Aug. 7, 1923. 1,463,966

J. NORTHROP

LET-OFF MECHANISM

Filed Feb. 19, 1920 3 Sheets-Sheet 1

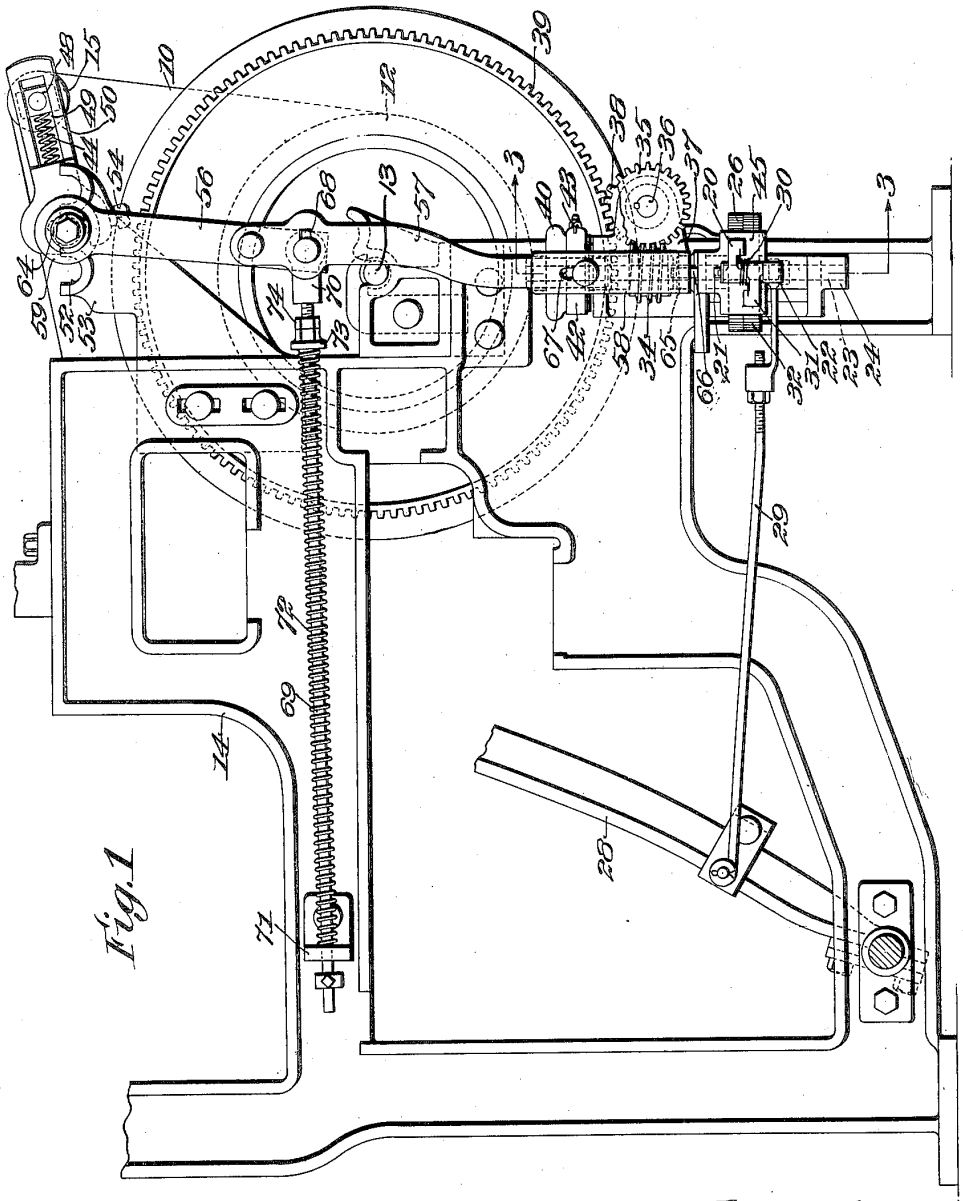

Fig. 1

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Fig. 2.

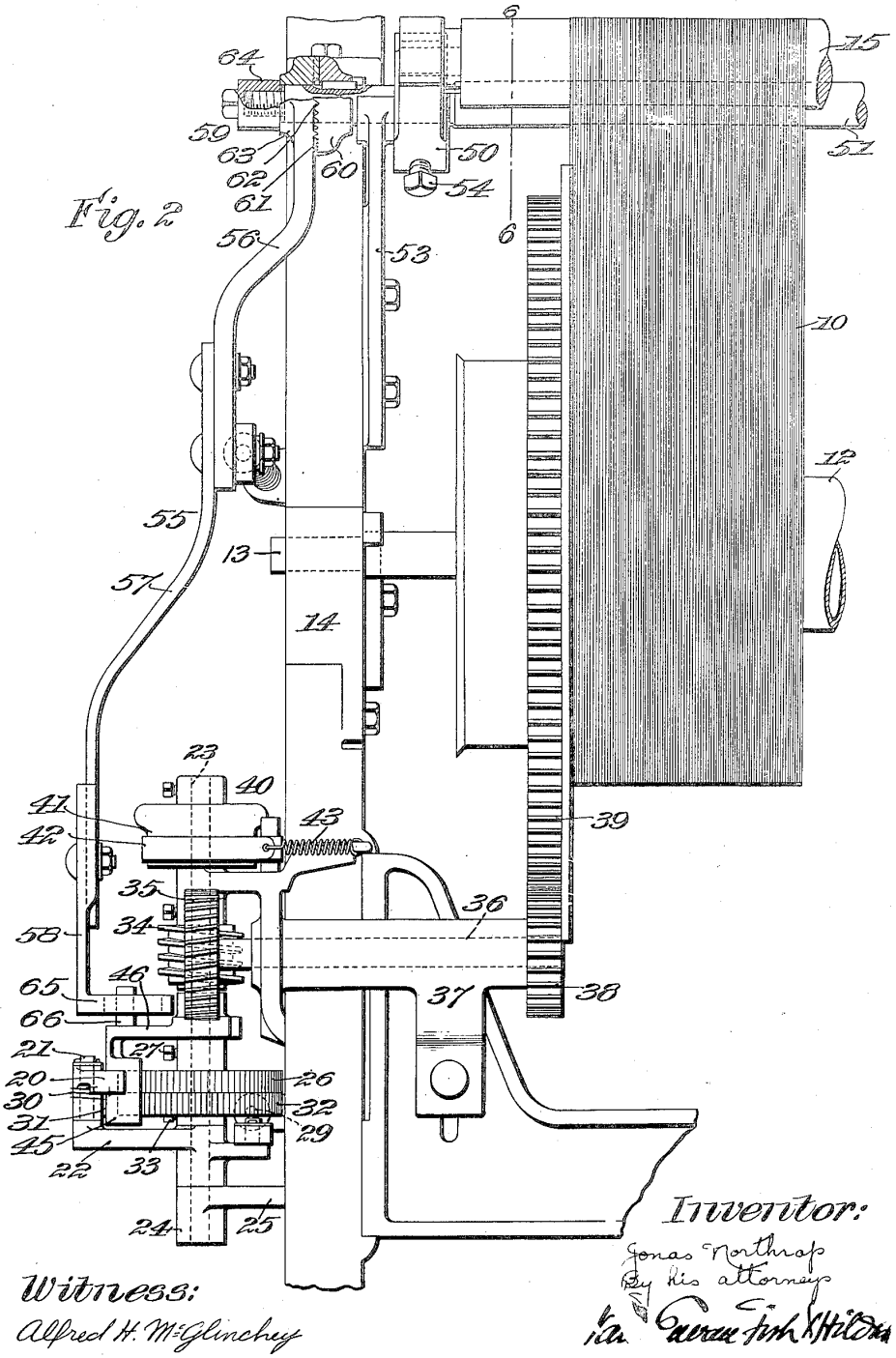

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Fig. 3

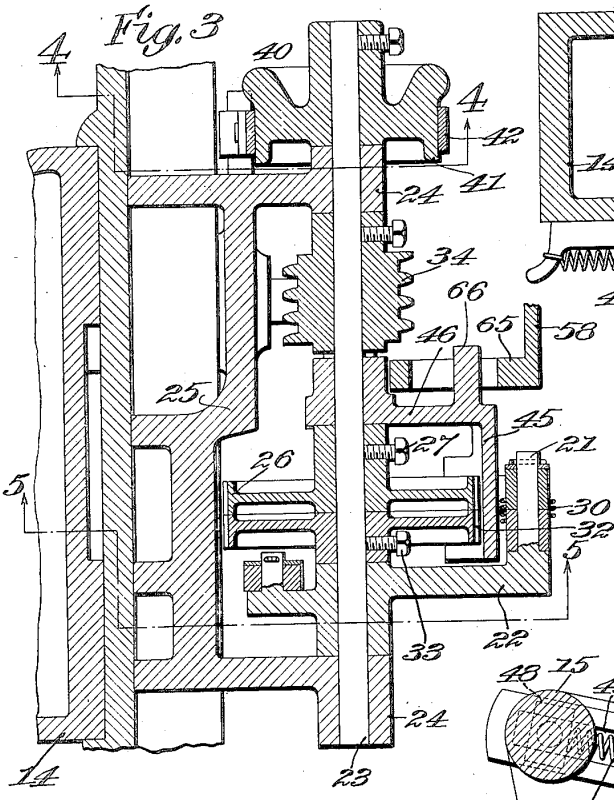


Fig. 4

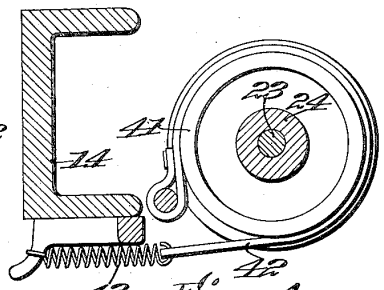


Fig. 6

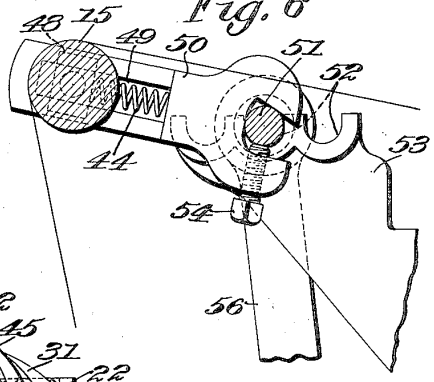
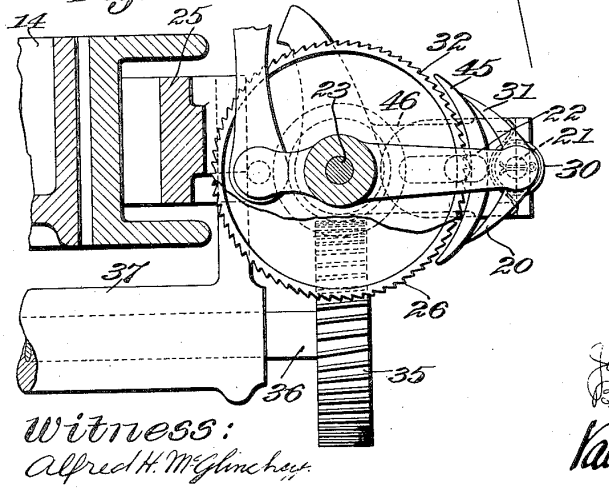


Fig. 5



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UNITED STATES PATENT OFFICE.

JONAS NORTHROP, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO HOPEDALE MANUFACTURING COMPANY, OF MILFORD, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

LET-OFF MECHANISM.

Application filed February 19, 1920. Serial No. 359,390.

To all whom it may concern:

Be it known that I, JONAS NORTHROP, a citizen of the United States, residing at Hopedale, in the county of Worcester and State of Massachusetts, have invented certain new and useful Improvements in Let-Off Mechanism; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a let-off mechanism for looms. The invention has for an object to provide a let-off mechanism of novel and efficient construction adapted to let-off the warp threads from the warp-beam in such a manner as to maintain a uniform tension thereon.

To this end one feature of the invention contemplates a construction of let-off mechanism in which the rate of let-off of the warp is controlled by the tension on the warp threads to the end that a uniform tension is maintained at all times. Another feature of the invention resides in the provision of means for immediately taking back any slack in the warp threads to thereby restore the tension thereon to its normal operating value.

The invention consists in these and such other features as may hereinafter appear and are particularly pointed out in the claims.

In the drawings illustrating the preferred embodiment of the invention Figure 1 is a side elevation of a portion of a loom showing the improved let-off mechanism; Fig. 2 is a rear elevation of a portion shown in Fig. 1; Fig. 3 is a vertical section taken on the line 3—3 of Fig. 1; Figs. 4 and 5 are sections taken on the lines 4—4, 5—5 of Fig. 3 respectively; and Fig. 6 is a sectional view taken on the line 6—6 of Fig. 2.

The let-off mechanism illustrated in the drawings comprises in general a warp-beam, a movable whip roll over which the warp threads pass as they unwind from the warp-beam, means for rotating the warp-beam, and a mechanism cooperating with the whip roll and with said means adapted to control the rate of let-off of the warp in accordance with variations in the tension of the warp threads in order to maintain the tension uniform. The mechanism is also adapted to control the rotation of the warp-beam in order to take back slack which may occur in the warp. The mechanism operates therefore to selectively rotate the warp-beam in either one direction or the other in order to maintain such a rate of let-off as to provide a uniform tension on the warp threads during the operation of the loom.

Referring to the drawings, the warp threads 10 are unwound from the warp-beam 12 mounted on the shaft 13, journaled in the loom frame 14 and pass over a whip roll 15 and thence through the harness to the wind-up roll at the front of the loom in a manner well known and familiar to those skilled in the art.

The warp threads 10 are let-off from the warp-beam 12 by a mechanism which is described as follows: A let-off pawl 20 is pivotally mounted upon a stud 21 upon one end of a lever 22 pivoted upon a vertical shaft 23. The vertical shaft 23 is supported in bearings 24 in a supporting bracket 25 secured to the loom frame. The let-off pawl 20 is adapted to cooperate with a ratchet wheel 26 also mounted upon the shaft 23 and secured thereto by a set screw 27. The let-off pawl 20 is oscillated back and forth with the lever 22 about the vertical shaft 23 as a pivot upon each beat of the lay, the lever 22 being connected to the sword 28 of the lay by a link 29. A take-back pawl 31 is also mounted upon the stud 21 on the end of the lever 22 and operates in a manner similar to the let-off pawl 20, to engage the teeth of a second ratchet wheel 32. A coil spring 30 embraces the pawls 20 and 31 and tends to keep the tips thereof in engagement with the teeth of the ratchet wheels 26 and 32, so that unless prevented in a manner as will be described, the pawls operate to rotate the ratchet wheels 26 and 32 upon each rearward and forward beat of the lay. The ratchet wheels 26 and 32 are mounted upon the vertical shaft 23 and are secured thereto by set screws 27, 33 so that rotations of the ratchet wheels operate to cause rotation of the vertical shaft 23. The rotations of the vertical shaft 33 are transmitted to the warp-beam 12 through a worm 34, worm wheel 35 on a counter-shaft 36 journaled in a supporting bracket 37 secured to the loom frame, and through gears 38 and 39. A friction brake 40 comprising a drum 41 secured upon

the shaft 23 and a brake strap 42 yieldingly held in contact with the drum by a spring 43, operates to hold the shaft 23 from unintentional oscillation, and to permit oscillation of the shaft whenever the ratchet wheels 26, 32 are rotated in the operation of letting-off or taking-back the warp. In this manner the shaft 23 may be rotated and will stay in any position to which it is rotated.

The let-off pawl 20 and take-back pawl 31 are normally prevented from engaging the teeth of their respective ratchet wheels 26 and 32 by a shield 45 concentrically arranged about the peripheries of the ratchet wheels and between them and the pawls 20 and 31. The shield 45 is carried by an arm 46 rotatably mounted upon the vertical shaft 23 and is arranged to be oscillated in either one direction or the other upon oscillation of the arm 46. When the shield 45 is oscillated to the left as viewed in Fig. 1, the let-off pawl 20 is permitted to engage the ratchet wheel 26 and operates on the rearward beating of the lay to progressively cause the rotation of the ratchet wheel 26 and consequently the rotation of the warp-beam 12 in a direction to let-off the warp therefrom. The warp-beam 12 is continuously rotated in this manner until the shield 45 is returned to its original position between the tip of the let-off pawl 20 and the ratchet wheel 26. When the shield 45 is oscillated to the right as viewed in Fig. 1, the take-back pawl 31 is permitted to engage its ratchet wheel 32 and to thereby progressively rotate the warp-beam in a reverse direction so as to take back any slack which may occur in the warp. The warp-beam 12 is rotated in this direction continuously until the shield 45 is returned to its initial position thereby causing a disengagement of the take-back pawl 31 from the teeth of the ratchet wheel 32.

Provision is made for oscillating the shield 45 back and forth in accordance with variations in the tension on the warp above and below a normal operating value. To this end the whip roll 15 is provided with bearing boxes 48 slidably mounted in slots 49 in arms 50 extended rearwardly from a shaft 51 rotatably supported in U-shaped bearings 52 of a bracket 53 bolted to the loom frame. The whip roll 15 is yieldingly held rearwardly by light springs 44 which cooperate with the bearing boxes 48, and which permit a slight yield as the shed opens and closes. The arms 50 are secured to the shaft 51 to move therewith, by set screws, one of which is shown at 54. A depending lever arm 55, comprising three members 56, 57, 58, is mounted upon one outer end of the shaft 51 and is secured in fixed relation to the shaft 51 by an improved coupling 59. The coupling 59 comprises a housing 60 keyed upon the shaft 51 and provided with teeth 61 in the face thereof with which cooperate teeth 62 upon the face of a hub 63 of the upper member 56 of the lever arm 55. A cap 64 is screwed upon the end of the shaft 51 and holds the hub 63 against the housing 60 and the teeth 61, 62, in operative engagement with one another, so that movements of the shaft 51 operate to move the lever arm 55. The lower member 58 of the lever arm 55 is provided with a forked end 65 extended at right angles thereto and adapted to loosely engage an upturned arm 66 of the shield 45 rotatably mounted on the shaft 23, and to cause movement of the same, in a manner as will be described, whenever the lever arm 55 is moved. The lower member 58 and the upper member 56 are bolted to an intermediate member 57 to form the complete lever arm 55. A vertically arranged slot 67 in the lower member 58 permits vertical adjustment thereof, and a horizontal slot 68 in the upper end of the intermediate member 57 permits angular adjustment of the members 57 and 58. It will, therefore, be observed that whenever the shaft 51 is oscillated the lever arm 55 is swung about the shaft 51 as a pivot and operates through the engagement of the forked end 65 with the arm 66 of the shield 45 to oscillate the shield about its supporting shaft 23. A rod 69 is pivotally secured to the lower end of the upper member 56 of the lever arm 55, having its rear end screwed into a connector 70, pivotally secured to the upper member 56. The front end of the rod 69 is extended through and supported by a bracket 71 laterally extended from the loom frame 14. A coil spring 72 embraces the rod 69, its front end abutting the bracket 71 and its rear end abutting a collar 73 screwed upon the rear end of the rod 69, and held in adjusted position by a lock nut 74 so that the tension in the coil spring 72 may be adjusted. From the description thus far it will be apparent that the tension upon the warp threads operates through the whip roll 15 to rotate the shaft 51, as viewed in Fig. 1, in a clockwise direction, and also that the coil spring 72 operates through the lever arm 55 to resist this tendency of the shaft 51 to rotate. If the tension in the coil spring is initially adjusted by means of the position of the lock nut 74 on the rod 69 so that the normal operating tension on the warp threads is exactly compensated for and the lever arm 55 is balanced in its normal position, it will be apparent that any variations which may occur in the tension on the warp threads will operate to cause movement of the lever arm 55 in either one direction or the other accordingly as the tension is increased or decreased.

In the normal operation of the loom the cloth is wound upon the wind-up roll at the front of the loom. As the cloth is wound up in this manner the tension on the warp gradually increases. As soon as the tension

increases sufficiently to depress the whip roll 15, the shield 45 is oscillated to the left as viewed in Fig. 1 and permits the engagement of the let-off pawl 20 with the teeth of the ratchet wheel 26. Upon subsequent rearward beats of the lay, the ratchet wheel is progressively rotated, and operates to let off additional warp from the warp-beam 12 until the tension on the warp drops to its normal value causing the return of the lever arm 55 and shield 45 to their initial positions. Whenever because of variations in the amount of let-off as the diameter of the warp upon the warp-beam decreases, or from other causes, the tension on the warp varies, sufficiently to overcome the light spring 44, the lever arm 55 is immediately displaced from its neutral or normal position and operates through displacement of the shield 45 to either let off additional warp or on the other hand to take back any slack which may occur in the warp, thus maintaining a uniform tension at all times.

It is to be observed that the rate at which the warp-beam is rotated is gradually increased as the diameter of the warp on the warp-beam decreases in order that the warp may be delivered at a uniform rate, and further that the amplitude of oscillation of the pawl members is sufficient to rotate the warp-beam at its maximum rate corresponding with the minimum usable diameter of warp upon the warp-beam. It will also be observed that upon each beat of the lay the pawl members are oscillated over a maximum number of the teeth of the ratchet wheel.

The improved let-off mechanism is extremely sensitive in operation, and serves to control the rate of let-off in strict accordance with variations in tension on the warp at all times and under all operating conditions.

While the preferred embodiment of the invention has been illustrated and described, it will be understood that the same may be embodied in other forms within the scope of the following claims:—

1. A loom having, in combination, a whip roll, a warp beam, a let-off contrivance for actuating the warp beam comprising a ratchet wheel, pawl and shield, the shield being provided with a pin, an arm connected to the whip roll and consisting of three parts, an upper part, a middle part and a lower part, the upper and middle parts being adjustably attached to each other, so that the angular position of the middle part with relation to the upper part may be adjusted and fixed, a sliding adjustable connection between the lower part and the middle part whereby the vertical position of the lower part may be adjusted and fixed, the lower part being provided with a slot to receive the pin in the shield, a spring rod connected to the upper part of the whip roll arm, a spring on the spring rod acting to press against the whip-roll arm and to tend to move it in a direction to tighten the warp.

2. A let-off and take-back mechanism for looms having, in combination, a bracket adapted to be attached to the loom frame, bearings on the bracket, a vertical shaft mounted in the bearings, two ratchet wheels provided with oppositely disposed teeth secured to the shaft, a pawl lever, two pawls pivoted on the pawl lever, the one in a position to engage one of the ratchet wheels, and the other in a position to engage the other ratchet wheel, connections between the pawl lever and the lay for oscillating the pawl lever, a shield pivotally mounted on the shaft and provided with an upwardly extended pin, said shield being interposed between the pawls and the ratchet wheels and of sufficient width to prevent the contact of the pawls with either of the ratchet wheels throughout their entire strokes, a brake drum mounted on the shaft and secured thereto, a whip roll and a whip roll arm extending from the whip roll downwardly and provided on its lower end with a right angle portion having a slot adapted to receive the upwardly extended pin of the pawl shield, and driving connections between the shaft and the warp beam.

JONAS NORTHROP.