawl mechanism to be moved by the actuator to overcome the frictional resistance and move the train, whereupon the warp will be able to move the beam.

Letoff mechanisms of the type set forth herein-after are of the kind which are used on the heavier type of looms, such for instance as the worsted and woolen looms employing the Knowles head. In these looms provision is made for disconnecting the shedding mechanism to permit a pickout and it is a further object of the invention

2

to provide simple means for moving the aforesaid pawl mechanism to inoperative position so that it cannot interfere with the pickout operation.

In order that the invention may be clearly understood reference is made to the accompanying drawings which illustrate by way of example the embodiments of the invention and in which:

Fig. 1 is a side elevation of the rear part of a loom having the invention applied thereto,

Fig. 2 is a plan view looking in the direction of arrow 2, Fig. 1, parts being broken away,

Fig. 3 is an enlarged vertical section on line 3—3, Fig. 2, parts being broken away,

Fig. 4 is an enlarged detailed vertical section on line 4—4, Fig. 3,

Fig. 5 is a diagrammatic view on an enlarged scale showing part of the structure set forth in Fig. 1, and

Fig. 6 is a detail diagrammatic plan view looking in the direction of arrow 6, Fig. 1.

Referring to Figs. 1 and 2, the loom frame 1 is associated with an upright support 2 which may rest on the foot 3 of the rear part of the loom frame. A brace 4 connected to the loom frame at 5 extends rearwardly and is connected as at 6 to the upright 2. A support 7 also extending rearwardly from the loom frame is secured to the latter as at 8 and rests on the upper end 9 of the upright 2.

The upright 2 supports a bearing 10 receiving a gudgeon 11 of a warp beam B. The warp W from the beam leads upwardly behind a guide roll 12 rotatable in bearing 13 depending from the support 7 and then over a whip roll 14 and thence forwardly to the weaving instrumentalities of the loom not shown herein. The whip roll is mounted on a lever 15 swingable about a pivot 16 carried by a bearing 17 also mounted on the support 7.

Connected to the lower end of lever 15 is an adjustable connector rod 20 which is pivoted to a lever arm 21 rotatable about a vertical stud 22 fixed with respect to the upright 2. A lever arm 23 fixed with respect to the arm 21 is connected by a link 24 to a weight lever 25 pivoted about a stud 26 supported by the upright 2. A weight 27 is suspended from lever 25 and may be connected to the latter at different points along its length. An upright rod 30 is pivoted as at 31 to lever 25 and extends upwardly through a guide 32 on the loom frame.

A housing 35 is supported by and extends upwardly from the support 7 and is connected to a brace 36 which extends forwardly for attachment

to the loom frame. This housing contains gearing mechanism including a gear 40 and a pinion 41 fixed to gear 40 and meshing with a gear 42. A sprocket wheel 43 fixed with respect to gear 42 has trained over it a chain 44 which extends downwardly and around a sprocket 45 concentric with and rotatable about shaft 11. Sprocket 45 has a flange 46 within which is located a ratchet wheel 47 secured to and turning with the beam barrel 48 on which the warp is wound. Pawls 49 are pivoted on the web 50 of sprocket wheel 45 and are normally urged into engagement with the teeth 51 of ratchet wheel 47.

When the invention is used on certain of the heavier types of looms having a shedding mechanism of the Knowles type there will be an upright shaft 52 which rotates once for each beat of the loom and has associated with it a clutch 53 and lever mechanism 54 controllable by a forwardly extending rod 55. The clutch is normally in its down driving position so that when rotating it will operate the shedding mechanism, but by manipulation of the rod 55 the lever mechanism 54 can be turned in a clockwise direction as viewed in Fig. 1 to lift the clutch and disconnect it from the loom so that the warp can be moved for a pickout operation. The lever mechanism 54 includes a bell crank lever 56 which is connected to a part of the present invention as will be set forth hereinafter.

During operation of the loom the whip roll 14 will swing forwardly, to the right in Fig. 1, and backwardly due to variations in the tension of the warp W and will swing forwardly when the tension increases, thereby lifting the weight 27. The weight tends to move the whip roll rearwardly and is likely to rise and fall during loom operation due to movement of the whip roll.

The mechanism thus far described may be similar to parts of known letoffs such as shown for instance in prior patent to Payne No. 2,103,321 and except as noted hereinafter will be made and operate in the usual manner.

In carrying the invention into effect a driven member or ratchet wheel 60 is mounted for rotation on the casing 35 and is fixed with respect to a pinion 61 which meshes with gear 40. The ratchet wheel 60 is between guide disks 62 and 63 of larger diameter than that of the ratchet wheel to guide a pawl 64 secured to the rear end of a rod 65. The latter is pivoted as at 66 to an actuator lever 67 pivoted at 68 to a small stand 69 held in fixed position on the loom frame. This lever is connected to a spring 70, see Fig. 2, the rear end of which is connected as at 71 to the loom frame. The spring tends normally to move the lever 67 and rod 65 rearwardly, or to the left as viewed in Fig. 2. Knobs or hand holds 72 on disk 62 afford means for manually turning ratchet wheel 60.

Secured to the shaft 52 is a cam 75 which has a low point 76 of minimum radius and a high point 77 of maximum radius. The difference between these two radii represent the throw or working stroke of the actuator, and during loom operation the cam will rotate once for each beat of the loom in a counter-clockwise direction as viewed in Fig. 2. The cam has a working surface 78 for cooperation with the free end of lever 67.

The previously mentioned upright rod 30 has secured at the upper end thereof in adjusted position therealong a stop collar 80 which serves to limit upward motion of a substantially horizontal arm 81 of a control lever 82 pivoted as at 83 to a small stand 84 extending upwardly from and secured to the loom frame. Lever 82 has a de-

pending arm 85 which is forked as at 86, see Fig. 4, to bridge rod 65. The latter has a positioning collar 87 secured thereto adjustably therealong for engagement with the lower end of arm 85 of the lever 82.

A small bell crank lever 90 is pivoted as at 91 to the stand 84 and is connected by a forwardly extending rod 92 to the previously described bell crank lever 56. Lever 90 has a rearwardly extending arm 93 provided with a laterally extending pin 94 extending under the rod 65. Under normal running conditions the bell crank lever 90 will be in the full line position shown in Fig. 3 so that the rod 65 can be in its down operating position to permit cooperation between the pawl 64 and the ratchet wheel 60.

Ratchet wheel 60 has extending laterally therefrom a cylindrical brake drum 95 around which extends a clamp designated generally at 96, see Fig. 3. The clamp comprises two parts 97 pivoted on a stationary stud 98 and held in frictional engagement with drum 95 by a spring 99 the force of which is adjustable by a nut 100 on rod 101 pivoted to one of the parts 97 and passing through the other part.

As contemplated herein the train of mechanism which controls the warp beams starts with the pawls 49 and extends upward through the chain and gearing to and including the driven member or ratchet wheel 60. The operative connection between this train and the beam is the ratchet wheel 47, and the pawl mechanism, which is a feed means or loom driven train operating mechanism, includes the pawl 64, rod 65 and lever 67. The clamp 96 is the brake which frictionally prevents movement of the train by the warp, and the control means for the pawl mechanism includes stop collar 80, lever 82, positioning collar 87 and the spring 70. While these various means and mechanisms have been specifically identified with particular parts of the structure the invention is not necessarily limited to the particular parts named.

In operation, the running of the loom will result in forward movement of the warp by both the take-up and the lay neither of which is shown in the drawings. The clamp 96 for the drum 95 will ordinarily impose sufficient frictional load on the system so that the warp will not be able to drive the train of mechanism, although the warp tension will be sufficient to turn the warp beam if the latter is free to turn.

Assuming that at any given point in the operation of the loom the whip roll 14 is in its normal rearmost position as suggested in Fig. 1, the weight lever 25 will be down so that the stop collar 80 will be in low position, and the spring 70 acting through positioning collar 87 will hold arm 81 of control lever 82 up against collar 80, see full lines Fig. 5. Under these conditions the rod 65 will ordinarily be far enough forward so that lever 67 will be just beyond the throw or working stroke of the actuator 75.

A weaving continues and the clamp brake holds the beam stationary the warp tension will increase and the whip roll will move forwardly and in doing so will lift lever 25 and also stop collar 80 so that spring 70 can move lever 82 to some such position as that shown in dotted lines, Fig. 5. The accompanying rearward movement of rod 65 will move pawl 64 rearwardly to the dotted line position, Fig. 5, and move lever 67 within the range of operation or working stroke of the actuator 75, see dotted lines, Fig. 2. When the actuator 75 moves lever 67 forwardly the pawl 64 will

5

turn the ratchet wheel 60 in a clockwise direction as viewed in Fig. 1, overcoming the frictional resistance of the frictional brake clamp 96 and acting through the mechanism to turn the sprocket wheel 45 and pawls 49 clockwise as viewed in Fig. 2. Under this condition the warp beam will be free to turn and the warp will rock the beam B slightly in a forward direction to unwind warp. During turning of the beam by the warp the ratchet wheel 51 will follow pawls 49 until their motion stops at the end of the forward or feeding stroke of the pawl 64, at which time the train of gearing and the beam will again become stationary and be held so by clamp 96.

Turning of the warp beam will momentarily reduce the warp tension so that the weight 27 will be able to return the whip roll 14 to its rearward position and lower stop collar 80 and therefore move the rod 65 forwardly until the lever 67 is again beyond the range of the working stroke of the actuator cam 75. During operation of the loom therefore it will be seen that there will be periods when the brake clamp 96 is able to hold the train of mechanism and beam stationary against the pull of the warp and that there will be other periods when the loom driven pawl mechanism will positively overpower the frictional resistance of the clamp and move the train of mechanism and pawls 49 so that ratchet wheel 47 can follow them with accompanying turning of the beam by the warp to supply warp for the weaving process.

It will be apparent that the amount of motion imparted by the actuator to the pawl mechanism, and thus to the train and pawls 49, will vary with the distance by which the whip roll is forward of its rearward position. If the whip roll moves forwardly only slightly then stop collar 80 will rise only a small amount and lever 67 will move only a short distance within the working stroke of cam 75. If on the other hand the whip roll has a considerable forward motion there will be a correspondingly greater motion of lever 67 within the working stroke of cam 75 and the train will be given a relatively large motion, thereby permitting the warp due to its tension to give the beam a larger angular motion.

As the diameter of the warp on the beam diminishes there will be need for increased rotation of the beam, but this will be taken care of by more frequent turning of the ratchet wheel 60 by the pawl 64, and in fact the extent of motion of the pawl may be increased due to a greater forward displacement of the whip roll. If it is found that the single lobe cam 75 shown in Fig. 2 does not give sufficient feed for the ratchet wheel 60 an additional lobe can be supplied so that lever 67 can be rocked twice for each beat of the loom, but it is not thought necessary to illustrate a double lobed cam.

When a pickout is necessary clutch 53 will be raised, thereby lifting the rear end of rod 65 by pin 94 to move pawl 64 from its operative position, full lines in Fig. 3, to its inoperative position relative to ratchet wheel 60, see dotted lines, Fig. 3. Collar 87 will by reason of spring 70 be held frictionally against the forked end of lever 82 and rod 65 will be held up frictionally due to spring 70 without further attention from the weaver. The defective picks will then be removed, and the take-up reversed, thus slackening the warp and permitting weight 27 to fall to move whip roll 14 rearwardly. Then by the knobs 72 the ratchet wheel 60 can be turned in a direction to turn the sprocket wheel 45 and beam positively

6

in a counter-clockwise direction as viewed in Fig. 1. If desired the clamp 96 can be slackened for this operation by manipulation of nut 100 and later reset. The weaver will ordinarily raise lever 25 at this time and when proper tension has been restored the whip roll will be forward of its rear position and lever 67 will be within the working range of cam 75. The clutch 53 will then be lowered and on the first beat of the loom lever 67 will be moved forwardly and move collar 87 away from lever 82, whereupon rod 65 will fall to return pawl 64 to its operating position without attention by the weaver.

In manipulating the loom incident to a pickout the weaver may move the lever 25 upwardly but it will be apparent from Fig. 5 that the lever 82 will not interfere with upward movement of the stop collar 80 on rod 30 and the weaver will be free to lift lever 25. If, on the other hand, the lever 25 should assume an abnormally low position during the pickout operation the lever 82 will be turned in a counter-clockwise direction as viewed in Fig. 5 beyond the position which it will ordinarily occupy under loom operation, but the lever is free to have this motion since lever 67 under these conditions will move away from the actuator cam 75 as far as necessary.

From the foregoing it will be seen that the invention sets forth a letoff mechanism adaptable more particularly though not necessarily to the weaving of lighter weight fabrics having a low number of picks per inch wherein the train of control mechanism supported largely by the casing 35 and controlling the warp beam is not moved by the warp but is moved positively by the pawl mechanism. The warp tension will be enough to turn the warp beam when the latter is free to turn so that the ratchet wheel 47 will be kept in engagement with the pawls 49. Also, the extent of feed of the pawl 64 is controlled by a means movable in response to variations in warp tensions, such as the whip roll, the feed being increased with increased warp tension. Furthermore, the feed pawl 64 will be moved to its raised inoperative or non-feeding position whenever the clutch 53 is lifted to disconnect the shaft 52 and the cam 75 from the loom, and manual turning of the feeding mechanism cam can be effected during a pickout without interference by the pawl. A specific type of connection has been described between the chain 44 and the warp beam, such for instance as the ratchet wheel 47, but the invention is not necessarily limited to this particular connection and it will be sufficient for certain features of the invention if the train of mechanism normally restrains or prevents turning of the beam B by the warp but permits the warp to turn the beam during the time that the train is being moved positively by the loom. The frictional resistance offered by the clamp will vary with the force exerted by spring 99, but since this resistance is overcome by ample power derived by the loom the setting of the clamp is not critical.

Having now particularly described and ascertained the nature of the invention and in what manner the same is to be performed, what is claimed is:

1. In warp letoff mechanism for a loom, warp beam which when free to turn can be turned by the warp threads, a train of mechanism including a driven member moving with the train and a brake normally preventing movement of the driven member and train, operative connections between the train and beam preventing the warp

from turning the beam in a direction to unwind warp when the train is prevented from moving by the brake, loom driven train operating mechanism including a regularly moving actuator and a part to be moved by the actuator, and means moving in response to variations in warp tension controlling the position of said part relative to the actuator and effective upon an increase of warp tension to cause said actuator and part to cooperate to move said driven member and move the train against the action of the brake in a direction to free the beam for turning and enable the warp to turn the beam in a direction to unwind warp.

2. In warp letoff mechanism for a loom provided with a warp beam which when free to turn can be turned by the warp threads, a train of mechanism including a driven member moving with the train and a brake normally preventing movement of the train, operative connections between the train and beam preventing the latter from turning in a direction to unwind warp when the train is prevented from moving by the brake, loom driven train operating mechanism, and means moving in response to variations in warp tension controlling the operating mechanism and effective upon an increase of warp tension to cause said operating mechanism to move said driven member and move the train against the action of the brake in a direction to free the beam for turning and enable the warp to turn the beam in a direction to unwind warp, said operative connections including a ratchet wheel secured to the beam and said train including a pawl engaging the ratchet wheel.

3. In warp letoff mechanism for a loom provided with a warp beam which when free to turn can be turned by the warp threads, a train of mechanism including a driven member moving with the train and a brake normally preventing movement of the train, operative connections between the train and beam preventing the latter from turning in a direction to unwind warp when the train is prevented from moving by the brake, loom driven train operating mechanism, and means moving in response to variations in warp tension controlling the operating mechanism and effective upon an increase of warp tension to cause said operating mechanism to move said driven member and move the train against the action of the brake in a direction to free the beam for turning and enable the warp to turn the beam in a direction to unwind warp, said driven member being a ratchet wheel and said train operating mechanism including a pawl to turn the ratchet wheel and move the train.

4. In warp letoff mechanism for a loom provided with a warp beam which when free to turn can be turned by the warp threads, a train of mechanism including a driven member moving with the train and a brake normally preventing movement of the train, operative connections between the train and beam preventing the latter from turning in a direction to unwind warp when the train is prevented from moving by the brake, loom driven train operating mechanism, and means moving in response to variations in warp tension controlling the operating mechanism and effective upon an increase of warp tension to cause said operating mechanism to move said driven member and move the train against the action of the brake in a direction to free the beam for turning and enable the warp to turn the beam in a direction to unwind warp, said driven member being a ratchet wheel and said train op-

erating mechanism including a regularly moving actuator and feed pawl mechanism for the ratchet wheel to be operated by the actuator, and said means including a whip roll movable forwardly upon an increase in warp tension operatively connected to the pawl mechanism effective to relate the feed pawl mechanism operatively to the actuator to cause the latter to operate the pawl mechanism and driven member to move said train when the whip roll moves forwardly.

5. In letoff mechanism for a loom, a warp beam which when free to turn is turned by the warp to unwind warp, a whip roll responsive to changes in warp tension moving forwardly when warp tension increases from normal and moving rearwardly when warp tension decreases to normal, a train of mechanism operatively connected to the beam normally imposing a restraint on the warp beam preventing turning thereof by the warp, thereby increasing warp tension as the loom continues to operate and causing the warp to move the whip roll forwardly, the warp under normal and increased tension being incapable of turning the beam, and train operating mechanism including a regularly moving actuator and a lever movable toward and from the actuator under control of the whip roll, the latter effective when moving forwardly to move said lever toward said actuator independently of the warp tension, said actuator and lever thereupon cooperating to act on said train of mechanism to remove said restraint and enable the warp to turn the beam to unwind warp for the weaving operation.

6. In letoff mechanism for a loom, a warp beam which when free to turn is turned by the warp to unwind warp, a whip roll responsive to changes in warp tension moving forwardly from the normal position thereof when warp tension increases and moving rearwardly to normal position when warp tension decreases, a train of mechanism operatively connected to the beam normally imposing a restraint on the warp beam preventing turning thereof, thereby increasing warp tension as the loom continues to operate and causing the warp to move the whip roll forwardly, the warp under normal and increased tension being incapable of turning the beam, an actuator having a regularly recurring working stroke, and feed means for moving said train operable by said actuator and having the position thereof relative to said actuator controlled by the whip roll, the latter when in rearward position effecting positioning of the feed means beyond said working stroke and the whip roll when in forward position positioning the means in said stroke to enable the actuator to act through said feed means to move the train independently of warp tension in a direction to remove said restraint and enable the warp to turn the beam.

7. The letoff mechanism set forth in claim 6 wherein the amount by which said feed means moves into said working stroke increases as the position of the whip roll forward of the rearward position thereof increases.

8. In warp letoff mechanism for a loom provided with a warp beam which when free to turn can be turned by the warp threads, a train of mechanism comprising a driven member and a brake normally preventing movement of the train, operative connections between the train and the beam by which the brake member acting through the train is capable of preventing turning of the beam by the warp, a regularly moving actuator

having a given working stroke, driven member operating mechanism movable relatively to said working stroke and capable of operation by said actuator, and a whip roll controlling the driven member operating mechanism moving away from the normal position thereof in response to an increase in the tension of the warp and moving back to the normal position thereof in response to a decrease in warp tension, said whip roll being effective to control the position of said driven member operating mechanism relative to said working stroke of the actuator and being effective when moving away from the normal position thereof in response to an increase in warp tension to move said driven member operating mechanism within the range of said working stroke to enable said actuator to move said operating mechanism and cause the latter to move the driven member to move the train against the action of said brake, thereby freeing the warp beam and enabling the warp to turn the beam to reduce warp tension and unwind warp for the weaving operation.

9. In warp letoff mechanism for a loom, a warp beam which when free to turn can be rotated by the warp threads, ratchet wheel secured to and turning with the warp beam, a train of mechanism including a pawl engaging the ratchet wheel and a friction clamp preventing movement of the train by the warp, a regularly moving loom driven actuator, operating mechanism for said train capable of actuation by said actuator, a whip roll moved by the warp when the tension of the latter is increased, and control connections intermediate the whip roll and the operating mechanism effective when the whip roll is moved due to an increase in warp tension to move the train operating mechanism into operative relation with respect to the actuator to enable the latter to move said train operating means and effect movement of said train to move said pawl in a direction to enable the warp to turn the beam.

10. In letoff mechanism for a loom having a warp beam, a train of mechanism controlling the turning of the beam and including a ratchet wheel, pawl mechanism for the ratchet wheel normally in operative position relative to the ratchet wheel, an actuator for the pawl mechanism, a clutch normally operatively connecting the actuator to the loom but movable to inoperative position incident to a pickout operation to operatively disconnect the actuator from the loom, and means operatively connected to the clutch moving the pawl mechanism to a position inoperative with respect to said ratchet wheel when the clutch moves to the inoperative position thereof.

11. In a loom having a warp beam, a clutch normally in an operative position for the weaving operation but movable to inoperative position when a pickout is to be made, a train of mechanism which normally moves in a given direction to control the turning of the beam to unwind warp for the weaving operation but moves in a reverse direction incident to a pickout, a ratchet wheel forming part of and moving with said train either in said given or reverse direction, loom driven feed pawl mechanism normally in an operative position with respect to said ratchet wheel and effective to move the latter in said given direction, and means operated by the clutch when the latter moves to the inoperative position relative to said ratchet wheel to enable the latter to move in a reverse direction.

12. In letoff mechanism for a loom having a warp beam, a whip roll movable forwardly from the normal position thereof upon an increased warp tension and returning to the normal position thereof upon a decrease in warp tension, a movable stop operatively connected to and moving in unison with the whip roll, a control lever for engagement with the stop, a train of mechanism controlling rotation of the warp beam and including a ratchet wheel, pawl mechanism for the ratchet wheel operatively engaging the control lever, resilient means holding the pawl mechanism against said lever and holding the latter against said stop, and a loom driven actuator for the pawl mechanism having a regularly recurring working stroke, said stop determining the position of the control lever and the latter cooperating with said resilient means to determine the location of said pawl mechanism with respect to said working stroke, the degree of movement imparted by the working stroke of the actuator to the pawl mechanism and through the latter to said train being dependent upon the position of the control lever as determined by said stop.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,023,994	Coburn	Apr. 23, 1912
1,695,385	Payne	Dec. 18, 1928
1,976,205	Wilson	Oct. 9, 1934
2,435,437	Foster et al.	Feb. 3, 1948

FOREIGN PATENTS

Number	Country	Date
373,181	Great Britain	May 17, 1932