

March 4, 1930.

H. A. DAVIS

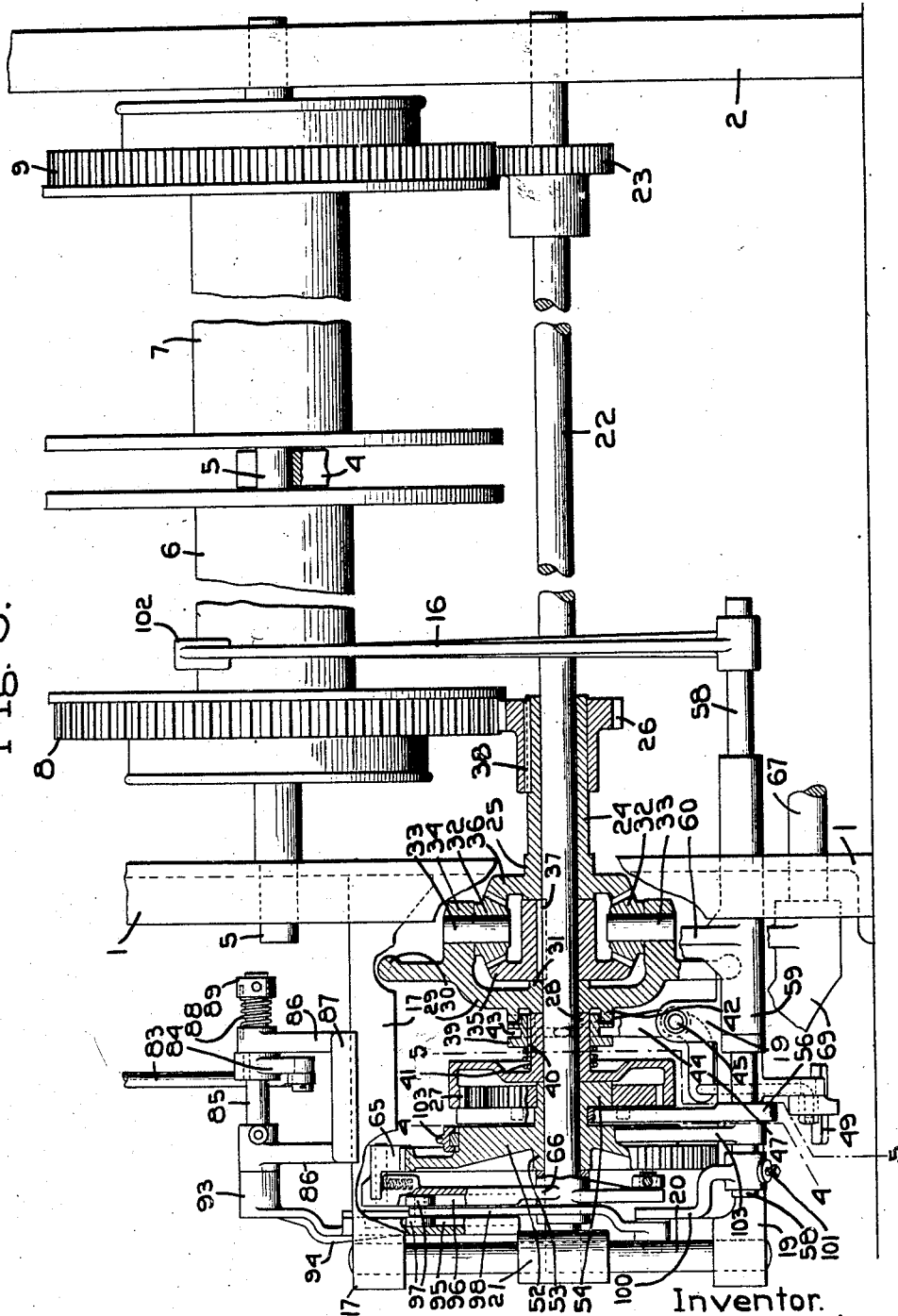
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LET-OFF MECHANISM FOR LOOMS

Filed March 26, 1927

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Fig. 3.



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Fig. 4.

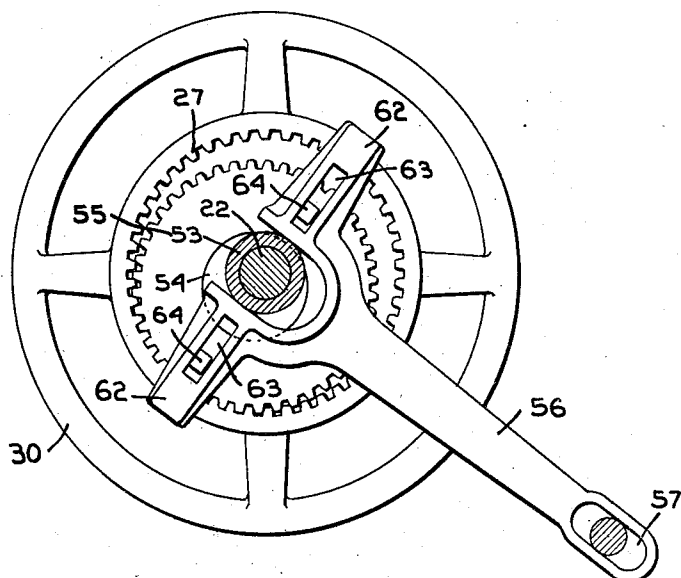
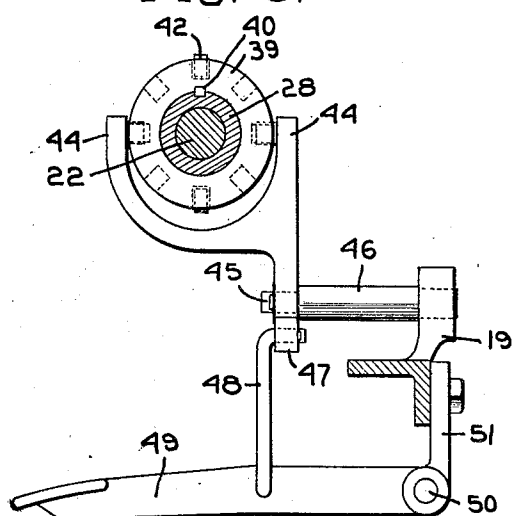


Fig. 5.



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LET-OFF MECHANISM FOR LOOMS

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This invention relates to a let-off mechanism for a loom having two warp beams, such, for example, as a broad or wide loom where the warp is divided between two beams arranged in axial alignment.

The object of the invention is to provide a let-off mechanism which will act automatically to equalize the tension on the warp on both beams and thus to equalize the tension throughout the entire warp sheet.

The object of the invention is further to provide such a let-off mechanism thus equalizing the tension on the warps on both beams in which the let-off movement shall be controlled in proportion both to the warp tension and to the amount of yarn on the beams or to the varying diameter of the warp mass on the beams, thus enabling the warp tension to be maintained constant at each pick.

The object of the invention is further to provide in such a let-off mechanism means whereby both beams may be rotated in either direction by hand with the tension on the warp beams remaining equalized.

The object of the invention is further to provide such a let-off mechanism with an included clutch and hand wheel by which the actuating let-off member and the hand wheel may be connected and disconnected by the clutch thus to place the rotary movement of the warp beams under the control of the hand wheel when desired.

The object of the invention is further to provide such a let-off mechanism which may readily be embodied in existing looms.

These and other objects and features of the invention will appear more fully from the accompanying description and drawings and will be particularly pointed out in the claims.

In the preferred construction illustrated as one embodiment of the invention, the principle of the well known Draper Roper let-off mechanism, such as shown in Patent No. 647,815, granted April 17, 1900, is utilized and as this mechanism and as the general construction and operation of a wide or broad loom are both well known and familiar to those skilled in the art, it is only necessary here to illustrate and describe in detail those features

of construction in which one preferred form of the invention may be embodied.

In the drawings:

Fig. 1 is a side elevation partially broken away of the rear of the loom.

Fig. 2 is a top plan view of the right-hand portion of the construction shown in Fig. 1.

Fig. 3 is a view partially broken away and partially in vertical section looking from the front toward the rear portion of the loom.

Fig. 4 is a detail partially in vertical cross section taken on the line 4-4 of Fig. 3.

Fig. 5 is another detail partially in vertical cross section taken on the line 5-5 of Fig. 3.

In the construction illustrated, the rear portion of the usual side frames 1 and 2 of the loom are provided with suitable bearings 3 in which, together with an intermediate bearing 4, are supported the gudgeons 5 of the two axially aligned warp beams 6 and 7. These warp beams are of the usual construction, but with the warp beam 6 provided preferably on the head adjacent the loom side 1 with the large gear 8 rigidly secured thereto and with the warp beam 7 on the head adjacent the loom side 2 provided with the large gear 9 rigidly secured thereto.

A whip roll 10 of the usual type extends across above the two beams and is journaled in arms 11 projecting from the shaft 12 journaled in bearing brackets 13 on the loom sides. At the left-hand side this shaft is provided with a radially extending arm 14. The sheet of warps 15 extends from the barrels of both beams 6 and 7 up over this whip roll 10 and thence forwardly through the usual shed-forming mechanism and to the usual take-up roll at the front of the loom.

It is obvious that the tension upon the warp, thus divided between the two beams 6 and 7, must be equalized throughout during the entire weaving operation or else there will be a variation in the character and quality of the cloth at different portions of its width. It is also obvious that the tension on the warps must remain constant at each pick or at corresponding periods in each cycle of the weaving operation notwithstanding the continually decreasing diameter of the warp

mass on the warp beams as the weaving operation proceeds, or else there will be a variation in the character and quality of the cloth lengthwise. The present invention has for its ultimate purpose the securing of both of these results. It is assumed that the two beams when placed in the loom will have substantially the same diameter of warp mass and that consequently as the weaving operation proceeds, the diameter of the warp mass on both beams will decrease at the same rate.

In the preferred form of the present invention illustrated, as in the Draper Roper let-off above referred to, the movement of the whip roll shaft 12, due to the variation in tension on the warp at each pick, and the position of an arm 16 determined by the diameter of the warp mass on one of the beams are utilized to control the extent of the let-off of the warps at each pick.

The main elements of construction embodying a preferred form of the invention may conveniently be located on a framework attached to and projecting from one of the side frames of the loom such as the side frame 1, thus enabling the mechanism readily to be applied to existing looms.

A bracket 17 is shown secured by the bolts 18 to the side frame 1 and projects laterally therefrom just beneath the gudgeon 5 of the warp beam 6. Another bracket 19 is similarly secured to the side frame 1 and projects laterally therefrom near the bottom of the loom. These brackets at their outer ends are rigidly connected by a post 20. A bearing bracket 21 is rigidly secured to the post 20 and projects rearwardly therefrom midway between the outer ends of the brackets 17 and 19. A shaft 22 extends across the loom and has its bearing at one end in the side frame 2 and at the other end in the supporting bracket 21. This shaft has secured thereto a pinion 23 meshing with a gear 9 of the warp beam 7. A sleeve 24 is journaled on this shaft, has a bearing at 25 in the side frame 1 and has secured thereto a pinion 26, similar to the pinion 23, which meshes with the gear 8 of the warp beam 6. An internal driving gear 27 has its hub 28 journaled on the shaft 22. A hand wheel 29 having a rim 30 by which it may be manually operated has its hub 31 journaled on the shaft 22 adjacent the hub 28. Normally this gear and hand wheel are clutched together and thus rotate as a single element. The hand wheel 29 has journaled radially thereof one or more, herein shown as two, bevel pinions 32, these pinions being shown as mounted upon radial stud shafts 33 secured in the annular flange 34 of the hand wheel. These pinions mesh with both members of a pair of bevel gears 35 and 36. The bevel gear 35 is splined at 37 to the shaft 22, while the bevel gear 36 has a hub journaled on the shaft 22 and elongated to form the sleeve 24 to which is splined at 38

the pinion 26. It will thus be seen that when the gear 27 is clutched to the hand wheel and is rotated in either direction, it will drive differentially, through the mechanism just described, the two warp beams and thus continuously equalize the tension on the warps extending from the two beams.

The gear 27 which thus drives differentially the two warp beams is a positively actuated let-off member and its rotary movement is controlled in accordance with the principle of the Draper Roper let-off mechanism. It is frequently desired to rotate the warp beams by hand, as in the case of a "pick-out", or whenever required in the operation of the loom. This hand rotation of the warp beams is provided for by the hand wheel 29, the rotation of which, it will be observed, is also imparted differentially to the two warp beams so as to equalize the tension thereon under all conditions. A manually controlled clutch is provided for connecting and disconnecting the let-off member or gear 27 and the hand wheel 29. In the construction illustrated, a clutch sleeve 39 is splined at 40 to the hub 28 of the gear 27. A helical spring 41 on the hub 28 between the sleeve 39 and the gear 27 acts normally to force this clutch sleeve 39 into engagement with the hand wheel, interlocking projections being provided between the adjacent surfaces of the clutch sleeve and the hand wheel, as shown at 42. The clutch sleeve has its periphery grooved at 43 and this groove is engaged by the arms 44 of a bifurcated bell crank lever having a fulcrumed shaft 45 journaled in a bearing sleeve 46 projecting from the bracket 19. The shorter arm 47 of this bell crank lever extends laterally and is connected by a link 48 to a treadle 49 fulcrumed at 50 in an arm 51 projecting downwardly from the bracket 19. It will thus be seen that the operator by pressing his foot on the treadle 49 may readily disconnect the clutch and thus place the rotation of the warp beams under the control of the hand wheel 30 and may effect the connection of the clutch by removing his foot from the treadle 49 and allowing the spring 41 to act.

The gear 27 is rotated by a speed reducing gear from the ratchet wheel 52. The hub 53 of this ratchet wheel is journaled on the shaft 22 and extends within the internal gear. An eccentric 54 is formed integrally with or secured to the hub 53 and has journaled thereon the gear 55 having a less number of teeth and being of smaller diameter than the gear 27 and meshing therewith. An arm 56 extends radially of the shaft 22 adjacent the gear 55. At its outer end this arm is slotted at 57 to slide on a shaft 58 journaled in an elongated bearing sleeve 59 formed on the lower part of a bracket 60 clamped by bolts 61 to, and depending from, the side frame 1. At the other end the arm 56 is bifurcated to

straddle and slide on the hub 53. The bifurcations of the arm are extended transversely thereto at 62 and provided with longitudinal slots 63 engaging diametrically disposed lugs 64 projecting from the face of the gear 55. Thus it will be seen that rotation of the ratchet wheel 52 will impart through the eccentric 54 a circular movement to the gear 55, its rotation being prevented by the arm 56 while the gear travels along the internal gear 27, rotating the latter in the same direction, but owing to the difference in the number of teeth of the two gears, the internal gear will rotate more slowly than the gear 55.

The extent of rotary movement imparted to the ratchet wheel 52 to let off the warp at each pick is here under the control both of the tension on the warps, as indicated by the extent of movement of the whip roll shaft 12, and of the amount of warp on the beams or the diameter of the warp mass at each pick. The rotary movement thus imparted under these controls to the ratchet 52 is reduced by the speed reducing gear mechanism just described and by the ratio of the pinions 26 and 23 to the gears 8 and 9 so that the warp beams are rotated to the required extent.

The mechanism for rotating the ratchet wheel 52 comprises a spring-pressed pawl 65 pivoted on a pawl carrying lever 66 fulcrumed on the shaft 22. This pawl carrying lever is given its advancing movement by the lay and is always advanced to the same point when once adjusted. Its retracting movement, which determines the number of teeth thus advanced, is under the control jointly of the movement of the whip roll shaft and the diameter of the warp mass on the beam.

Since this mechanism is set well out from the side of the loom frame, it is necessary to provide a suitable connection to the lay. The lay rocker shaft 67 is shown provided with an upward projection 68, preferably on the lay rocker support 69. A bracket 70 is secured by bolts 71 to the side frame 1 and projects laterally therefrom. A shaft 72 is journaled in this bracket and carries at each end rigidly secured thereto upstanding arms 73 and 74. An upstanding arm 75 is secured as by the bolt 76 to the projection 68 and a link 77 is pivotally connected to the upper end of this arm 75 and to the upper end of the arm 73. A link 78 is pivoted at 79 to the lower end of the pawl carrying lever 66 and at its other end has adjustably secured thereto, as by the set screw 80, a slotted head 81 engaging a stud 82 on the upper end of the arm 74. It will thus be seen that as the lay beats up, rocking the shaft 67, these connections will act to rock the pawl carrying lever 66 counter-clockwise and always advance the pawl 65 to the same extent. It will

also be seen that the slotted head 81 permits the pawl to be retracted, upon the backward movement of the lay, to a variable extent and thus to pass over a variable number of teeth of the ratchet wheel.

The arm 14 extending from the whip roll shaft 13 is connected by a link 83 to an arm 84 secured to a shaft 85 journaled in the upstanding arms 86 of an auxiliary bracket 87 mounted on the top of the bracket 17. This shaft 85 is yieldingly rotated against the warp by a helical spring 88 on one end of the shaft engaging at one end the arm 86 and at the other end a collar 89 adjustable on the shaft. Powerful springs 90 on the link 83 extend between the arm 14 and an abutment 91 secured to the auxiliary bracket 87. Collars 92 enable one or both of these springs to be thrown into action and their force adjusted to produce a greater or less tension on the warp or pressure of the whip roll 10 against the warp. The outer end of the shaft 85 has secured thereto the hub 93 of an arm 94 which extends down alongside the pawl carrying lever 66. This arm 94 and the opposed surface of the lever 66 are both longitudinally recessed or grooved at 95 and 96, respectively. Small rolls 97 pivoted in alignment to the upper end of an arm 98 slide in these grooves 95 and 96. This arm 98 is offset to avoid the shaft 22 and is pivoted at its lower end at 99 to an arm 100, the hub of which is secured by a set screw 101 to the end of the shaft 58. The opposite end of the shaft 58 has secured thereto the arm 16 already mentioned and the upper enlarged head 102 of which is adapted to rest against the warp mass on one of the beams.

It will thus be seen that the tension on the warps 15 acts after each beat-up to depress the whip roll, thus compressing the springs 90 and rocking the arm 84 and consequently the shaft 85 and the arm 94 forwardly. But, as this arm 94 is connected by means of the rolls 97 to the pawl carrying lever 66, the pawl 65 is retracted to an extent depending upon the tension on the warp. The extent of this retraction is further controlled by the vertical position of the rolls 97 and this vertical position depends upon the position of the arm 16 engaging the warp mass. As the diameter of the warp mass decreases, the arm 16 swings rearwardly rocking the shaft 58, lowering the arm 100 and consequently the arm 98 in which the rolls 97 are pivoted. The rearward limit of movement of the actuating pawl 65 is determined by the forward movement of the lay. Thus the extent of movement of the actuating pawl is controlled both by the tension on the warp and the diameter of the warp mass on the warp beam.

A suitable friction brake 103 is provided engaging the ratchet wheel 52 to prevent ro-

tation thereof during the retracting movement of the actuating pawl.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. Let-off mechanism for a loom having two warp beams comprising a positively rotated let-off member, a hand wheel rotatable with the let-off member, manually controlled means for connecting and disconnecting the let-off member and hand wheel, differential driving connections between the hand wheel and both beams whereby the tension on the warp on both beams is continuously equalized, and means to vary the amount of said rotation of the let-off member in proportion both to the warp tension and to the amount of yarn on the beams at each pick.
2. Let-off mechanism for a loom having two warp beams comprising the construction defined in claim 1, in which the said manually controlled means connecting and disconnecting the let-off member and hand wheel comprises a clutch, a spring acting normally to throw the clutch into connecting position and a lever manually operable in opposition to said spring.
3. Let-off mechanism for a loom having two warp beams comprising a driving gear, a hand wheel, a manually controlled clutch for connecting and disconnecting the hand wheel to the driving gear, a pair of gears driven differentially by the hand wheel, driving connections respectively between the two beams and the driven gears, means for positively rotating the driving gear to let off the warp, and means to vary the amount of said rotary movement of the driving gear in proportion both to the warp tension and to the diameter of the warp mass at each pick, the disconnection of the clutch enabling the two warp beams to be rotated in either direction by the hand wheel through the differential gear mechanism.
4. Let-off mechanism for a loom having two warp beams comprising a positively rotated let-off member, a hand wheel rotatable with the let-off member, manually controlled means for connecting and disconnecting the let-off member and hand wheel, differential driving connections between the hand wheel and both beams whereby the tension on the warp on both beams is continuously equalized, and means to vary the amount of said rotation of the let-off member.
5. Let-off mechanism for a loom having two warp beams comprising the construction defined in claim 4, in which the said manually controlled means connecting and disconnecting the let-off member and hand wheel comprises a clutch, a spring acting normally to throw the clutch into connecting position and a lever manually operable in opposition to said spring.
6. Let-off mechanism for a loom having

two warp beams comprising a driving gear, a hand wheel, a manually controlled clutch for connecting and disconnecting the hand wheel to the driving gear, a pair of gears driven differentially by the hand wheel, driving connections respectively between the two beams and the driven gears, means for positively rotating the driving gear to let off the warp, and means to vary the amount of said rotary movement of the driving gear, the disconnection of the clutch enabling the two warp beams to be rotated in either direction by the hand wheel through the differential gear mechanism.

7. Let-off mechanism for a loom having two warp beams comprising differential driving connections for the two beams, a hand wheel acting through said connections to rotate the beams manually with the tension equalized, and automatically controlled means acting through said connections to rotate the beams and let off the warps on both beams with the tension equalized.

8. Let-off mechanism for a loom having two warp beams and having the construction defined in claim 7, together with means for disconnecting said automatically controlled means from, and connecting it to, the differential driving connections.

9. Let-off mechanism for a loom having two warp beams and having the construction defined in claim 7, together with manually operated means for disconnecting said automatically controlled means from, and connecting it to, the differential driving connections.

10. Let-off mechanism for a loom having two warp beams and having the construction defined in claim 7, together with yielding means acting normally to connect said automatically controlled means to the differential driving connections and manually operable to effect disconnection thereof.

11. Let-off mechanism for a loom having two warp beams comprising a positively rotated let-off member, a hand wheel rotatable with the let-off member, manually controlled means for connecting and disconnecting the let-off member and hand wheel, differential driving connections between the hand wheel and both beams whereby the tension on the warp on both beams is continuously equalized.

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

HARRY A. DAVIS.