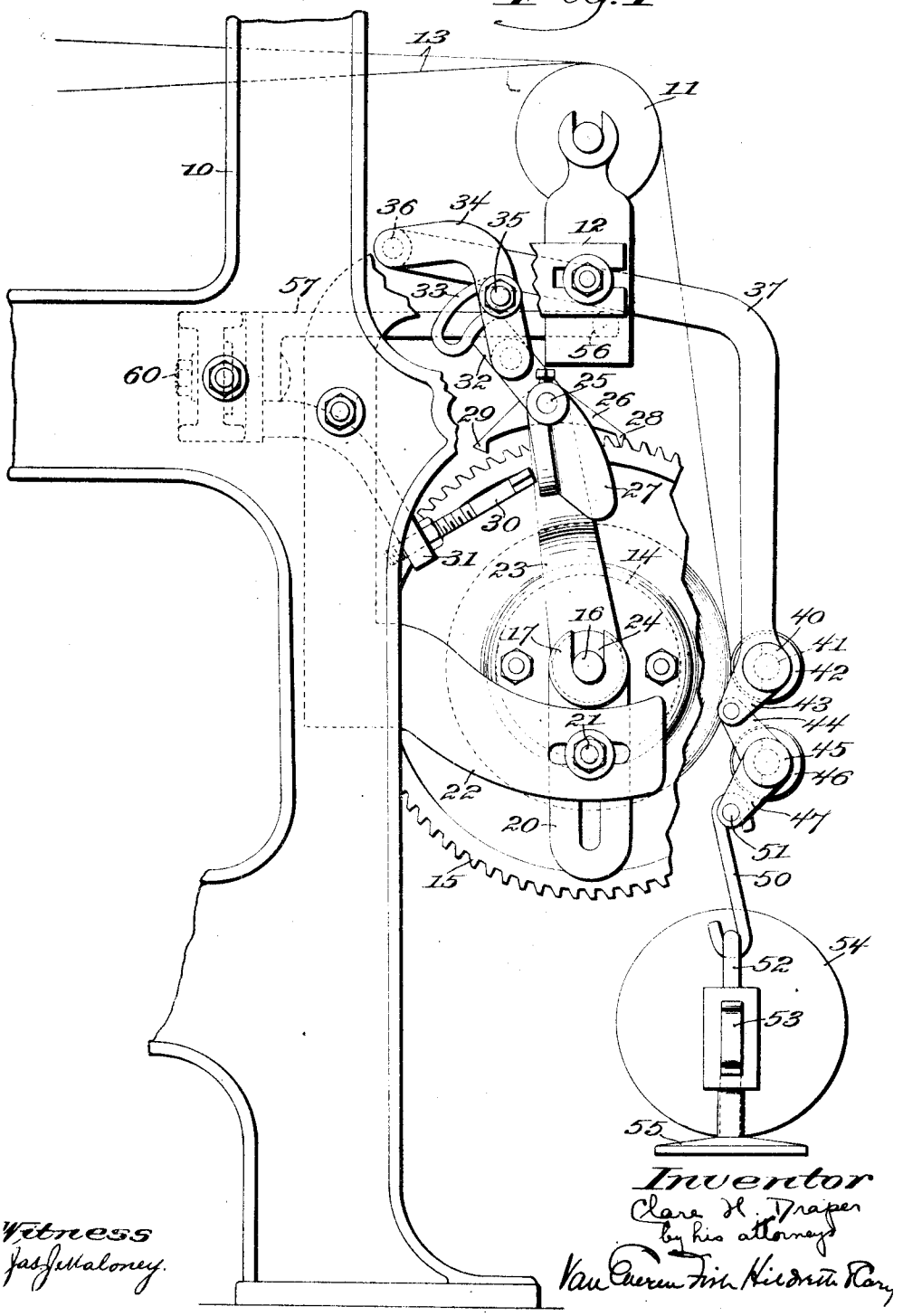
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LET-OFF MECHANISM FOR LOOMS

Filed May 3, 1927 3 Sheets-Sheet 1

Fig. 1



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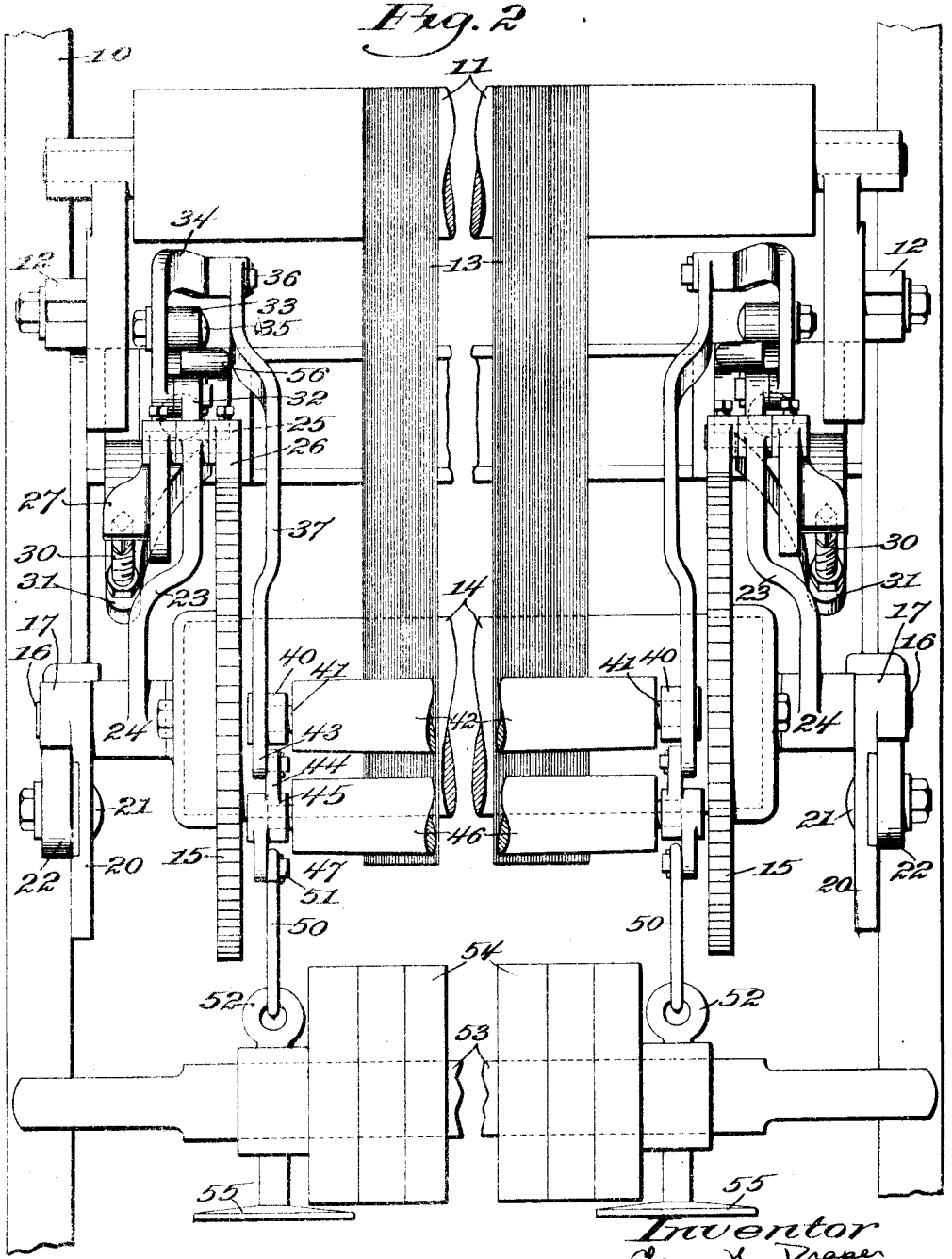
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LET-OFF MECHANISM FOR LOOMS

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Fig. 2



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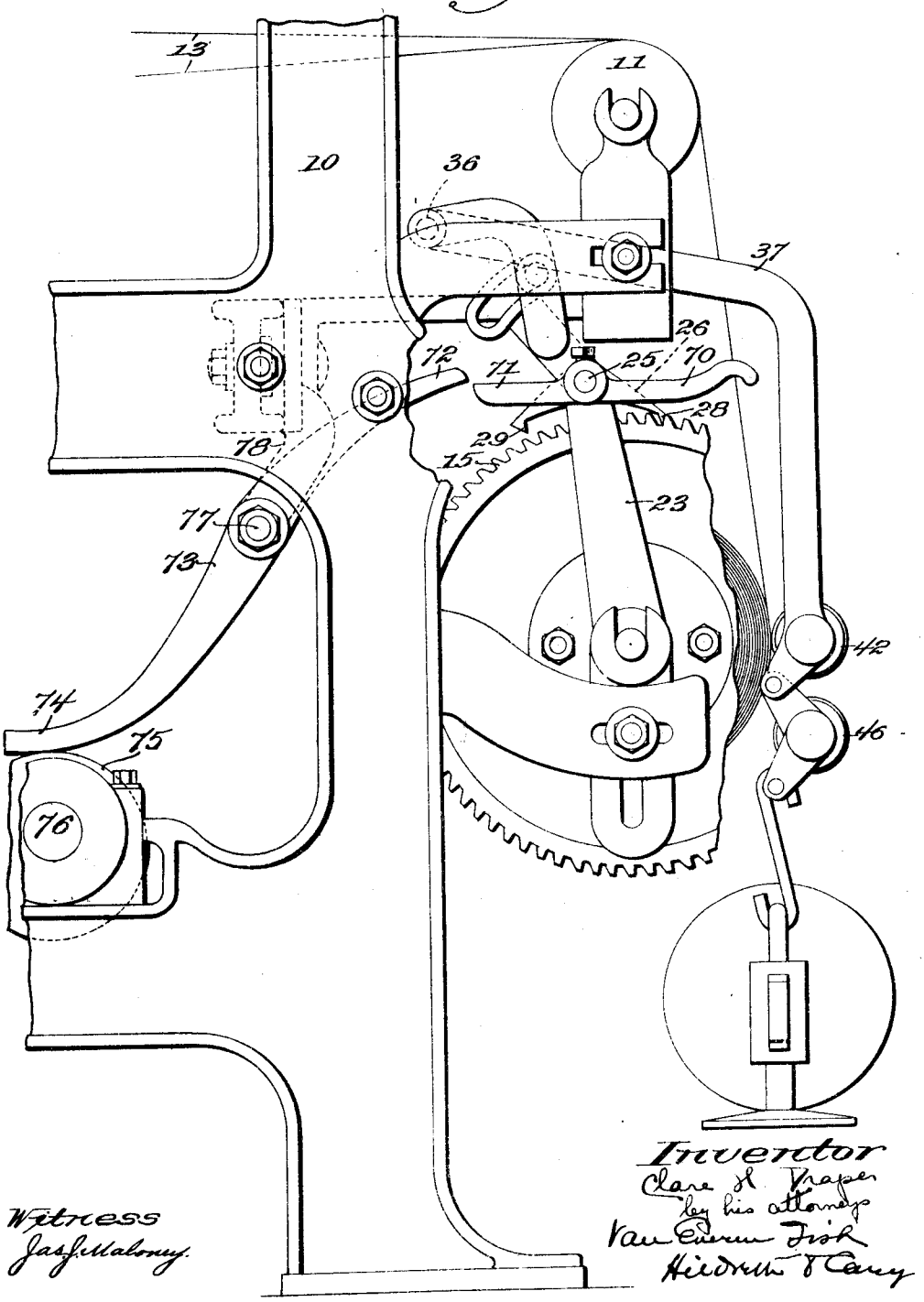
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Fig. 3



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UNITED STATES PATENT OFFICE.

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LET-OFF MECHANISM FOR LOOMS.

Application filed May 3, 1927. Serial No. 188,493.

The present invention relates to an improvement in let-off mechanism for looms.

The object of the invention is to produce a new form of let-off which is entirely controlled by the tension of the warp, and which is particularly adapted for silk or rayon, although it may also be used on looms for weaving other materials. The invention consists in the construction hereinafter described and particularly defined in the claims.

In the accompanying drawings illustrating the preferred form of the invention, Fig. 1 is an end elevation of the rear portion of a loom showing the mechanism; Fig. 2 is a rear elevation of a loom with the parts in position; and Fig. 3 is a view similar to Fig. 1 showing a modified form of the invention.

The illustrated embodiment of the invention is described as follows: This let-off construction depends for its operation upon the tension of the warp. When the warp tension reaches a certain amount it turns the warp beam to cause it to give up the warp, and thereby causes the impingement of a part of the mechanism carried by the warp beam against a stationary part of the loom, which operates an escapement to permit further rotation of the beam in a direction to give up the warp. The loom frame 10 supports the whip roll 11 on the bracket 12. The warp 13 passes over this whip roll, which is stationary and held in a fixed position to the warp beam 14. The warp beam is provided on its ends with escapement wheels 15, which form end disks for the beam. The gudgeons 16 of the warp beam are received in the open bearings 17 which are formed in adjustable gudgeon supports 20, bolted at 21 to the bracket arm 22 secured to the frame of the loom. The slots in the bracket arm 22 and gudgeon support 20 provide vertical and horizontal adjustment of the position of the warp beam on the loom.

Mounted on the gudgeons are two escapement arms 23, whose bosses 24 slip over and are pivoted on the gudgeons between the end of the warp beam and the bearings 17. These escapement arms 23 are provided at their upper ends with an escapement pivot pin 25, to which are secured the escapement lever 26 and the release arm 27, the pin itself being rotatably mounted in a boss formed at the upper portion of the escapement carrying arms 23. The escapement lever is provided on its right-hand end, as seen in Fig. 1, with a holding tooth 28, and on its left-hand end with a restraining tooth 29. The tension of the warp 13 tends to hold the holding tooth 28 in engagement with one of the teeth of the ratchet wheel 15, and this tends to rotate the warp beam in a direction to cause it to exert a pull upon the warp. When the warp is drawn through the loom by the process of weaving, the warp beam is turned to the left, as viewed in Fig. 1, until the release arm 27 strikes the stop pin 30, adjustably mounted in the bracket 31 secured to the frame of the loom. Upon the engagement of the release arm with the stop pin the holding tooth of the escapement lever is withdrawn from engagement with a given tooth of the ratchet wheel 15, and at the same time the restraining tooth 29 is brought into engagement with the opposite side of another tooth which prevents over-running of the warp beam due to the tension of the warp. The release of the holding tooth is immediately followed by its re-engagement with the next successive tooth of the ratchet wheel owing to means which are provided tending to turn the escapement arm to the right so that tension is always maintained upon the warp either by the holding tooth or the restraining tooth of the escapement lever 26.

The weight is employed to act on the escapement arm in a direction to tend to move it to resist the tension of the warp. The mode of applying this weight to the escapement arm is as follows: Beyond the pivot pin 25 the escapement arm is continued in an inclined direction to the original direction of the escapement arm at 32. The end of this extension is provided with a slotted head 33. To the extension 32 of the escapement arm 23 is pivotally attached a secondary part 34 of the same arm which is bolted to the extension by a bolt 35 which extends through the secondary arm 34 and through the slot in the head 33, whereby the secondary portion 34 of the arm may be

adjusted to different positions with respect to the extension. To the upper end of the extension 34 at 36 is pivotally attached the upper end of the weight link 37. The whole escapement arm comprises the arm proper 23, the extension 32, and the secondary portion 34, which are all rigidly connected together.

The lower ends of the weight links 37 are provided with open bearings 40, which receive the pintles 41 of the roller 42. This roller engages the surface of the warp on the warp beam. A weight is attached to the weight links to cause the weight links to pull upon the escapement arm. From the lower end of each weight link there extends a short arm 43, to the end of which is pivotally attached an arm 44, carrying an open bearing 45 for a second roller 46, the pintles of which are received in the open bearing. The arm 44 and its bearing carry another arm 47 for supporting the weight. S-hooks 50 hang on the pins 51 of the arms 47, and the hooks at the lower ends of these S-hooks 50 engage the eyes 52 formed upon the castings that carry the weight bar 53. Weights 54 are slipped over the bar. Upon the lower side of the eye castings 52 may be formed the feet or standards 55, upon which the whole weight bar may stand when desired.

The rollers are made of wood, and are tapered from the center to the ends, being 1/8 of an inch smaller at their ends than in the center, so that although they may spring under the pressure exerted on them by the weight pressing them against the surface of the warp on the beam, they will still press continuously upon the warp from end to end of the same.

The weight links 37 are angularly formed for the purpose of equalizing the tension exerted on the warp by the weight, irrespective of the diameter of the warp beam at any given time. When the warp beam is large, both of the rollers 42 and 46 will engage the warp beam, and the leverage on the escapement arm will be less than when the diameter of the warp beam is small.

In operation it will be seen that as the warp is gradually consumed, the escapement arms are turned to the left and the weight is lifted until the release arms strike the stop pins, whereupon the holding teeth of the escapement are withdrawn from engagement with the teeth of the ratchet wheels, and are re-engaged with the next teeth. This involves a backward and forward movement of the escapement arm which moves with the holding tooth toward the left until the ratchet wheel tooth is released, whereupon the escapement arm again moves to the right and causes the holding tooth of the escapement lever 26 to engage the next tooth of the ratchet wheel, continuously applying resisting pressure to the beam as the releasing tooth 29 operates to engage the face of a ratchet wheel tooth at about the time the holding tooth is released from the face of another advancing ratchet wheel tooth. A continuous warp tension is thus maintained which is dependent upon the amount of weight applied, and does not vary with the diameter of the warp beam at any given time.

When a warp is exhausted and the loom is stopped, the operative takes hold of the ears of the release arms and works them back and forth, thereby gradually releasing the tension on the warp until the extensions 32 of the escapement arms 23 strike the stops 56, carried by the rods 57 bolted to the loom frame at 60. The weight is then removed from the weight links, the rollers 42 and 46 are removed from their bearings, one end of the warp beam is lifted so as to remove the gudgeon from the bearing 17, whereupon the boss 24 is slipped off of the gudgeon on that end of the beam. A similar operation performed at the other end removes the other weight link and associated part from the gudgeon on the other end of the warp beam. Then the warp beam is taken out of the loom and a new one put in place. One end is raised, and the head 24 of the escapement arm is slipped on to the gudgeon on both ends of the beam, and the beam is turned after the front end of the warp is made fast to the take-up mechanism, until the tension is again applied to the warp, after which the rollers 42 and 46 are replaced, and the weights are again put in place.

A feature of this invention resides in the fact that the warp is subjected to tension by means of mechanism which is directly hung upon the warp beam, and which operates from time to time with exhaustion of the warp to pay out the warp specifically by the use of an escapement mechanism which permits the turning of the warp beam while maintaing at all times the tension on the warp. More specifically the invention contemplates the employment of an escapement mechanism on the warp beam operating continuously to exert a tension upon the warp, and at the same time to permit the turning of the warp beam by the operation of the escapement as the warp is exhausted.

It is to be further observed that there are no friction parts which are employed to resist the letting-off of the warp, but that such resistance is secured by the application of a weighted mechanism which swings freely under the tension of the warp, only being resisted by a weight which resists such tension so that uniformity of warp tension is secured, whereas where friction devices are employed in let-offs, the friction devices require constant adjustment in order to secure the proper warp tension. It is believed

that this is the first let-off mechanism acting to resist the tension of the warp solely by means of a weight so applied as to cause a uniform tension to be applied to the warp at all times during the weaving.

In the illustrated embodiment of the invention the escapement employed is one in which a toothed escapement is used, but it is apparent that, viewed in its broader aspects, other devices for holding the escapement arm from motion with respect to the warp beam might be employed.

The invention finds embodiment in the construction illustrated in Figs. 1 and 2 as thus far described. It also finds embodiment in the construction illustrated in Fig. 3, in which the means for controlling the escapement is different. The entire mechanism with the exception of parts referred to, is the same as in the mechanism illustrated in Figs. 1 and 2. In this modified form, however the release arm 70, mounted on the pivot pin 25 is provided with a rearwardly extending portion adapted to be engaged by the hand of the operator so that the escapement may be conveniently actuated manually. This release arm is also provided with a forwardly extending arm 71 adapted to be engaged by the rearwardly extended end 72 of the lever 73, the forward end 74 of which is actuated by the cam 75 on the cam shaft 76 of the loom. This lever 73 is pivotally mounted at 77 upon the bracket 78 bolted on the frame of the loom. This lever 73 is an escapement hammer, and is continuously oscillated in the operation of the loom to cause its rear end to rise and fall. As the warp is consumed the escapement arms 23 are turned to the left, and the weight is lifted until the forward end 71 of the release arm 70 is moved under the rear end 72 of the escapement hammer or lever 73. Thereupon, on the next downward movement of the rear end 72 of the escapement hammer the release arm 70 is turned, whereupon the holding teeth of the escapement are withdrawn from engagement with the teeth of the ratchet wheels and are re-engaged with the next teeth. This involves the same backward and forward movement of the escapement arm which moves with the holding teeth toward the left until the ratchet wheel tooth is released, whereupon the escapement arm again moves to the right and causes the holding teeth of the escapement lever 26 to engage the next tooth of the ratchet wheel, continuously applying resisting pressure to the beam as the releasing tooth 29 operates to engage the face of a ratchet wheel tooth at about the time the holding tooth is released from the face of another advancing ratchet wheel tooth. A continuous warp tension is thus maintained with this construction as with the construction of Figs. 1 and 2, which is dependent upon the amount of weight applied, and does not vary with the diameter of the warp beam at any given time.

Having thus described the invention, what is claimed is:

1. A let-off for looms having, in combination, a warp beam provided with an escapement disk, an escapement arm pivoted concentrically with relation to the disk, escapement connections between the escapement arm and the disk, a weight tending to move the escapement arm in the direction to resist the pull of the warp, operating automatically upon consumption of the warp to release the escapement from time to time and re-apply it so as to secure the gradual letting-off of the warp under the restraint of the weight.

2. Let-off mechanism for looms having, in combination, a warp beam provided with an escapement wheel, an escapement having teeth for alternating engagement with the escapement wheel, a carrier for said escapement, means for operating the escapement when the escapement is moved a predetermined distance so as to permit the movement of the escapement wheel to pay off the warp, and weighting means connected with the escapement carrier to restrain the movement of the escapement wheel in a direction to let-off the warp.

3. A let-off for looms having, in combination, a warp beam provided with an escapement wheel, an escapement lever having a holding tooth at one end and a restraining tooth at the other adapted alternately to engage the teeth of the escapement wheel, a carrier for the escapement, a weight connected with the escapement tending to move it in a direction to cause it to apply tension to the warp, and means for actuating the escapement upon movement of the escapement wheel for a certain arcuate distance.

4. Let-off mechanism for looms having, in combination, a warp beam provided with an escapement wheel, a weight actuated arm adapted to exert a continuous rotative force upon the warp beam in the warp winding direction to exert tension on the warp, means connected to said weight actuated arm and adapted to engage the teeth of the escapement wheel, and means actuated by the tension of the warp to operate said tooth engaging means to pay off the warp step-by-step.

5. Let-off mechanism for looms having, in combination, a warp beam provided with an escapement wheel, a weight actuated arm adapted to exert a continuous rotative force upon the warp beam in the warp winding direction to exert tension on the warp, means upon said arm adapted to engage the teeth of the escapement wheel, and means actuated by the tension of the warp to shift said arm and thereby actuate the tooth engaging means to pay off the warp.

6. Let-off mechanism for looms having, in combination, a warp beam provided with an escapement wheel, an arm adapted to exert a continuous rotative force upon the warp beam in the warp winding direction to exert tension on the warp, an escapement associated with said arm and adapted to engage the teeth of the escapement wheel, means actuated by the tension of the warp to operate said escapement to pay off the warp, a weight acting upon said arm to tension the warp, and means adapted to engage the warp on the beam and shift said weight to vary its action upon said arm.

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