Feb. 13, 1951 E. C. NICHOLS 2,541,969

LOOM LETOFF RATCHET LEVER

Filed Dec. 26, 1946 3 Sheets-Sheet 1

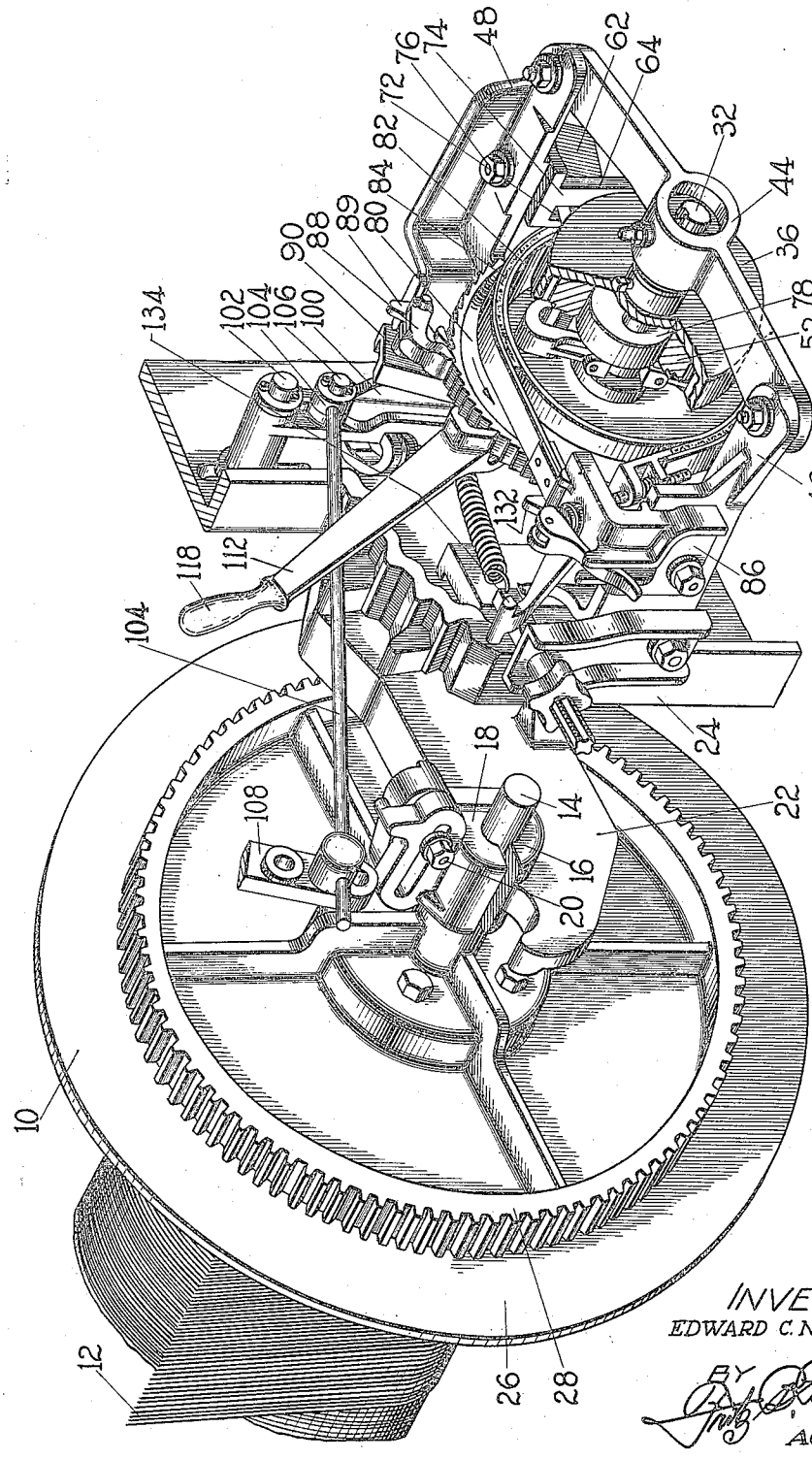


Fig. 1.

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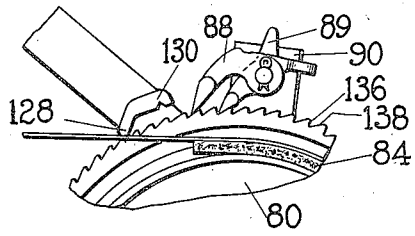


Fig. 3.

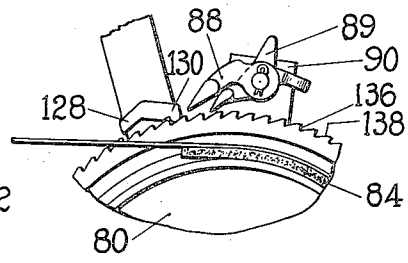


Fig. 4.

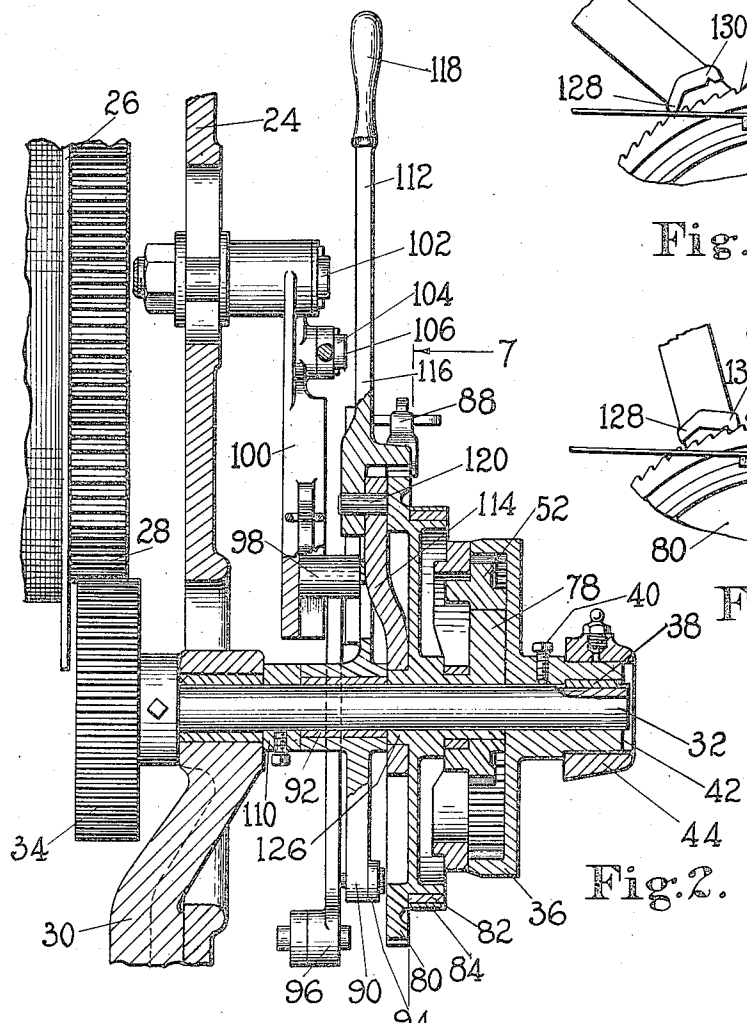


Fig. 2.

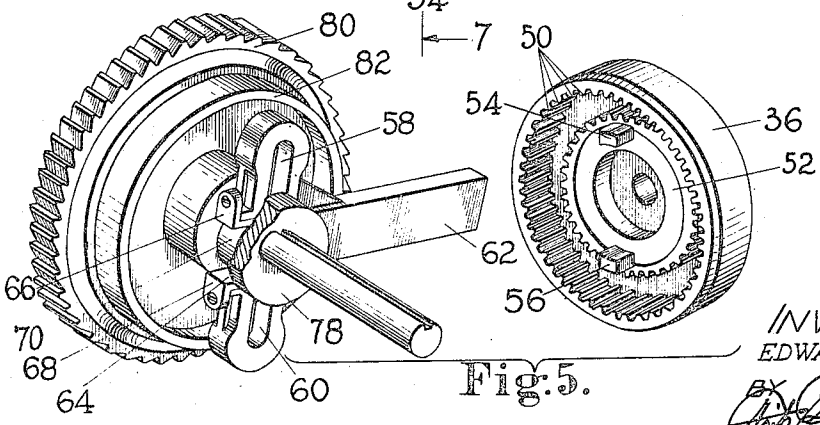


Fig. 5.

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LOOM LETOFF RATCHET LEVER

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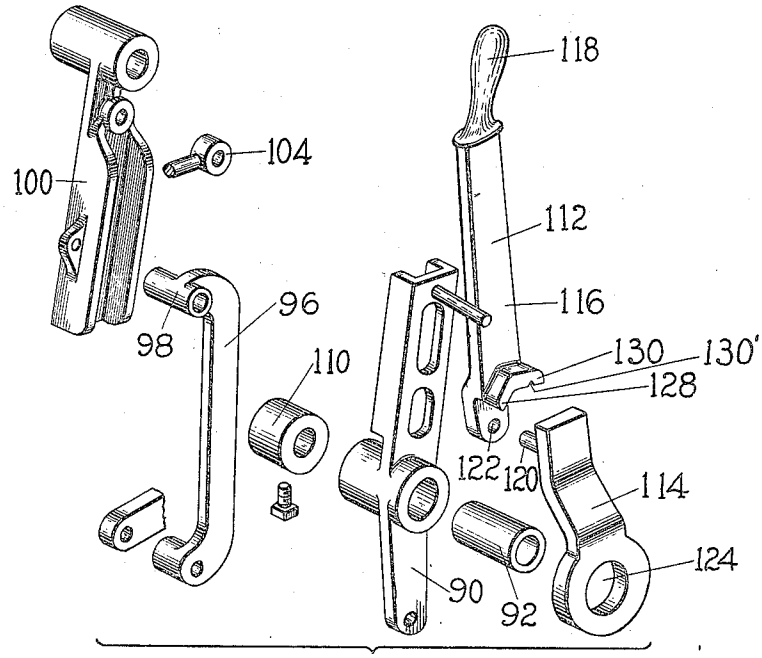


Fig.6.

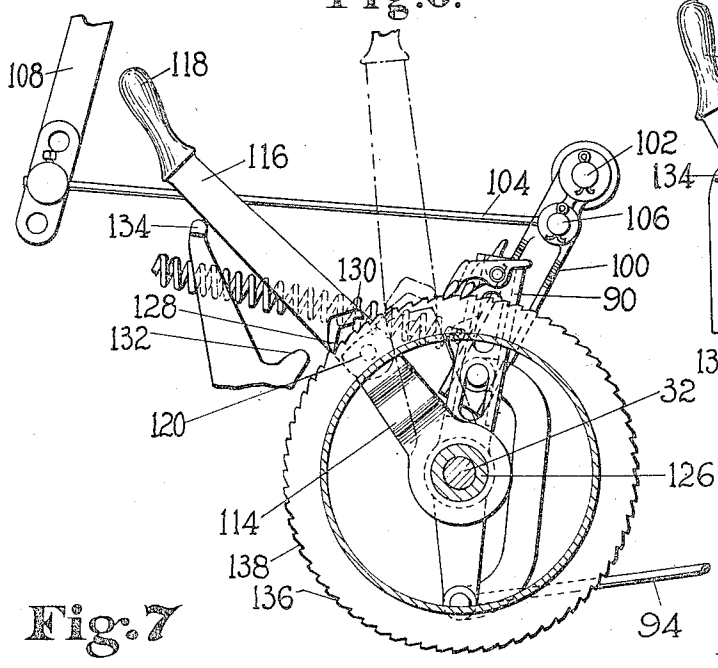


Fig.7

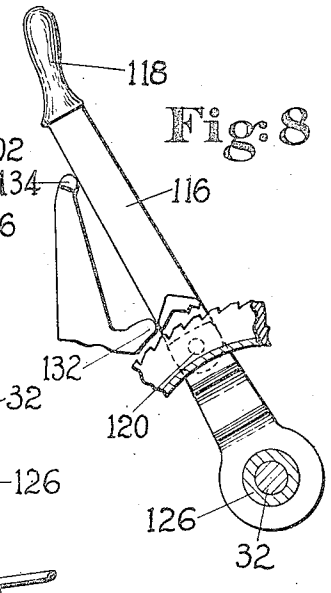


Fig:8

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# UNITED STATES PATENT OFFICE

2,541,969

## LOOM LETOFF RATCHET LEVER

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7 Claims. (Cl. 139—113)

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The present invention relates to weaving looms and more particularly to warp let-off mechanisms for such looms. The majority of looms commercially used are equipped with a warp beam containing a wound mass of warp threads which extend from the mass in the form of a warp sheet to a whip roll or guide roll from which the warp sheet passes to the actual weaving instrumentalities to be incorporated with the weft to form woven cloth. The warp beam usually is positively driven or rotated in a forward direction to unwind or let off the warp sheet from the beam, being driven by reduction gearing connected to the beam and in turn driven, in the majority of installations, by oscillating pawl means intermittently rotating a ratchet wheel arranged in driving relation with the gearing. Structure generally is provided whereby the average rate of rotation of the warp beam is regulated so the warp sheet is let off at a desired rate and under fairly uniform tension. At times during the weaving process it becomes necessary to reversely rotate the warp beam, i. e., to rotate the beam in a direction to wind the warp sheet onto the beam. For instance, it is customary to let back the woven cloth from the take-up mechanism and reversely operate the weaving mechanism by hand and unweave the cloth to remove a mispick or length of weft, or for other reasons. Since the pawl and ratchet driven let-off means operate unidirectionally it is evident that the warp beam is not reversely rotated during the unweaving process, and accordingly other means must be provided to reversely rotate the beam to remove slackness from the warp sheet. Otherwise an objectionable "thin place" would be produced in the cloth, lowering its value.

Heretofore reverse rotation of the warp beam was accomplished through direct rotation of a shaft carrying a pinion engaged with a gear formed on the warp beam, the rotation of the shaft being effected either by rotation of a handwheel affixed on the shaft or in other instances by releasing clutch means and rotating a part of the clutch secured on the shaft. If the loom was equipped with a handwheel, the driving pawl had to be held in inoperative position, and if the loom was equipped with a let-off clutch, the clutch had to be disengaged, during reverse rotation of the shaft. In view of the fact that most let-off drive mechanisms are located near the bottom of the loom and protrude from the side thereof, operation of the handwheel or clutch to reversely rotate the warp beam has been relatively difficult and tedious. Especially has this

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been true because of the fact that the hand wheel or clutch member did not operate through the greater portion of the reduction gearing, necessitating the operator applying a relatively great torque on the respective part to cause beam rotation. This has obvious disadvantages. Furthermore, the alternative means provided for reverse rotation of the beam are in each instance encumbered with other objectionable features. The clutch type mechanism suffered the disadvantages of being expensive to produce, easily broken or deranged, and involved production and assembly of a relatively large number of parts. The handwheel type mechanism involved a shaft extension to carry the handwheel, thus unduly obstructing the weave room aisle with a shaft and wheel.

With the above objectionable features of prior warp let-off mechanisms in view, it is an object of the present invention to provide a simple readily accessible and easily operated manual means for operating the let-off mechanism either forwardly to let off warp or reversely to wind on warp, and dispensing with the necessity for a clutch or a hand wheel. A further object is to simplify existing let-off mechanisms whereby fewer parts and less space are necessary and whereby manual let-off and wind-on of the warp may easily be accomplished through effort transmitted through the usual reduction gearing. It is another object of the invention to provide an articulated manual pawl lever which may be normally idle but movable in either of two directions alternatively to forwardly or reversely rotate the ratchet wheel of a loom let-off mechanism. It is a further object of the invention to provide a manual pawl lever movable to engage alternatively with a front or a rear face of a tooth of a loom warp let-off mechanism ratchet-wheel and concurrently forwardly or reversely, respectively, rotate the ratchet-wheel, whereby the lever may be employed alternatively to forwardly or reversely rotate the warp beam.

The above objects and others to become hereinafter evident are accomplished by the invention, one preferred embodiment of which is fully disclosed in the following description and accompanying drawings considered each with the other.

In the drawings:

Fig. 1 is a pictorial view of a loom warp let-off mechanism incorporating the invention and showing associated portions of the warp beam and loom frame;

Fig. 2 is a sectional view showing the position of a pawl lever according to the invention rela-

tive to conventional portions of the let-off mechanism;

Figs. 3 and 4 are views illustrating relative positions of the pawls acting on the ratchet-wheel of the let-off mechanism;

Fig. 5 is a view of parts of the let-off mechanism in disassembled array;

Fig. 6 is an "exploded" view of certain parts of the let-off mechanism;

Fig. 7 is a view illustrating forward and reverse rotation of the ratchet-wheel of the let-off mechanism by the lever of the invention, and

Fig. 8 is a view illustrating the normal idle position of the lever of the invention.

In the drawings there is shown only so much of conventional loom structure as is necessary to a full understanding of the invention. Of this structure there is shown a warp beam 10 (Fig. 1) from which extends a warp sheet 12. The beam is supported on a shaft 14 resting in bearings 16, of which only that one at the left hand loomside is shown. The bearing 16 may comprise a cap 18 secured as by a bolt 20 to a bracket 22 secured in any desirable manner to loomside 24. It will be understood that similar and complementary bearing and bracket structures may be provided to support the other end of shaft 14. Beam 10 includes a head 26 carrying a gear 28 preferably formed as an integral part of the beam head. Mounted for free rotation in a bearing 30 (Fig. 2) at the inner end thereof is a shaft 32 on which is fixed a pinion 34 in driving engagement with gear 28. At the opposite end of shaft 32 is an internal gear 36. This gear may be secured to shaft 32 as by key means 38 or set screw means 40, or both such means. Gear 36 is provided with a machined hub 42 which rotates in and is supported by an outboard bearing 44, which bearing consequently supports the outer end of shaft 32. Bearing 44 is supported by brackets 46, 48 (Fig. 1) which are attached to and supported by the loomside 24 in any desired suitable manner. Internal gear 36, as may be seen in Figs. 2 and 5, is provided with internal teeth 50 with which is meshed an annular planetary gear 52 provided with two lateral lugs 54, 56. Lugs 54, 56, are arranged to ride in respective guide slots 58, 60 in a T-shaped member 62. Member 62 is provided with a third guide slot 64 formed by opposed portions 66, 68 of the member, which guide slot allows member 62 to reciprocate transversely of shaft 32 while guided by a hub 70 of a wheel to be more fully described hereinafter. Member 62 is prevented from partaking of rotation about hub 70 (see Fig. 1) by having an end thereof slidably confined in an aperture 72 of a bracket 74 secured to bracket 48 as by a bolt 76. With gears 36 and 52 assembled about shaft 32 and with lugs 54, 56 engaged in slots 58, 60, gear 52 is constrained against rotation about its own axis, but may partake of planetary movement within the confines of gear 36. Planetary driving movement is given gear 52 by an eccentric 78 preferably formed as an integral extension of previously mentioned hub 70 and slidably fitted within the annulus of gear 52 (Figs. 1 and 2). Eccentric 78 and hub 70 are preferably formed as integral extensions of the hub of a ratchet-wheel 80 which is mounted for free rotation on shaft 32. Ratchet-wheel 80 is thus made capable of rotating shaft 32 through the medium of eccentric 78, planetary gear 52, and gear 36, the planetary gear moving in an orbit about the shaft 32 and imparting a reciprocatory movement to member 62 as the ratchet-wheel is slowly rotated. It will be noted that due to the difference in the diameters of gears 52 and 36, the gearing comprising those gears is a reduction gearing when viewed from the ratchet-wheel end of the gear train.

As illustrated best in Fig. 1, ratchet-wheel 80 is provided with a friction flange 82 on which is fitted a friction strap 84 anchored to a bracket 86 secured to bracket 46. This friction strap is tightened about the friction flange to the degree necessary to maintain the gearing quiescent under the torque applied by the tension of warp sheet 12 acting on beam 10. The ratchet-wheel is arranged to be given a step-by-step or intermittent forward rotation by pawls 88 and 89 carried on a lever 90 pivotally mounted on a sleeve 92 on shaft 32 (Fig. 2). Lever 90 may be given an intermittent rocking motion by a rod 94, Figs. 2 and 7, pivotally attached to the lower end of the lever, which rod may be actuated by any suitable means, as by a connection to a lay sword (not shown) of the loom. Normally rod 94 is moved in the pawl-driving direction to a fixed limit or position during each cycle of the loom, and is allowed to return in idle movement an extent dependent upon the tension of the warp sheet and upon the diameter of the mass of warp remaining on the beam. Instrumentalities for this regulation of the idle or return movement of lever 90 include a bar 96 (Fig. 2) operated by a beam follower (not shown), which bar governs the vertical position of a transmitter 98 in opposed channels of a lever 100 and lever 90. Referring to Figs. 1 and 2, lever 100 is pivotally mounted on a pivot 102 affixed to the loomside 24, and is moved by a rod 104 pivoted thereto as at pivot pin 106. Rod 104 is actuated through pivotal connection with a lever 108 which in turn is regulated as to position by means influenced by the tension of the warp sheet 12, which last mentioned means are not shown. Lever 90 and sleeve 92 (Fig. 2) together with ratchet-wheel 80, may be held in assembled relation against gear 36 by a collar 110 on shaft 32.

The enumerated structure hereinabove described, and the operation thereof, are conventional and well known to those skilled in the art. In the prior constructions shaft 32 necessarily was longer, to accommodate either a clutch means between gear 36 and bearing 44, or to accommodate a hand-wheel outwardly of bearing 44 and on the end of the shaft. By the present invention the extent to which bearing 44 or shaft 32 protrudes into the weave room aisle is materially reduced, and at the same time a more convenient and simple structure is provided for forwardly or reversely operating the ratchet-wheel 80 to forwardly or reversely rotate the warp beam 10. Further, the invention provides means whereby effort of the operator is transmitted through all of the reduction gearing of the let-off driving mechanisms, thus reducing the amount of force which it is necessary for the operator to exert in order to rotate the warp beam.

In attaining the objects of the invention there is provided an articulated ratchet or pawl lever 112 comprising a lower member 114 (Figs. 6 and 7) and an upper member 116 preferably provided with an extended handle 118. The two members of the pawl lever are pivotally interconnected by means of a pivot pin 120 secured in member 114 and which fits within a hole 122 formed in the lower end of member 116. Lower member 114 is provided with a bore 124 (Fig. 6) at its lower end,

which bore is arranged for a sliding fit on a hub portion 126 (Fig. 2) of ratchet-wheel 80. As indicated in Figs. 2 and 6, lower member 114 is offset somewhat in its central portion, so it will clear the rim of ratchet-wheel 80. Upper member 116 is provided with a double pawl structure, preferably formed integrally with the parent member and comprising two pawls, 128 and 130. Pawl 128 is formed with a point to engage between ratchet wheel teeth while pawl 130 is characterized by a notch 130' for embracing the backs and ends of the teeth. As indicated in Fig. 7, pawl 128 is so arranged that when handle 118 is rotated counterclockwise about pivot pin 120, that pawl will engage with a back face 136 of a ratchet-wheel tooth. If then the handle is further moved, the entire articulated pawl lever will be rotated counterclockwise (forwardly) about shaft 32 as an axis, rotating the ratchet-wheel forwardly and through the gearing rotating the warp beam to let off the warp sheet. Likewise, if the handle 118 is rotated clockwise about pivot pin 120 as viewed in Fig. 7, pawl 130 will be rocked into engagement with the front face 138 of a ratchet-wheel tooth. Continued clockwise movement of handle 118 will cause clockwise movement of the entire articulated pawl lever about the axis of shaft 32, it being evident that the pawls on lever 90 must be raised to allow such movement. This continued movement results in reverse (backward) rotation of the ratchet-wheel and consequent reverse rotation of the warp beam, whereby the warp sheet is wound on the beam. As when lever 90 operates the ratchet-wheel, rotation by pawl lever 112 is opposed by the action of friction strap 84, which holds the ratchet wheel stationary between working strokes of the pawls. Fig. 3 illustrates the action of pawl 128 in driving the ratchet-wheel forwardly, pawls 88 and 89 on lever 90 riding freely over the ratchet-wheel. Fig. 4 illustrates reverse rotation of the ratchet-wheel by pawl 130, pawls 88, 89 on lever 90 necessarily being raised into inoperative position during this operation. It will be evident that to effect idle movement of the articulated pawl lever, it is only necessary to pull handle 118 outwardly of shaft 32, thus aligning the two members of the lever and freeing pawls 128 and 130 of engagement with the ratchet wheel, followed by rotation of the handle in the desired direction about shaft 32, the outward pull being maintained in the meantime.

From an examination of Fig. 2 it will be evident that lower member 114 is held in assembled relation on hub 126 of the ratchet-wheel by the hub of lever 99 which is in turn held in place by collar 110. Examination of Figs. 7 and 8 will reveal the relative positions of pawl lever 112 and pawl lever 90 whereby the two may operate upon the ratchet-wheel without mutual interference. Affixed to the loomside in any desired suitable manner is a member providing two abutments 132 and 134 (Figs. 7 and 8), arranged to act as stops for member 116. When the articulated lever is carried to a position near the stops, either through rotation of ratchet-wheel 80 or by manual action of the loom operator, the two lever members will be moved by gravitational forces to relative positions indicated in Fig. 8, or so that the lever is straightened or extended, wherein pawls 128 and 130 are both clear of the teeth of the ratchet-wheel. Thus the ratchet-wheel may freely be rotated during normal loom operation by pawl lever 90.

Since the articulated pawl lever provided by the invention fits into previously unoccupied space, and since it replaces a clutch or a hand-wheel, or both, the overall length of shaft 32 protruding from the loomside may be materially decreased. Additionally, since handle 118 extends upwardly from shaft 32 the pawl lever may easily be operated to cause either forward or reverse rotation of the warp beam and that without necessity of the operator bending over into an uncomfortable attitude. Further, since the pawl lever operates through all of the reduction gearing of the let-off mechanism, it is evident that the force required to be exerted by the operator is greatly lessened from that required with other constructions. Thus it is evident that the objects of the invention are fully attained by the preferred embodiment of the invention herein disclosed.

Having thus disclosed the invention it will be evident that modifications and changes within the scope of the invention will occur to those skilled in the art, and what I claim and desire to secure by Letters Patent of the United States is:

1. In a loom comprising a rotatable warp beam, automatic means acting during operation of the loom to rotate the warp beam in one direction and including a ratchet-wheel and driving pawl therefor; stationary abutment means, and an articulated manual pawl lever comprising two lever portions each normally held in inoperative position by said abutment means and movable in one direction to engage and rotate said ratchet-wheel in a first direction and movable in another direction to rotate said ratchet-wheel in a direction opposite to said first direction, whereby said warp beam may alternatively be rotated in either of two opposite directions by alternative movements of said pawl lever.

2. In a loom comprising a rotatable warp beam from which extends a warp sheet, means including a ratchet wheel and gearing driven thereby engaging the beam to rotate the same, the ratchet wheel being rotatable in a first direction to cause rotation of the beam to let off the warp sheet therefrom and in a second direction to cause rotation of the beam to wind on the warp sheet, and means including a pawl arranged to rotate said ratchet wheel in said first direction, manually operable means including a double-acting, articulated, pawl lever adapted to be used in either of two positions, in one of which it engages the front faces of ratchet wheel teeth to move the beam in one direction, and in the other of which it engages the back faces of ratchet wheel teeth to rotate the said wheel and the beam in the opposite direction.

3. In a loom comprising a rotatable warp beam from which extends a warp sheet, reduction gearing, a shaft, and a hubbed ratchet-wheel arranged in driving relationship with said beam to rotate the same through said reduction gearing, and means including a driving pawl arranged to intermittently drive the ratchet-wheel to rotate the beam in a first direction to let off the warp sheet therefrom; an articulated manual pawl lever pivotally mounted on the ratchet-wheel hub and engageable with said ratchet wheel and movable forwardly to rotate the ratchet wheel forwardly and movable rearwardly to rotate the ratchet-wheel rearwardly, whereby said beam may by said pawl lever be rotated in said first direction or in the reverse direction, and through said reduction gearing.

4. In a loom comprising a rotatable warp beam from which extends a warp sheet, gearing means

including a shaft and a ratchet-wheel thereon and arranged in driving relation with said beam to rotate the same, means including a driving pawl effective to intermittently drive the ratchet-wheel, and yieldable friction means yieldingly maintaining said gearing means quiescent between pawl driving strokes; an articulated two-part, pawl lever pivotally movable about the axis of said shaft and having a point and a notch for selectively engaging a front face of a tooth or a back face of a tooth of said ratchet-wheel, said lever when moved in one direction engaging the front face of a ratchet-wheel tooth to rotate the ratchet wheel in one direction and when moved in the opposite direction engaging the back face of a ratchet-wheel tooth to rotate the ratchet-wheel in a direction opposite to said one direction, whereby said beam may by movement of said lever be alternatively rotated to let off or to wind on the warp sheet.

5. In a loom comprising a rotatable warp beam having a gear thereon, a pinion in driving engagement with said gear, a shaft fixedly carrying said pinion, means mounted on said shaft for driving the same and including a ratchet wheel having a hub, automatic means including a pawl and acting to rotate said ratchet wheel intermittently in one direction during operation of the loom, means maintaining said shaft normally quiescent between pawl driving strokes, a double-acting, articulated, manually operated pawl lever including one member pivotally mounted on said hub and a second member pivotally mounted on said first member, said second member having two pawls and being movable to different positions, in one of which its pawls engage no ratchet teeth, in a second of which one of its pawls engages ratchet teeth to rotate the ratchet wheel in a forward direction, and in a third of which positions, the other of its pawls engages the ratchet wheel teeth in a manner to rotate the ratchet wheel in a reverse direction, and stationary means engageable with the lever at spaced points thereon to hold it in a position of rest where its pawls engage no ratchet teeth.

6. In a loom having a rotatable warp beam and means interconnected to said warp beam for rotating it to let off warp yarns therefrom which includes reduction gearing, a ratchet wheel for imparting movement to said reduction gearing and an automatically driven pawl means for periodically moving said ratchet wheel in a direction to let off the warp, a manually operated, two part, jointed, pawl lever having two tooth



engaging means, the jointed parts of said lever being swingable about their connecting joint to either side of an extended and inoperative position, and means comprising spaced abutments engageable with the jointed lever to retain it in its extended position for normally retaining said lever in an inoperative position, said tooth engaging means being effective for rotating the ratchet wheel selectively in either direction to let off or to take back warp through the said reduction gearing.

7. In a loom having a rotatable warp beam and means interconnected to said warp beam for rotating it to let off warp yarns therefrom which includes reduction gearing, a ratchet wheel for imparting movement to said reduction gearing and an automatically driven pawl means for periodically moving said ratchet wheel in a direction to let off the warp, a manually operable, two part, pawl lever the jointed parts of said lever being swingable about their connecting joint to either side of an extended and inoperative position and means comprising spaced abutments engageable with the manually operable pawl lever to retain it in its extended position for normally retaining it in an inoperative position, said lever being articulated and having two opposed pawl means, one for engaging the front of the ratchet wheel teeth and the other for engaging the back of said teeth, said pawl means being effective upon selective movement of the articulated lever for rotating the ratchet wheel forwardly or backwardly to let off or take back warp through said reduction gearing.

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