A. E. RHOADES.

LET-OFF MECHANISM FOR LOOMS.

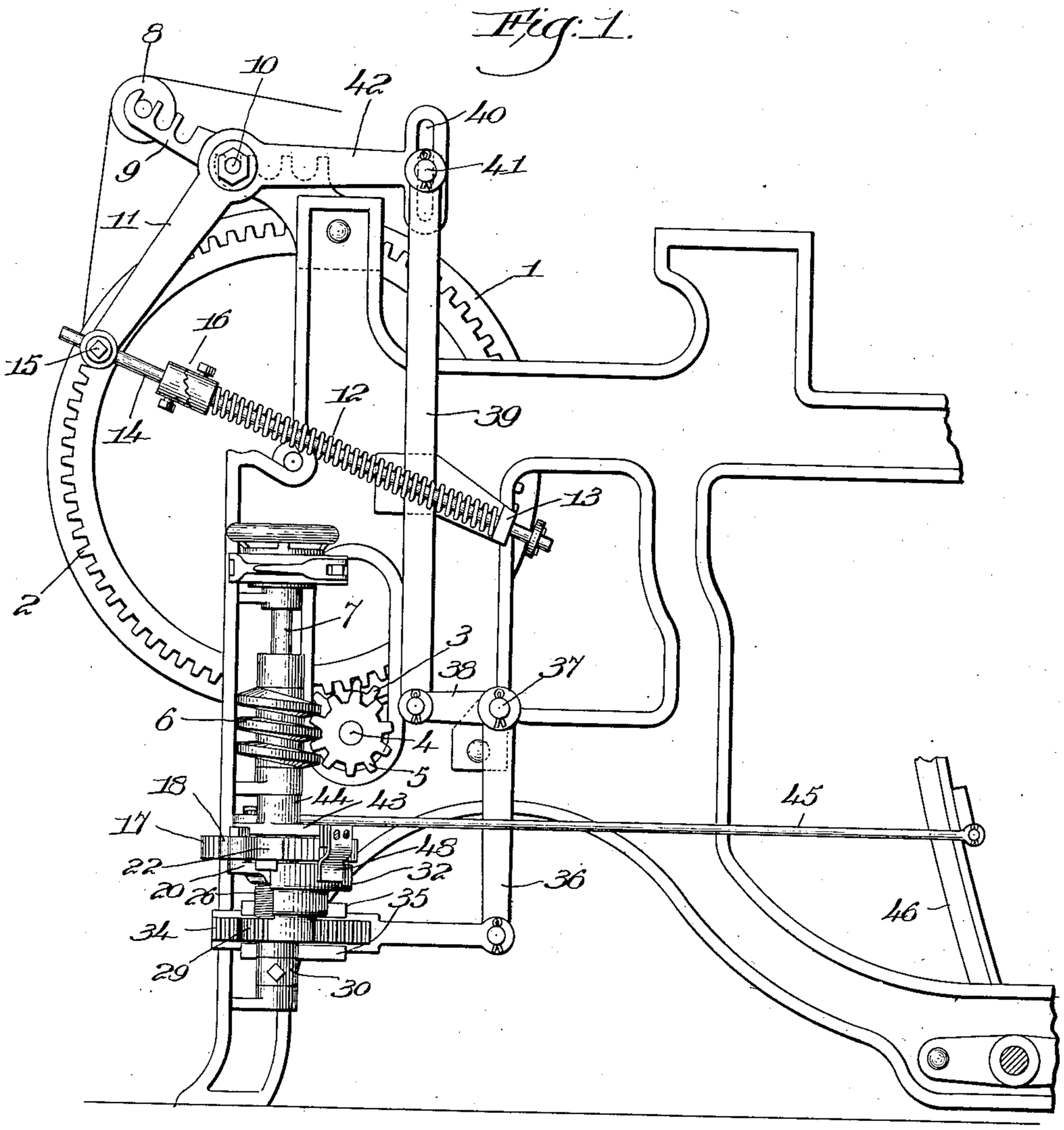
APPLICATION FILED SEPT. 13, 1909.

954,648.

Patented Apr. 12, 1910.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

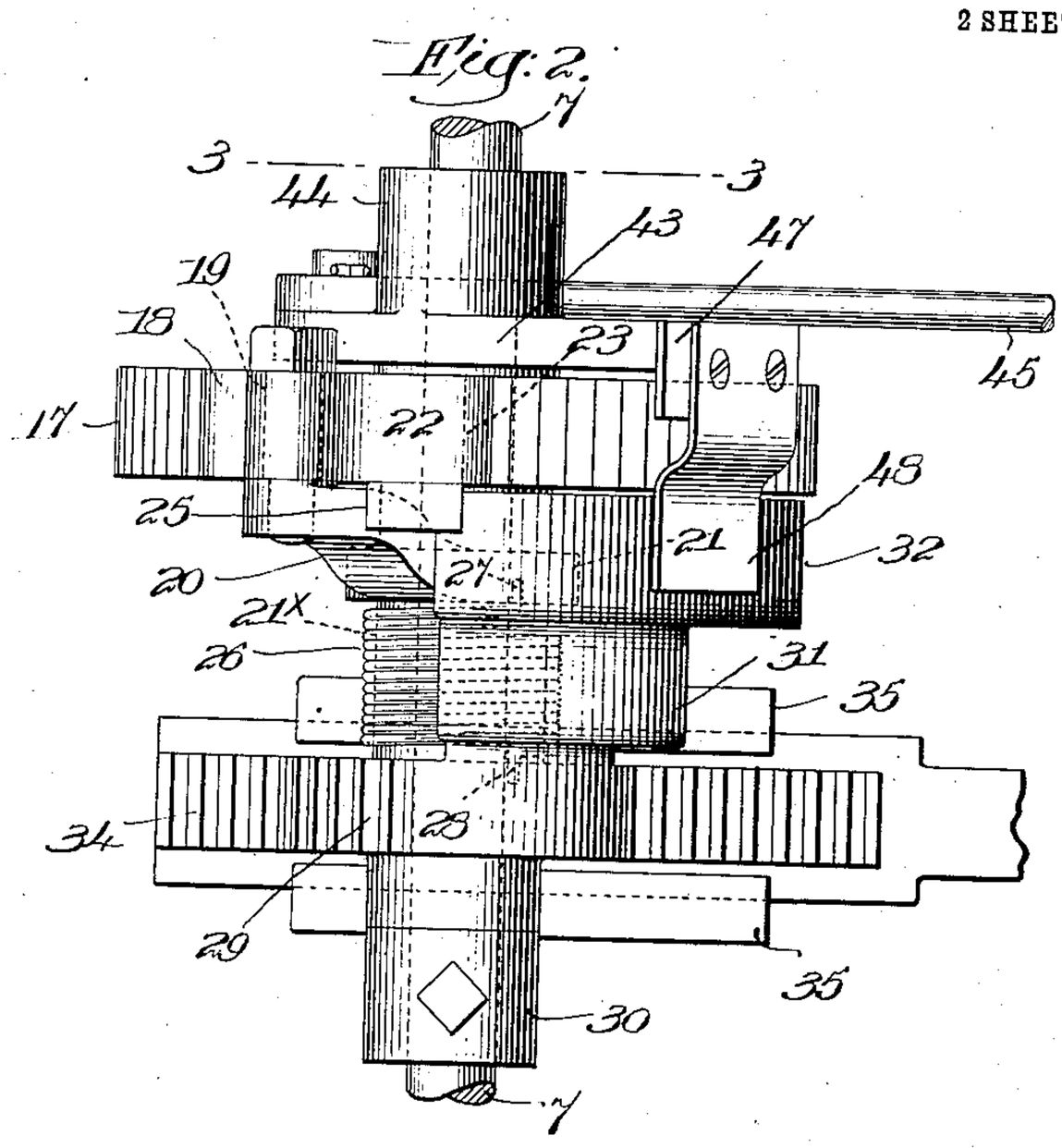


Fig. 4.

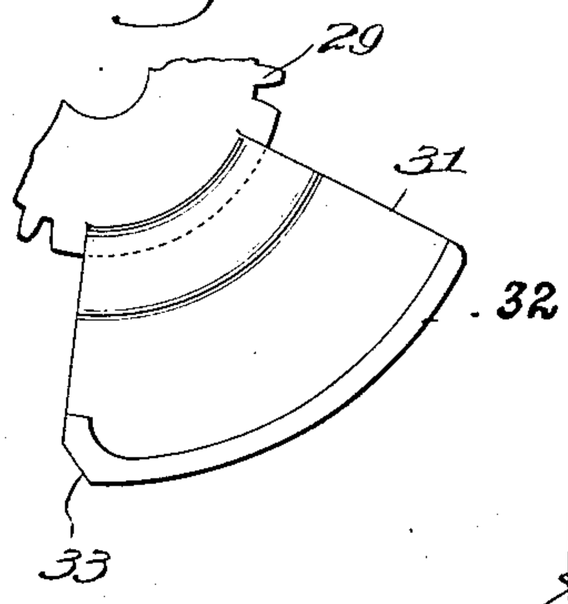
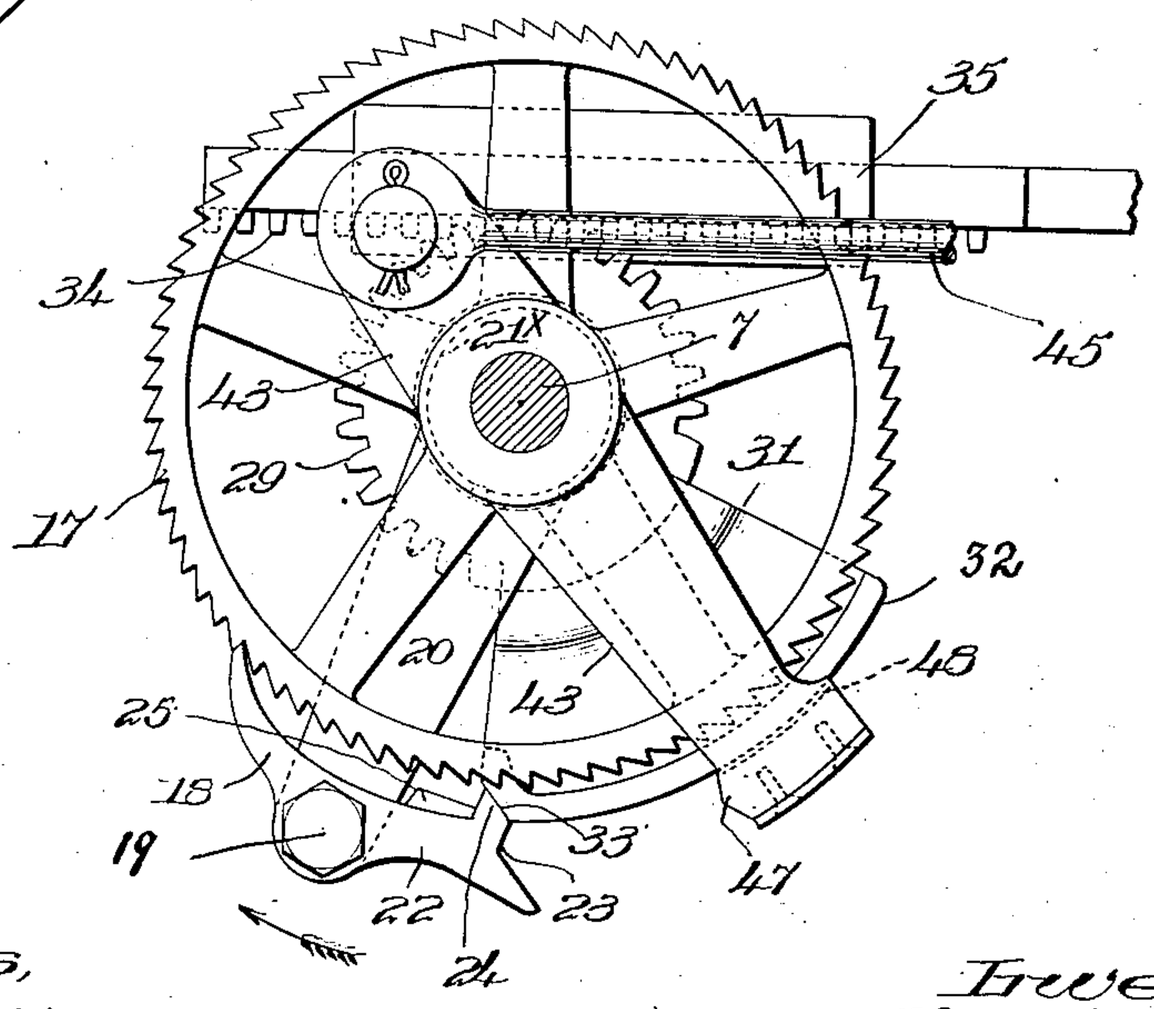


Fig. 3.



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UNITED STATES PATENT OFFICE.

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LET-OFF MECHANISM FOR LOOMS.

954,648. Specification of Letters Patent. Patented Apr. 12, 1910.

Application filed September 13, 1909. Serial No. 517,354.

To all whom it may concern:

Be it known that I, ALONZO E. RHOADES, a citizen of the United States, residing at Hopedale, county of Worcester, and State of Massachusetts, have invented an Improvement in Let-Off Mechanism for Looms, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to let-off mechanism whereby the warp-beam of a loom is rotated to let off the warp during the weaving operation, and it has for its object the production of novel means for effecting and controlling the rotation of the warp-beam in such manner that the delivery of the warp will correspond very closely to the warp tension.

In so-called positive let-off mechanisms, wherein the warp-beam is rotated by means other than the pull of the warp, as for instance, by a pawl and ratchet device, the variation in the warp tension has been utilized to change the amplitude of rotative movement of the beam, because the greater the warp tension the greater should be such movement of the beam. Conversely, when the warp tension decreases the beam should be turned to deliver less warp, and in certain prior structures the variable movement of the whip-roll or warp-guide, (over which the warp passes from the beam) has been arranged to govern the delivery movements of the beam.

In my present invention I utilize the whip-roll in a somewhat similar manner, but with simple and direct-acting mechanism, the starting point of each stroke of the actuating pawl being determined by means governed wholly by the whip-roll. Said pawl is operated by a vibrating driving member which has a constant stroke, and a species of stop is variably positioned by or through the whip-roll to determine the point in the active stroke of the driving member at which it shall cause the pawl to begin its feed stroke. As the driving member returns the pawl follows in unison therewith until arrested by the device referred to, said device being shifted to provide for a longer or a shorter feed-stroke of the pawl according to increased or decreased warp tension, respectively.

As will appear hereinafter the mechanism embodying the practical form of my invention herein set forth is compact, strong and durable, positive in action and readily accessible.

The various novel features of my invention will be fully described in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a left-hand side elevation of a loom with let-off mechanism embodying my invention applied thereto; Fig. 2 is an enlarged side elevation of a portion of the mechanism shown in Fig. 1, including the actuating pawl and ratchet, the shiftable stop, and the driving member; Fig. 3 is a top plan view of the parts shown in Fig. 2, below the line 3—3; Fig. 4 is a detached detail in plan of the shiftable stop and a part of its attached pinion, to be referred to.

Referring to Fig. 1 the warp-beam 1 has an attached large gear 2 meshing with a pinion 3 on an intermediate shaft 4 having fast upon it a worm-gear 5, the latter meshing with a worm 6 on the upright actuating shaft 7, and the whip-roll or bar 8 is mounted in a rocking carrier 9 attached to a rock-shaft 10, the latter having a depending arm 11 acted upon by a tension-spring 12, all of the parts referred to being of usual construction in let-off mechanism and operating in a well-known manner. The spring 12 abuts against a fixed ear 13 on the loom-side and is coiled around a rod 14 slidable through said ear and jointed at 15 to the arm 11, an adjustable collar 16 on the rod governing the tension of the spring, substantially as in United States Patent No. 647,815, granted April 17, 1900, to Draper and Roper.

In the present embodiment of my invention the upright shaft 7 has fixedly attached to it a ratchet 17 the teeth of which are intermittingly engaged by an actuating pawl 18 pivoted at 19 on a pawl-carrier, shown as a horizontally-swinging arm 20 having its hub 21 loosely surrounding shaft 7 below the ratchet, see dotted lines Fig. 2.

A tail 22 extended from the actuating pawl has an upright, V-shaped notch 23 in its end, Fig. 3, an adjacent beveled face 24, and a depending lug 25 which by engagement with the side of the pawl-carrier 20 limits the inward swing of the tail.

The hub 21 is reduced in diameter and is elongated, as at 21^x, Fig. 2, and a retracting spring 26 is coiled about said elongated part,

one end of the spring being attached at 27 to the hub 21, while its other end is secured at 28, see dotted lines Fig. 2, to a pinion 29 loosely mounted on the actuating shaft 7 between the lower end of the hub extension 21× and a collar 30 fast on said shaft. A segmental wing 31 is upturned and radially extended from the upper face of the pinion and it has a peripheral, upturned flange 32 which extends nearly to the lower face of the ratchet 17, the leading end of said flange having a beveled, upright face 33 adapted to coöperate with the face 24 on the pawl-tail 22, as shown in Fig. 3, and constituting a shiftable stop for the pawl, as will be explained.

Inasmuch as the spring 26 is connected at its ends with the pawl-carrier and the pinion 29, respectively, it will be manifest that if the pinion is held from rotative movement and the pawl-carrier is swung in the direction of the arrow, Fig. 3, the spring will be flexed, and when the pawl-carrier is free to do so it will be retracted by the action of said spring, to bring the face 24 of the pawl-tail against the stop 33. Such engagement acts to throw outward the tail and to positively move the pawl 18 inward, into operative engagement with the ratchet, as shown in Fig. 3, in readiness for the next feed stroke, in the direction of the arrow, and by moving the stop 33 to the right or left, Fig. 3, the effective or feed stroke of the pawl will be lengthened or shortened, respectively.

Shifting of the stop is effected by longitudinal movement of a rack 34, meshing with the pinion 29 and horizontally slidable in a guide 35 fixed to the loom-side, the forward end of the rack being jointed to the longer, depending arm 36 of a bell-crank, see Fig. 1, fulcrumed at 37 on the loom-side and having its shorter arm 38 pivotally connected with the lower end of a link 39. The upper end of said link is adjustably and pivotally connected, by a slot-and-pin connection 40, 41, with a forwardly extended arm 42 fixedly attached to the rock-shaft 10, and herein I have shown the arms 42 and 11 as made integral, for convenience in construction.

From Fig. 1 it will be apparent that the warp tension will depress the whip-roll 8 at each pick, and the greater the tension of the warp the greater will be the amplitude of the up-swing of arm 42, said arm thus being rocked to a greater or less extent in conformity with the warp tension. Following the connections between arm 42 and rack 34, the up-swing of the arm acts to move the rack rearward, or to the left, Fig. 1, thereby turning the pinion 29 more or less, and thereby the stop 33 is shifted to the right, Fig. 3, to position the starting point of the next feed-stroke of the actuating pawl 18. The greater the warp tension the greater will be the movement of the rack 34 to the left, Fig. 1, and the farther to the right will the stop 33 be positioned, the spring 26 causing the pawl and pawl-carrier to follow up or move with the stop, and as the pawl will have a longer stroke the ratchet 17 will be turned through a greater angle, and an increased movement of the beam 1 will be effected. This is as it should be, for the greater the tension of the warp the larger should be the amount let off or delivered by the beam. Conversely, if the warp slackens the spring 12 then acts to depress the arm 42 and the rack will be moved to the right, so that the stop 33 will be moved to the left, Fig. 3, shortening the feed-stroke of the pawl and causing less warp to be given off by the beam.

From the foregoing it will be manifest that the feed-stroke of the actuating pawl is controlled as to its length wholly by or through the warp tension, and as the tension increases as the diameter of the yarn-mass on the beam gradually decreases the depression of the whip-roll due thereto will act through the described devices to proportionately increase the feed-stroke of the actuating pawl. Thereby a very uniform tension of the warp is provided for, and in a very simple manner, and by adjusting the link 39 as to its connection with the arm 42 the mechanism can be easily adjusted according to the requirements of different kinds of warp.

The pawl is actuated by a vibrating driving member having a constant stroke, such member being herein shown as a horizontally swinging lever 43 having its hub 44 loosely embracing the shaft 7 above the ratchet 17, the shorter arm of the lever being connected by a link 45 with a convenient going part of the loom mechanism, preferably the lay-sword 46. The longer arm of said lever 43 is extended radially above the ratchet and has its end thickened and its rear upright face is oppositely beveled at 47 to enter and fit into the notch 23 in the end of the pawl-tail 22 when the lever 43 is moved up to it, to thereafter move the pawl ahead and effect its feed-stroke. The driving member 43 has a constant stroke, as has been stated, and its beveled part 47 will engage the pawl-tail and begin the active or feed stroke of the actuating pawl earlier or later according as the shiftable stop is to the right or the left, respectively, of the position shown in Figs. 1, 2 and 3, making the feed stroke longer or shorter in consequence. As will be manifest the feed-stroke of the pawl always terminates at the same point, but its starting point varies in accordance with variations in warp tension. On the return stroke of the driving member 43 the part 47 leaves the notched end of the pawl-tail when the latter is brought by spring 26 into engagement with the stop 33.

There may be some slight play or back-lash between the pinion 29 and rack 34, and in order to prevent slight variations in the position of stop 33 due to such back-lash, I provide the outer end of the vibrating driving member 43 with a depending wiper 48, preferably a piece of spring metal, which bears yieldingly against the outer face of the flange 32.

When the member 43 moves back, or to the right, Fig. 3, the wiper acts frictionally upon the flange 32 and takes up any lost motion or back-lash between the rack and pinion, so that the stop 33 will be accurately set, the spring 26 holding the pawl-tail and stop stationary on the opposite stroke by the driving member until it engages and moves the pawl with it.

Various changes or modifications in details of construction and arrangement may be made by those skilled in the art without departing from the spirit and scope of my invention as set forth in the claims annexed hereto.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and pawl, and a vibrating driving member having a constant stroke, to intermittingly and directly engage and effect the feed-stroke of the pawl, a shiftable stop independent of said driving member, to arrest the pawl on its return stroke and determine the starting point of each feed-stroke of said pawl, a spring to effect the return stroke of the latter and move it against the stop, and means controlled by the warp tension to position the stop for arresting the pawl on its return stroke.

2. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and pawl, a driving member to move the pawl to a fixed point at each feed stroke, a spring to retract the pawl, a stop for the pawl, to arrest it on each return stroke and thereby determine the starting point of each feed stroke thereof, and means controlled by the warp tension to shift the stop independently of said driving member in accordance with variations in the tension of the warp.

3. In let-off mechanism for looms, in combination, a warp-beam and means to rotate it, including a ratchet and pawl, a pawl-carrier, a driving member to intermittingly and directly engage the pawl and thereby effect bodily movement of said pawl-carrier and pawl and cause the feed stroke of the latter, a shiftable stop to engage and arrest the pawl on each return stroke and thereby determine the starting point of each feed stroke of the pawl, the stop and pawl-carrier being co-axial, a spring to effect the return stroke of the pawl-carrier and pawl and move the latter against the stop, and means controlled by the warp tension to vary the angular position of said stop and thereby lengthen or shorten the feed stroke of the pawl.

4. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and a pawl, the latter having a tail provided with a beveled face, and a swinging pawl-carrier on which the pawl is pivoted, a driving member to move the pawl to a fixed point at each feed stroke, a stop to engage the beveled face on the pawl-tail and insure the positive engagement of the pawl and ratchet at the starting point of each feed stroke of the pawl, a spring to retract the pawl and effect engagement of the beveled face with the stop, and means controlled by the warp tension to shift said stop and thereby determine the starting point of each feed stroke of the pawl.

5. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and pawl, a driving member to effect movement of the pawl to a fixed point at each feed stroke, a movable stop independent of the driving member, to directly engage the pawl on each return stroke and thereby determine the starting point of each feed stroke of the pawl and to insure positive engagement of the latter with the ratchet, means controlled by the warp tension to position the stop independently of the driving member and in accordance with variations in the warp tension, and separate means to effect the return of the pawl to the starting point of the next feed stroke.

6. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and pawl, a vibrating driving member having a constant stroke and adapted to intermittingly and directly engage and effect bodily movement of the pawl to a fixed point at each feed stroke, a movable stop independent of said driving member to coöperate with and arrest the pawl on its return stroke and thereby determine the starting point of the pawl at each feed stroke, means, including a rack and pinion and governed by the warp tension, to position the stop, and a spring to effect the return stroke of the pawl and bring it into engagement with the stop.

7. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and a pawl having a notched tail, a vibrating driving member co-axial with the ratchet and having a constant stroke, said member intermittingly engaging the notched tail of the pawl and moving said pawl to a fixed point at each feed stroke, a movable pawl-stop co-axial with the driving member and adapted to coöperate with said pawl and determine the starting point of each feed

stroke, a spring to retract the pawl, a whip-roll adapted to be rocked by or through variations in the warp tension, and means controlled by rocking movement of the whip-roll to position the pawl-stop and thereby lengthen or shorten the feed stroke of the pawl.

8. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and a pawl, a vibrating driving member co-axial with the ratchet and having a constant stroke, to intermittingly engage and move the pawl to a fixed point at each feed stroke, a movable pawl-stop mounted co-axially with the driving member and having a segmental flange, means controlled by the warp tension to vary the position of the stop and thereby determine the starting point of each feed stroke of the pawl, said means including a pinion fixedly connected with the stop, and a rack in mesh with the pinion, a friction device on the driving member and cooperating with the flange of the stop, to take up lost motion between the rack and pinion, and a spring to retract the pawl and return it to the control of the stop.

9. In let-off mechanism for looms, a warp-beam, means to rotate it, including an actuating shaft, a ratchet fast thereon, a pawl, and a pawl-carrier fulcrumed on the shaft, a pawl-stop fulcrumed on the shaft, to directly engage the pawl on its return stroke and thereby determine the starting point of each feed stroke thereof, a vibrating driving member also fulcrumed on said shaft and having a constant stroke, to effect movement of the pawl to a fixed point at each feed stroke, means controlled by the warp tension to shift the position of the pawl-stop and thereby determine the length of each feed stroke of the pawl, and a spring to retract the latter after the completion of its feed stroke and bring it into engagement with the stop.

10. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and pawl, means to move the pawl to a fixed point at each pick, a shiftable stop independent of said pawl moving means, to engage the pawl on its return stroke and determine the starting point of each of the feed movements of the pawl, a rocking whip-roll, and means controlled wholly thereby to shift the stop in conformity with variations in warp tension and maintain a substantially uniform tension upon the warp as it is let off from the beam.

11. In let-off mechanism for looms, a warp-beam, means to rotate it, including a ratchet and pawl, means to move the pawl to a fixed point at each pick, a shiftable stop to determine the starting point of each of such feed movements of the pawl, a rocking whip-roll, and means controlled wholly thereby to shift and position the stop in conformity with variations in warp tension, said means including a pinion fixedly connected with the stop, a rack meshing with the pinion, and connections between the whip-roll and rack, to move the latter longitudinally.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

ALONZO E. RHOADES.

Witnesses:

FRANK H. FRENCH,

E. D. OSGOOD.