

Oct. 9, 1934.

E. J. WILSON

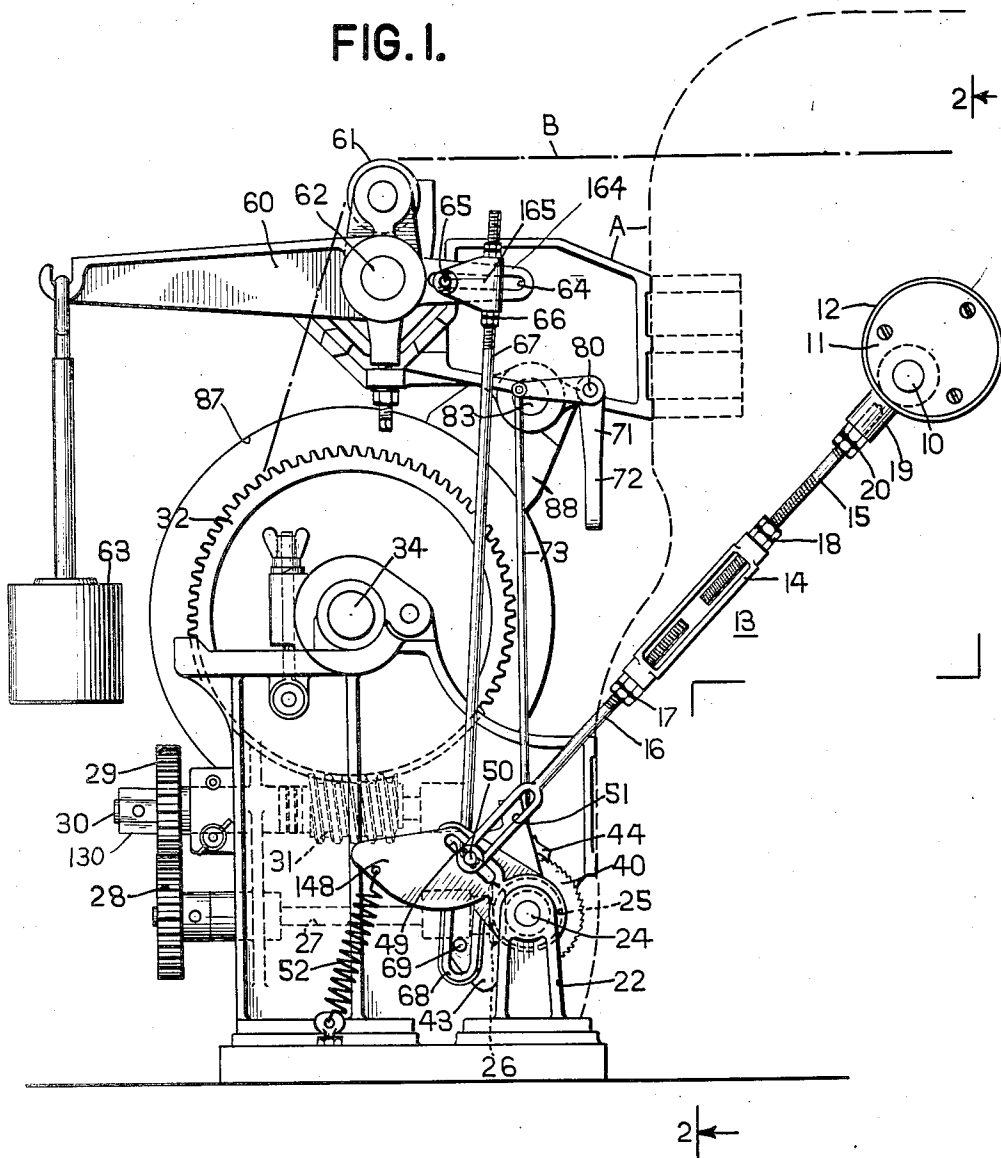
1,976,205

LET-OFF FOR LOOMS

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4 Sheets-Sheet 1

FIG. 1.



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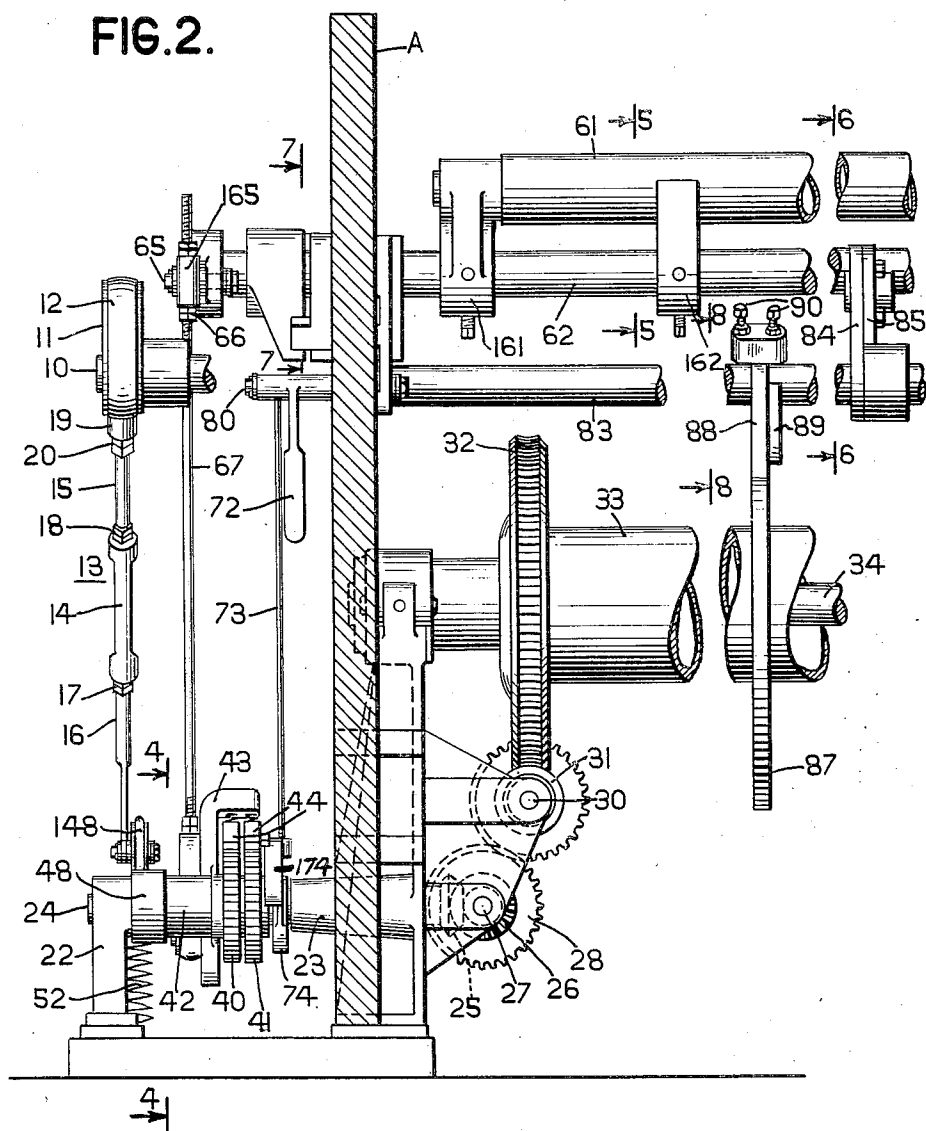
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FIG.2.



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FIG. 4.

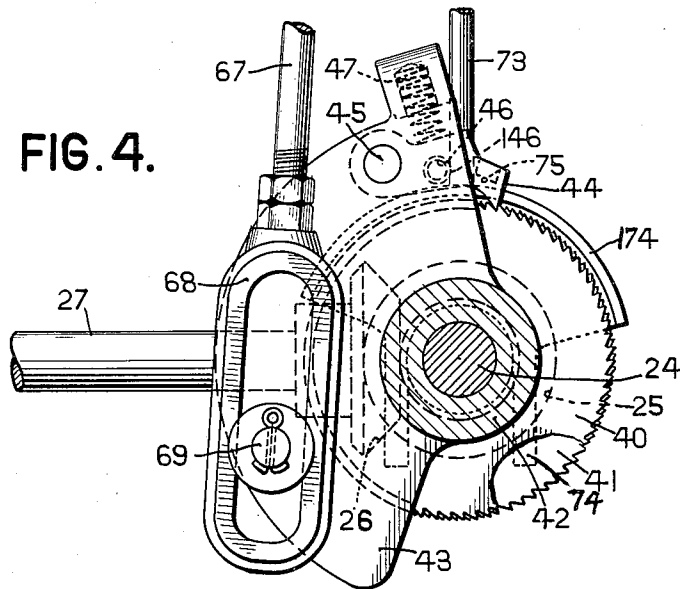
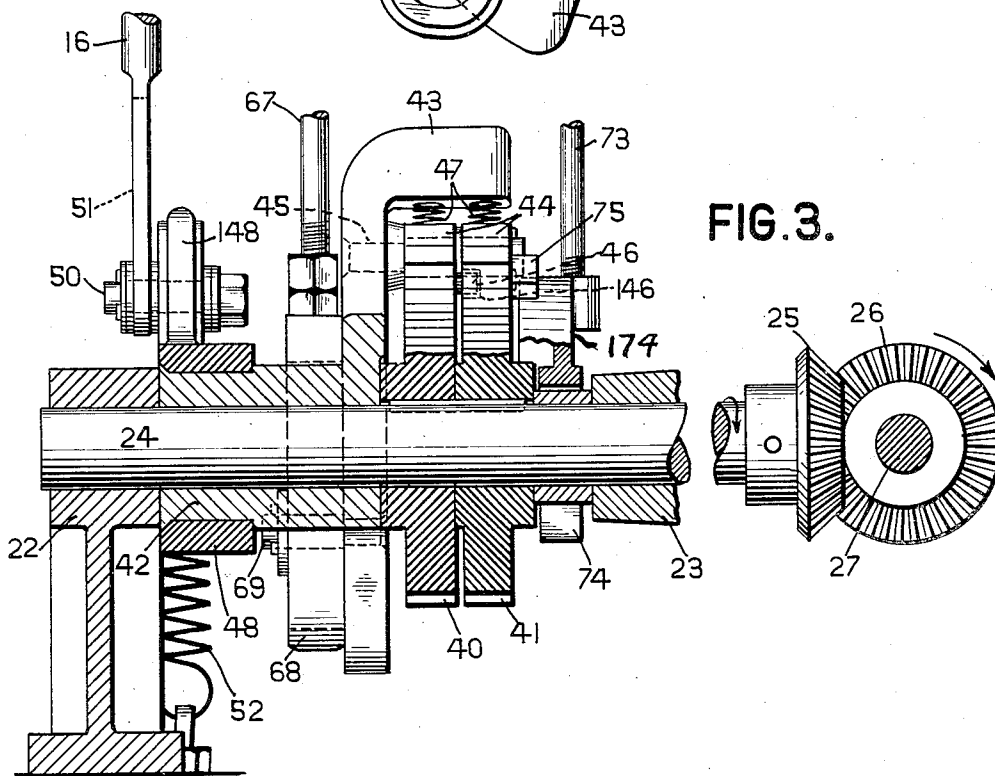


FIG. 3.



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FIG. 5.

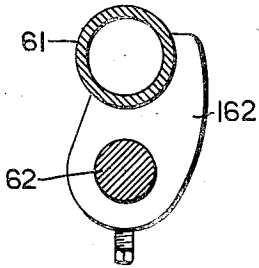


FIG. 6.

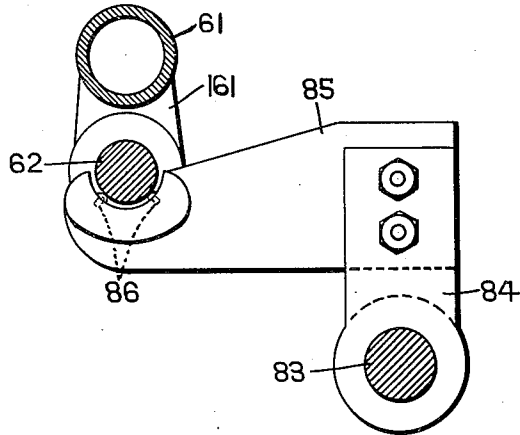


FIG. 7.

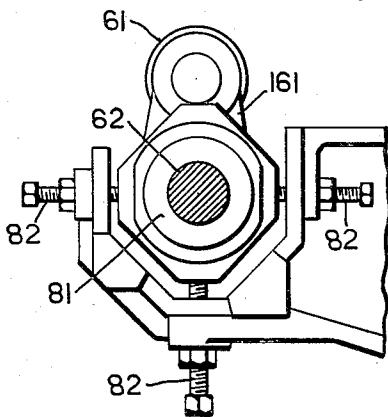


FIG. 9.

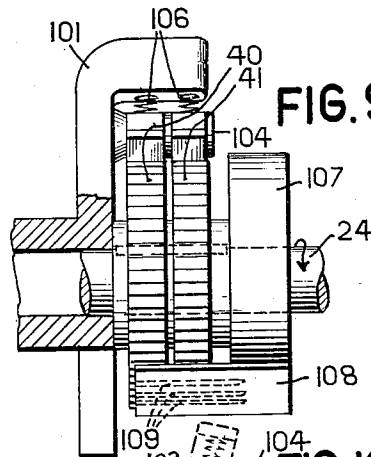
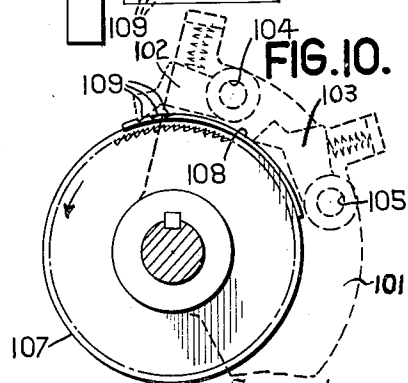
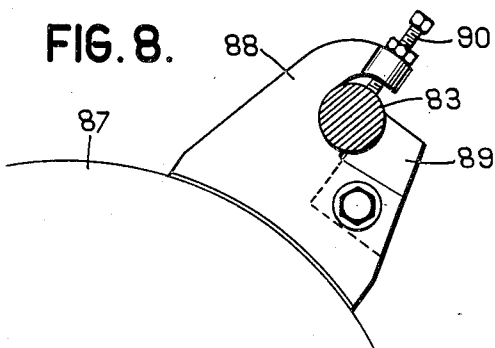


FIG. 10.



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UNITED STATES PATENT OFFICE

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LET-OFF FOR LOOMS

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Application April 4, 1930, Serial No. 441,690

8 Claims. (Cl. 139—110)

The invention relates in general to the art of weaving, and more particularly to a let-off device for a loom.

According to one form of the invention a loom having the usual warp beam and the usual weaving apparatus is provided with a whip roll over which the warp threads pass, together with suitable arrangement for controlling the feed of the warp threads by the pressure thereof on the whip roll. A suitable worm and worm wheel operated by a suitable ratchet-and-pawl arrangement is arranged for driving or letting off the warp beam. The pawl may be driven directly from a main shaft of the machine and its throw may be controlled by the whip roll. Suitable change gears may be provided, preferably between the ratchet-and-pawl arrangement and the worm and worm wheel arrangement for regulating the feed of the warp threads according to the number of picks to the inch it is desired to make in the cloth. If desired, a suitable pawl lifter may be provided for lifting the pawls off the ratchet to stop the let-off motion when desired. Suitable adjusting devices may be provided for the whip shaft to adjust its position in the frame of the machine, and also suitable supporting devices may be provided between the whip roll, whip shaft and other members to impart rigidity thereto. Both of these provisions may be especially desirable with wide looms.

The invention also consists in certain new and original features of construction and combinations of parts hereinafter set forth and claimed.

Although the novel features which are believed to be characteristic of this invention will be particularly pointed out in the claims appended hereto, the invention itself, as to its objects and advantages, the mode of its operation and the manner of its organization may be better understood by referring to the following description taken in connection with the accompanying drawings forming a part thereof, in which

Fig. 1 is a side elevation of the let-off apparatus;

Fig. 2 is a section in elevation taken on the line 2—2 of Fig. 1;

Fig. 3 is an enlarged section taken through the ratchet and pawl mechanism;

Fig. 4 is a detail taken on line 4—4 of Fig. 2, illustrating the control of the throw of the pawl; and

Figs. 5, 6, 7 and 8 are details taken on the lines 5—5, 6—6, 7—7 and 8—8, respectively, of Fig. 2; and

Figs. 9 and 10 are details illustrating a modified form.

In the following description and in the claims parts will be identified by specific names for convenience, but they are intended to be as generic in their application to similar parts as the art will permit.

Like reference characters denote like parts in the several figures of the drawings.

In the drawings so much of a loom is shown as is necessary for an understanding of the invention. The loom comprises in general a suitable frame A, having mounted thereon the usual weaving apparatus (not shown) and the let-off apparatus. The frame A journals a shaft 10, which may be one of the main shafts of the machine and which rotates at constant speed. The shaft 10 has an eccentric sheave 11 attached thereto which is surrounded by an eccentric strap 12 attached to an operating rod 13 which extends to the ratchet mechanism.

The operating rod 13 comprises sections 15 and 16 connected by an adjustable turnbuckle 14 and locked in position by lock nuts 17 and 18. The section 15 is threaded into a hub 19 on the eccentric strap 12 and is locked in position by lock nuts 20.

At the lower part of the machine journaled in bearings 22 and 23 (Fig. 3) is a ratchet shaft 24 having a bevel gear 25 rigidly secured thereto. Bevel gear 25 meshes bevel gear 26 rigidly secured to counter shaft 27 which is also suitably journaled in the lower part of the machine and which has rigidly secured thereto a spur gear 28.

Also journaled in the lower part of frame A is a worm shaft 30 having worm 31 thereon meshing a worm wheel 32 which is secured to warp beam 33 mounted on shaft 34. It will be understood that the warp beam 33 carries all of the warp threads B wound thereon, say thirty threads to the inch. Also secured to worm shaft 30 is a spur gear 29 meshing gear 28 and a wind-up nut 130. It will be understood that the wind-up nut 130 is adapted to be engaged by a suitable wrench to turn the warp beam 33 by hand.

Keyed to shaft 24 are a pair of ratchet wheels 40 and 41 having their teeth staggered as indicated particularly in Fig. 4. Loosely mounted on shaft 24 is a hub 42 having secured thereto the pawl holder 43. Pivoted to the pawl holder on the same pivot 45 is a pair of pawls 44 equal in length. One of the pawls 44 has secured thereto a pin 46 which fits loosely in a recess 146 in the other pawl 44. Coil springs 47 seating in recesses in the holder 43 serve to urge pawls 44 inde-

pendently against the ratchet wheels 40 and 41, respectively.

Rigidly secured to the hub 42 is a collar 48 having an arm 148 which has a slot 49. Adjustably clamped in this slot 49 is a pin 50, the pin 50 also working in a slot 51 in the lower end of operating arm 13. A coil spring 52 connects arm 148 and the base of the machine to assist gravity in urging the pawl holder 43 to return to its lower extreme position.

Mounted at the top of the frame A is the whip roll 61 supporting the warp threads B. The whip roll 61 is mounted on supports 161 and 162 secured to a shaft 62 which is adjustably mounted in the frame of the machine. Secured to shaft 62 is a member 60 on which the weight 63 hangs to normally exert tension on the warp threads B. Also secured to shaft 62 is a member 164 having a slot 64 in which is adjustably clamped a pin 65. Secured to the pin is a member 165 to which a control rod 67 is secured by lock nuts 66. The control rod 67 carries a slotted link 68 which slidably receives a pin 69 secured to the pawl holder 43.

For raising the pawls 44 off the ratchet wheels 40 and 41 a lifting rod 73 having a U-shaped member 74 straddling the shaft 24 is provided. The U-shaped member 74 has a curved extension 174 which is adapted to engage a lug 75 on one of the pawls 44 so that, when the rod 73 is raised, both pawls 44 will be raised together. It will be noted that the loose connection between pin 46 and recess 146 allows both pawls to be lifted by the U-shaped lifter 74, but is sufficiently loose to allow the pawls to engage the teeth of their respective ratchet wheels 40 and 41 independently. A bell crank lever 71 having a handle 72 is pivoted at 80 to the frame of the machine for raising the rod 73.

In operation, as the main shaft 10 rotates, the pawl holder 43 will be oscillated back and forth feeding the ratchet wheels 40 and 41 step by step. The upper position of the pin 50 is fixed while the lower position of the pin 50 is determined by the position of link 68 which in turn is controlled by the position of the whip roll 61. The step-by-step movement of the ratchet wheels 40 and 41 is communicated through bevel gears 25 and 26, spur gears 28 and 29, worm 31 and worm wheel 32 to the warp beam to feed the warp beam.

It will be seen that the weight 63 operates to tension the warp threads B. If the warp threads B tend to get too tight, the control rod 67 will be moved downwardly allowing the throw of the pawl holder 43 to be increased, this causing a quicker feed in the warp beam to rectify the over tension condition. Similarly, if the warp threads tend to be too loose, the control rod 67 is raised, thereby decreasing the throw of the pawl holder 43 and decreasing the rate of feed of the warp beam.

The gears 28 and 29 are positioned so as to be easily replaceable to change the gear ratio according to the desired number of picks per inch for the cloth. For instance, for cloth with a large number of picks a gear ratio of 1 to 1 might be used; for cloth with a small number of picks a gear ratio of 1 to 2 to 1 to 4 might be used, the gear 28 being the larger gear, the gear 29 being the smaller. Thus no matter what the number of picks per inch, the average working speed of the ratchet and pawl mechanism may be kept within closer limits than would be the case if no change speed gears were used. By the use of

change gears a perfect cloth is insured and the number of picks to the inch can be guaranteed as the arrangement is set.

Referring now to Fig. 7 for a detailed description of the adjustable mounting of the whip shaft 62, the frame A of the machine, on each side, is provided with a U-shaped recess in which the bearing block 81 for the shaft 62 is disposed. Suitable set screws and lock nuts indicated by 82 are provided on three sides of the bearing block 81 for adjusting the same as shown. Thus it will be seen that the position and direction of the whip shaft 62 may be adjusted, if necessary, for different jobs. This has been found to be desirable especially on very wide looms where the whip shaft and whip roll must be long.

For supplying sufficient rigidity to the parts 33, 61 and 62 a supporting structure including a rod 83 is provided. This rod 83 is fastened on each side to the frame of the machine. Secured to the rod 83 are one or more members 84 as indicated in Figs. 2 and 6. Secured to the members 84 are members 85 having recesses in which are disposed buttons 86 for supporting the whip shaft 62. Also secured to the rod 83 is a clamp 88 (Fig. 8) having a removable part 89 bolted thereto. A pair of set screws 90 are provided for clamping the member 88 to the rod 83, as shown.

The warp beam 33 is provided with a center flange 87 which bears against member 88 to provide supporting relation therebetween. It will be seen, particularly from Figs. 2, 5 and 6, that the supports 161 journal the ends of the whip roll 61 while the supports 162 support the whip roll at intermediate points.

By the interconnected supporting structure, above described, the various parts including the whip roll 61, whip shaft 62 and warp beam 33 are prevented from sagging or bending during the operation of the machine. It will be understood that this is particularly desirable in looms of great width.

Thus a let-off mechanism has been provided which gives a positive intermittent feed to a warp beam, the amplitude of the feed increments being varied according to the tension of the warp threads, change gears being provided for varying the feed according to the number of picks per inch it is desired for the cloth. Furthermore, the arrangement is such that it may be used with machines of greatly varying widths. The expedients disclosed are particularly advantageous with looms of great width. Looms up to, for instance, fifty feet between frames may be operated successfully by utilizing features from the invention.

On certain occasions it is desirable to turn the worm wheel 32 and warp beam 33 in the opposite direction from the direction in which it is driven. When this is necessary the handle 72 may be moved to cause the pawl lifter 74 to lift pawls 44 from the ratchet wheels 40 and 41. In the modification above described, this may be done without shutting down the machine, the pawl holder 43 oscillating back and forth with the pawls 44 in raised position. A suitable wrench (not shown) may be fitted onto the wrench engaging member 130 and the warp beam 33 may be turned by hand as desired. It will be understood that such hand adjustment may become necessary under certain conditions, such as when the yarn is bad or when the yarn breaks or when other mishaps occur.

In place of the ratchet-and-pawl arrangement and pawl lifting assembly above described, the ratchet-and-pawl arrangement and pawl lifting

assembly illustrated in Figs. 9 and 10 may be used. In this modification the ratchet shaft 24 has ratchet wheels 40 and 41 secured thereto with the teeth thereof so staggered that the teeth of one ratchet wheel are midway the teeth of the other.

A pawl holder denoted by 101 may be mounted upon the ratchet shaft 24 in a manner similar to the pawl holder 43 and the pawl holder 101 may be driven in a manner similar to pawl holder 43. Pawl holder 101 has a pair of pivots 104 and 105.

On pivot 104 a pair of pawls 102 are mounted and on pivot 105 a pair of pawls 103 are mounted. It will be understood that the pawls 102 and 103 engaging any ratchet wheel 40 or 41 engage their respective teeth by the difference of one-quarter of a tooth. By this arrangement only one pawl engages the bottom of a tooth at one time and but one-fourth of a tooth's movement is permitted before another pawl engages the bottom of its tooth. Springs 106 may be provided to urge the pawls 102 and 103 against the ratchet wheels as described in connection with Figs. 3 and 4.

For lifting the four pawls 102 and 103 a pawl lifter comprising a disc 107 is loosely mounted on shaft 24 and an arcuate plate 108 is secured to the disc 107. The plate 108 has a plurality of grooves or notches 109 cut in the surface.

In the operation of the construction shown in Figs. 9 and 10 the weight of the pawl lifter will be so distributed that its normal position will be that illustrated in Fig. 9. In this position the pawls 102 and 103 are free to drive the ratchet wheels 40 and 41. When it is desired to move the warp beam 33 by hand, the drive shaft 10 must be stopped, which also stops the oscillation of the pawl holder 101 and pawls 102 and 103. The pawl lifter is then rotated by hand to the position shown in Fig. 10 so that the pawls 102 engage in the grooves or notches 109. Thus it will be seen that the pawl lifter holds the pawls off the ratchet wheels and at the same time the pawls by their engagement in the notches 109 prevent the pawl lifter from rotating to its lower position. After the hand adjustment above described is made, the pawl lifter may be turned by hand to disengage the pawls and moved to its lowermost position illustrated in Fig. 9, causing the pawls to drop upon the ratchet wheels.

While certain novel features of the invention have been shown and described and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes in the forms and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a let-off mechanism for looms, a ratchet shaft, a ratchet wheel secured thereto, a pawl holder mounted to oscillate about said shaft, a pawl pivoted to said pawl holder and engaging said ratchet wheel, a first pin secured to said pawl holder, a driving member having a slot engaging said pin, means for moving said driving member, said pawl holder having a second pin, a control link having a second slot engaging said second pin, a warp beam driven by said shaft and having warp threads thereon, and means operated by tension of said threads for controlling the position of said control link.

2. In a let-off mechanism for looms, a ratchet shaft, a ratchet wheel secured thereto, a pawl holder comprising a hub fitting said shaft and a

holder member, a pawl pivoted to said holder member and engaging said ratchet wheel, an arm connected to said hub and having a pin secured thereto, a driving member having a slot engaging said pin, means for reciprocating said driving member, said holder member having a second pin, a control link having a second slot engaging said second pin, a whip roll controlling the position of said control link, and a warp beam driven by said shaft.

3. In a loom, a warp beam having warp threads thereon, a whip member over which said warp threads pass, a pivoted support for said whip member, a control link pivoted to said support, a drive shaft parallel to said warp beam, a crank connected to said drive shaft, a drive link pivoted to said crank, a second drive shaft driving said warp beam, a counter shaft parallel to said second drive shaft, a pair of removable gears on said second drive shaft and counter shaft, respectively, a ratchet shaft at right angles to said counter shaft, gears on said counter shaft and ratchet shaft, respectively, a ratchet wheel on said ratchet shaft, a pawl holder loosely mounted on said ratchet shaft, a pawl attached to said pawl holder, said pawl holder having pin-and-slot connections with said control link and drive link, respectively.

4. In a loom, a warp beam having warp threads thereon, a whip roll over which said warp threads pass, a pivoted support for said whip roll, a control link pivoted to said support having a slot in its lower end, a drive shaft parallel to said warp beam, a crank connected to said drive shaft, a drive link having a second slot at its lower end and pivoted to said crank, a worm wheel attached to said warp beam, a worm shaft having a worm meshing said worm wheel, a counter shaft parallel to said worm shaft, a pair of removable gears on said worm shaft and counter shaft, respectively, a ratchet shaft at right angles to said counter shaft, bevel gears on said counter shaft and ratchet shaft, respectively, a ratchet wheel on said ratchet shaft, a pawl holder loosely mounted on said ratchet shaft, a pawl attached to said pawl holder, said pawl holder having a first pin slidable in said first slot and a second pin slidable in said second slot.

5. In a loom, a warp beam having warp threads thereon, a whip roll over which said warp threads pass, a pivoted support for said whip roll, a control link pivoted to said support and having a slot in its lower end, a drive shaft parallel to said warp beam, a crank connected to said drive shaft, a drive link having a second slot at its lower end and pivoted to said crank, a worm wheel attached to said warp beam, a worm shaft having a worm meshing said worm wheel, a counter shaft parallel to said worm shaft, a pair of removable gears on said worm shaft and counter shaft, respectively, a ratchet shaft at right angles to said counter shaft, bevel gears on said counter shaft and ratchet shaft, respectively, a ratchet wheel on said ratchet shaft, a pawl holder loosely mounted on said ratchet shaft, a pawl pivoted to said pawl holder, an arm attached to said pawl holder having a pin slidable in said second slot, said pawl holder having a second pin slidable in said first slot and a spring connecting said pawl holder and the frame of the machine to urge said pawl holder downwardly.

6. In a let-off mechanism for a warp beam, a driving device therefor, a step-by-step mechanism between said driving device and warp beam comprising a plurality of ratchet wheels having

their teeth staggered, a pawl holder pivotally mounted about the center of said wheels, a plurality of pawls of equal length and meshing the teeth of said ratchet wheels, respectively, means
5 for pivotally mounting said pawls on said holder, interlocking means loosely connecting said pawls, a lifter, and interengaging means on said lifter and on one only of said pawls to disengage all pawls from said ratchet wheels.

10 7. The method of operating a let-off mechanism for a loom, said loom having a warp beam, a constant speed drive shaft, a control member for governing the warp tension, a ratchet and pawl mechanism operated by said drive shaft
15 under control of said control member, said method comprising changing the speed ratio between the warp beam and the ratchet and pawl mechanism to change the speed of the warp beam with change in the desired number of picks per
20 inch, whereby the average throw of the ratchet and pawl mechanism may be maintained within given limits which are independent of the number of picks per inch.

8. In a let-off mechanism for a warp beam, a worm wheel for driving said warp beam, a worm
80 shaft having a worm meshing said worm wheel, a countershaft, a ratchet and pawl mechanism for driving said countershaft step by step, a constant speed member for driving the pawl of said ratchet and pawl mechanism, a control
85 member for governing said ratchet and pawl mechanism to control the tension of the warp threads from the warp beam and replaceable gears on said worm shaft and countershaft, respectively, for changing the speed ratio between said shafts, whereby the action of said
90 ratchet and pawl mechanism may be kept within given limits which are independent of the number of picks per inch of the cloth.

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