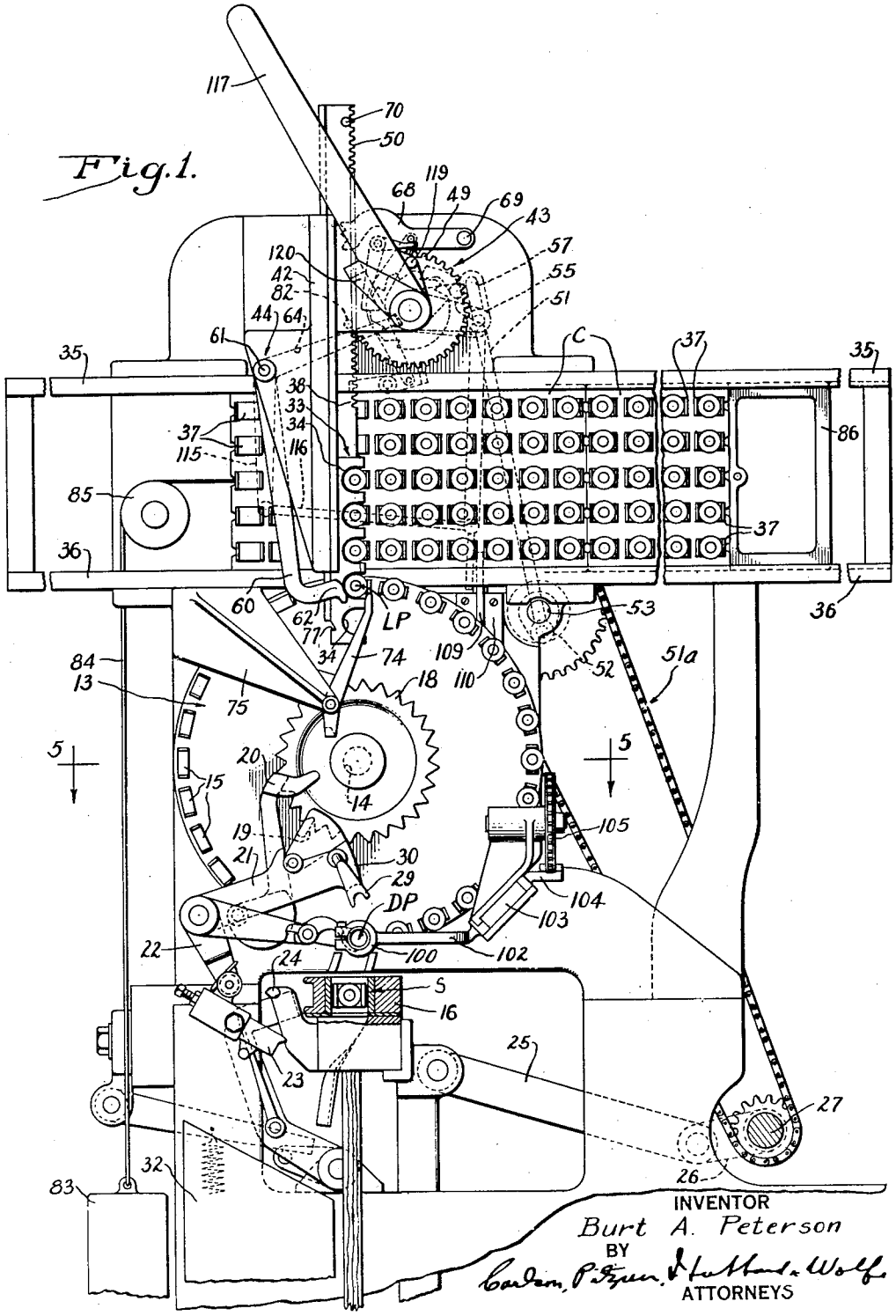
March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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Fig. 1.



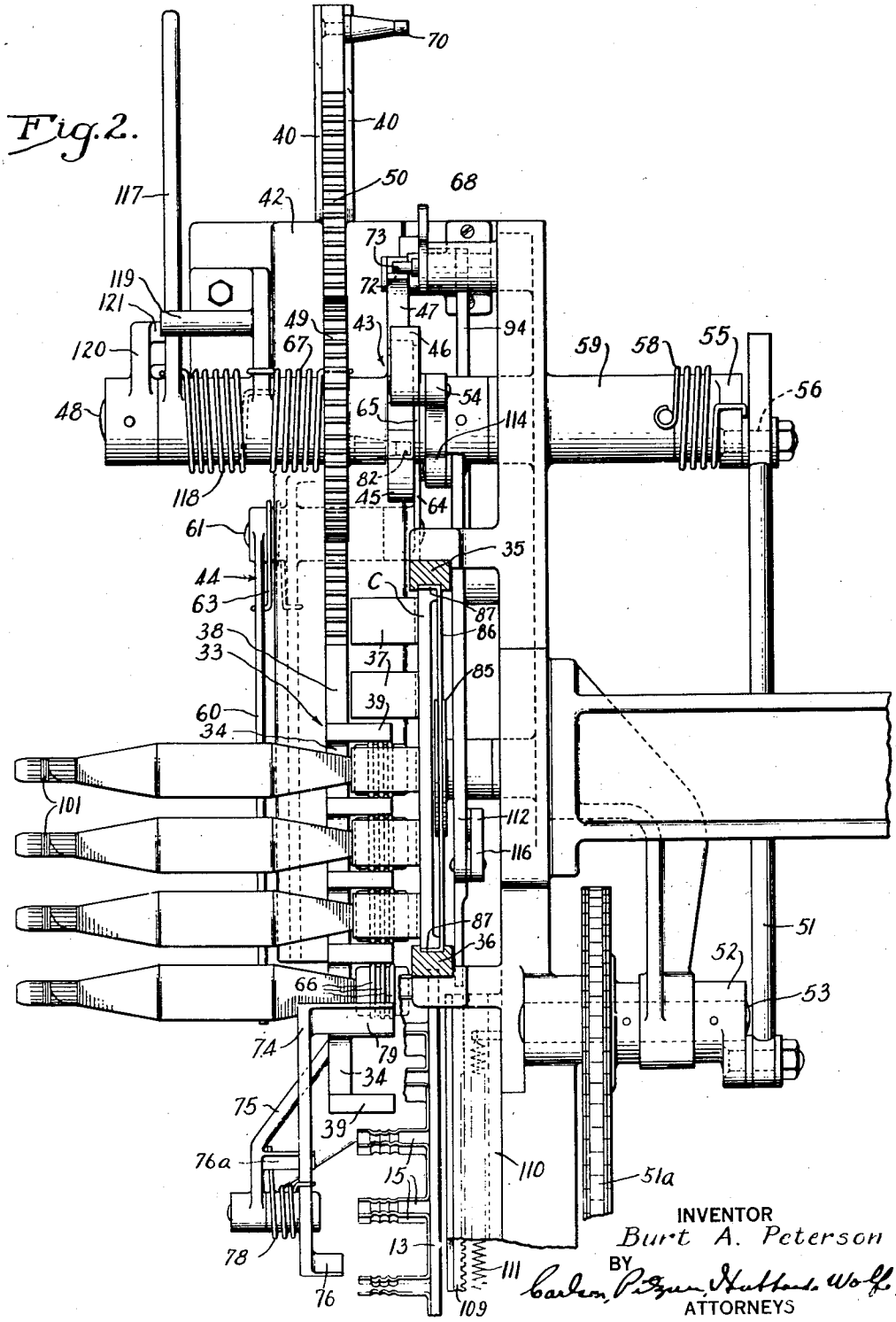

INVENTOR
Burt A. Peterson
BY
Carlson, Price, Hutchinson & Wolf
ATTORNEYS

March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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Fig. 2.




INVENTOR
Burt A. Peterson
BY
Carlson, Pitzner, Hubbard & Wolfe
ATTORNEYS

March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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Fig. 3.

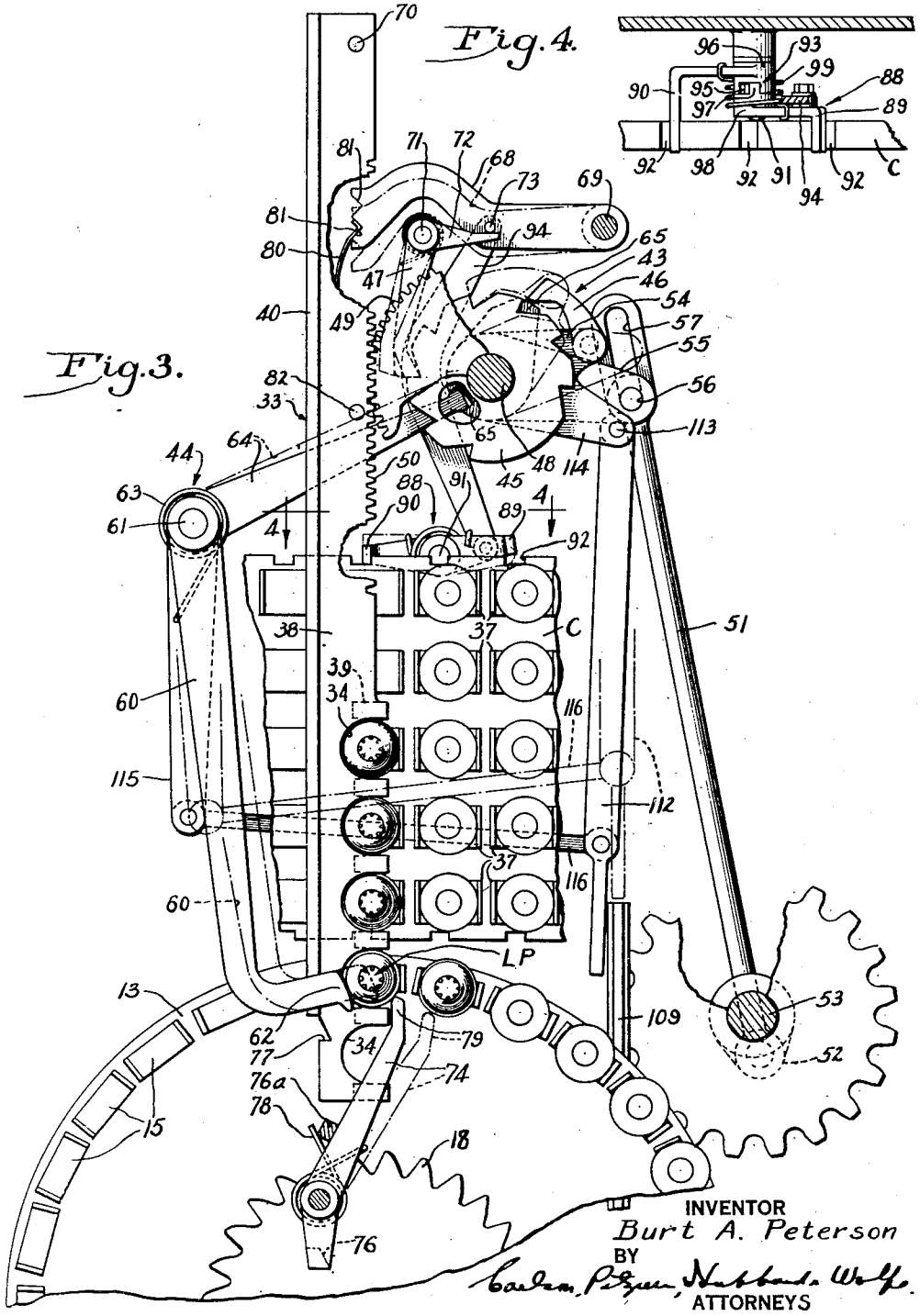



Fig. 4.




INVENTOR
Burt A. Peterson
BY
Cadwalader, Pierson, Hubbard & Wolf
ATTORNEYS

March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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Fig. 5.

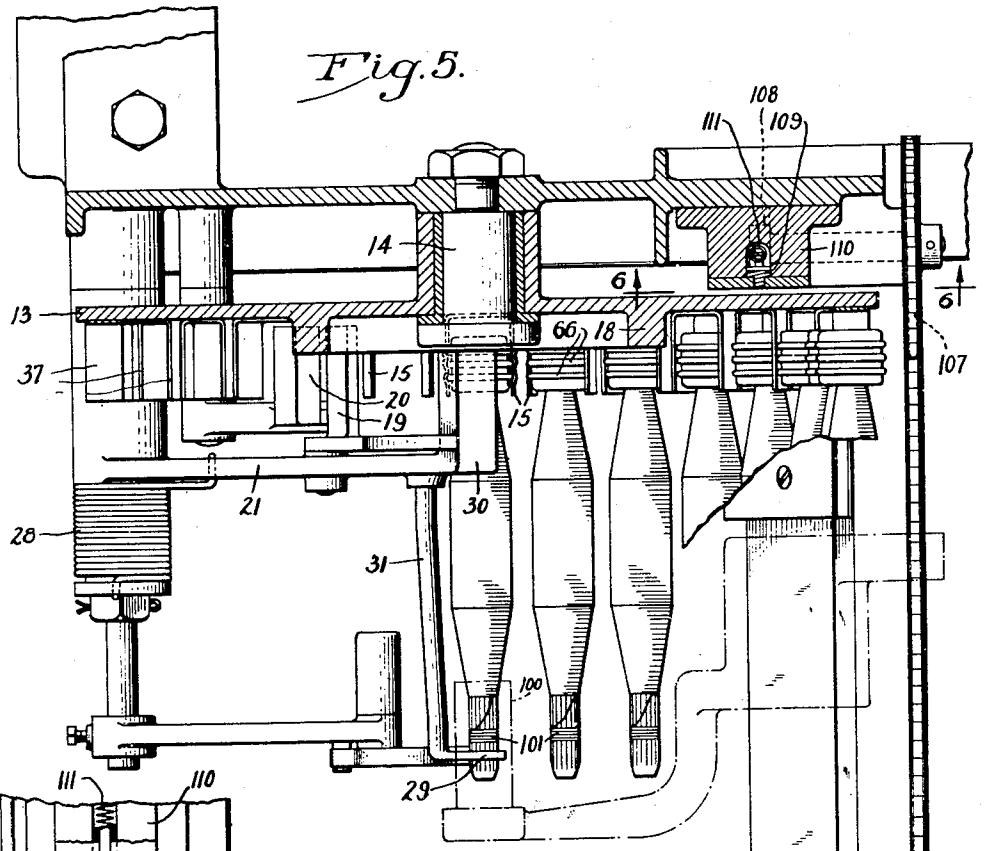
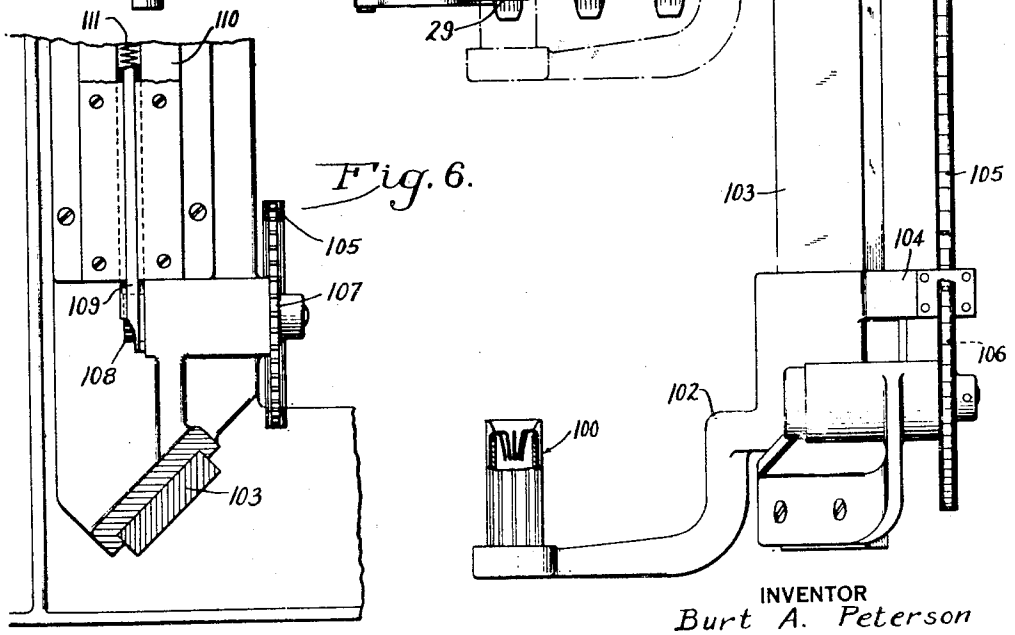



Fig. 6.




INVENTOR
Burt A. Peterson
BY
Carlson, Pegman, Hubbard & Wolfe.
ATTORNEYS

March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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Fig. 7.

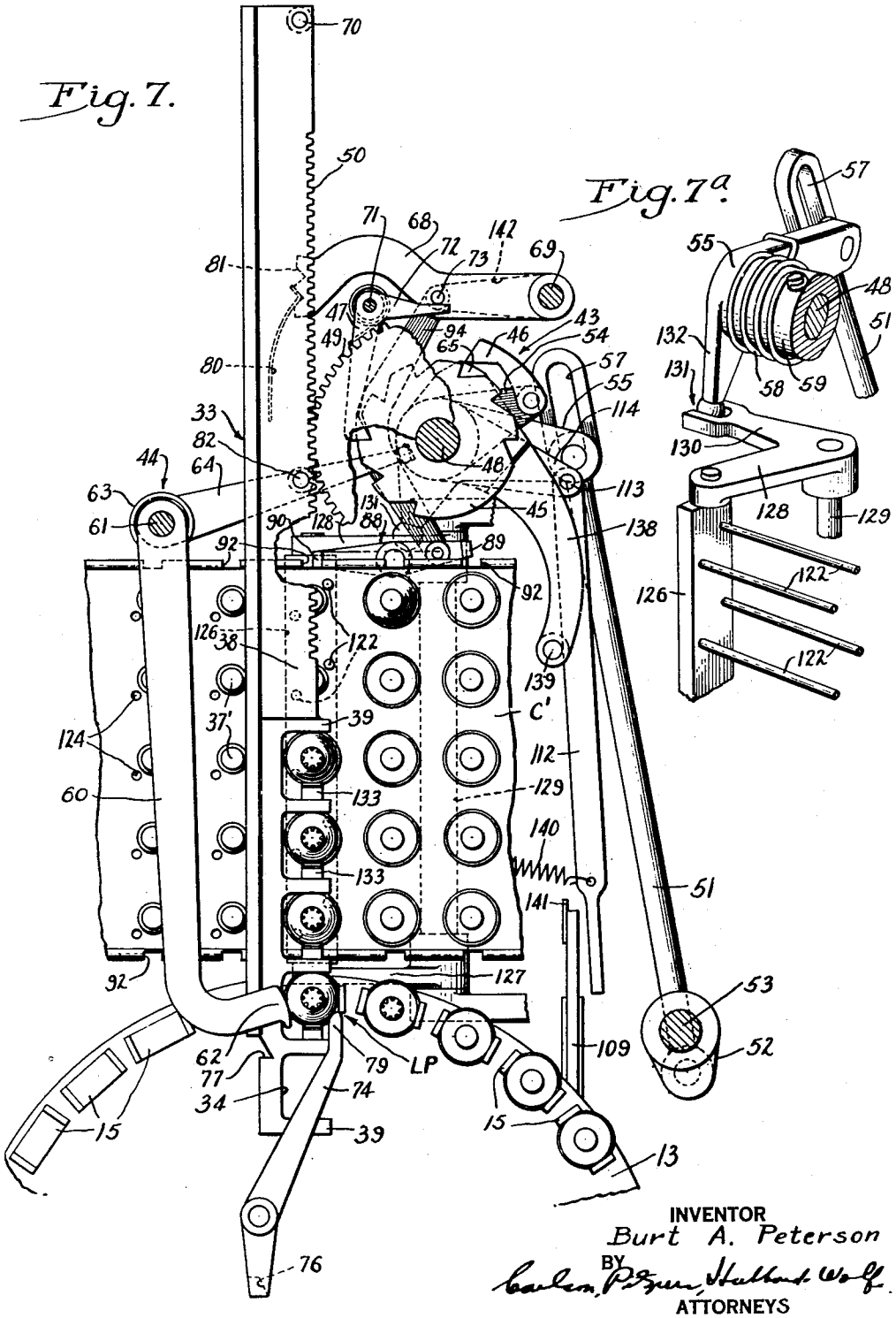



Fig. 7a.




INVENTOR
Burt A. Peterson
BY
Carlson, Pegram, Hallard & Wolf
ATTORNEYS

March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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Fig. 8.

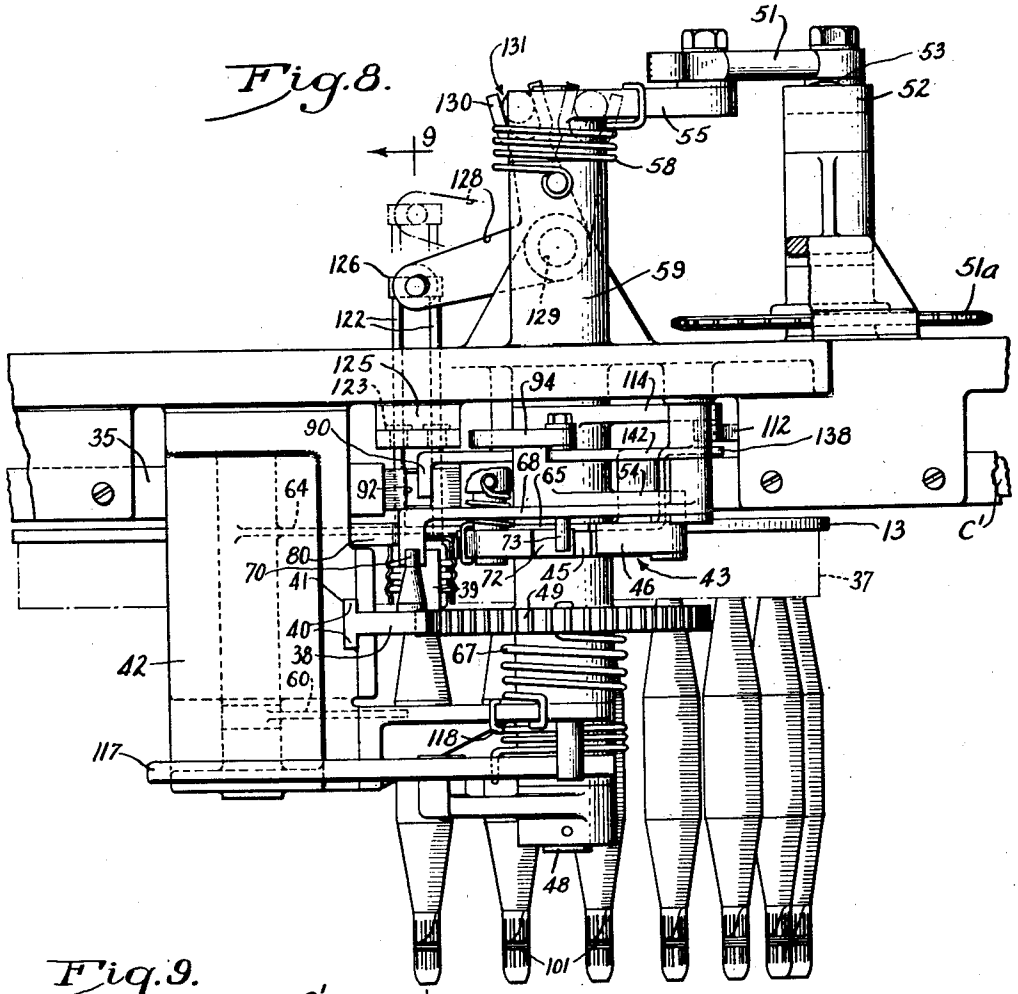
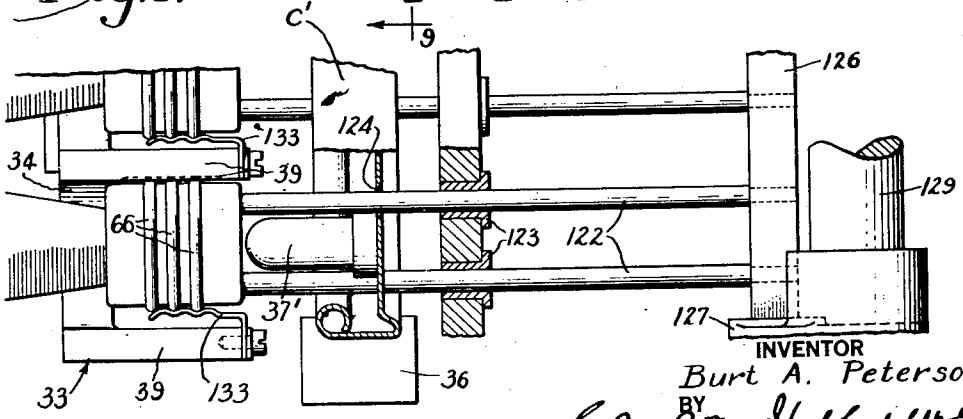



Fig. 9.




INVENTOR
Burt A. Peterson
BY
Carlson, Pitzer, Hubbard & Wolfe.
ATTORNEYS

March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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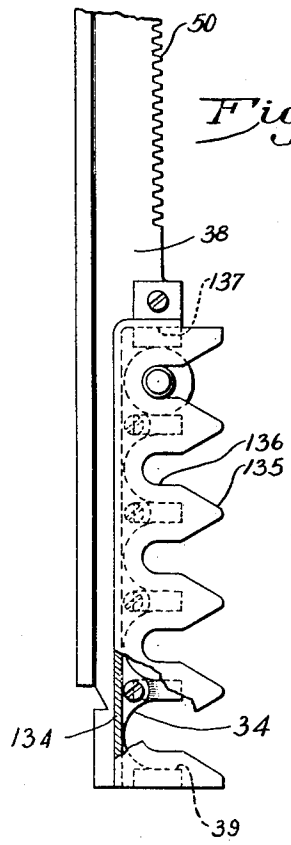



Fig. 11.

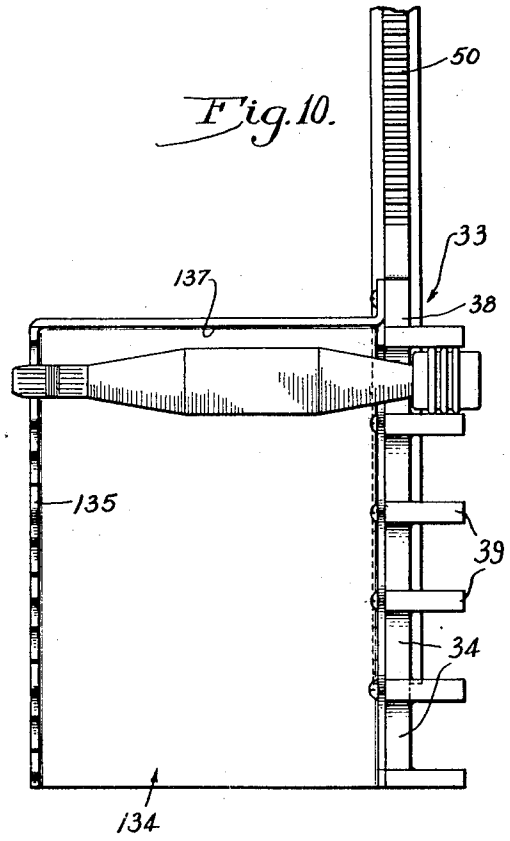



Fig. 10.

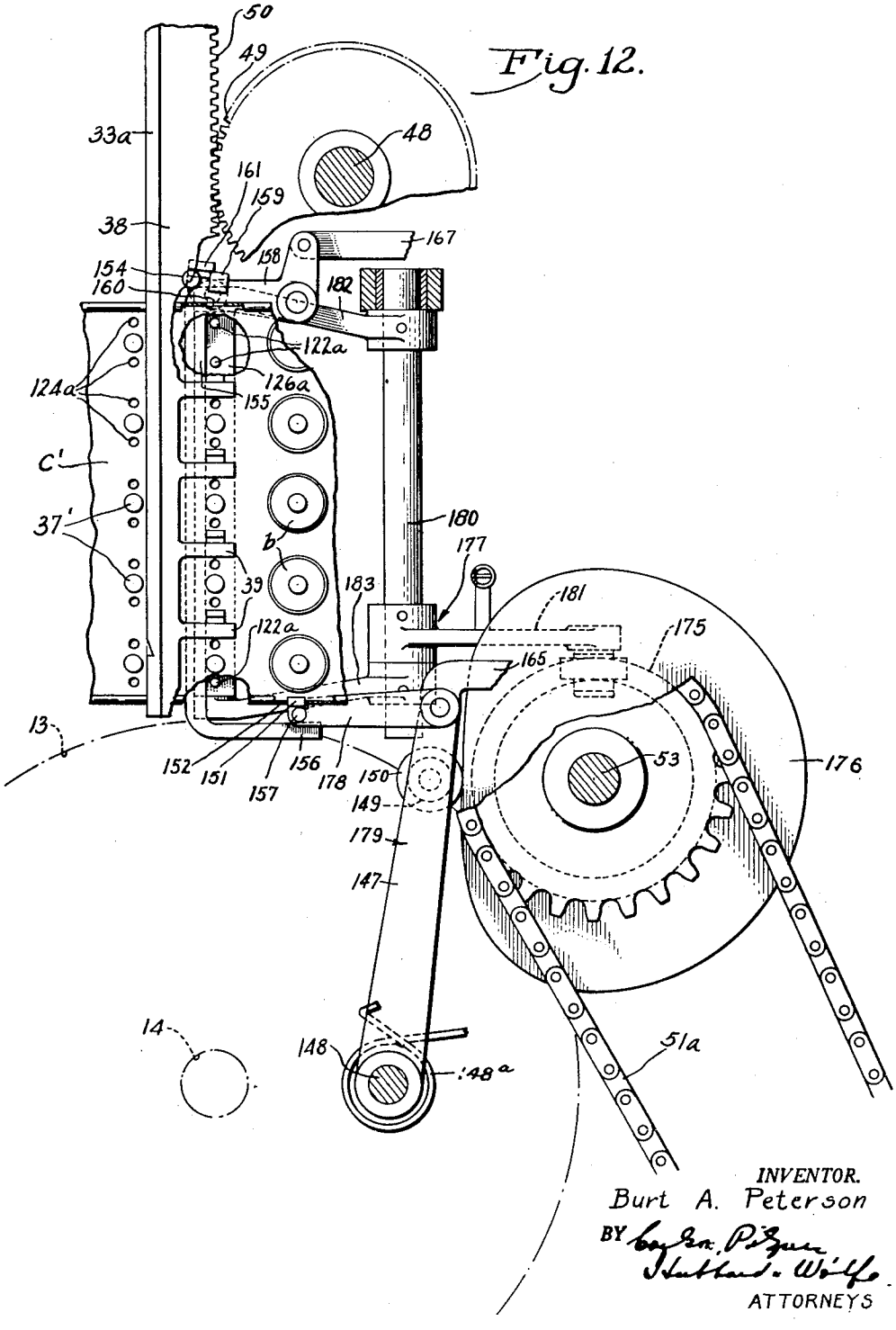
INVENTOR
Burt A. Peterson
BY
Carlson, Price, Hutchinson & Wolfe
ATTORNEYS

March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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Fig. 12.




INVENTOR.
Burt A. Peterson
BY by Ex. Pitzer
Hubbard & Wolfe
ATTORNEYS

March 8, 1949. B. A. PETERSON 2,463,904

BOBBIN REPLENISHING MECHANISM FOR LOOMS

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Fig. 13.

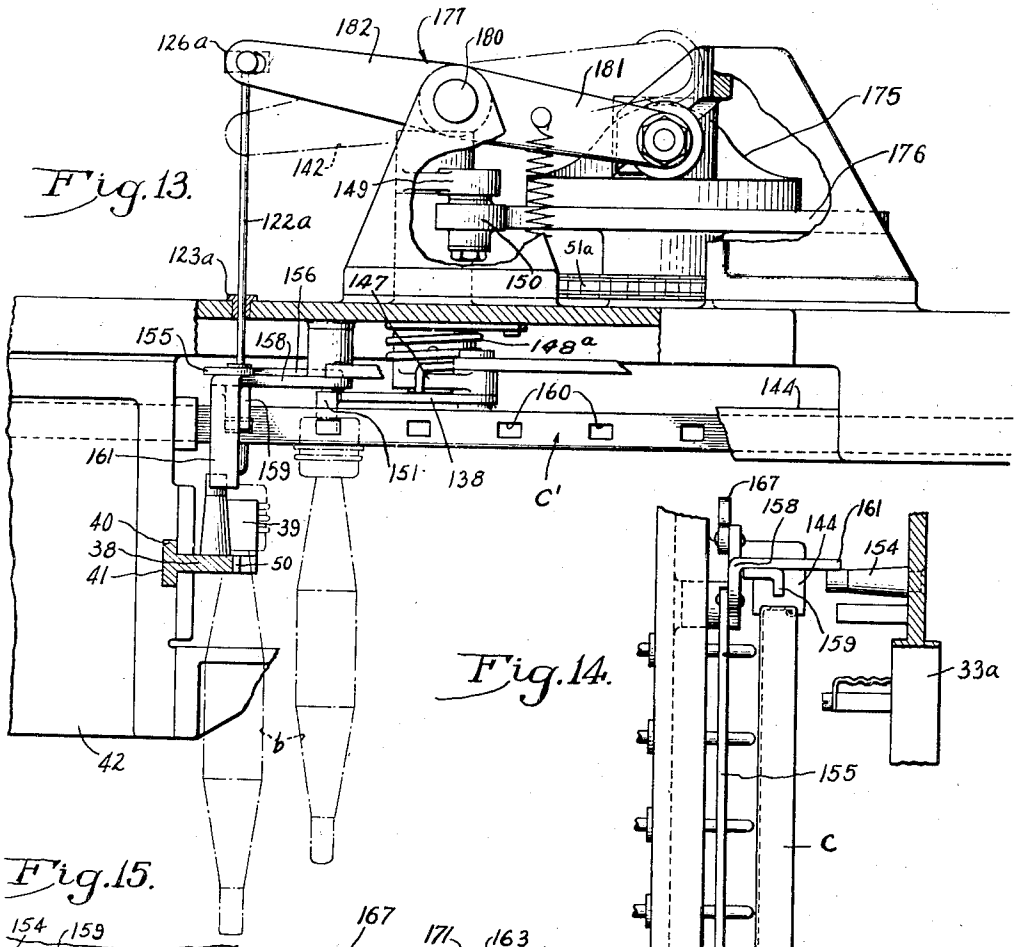
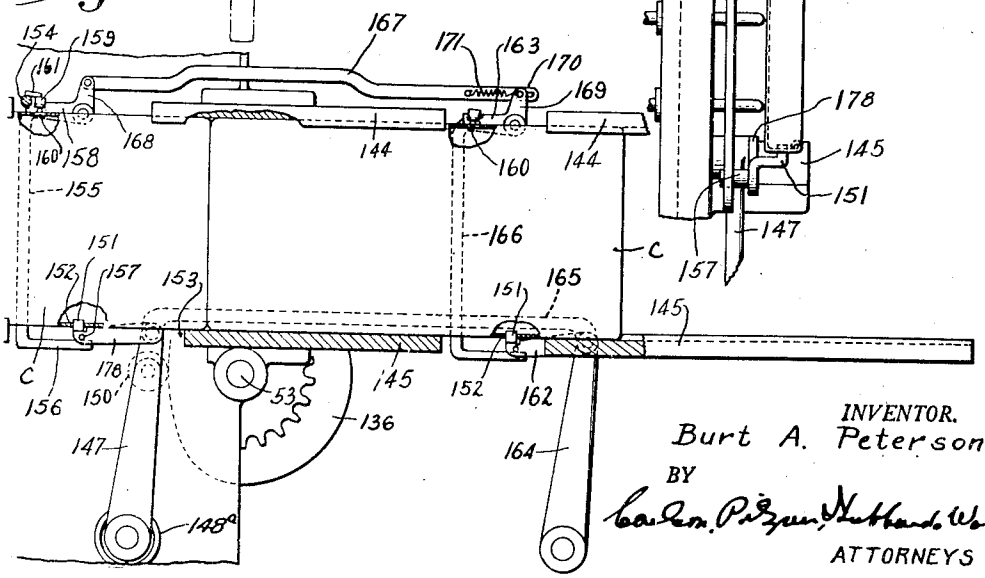



Fig. 14.




Fig. 15.




INVENTOR.
Burt A. Peterson
BY
Carlson, Pitzen, Hubbard & Wolfe
ATTORNEYS

Patented Mar. 8, 1949 2,463,904

# UNITED STATES PATENT OFFICE

2,463,904

## BOBBIN REPLENISHING MECHANISM FOR LOOMS

Burt A. Peterson, Rockford, Ill., assignor to Barber-Colman Company, Rockford, Ill., a corporation of Illinois

Application June 27, 1946, Serial No. 679,706

45 Claims. (Cl. 139—245)

1

The invention pertains to a mechanism for delivering wound bobbins automatically to a weft replenishing loom, and has especial reference to a mechanism for operating upon bobbins wound with rayon or the like for transferring the same one by one to the loom shuttle from holders supporting individual bobbins in spaced relation, it being necessary that rayon wound bobbins be supported individually and out of contact with each other so as to prevent injury to the yarn.

Weft replenishing looms are commonly provided with means for supplying wound bobbins to the shuttle, such means including a rotary carrier or magazine containing a supply of wound bobbins, in combination with means responsive to the exhaustion of the bobbins in the operation of the loom to remove a wound bobbin from the magazine, deliver it to the shuttle and at the same time eject the exhausted bobbin from the shuttle.

The primary object of the present invention is to supply wound bobbins to the magazine while supporting the bobbins individually so as to prevent injury to the yarn wound thereon.

A further object is to provide in association with the magazine of the replenishing mechanism, a supply mechanism including a loading device providing a plurality of bobbin receptacles and operative to effect the transfer of the bobbins in such receptacles one by one to the magazine.

Another object is to provide for the automatic delivery of wound bobbins to the loading device.

Still another object is to provide a bobbin supply in which the individual bobbins are supported upon carriers of the pin board type equipped with holders for supporting the individual bobbins in spaced relation, in combination with means for transferring a row of bobbins from the carrier or pin board to the loading device.

A further object is to provide for the actuation of the loading device and of the means for supplying bobbins thereto in proper timed relation to the successive indexing operations of the magazine.

Another object is to provide an end finder mechanism operative in timed relation to the transfer of bobbins to the magazine to position the end of the yarn on a bobbin preliminary to its ejection from the magazine into the loom shuttle.

The objects of the invention thus generally set forth, together with other and ancillary advantages are attained by the construction and arrangement shown by way of illustration in the accompanying drawings, in which:

Figure 1 is an end elevational view of the weft

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replenishing side of a loom equipped with a bobbin supply and replenishing mechanism embodying my invention.

Fig. 2 is a fragmentary elevational view looking from the right of Fig. 1 and illustrating the upper portion of the mechanism on an enlarged scale, the guide means for the pin boards or carriers being shown in section.

Fig. 3 is a fragmentary front elevational view of the upper portion of the mechanism as shown in Fig. 1 but on a larger scale.

Fig. 4 is a sectional view taken approximately in the plane of line 4—4 of Fig. 3 and illustrating in plan an escapement mechanism forming part of the means for advancing the bobbin carriers.

Fig. 5 is a horizontal sectional view taken approximately in the plane of line 5—5 of Fig. 1 but on a somewhat enlarged scale.

Fig. 6 is a fragmentary sectional view taken approximately in the plane of line 6—6 of Fig. 5.

Fig. 7 is a view similar to Fig. 3 but showing a modified form of my invention adapted for the handling of bobbins mounted upon bobbin carriers through the medium of supporting pins necessitating axial movement of the bobbins out of engagement with the pins.

Fig. 7a is a fragmentary perspective view of a portion of the mechanism shown in Fig. 7.

Fig. 8 is a fragmentary plan view of the mechanism shown in Fig. 7.

Fig. 9 is an enlarged fragmentary view partially in section taken approximately in the plane of line 9—9 of Fig. 8.

Fig. 10 is a fragmentary side elevational view showing a modified form of loading device.

Fig. 11 is a fragmentary front elevational view of this device.

Fig. 12 is a fragmentary longitudinal sectional view showing a modified form of means for positively ejecting bobbins from the pin board, together with an alternative form of means for indexing the pin boards.

Fig. 13 is a fragmentary horizontal sectional view of the modified form shown in Fig. 12 but on a larger scale.

Fig. 14 is a fragmentary end elevational view of the pin board and associated indexing mechanism looking from the left in Fig. 13, the loading device being shown in section.

Fig. 15 is a fragmentary front elevational view with parts in section, showing the pin board indexing mechanism on a somewhat smaller scale than that of Fig. 12.

Referring to Fig. 1 of the drawings, I have shown for purposes of illustration a loom equipped

with a bobbin replenishing mechanism of a well known character, together with my improved loading and supply means. The means for delivering wound bobbins to the loom being old, it may be described briefly as comprising a magazine 13 in the form of a rotary plate or disk mounted for rotation on a shaft 14 and equipped at its periphery with a circumferential series of bobbin holders, herein in the form of U-shaped clips 15. Successive stepping or indexing movements are imparted to the magazine 13 to carry wound bobbins successively into a delivery position generally designated DP at the lower central edge of the magazine, and while in this position the bobbins are ejected from the magazine and delivered to a shuttle S supported in the lay 16 of the loom.

The means for imparting indexing movements to the magazine and for ejecting a wound bobbin into the shuttle from the magazine, is operative in response to the action of a detector mechanism which in turn is responsive to exhaustion of yarn from the loom shuttle. The indexing mechanism comprises a ratchet wheel 18 rigid with the magazine, an actuating pawl 19, and a holding pawl 20. The actuating pawl is carried by one arm 21 of a bell crank, the other arm 22 of which carries a member 23 shiftable in response to the action of the detector mechanism into the path of a bunter 24. The latter is mounted upon the lay 16 which is connected by a pitman 25 with a crank arm 26 on the loom drive shaft 27. When the member 23 is shifted into the path of the reciprocating bunter 24, the bell crank is actuated against the action of a coiled torsion spring 28 (Fig. 5) so as to swing the arm 21 and its pawl 19 downwardly, and upon the return movement of the lay, the arm is swung upwardly by the spring 28 to impart an indexing movement to the magazine. In the downward movement of the arm, and therefore in advance of the indexing operation, the wound bobbin previously advanced into the delivery position is engaged by a pair of spaced fingers 29 and 30 carried by the arm 21 (Figs. 1 and 5). Finger 29 is mounted on a rod 31, and both fingers are appropriately shaped to engage the tip and butt ends respectively of the bobbin. As the wound bobbin moves into the shuttle the exhausted bobbin is discharged therefrom into an underlying carrier container 32.

In accordance with my invention, individually supported wound bobbins are transferred one at a time to the magazine 13 by means comprising generally a loading device 33 providing a series of bobbin receptacles 34 and mounted for reciprocation toward and from the magazine transversely of the direction of movement of the bobbin holders 15 of the magazine. The loading device is herein shown as disposed above the magazine for vertical movement relative thereto, and is operative to carry wound bobbins in the receptacles 34 successively into engagement with successive holders 15 on the magazine when the holders occupy their uppermost or loading position generally designated LP.

The bobbin loading device 33 is herein shown as provided with five receptacles 34 disposed one above the other and in spaced relation. Rows of five bobbins each are delivered to the loading device successively, and in the preferred embodiment of my invention the wound bobbins are supported upon carriers C of the pin board type mounted for horizontal sliding movement in stationary guideways 35 and 36. Each of the carriers C is equipped with with a group of bobbin



holders 37 arranged in parallel vertical rows with five holders in each row. In general, the arrangement is such that with the loading device in its uppermost position (it being shown in Figs. 1 and 3 in a partially advanced position), the carrier is advanced to deliver the bobbins of the leading row into the receptacles 34, whereupon the loading device is actuated with a step-by-step movement in timed relation to the indexing movements of the magazine to present bobbins one by one to the loading position; and, upon the transfer of the last bobbin in the leading row to the magazine, the loading device is returned and the carriers advanced to position the next row of bobbins in the loading device.

The loading device 33, in the present embodiment of the invention, is in the form of a rack. It comprises a bar 38 mounted for vertical sliding movement on the loom frame and having a plurality of lugs 39 spaced apart so as to form between them the bobbin receptacles 34. The rack may be supported and guided in the frame in the manner shown in Fig. 8. Thus the bar 38 is formed with side flanges 40 which are guided in a way 41 in a frame member 42. It will be understood that the receptacles 34 formed by the lugs 39 are spaced apart vertically a distance corresponding to the spacing of the holders 37 on the carriers C, so that when the rack is in its uppermost position, an advancing movement imparted to the carriers horizontally (to the left in Fig. 1), will result in the positioning of the leading row of bobbins in the receptacles 34.

The rack 33 is advanced with a step-by-step movement in timed relation to the indexing movements of the magazine 13. In the present preferred embodiment of the invention this means comprises a pawl and ratchet mechanism generally designated 43 (Figs. 2 and 3) arranged for continuous actuation from a suitable power source but rendered effective by a feeler means 44 responsive to the indexing movements of the magazine.

As shown, the pawl and ratchet mechanism comprises a ratchet disk 45 having an actuating pawl 46 and a holding pawl 47. The disk is loosely mounted upon a shaft 48 and is rigid with a spur gear 49 meshing with rack teeth 50 on the upper end of the rack bar 38. The pawl 46 is arranged for reciprocation by a pitman 51 connected with a crank 52 on a power driven shaft 53, this shaft being connected with the loom drive shaft 27 by a chain and sprocket mechanism 51*a*. The pawl 46 is pivoted upon an arm 54 fast on the shaft 48 (Fig. 2). Also fast on the shaft and spaced inwardly therefrom is a second arm 55 carrying at its free end a pin 56 (Fig. 3) riding in a slot 57 in the upper end of the pitman 51. For a purpose which will subsequently appear, the pin 56 is normally held at the bottom of its slot 57 by a torsion spring 58 (Fig. 2) anchored at one end to a stationary bearing sleeve 59 for the shaft and at its other end to the arm 55.

The feeler device 44 comprises an arm 60 loose on a shaft 61 and carrying at its lower end a finger 62 disposed so as to engage with a bobbin in the loading position LP on the magazine. A coiled torsion spring 63 acts upon the arm 60 so that the finger 62 is biased to swing toward the bobbin in the loading position and to move with this bobbin in the indexing movement of the magazine.

The feeler is operative to control the pawl and ratchet mechanism through the medium of an arm 64 rigid with the arm 60 and connected with

a guard plate 65 loose on the shaft 48, the connection between the arm 64 and the plate being in the present instance in the form of a notch in the hub portion of the guard plate receiving the free end of the guard plate 65. It will be understood that the guard plate 65 is disposed on the shaft 48 so as to be engageable by the actuating pawl 46, the arrangement being such that when the feeler 62 engages with a bobbin in the loading position, the guard plate acts to hold the pawl in disengaged relation to the ratchet wheel 45, and when the feeler is permitted to move under the action of its spring 63 as an incident to the indexing of the magazine, the guard plate is shifted (in a clockwise direction, Fig. 3) to permit the pawl to engage with the ratchet wheel. Thus, while the actuating pawl is continuously reciprocated it becomes effective to impart an advancing movement to the rack 38 only when the guard plate 65 is shifted by the feeler 62 in response to the movement of the magazine.

In successive advancing movements of the rack the bobbins in the leading row of holders of the bobbin carrier C then in active position are moved step-by-step, the lowermost bobbin first moving into the delivery position and the remaining bobbins moving from their respective holders to the next lowermost holders. To permit of such movement of the individual bobbins transversely of their axes, the holders 37 are, like the holders 15 of the magazine, in the form of U-shaped spring clips, these clips being designed for coaction with the butt ends of the bobbins as shown in Figs. 2 and 5 equipped with the conventional wire rings 66.

After a predetermined number (herein five) of downward stepping movements imparted to the rack, and following movement of the last loaded bobbin out of engagement with its receptacle in the rack by movement of the magazine 13, the rack is restored to its initial upper position for the reception of a new vertical row of bobbins. Movement of the rack in an upward direction is effected by means of a coiled torsion spring 67 (Fig. 2) having one end anchored to the frame of the machine and its other end anchored to the spur gear 49, which spring is energized in the downward movement of the rack.

To permit of return movement of the rack, the holding pawl 47 of the pawl and ratchet mechanism is disengaged from the ratchet wheel 45. This is accomplished in the present instance by a lever arm 68 pivoted at 69 and having its free end disposed in the path of a pin 70 on the upper end of the rack bar 38. The holding pawl 47 is mounted on a pivot pin 71 and has rigid therewith a tail 72 underlying a pin 73 on the lever arm 68. When the rack moves into its lowermost position, the pin 70 strikes the arm 68 swinging it downwardly, thereby actuating the tail 72 of the pawl 47 to shift the latter into disengaged relation to the ratchet wheel.

To insure that the rack 38 will not be returned until the last bobbin advanced to loading position has been moved out of its receptacle in the rack, the return movement of the rack by the spring 67 is conditioned upon such indexing movement of the magazine. For this purpose I provide a second feeler 74 pivoted on a bracket 75 and having at its lower end a dog 76 for coaction with a notch 77 in the rack. A coiled torsion spring 78 causes the dog 76 to swing against a stop 76a and into engagement with the notch 77 as the uppermost bobbin of each row is advanced into loading position. The upper end of the



feeler has a finger 79 disposed adjacent the loaded bobbin as shown in Fig. 3 so that the latter operates in the succeeding indexing stroke of the magazine to swing the feeler so as to carry the dog 76 out of engagement with the notch 77. The holding pawl 47 of the ratchet mechanism having also been disengaged as above set forth, the rack is now free for return by the action of the spring 67.

During the return movement of the rack, the holding pawl 47 of the ratchet drive mechanism is retained in disengaged relation to the ratchet wheel by a spring detent 80 engaging with the upper one of two notches 81 in the free end of the arm 68. The detent normally engages the lower one of the notches to hold the lever arm in its elevated position in which the holding pawl is permitted to engage with the ratchet wheel. At the end of the upward or return movement of the rack, a pin 82 thereon strikes the free end of the lever arm 68 carrying the pin 73 thereon upward and allowing the pawl 47 to move inwardly into engagement with the ratchet.

It will be seen that by the construction and arrangement set forth, the holding pawl 47 of the pawl and ratchet mechanism is actuated to permit return movement of the rack, but that such return movement is delayed for a sufficient time to permit movement of the last delivered bobbin to be carried out of engagement with or free of the rack by movement of the magazine 13. This is important because an immediate return movement of the rack upon disengagement of the holding pawl would serve to withdraw the last loaded bobbin upwardly from the magazine. Thus not only is the indexing movement of the magazine utilized to render the rack advancing mechanism effective, but such indexing movement is also utilized to control the return of the rack.

Upon the return of the rack to its initial or upper position, a new vertical row of bobbins is moved into the bobbin receptacles 34 of the rack. For this purpose, the bobbin carrier or carriers, as the case may be, are slid horizontally to the left (Fig. 1). This is accomplished in the present instance by the action of a weight 83 on the lower end of a cable 84 running over a guide pulley 85 and connected to a backer 86 slidable in the ways 35 and 36. As shown in Fig. 2, the backer is in the form of a metal plate having upper and lower edge flanges 87 engaging in the ways 35 and 36. The left-hand edge of the backer is disposed in abutting relation to the trailing carrier, two such carriers being shown in Fig. 1.

For controlling movement of the carriers under the action of the weight 83, I provide an escapement mechanism designated generally 88 (Figs. 3 and 4) conditioned as an incident to the movement of the rack into its lowermost position and actuated to initiate a stepping movement of the carrier upon the return of the rack to its return or upper position. This escapement mechanism comprises two pawls 89 and 90 pivotally mounted upon a common supporting stud 91 and respectively engaging in spaced notches 92 in the upper edges of the carriers C, such notches being formed in opposite edges of the carriers so that the latter may be positioned with either edge uppermost. As shown in Fig. 4, the pawls have portions extending laterally with respect to the carrier and these portions are of a thickness somewhat less than the width of the notches for a purpose which will present appear.

Normally, the pawl 90 engages in its notch 92

and the pawl 89 is elevated with respect to its notch as shown in Fig. 3. At the end of the downward movement of the rack, the pin 70 on the rack engages the lever arm 68 as above described, moving this arm downwardly, and this movement of the arm is utilized through the medium of a connecting link 94 to swing the pawl 89 downwardly into engagement with its notch while lifting the pawl 90 out of its notch. Due to the width of the notch into which the pawl 89 thus moves, the carrier is permitted to advance a short distance sufficient to carry the notch for the pawl 90 out from under this pawl so as to rest upon the upper edge of the carrier immediately to the right (Fig. 3) of the notch.

The notches 92 are spaced apart according to the spacing of the rows of bobbin holders on the carrier, and movement of the carrier is initiated upon the return movement of the rack 38 to its upper position. For this purpose, the pawls 89 and 90 have a yieldable lost motion connection 93 therebetween (Fig. 4) permitting the pawl 89 to be moved upwardly relative to the pawl 90 so as to free the carrier for movement by the weight 83 until the pawl 90 drops into the next notch. Such upward lifting movement is imparted to the pawl 89 through the medium of the link 94 connecting the pawl 89 with the lever arm 68. Thus, as the rack approaches its uppermost position, the pin 82 engaging with the lever arm 68 as above described, lifts the arm and thereby the pawl 89 as permitted by the yieldable lost motion connection.

In the present instance, the lost motion connection is formed by a notch 95 in a hub portion 96 rigid with the pawl 90, and a lug 97 rigid with a hub portion 98 of the pawl 89. A coiled torsion spring 99 acts upon the two pawls to take up the lost motion in one direction, so that in the conditioning operation incident to the descent of the rack to its lowermost position, the downward thrust of the link 94 on the pawl 89 is transmitted positively to the pawl 90 to lift it out of its notch on the carrier. On the other hand, the lost motion connection permits the pawl 89 to be moved upwardly by the link 94 as an incident to the return movement of the rack 38 to its uppermost position. Thus it will be seen that the escapement is conditioned in the downward movement of the rack in the sense that the pawl 90 is disengaged from its notch, and it is actuated to cause the carrier to be advanced one step as an incident to the return movement of the rack, in which movement the pawl 89 is disengaged from its notch in the carrier.

After a bobbin has been delivered to the magazine 13 it is necessary that the end of the yarn wound upon the bobbin be seized and positioned for engagement by the conventional selvage clamping and shearing device preliminary to the transfer of the bobbin into the loom shuttle. Accordingly, I have provided an end finding means including a finder 100 (Fig. 5) mounted for reciprocation toward and from the wound bobbin while in its delivery position. As shown, the bobbins are wound in such a way as to provide on the tip ends thereof an auxiliary or finding coil 101, and the finder is so constructed as to be capable of slipping over this coil in the approach of the finder to the bobbin and then stripping the coil from the bobbin in the retraction of the finder away from the bobbin so as to provide an extended end which is held in the ensuing movement of the shuttle.



The finder per se and its mode of operation with respect to the bobbin is of the type disclosed in Colman Patent No. 1,666,735. In the present instance, the finder is mounted on a bracket 102 slidable upon a horizontally disposed bar 103 and having a laterally extending portion 104 clamped to the lower run of an endless chain 105 (see also Fig. 1). The chain is supported by spaced sprockets 106 and 107 (Fig. 5) suitably journaled in the machine frame, and one of these sprockets, namely, the sprocket 107 is operatively associated with the pawl and ratchet drive mechanism for the bobbin rack 38 so as to be actuated in timed relation to the stepping movements of the rack and therefore to the indexing movements of the magazine 13 under the control of the feeler 62.

Referring to Figs. 5 and 6, the sprocket 107 has rigid therewith a pinion 108 with which meshes a rack bar 109 suitably guided for vertical sliding movement in a frame member 110. A coiled contractile spring 111 is connected with the bar and is placed under tension as the bar moves downwardly.

Actuation of the bar 109 in timed relation to the indexing movements of the magazine is accomplished through the use of a push rod 112 pivoted at 113 at its upper end to an arm 114 rigid with the supporting arm 54 of the actuating pawl 46. The push rod 112 is arranged to be positioned in alinement with the bar 109 (see broken lines in Fig. 3) under the control of the feeler 62. For this purpose, the push rod is connected to the feeler by an arm 115 rigid with respect to the feeler arm 60 and a link 116 connecting the arm 115 with the push rod.

When the push rod 112 is retracted to its upper position in the oscillation of the arm 114 and a stepping movement is imparted to the magazine so that the bobbin in the delivery position is carried to the right (Fig. 3), the push rod is swung by the feeler into alinement with the rack bar 109. Thereupon, and in the ensuing downward movement of the actuating arm 114, the rack bar is depressed against the action of its spring 111, with the result that the sprocket 107 is rotated in a direction to cause the bracket 102 to move rearwardly so as to carry the finder 100 into association with the bobbin in the delivery position DP (Fig. 1). In the retraction of the push rod 112, the rack bar 109 is operated reversely by its spring so as to cause the finder 100 to withdraw from the bobbin, carrying with it the coil 101 and holding the end of the yarn in the ensuing operation of the shuttle.

In order that the magazine 13 may be loaded manually, provision is made for the manual actuation of the loading rack, it being contemplated in such event that the magazine 13 will also be indexed manually. For this purpose (see Figs. 1 and 2), I provide a hand lever 117 loosely mounted on the outer end of the shaft 48 and normally urged by a torsion spring 118 against a stop 119. Pinned on the shaft forwardly of the hand lever 117 is an arm 120 having a lug 121 arranged for engagement by the hand lever 117 as the latter is swung in a counterclockwise direction (Fig. 1). In such operation of the hand lever, the shaft 48 is rocked counterclockwise and with it the arm 54 carrying the actuating pawl 46, the arrangement being such that for each swinging movement thus imparted to the hand lever, the actuating pawl is operated to impart a stepping movement to the loading rack 33.

It will be understood that in this operation the guard plate 65 is controlled by the feeler 62 and that in the initial operation the guard plate will occupy a position in nonblocking relation to the pawl 46 due to the absence of any bobbin in the loading position on the magazine 13. It will also be seen that in the normal automatic operation of the machine, the hand lever 117 will remain stationary, the arm 120 only being reciprocated in the operation of the ratchet drive mechanism. Moreover, the manual operation of the shaft 48, by the hand lever 117 independently of the pitman 51 is permitted by the slot 57.

To permit of the use of bobbin carriers in which the individual holders are in the form of pins instead of U-shaped clips, as above described, a somewhat different construction shown in Figs. 7, 7a, 8 and 9 may be employed. In this embodiment, bobbin carriers C' provided with rows of pins 37', are arranged for sliding movement as before in the guides 35 and 36, the carriers being arranged for advance by a weight actuated backer under the control of escapement mechanism as in the preceding embodiment. In this instance, however, the loading rack 33 is disposed outwardly of the bobbin carriers (see Fig. 9) so as to clear the pins 37'. For transferring a row of bobbins one at a time from a bobbin carrier to the loading rack, I provide ejecting means in the form of a plurality of ejector rods 122 arranged for reciprocation in guides 123 and through slots 124 in the carriers for engagement with the butt ends of the leading row of bobbins. The rods 122 are preferably arranged in pairs, one pair for each bobbin in the row and, as shown in Fig. 7, the rods of each pair are disposed diagonally substantially on diametrically opposite sides of the pins 37'.

The guides 123 for the push rods 122 may be supported in a suitable stationary frame member 125. At their rear ends the rods are fastened in a bar 126 pivotally supported between a pair of arms 127 and 128 fast upon a vertically disposed rockshaft 129.

The ejector is arranged for actuation by the pawl actuating arm 55 of the ratchet drive mechanism. For this purpose, the upper arm 128 of the ejector has rigid therewith a rearwardly extending arm 130 (Figs. 7a and 8) pivotally connected to the arm 55 through the medium of a yoke 131 and a downward extension 132 of the arm 55 (see Fig. 7a). The arrangement is such that the ejector rods 122 are retracted in the upward movement of the actuating pitman 51 and are actuated to eject the bobbins from the pins 37' in the downward stroke of the pitman, the pawl actuating arm 55 being swung downwardly by the spring 58.

To receive and hold the ejected bobbins, the rack 33 is in this instance preferably equipped with retaining springs 133 (Fig. 9) attached to the receptacle forming lugs 39. These springs 133 coact with the wire rings on the butt ends of the bobbins so as to hold the latter in proper position with respect to the loading rack. If desired, provision may be made for supporting the tip ends of the bobbins in which event the springs 133 may be omitted. In this connection, reference is made to Figs. 10 and 11 showing a loading rack equipped with a plate 134 secured to the outer side of the rack and having an outer flange 135 shaped to provide laterally opening notches 136 dimensioned to receive and support the tip ends of the bobbins. For stiffening purposes, the upper edge of the plate may be formed with a top flange 137.



In the embodiment of Figs. 7 to 9, the means for controlling the position of the push rod 112 for actuating the end finder mechanism is somewhat different from that of the embodiment shown in Figs. 1 to 6. In this instance, the position of the push rod is controlled by the feeler 62 through the medium of the guard plate 65, the latter having for this purpose a depending arm 138 formed rigid with the guard plate and carrying a pin 139 engageable with the push rod 112. A spring 140 acts upon the push rod as permitted by the arm 138 and therefore by the feeler controlled guard plate 65 to swing the push rod into alinement with the rack bar 109, the latter being provided at its upper end with a stop plate 141 for engagement by the push rod when the latter is in its upper or retracted position. In this embodiment also link 94 which connects the lever arm 68 with the escapement mechanism controlling the advance of the carriers is connected to the arm 68 through a second arm 142 (Fig. 7) rigid with the lever 68.

The operation of the mechanism may now be summarized, having particular reference to the embodiment shown in Figs. 1 to 6: Assuming that a plurality of bobbin carriers C have been placed in the machine for movement in the guides 35 and 36, with the backer 86 pressing against the trailing carrier under the action of the weight 83, the mechanism is operated, preferably manually, to cause the loading device to transfer the bobbins from the receptacles 37 to the holders 15 of the magazine 13. With the loading rack 33 in its uppermost position and no bobbin in the loading position on the magazine, the feeler 62 occupies the broken line position shown in Fig. 3 so that the guard plate 65 is positioned in unblocking relation to the actuating pawl 46 of the ratchet drive mechanism. Operation of the hand lever to the left actuates arm 120 and with it shaft 48 and arm 54 thereon carrying the actuating pawl. As a result, a stepping movement is imparted to the loading rack carrying all of the bobbins in the leading row downwardly and transferring the lowermost bobbin to the magazine.

The operation of the hand lever 117 is repeated for each indexing movement imparted to the magazine 13 to present an empty bobbin holder to the loading position, until a filled holder reaches the delivery position. Thereafter, the operation takes place automatically under the control of the loom and the feeler 62. As a bobbin is ejected from the magazine at the delivery position, a new bobbin is transferred by the rack 38 to the magazine at the loading position.

In the transfer of the bobbins to the magazine by the loading device, the bobbins of the leading row are retained within the receptacles 34 and advanced from one holder 37 to the next lowermost holder in the operation of the pawl and ratchet drive mechanism 43 under the control of the guard plate 65 positioned in nonblocking relation to the actuating pawl 46 by the feeler 62. When the last or uppermost bobbin in the row has been delivered to the magazine and carried out of its receptacle as an incident to the movement of the magazine, the pin 70 on the rack strikes the lever 68, causing the pin 73 to swing the tail of the holding pawl 47 out from engagement with the ratchet wheel 45. At about the same time, the dog 76 moves into engagement with the stop shoulder 77 on the rack so that

the return movement of the rack awaits the release of the dog in the ensuing indexing movement of the magazine. When this occurs, the feeler 74 is swung into the broken line position shown in Fig. 3, disengaging the dog 76 from its notch 77 and releasing the rack to the action of the spring 67. As the rack approaches its uppermost position, the pin 82 thereon strikes the lever 68, lifting the latter so as to free the holding pawl 47 for reengagement with the ratchet wheel.

Upon the delivery of one row of bobbins to the magazine, the carriers are advanced by the action of the weight 83 under the control of the escapement device 88 so as to carry a new row of bobbins into the receptacles 34 of the rack. In this operation, the escapement mechanism is controlled by the reciprocation of the rack, being conditioned upon movement of the rack into its lowermost position for actuation by the return of the rack to its uppermost position. The movement of the lever arm 68 in the approach of the rack to its lowermost position is transmitted by link 94 to the escapment pawls 89 and 90, moving the former downwardly into engagement with a notch 92 in the upper edge of the carrier, and swinging the pawl 90 upwardly out of engagement with its notch. Due to the fact that the notches are of greater width than their respective pawls, movement of the pawl 89 into its notch upon withdrawal of the pawl 90 from its notch permits a slight advancing movement of the carrier sufficient to carry the notch for the pawl 90 sufficiently beyond the pawl so as to rest upon the upper edge of the carrier. The lever arm 68 is yieldably retained in its lowered position by the action of the spring detent 80, and when upon the return movement of the rack to its uppermost position the lever arm is positively disengaged from its detent and swung into its upper position, the pawl 89 is swung upwardly as permitted by the lost motion connection 93 (Fig. 4) between the two pawls and against the action of the spring 99. Thereupon, the carriers are advanced until the pawl 90 is forced by the spring 99 into engagement with the succeeding notch 92, carrying the next succeeding row of bobbins into the loading device preliminary to the next downward advance of the rack by the pawl and ratchet drive mechanism 43.

In the alternative construction shown in Figs. 7 to 9, the operation of transferring bobbins from the carriers to the magazine is essentially the same as that above described with the exception that in this instance the bobbins of the leading row instead of moving directly into the bobbin receptacles of the loading rack are moved into a position in axial alinement therewith and then ejected from the carrier to the loading rack by the operation of the push rods 122 acting to move the bobbins axially into disengaged relation to the holding pins 37' of the carrier. The ejector rods 122 are actuated by the rockshaft 129 through the medium of the arms 127 and 128 and the lever 130 (Fig. 8) operatively connected with the main actuating arm 55 of the pawl and ratchet mechanism through the medium of the arm 132. Since the shaft 129 is actuated by the arm 55, an actuating stroke is imparted to the ejector rods, once for each operation of the crank 52.

Upon the delivery of a bobbin to the delivery position, the end finder 100 is actuated by the push rod 112 through the medium of the rack bar 109 under the control of the feeler 62, connected with a push rod by a link 116. The push rod is actuated by the ratchet mechanism 43 and



therefore under the control of the feeler 62, and in this operation the depression of the rack bar 109 drives the sprocket 107 (Fig. 6) and actuates the chain 105 to carry the bracket 102 and feeler thereon into engagement with the bobbin in the delivery position. Return movement of the rack 109 under the action of the spring 111 causes the feeler to strip the coil 101 from the tip end of the bobbin and holds the extended end in outwardly projected relation to the bobbin for seizure by the conventional selvage shearing and clamping device.

Figs. 12 to 15 show a modification of the means for ejecting the bobbins from pins on the pin boards for transfer to the loading rack, together with an alternative form of indexing means for the pin boards. In this instance, the actuation of the ejecting rods as well as the indexing of the boards is accomplished positively by cam means connected with the main drive shaft of the loom to insure the operation of the parts in proper timed relation to each other.

Referring to Figs. 12 and 13, the continuously driven shaft 53 is provided with two cams 175 and 176. The cam 175 is a cylindrical cam acting upon ejector rods 122*a* through the medium of a bell crank 177; and the cam 176 is a disk cam operatively associated with an indexing pawl 178 through the medium of a roller follower device 179.

As best shown in Fig. 12, the bell crank 177 comprises a vertically disposed rockshaft 180 having a roller follower arm 181 coacting with the cam 175. At the upper and lower ends of this shaft are two arms 182 and 183 pivotally supporting between them a bar 126*a* carrying the ejector rods 122*a*, the latter being slidable in guides 123*a* for movement through holes 124*a* in the pin board into engagement with the leading row of bobbins on the pin board in the general manner set forth in connection with Figs. 7 and 8.

Referring now to the indexing of the pin boards by the disk cam 176, the boards are mounted for movement along horizontal vertically spaced guides 144 and 145. The pawl 178 is pivotally supported upon the upper end of an arm 147 forming a part of the follower device 179, said arm being rigid with a rockshaft 148 carrying a second arm 149 (Fig. 13) equipped with a roller 150 for engagement with the cam 176. At its free end the pawl 178 carries a dog 151 engageable in one of a series of notches 152 in the lower edge of the pin board, the lower guide 145 being formed with a slot 153 (Fig. 15) to permit of movement of the pawl with the pin board in the operation of the cam 176. A coiled torsion spring 148*a* having one end anchored to the arm 147 and the other to the frame of the machine (Fig. 13) tends to rock the shaft 148 in a direction to urge the roller 150 against the cam 176.

The position of the pawl 178 with respect to the pin board is controlled by the loading rack 33*a*. For this purpose the rack carries a pin 154 (Fig. 14) arranged to actuate a vertical link 155 having a laterally extending portion 156 at its lower end for engagement with a pin 157 on the free end of the pawl 178. At its upper end, the link 155 is pivotally connected with a detent 158 (Fig. 14) turning on a fixed pivot and having a dog 159 for engagement in one of a series of notches 160 in the upper edge of the pin board. Rigid with the detent 158 is a lug 161 for engagement by the pin 154 so that when the rack is in its uppermost position, as shown in Fig. 12,

dog 159 is disengaged from its notch 160 and dog 151 of the indexing pawl is moved into engagement with its notch 152.

Assuming that the loading rack 33a has been returned to its uppermost position (Fig. 12) and that the leading row of bobbins b is to be advanced into the receptacles of the rack, the operation is as follows: In the first ninety degrees of rotation of the shaft 53 from the position shown in Fig. 12, the indexing pawl 178 is moved to the left to advance the pin board a distance sufficient to carry the row of bobbins b into the rack receptacles, it being observed that when the loading rack is in its uppermost position the dog 151 of the indexing pawl is in engagement with a notch 152 in the pin board alined with the row of bobbins, and that the detent 158 is disengaged from the pin board. In the next ninety degrees of rotation of the shaft 53, the face cam 175 actuates the bell crank 177 so as to cause the ejector rods 122a to act upon the bobbins to shift them axially of their respective holding pins 37' and into the receptacles of the loading rack. Thereupon, in the next ninety degrees of rotation of the shaft 53, the ejector rods are withdrawn, the indexing pawl remaining in its advanced position due to the shape of the cam 176. After withdrawal of the ejector rods, the loading rack moves downwardly one step as required to transfer the lowermost bobbin therein to the magazine, allowing the link 155 to move downwardly so as to permit disengagement of the indexing pawl from the pin board and to cause engagement of the detent dog 159 with the upper edge of the pin board. In the final ninety degrees of movement of the shaft 53, the indexing pawl is retracted to the initial position shown in Fig. 12. While the pawl 178 is reciprocated in succeeding revolutions of the shaft 53 it is disengaged from the pin board and is therefore ineffective to advance the pin board until all of the bobbins in the first vertical row have been delivered to the magazine and the rack 33a has been returned to its uppermost position so as to withdraw the detent 159 and lift the indexing pawl 178 into engagement with the next notch 152.

Positive indexing of the pin board as distinguished from the movement of the pin board by means of a weight and cable, as in the embodiment first above described, renders it necessary to provide means for advancing other or succeeding pin boards. I have herein shown an additional indexing and detent means for one succeeding pin board. Referring to Fig. 15, I provide for this purpose an additional indexing pawl 162 and an additional detent 163. The pawl 162 is mounted upon a lever arm 164 connected by a link 165 to the lever arm 147; and the pawl 162 is connected with the detent by means of a vertical link 166. The detents 158 and 163 are connected for operation in unison by means of a horizontal link 167 pivoted at opposite ends to arms 168 and 169 respectively rigid with the detents 158 and 163. The link 167 and arm 169 are preferably joined by a pin and slot connection 170, with a spring 171 acting upon the detent 163 so as to urge it into engagement with the upper edge of the pin board unless the detent is positively withheld by the link out of engagement with the board.

I claim as my invention:

1. In a bobbin replenishing mechanism for looms, the combination of a rotatable magazine having a circumferential series of bobbin holders thereon and movable step-by-step to carry said holders into and out of a predetermined loading position successively, a reciprocatory loading device having a series of bobbin receptacles supporting a row of bobbins for movement into said loading position successively, actuating means for effecting the advance of said loading device step-by-step to carry said bobbins one-by-one to said loading position, and means for effecting the return of the device to its initial position following delivery of the last bobbin in the row to the magazine.

2. A bobbin replenishing mechanism for looms having, in combination, a rotary magazine with a plurality of bobbin holders adapted to receive and support wound bobbins in a predetermined loading position and move the same out of position, a loading rack mounted for movement radially of the magazine at said loading position and having a series of laterally opening receptacles releasably supporting a row of bobbins, means for imparting stepping movements to the rack, and means for returning the rack following delivery of the last bobbin in the row to the magazine.

3. A bobbin replenishing mechanism for looms having, in combination, a rotary magazine with a plurality of bobbin holders adapted to receive and support wound bobbins in a predetermined loading position and move the same out of position, a loading rack mounted for movement radially of the magazine at said loading position and having a series of laterally opening receptacles releasably supporting a row of bobbins, means for imparting stepping movements to the rack, means for returning the rack following delivery of the last bobbin in the row to the magazine, and means operative automatically upon the return of the rack to its initial position to supply a new row of bobbins to the rack.

4. In a bobbin replenishing mechanism for looms, the combination of a rotatable magazine having a circumferential series of bobbin holders thereon and movable step-by-step to carry said holders into and out of a predetermined loading position successively, a loading device having a series of bobbin receptacles supporting a row of bobbins for movement into said loading position successively, actuating means for effecting the advance of said loading device step-by-step, means for effecting the return of the device to its initial position following delivery of the last bobbin in the row to the magazine, means supporting a bobbin carrier having a plurality of bobbin holders arranged in spaced parallel rows with the bobbins in each row spaced apart according to the spacing of the receptacles in the loading device, means supporting said carrier for movement toward the loading device to carry the leading row of bobbins into the receptacles of the loading device when the latter is in its initial position, and means operative upon the return of the loading device to said initial position to impart an advancing movement to the carrier.

5. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means operative in timed relation to the movement of a wound bobbin out of the loading position to deliver another bobbin to said loading position comprising a reciprocatory support having a plurality of bobbin holders releasably supporting a row of bobbins in spaced parallel relation, power driven means for advancing said support with a step-

by-step motion, and means for returning said support upon the delivery of the last bobbin in the row to loading position.

6. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, a loading device having a series of receptacles supporting a series of bobbins in spaced relation, and means for advancing said loading device to carry said bobbins into said loading position successively including an actuating mechanism and a feeler for controlling the same operative in response to the movement of a wound bobbin out of said loading position to effect the transfer of another bobbin to said loading position.

7. In a bobbin replenishing mechanism for looms having a magazine with a plurality of bobbin holders thereon and movable with a step-by-step motion to carry said holders into and out of a predetermined loading position, means for delivering a bobbin to each magazine holder presented to said magazine including a reciprocatory support having a series of bobbin holders, a drive mechanism for advancing the support with a step-by-step movement and for returning the support to a retracted position for the reception of a new supply of bobbins, and means operative in timed relation to the movement of the last bobbin on the support out of loading position to effect the return of the support to such retracted position.

8. In a bobbin replenishing mechanism for looms having a magazine with a plurality of bobbin holders thereon and movable with a step-by-step motion to carry said holders into and out of a predetermined loading position, means for delivering a bobbin to each magazine holder presented to said magazine including a reciprocatory support having a series of bobbin holders, and drive mechanism for advancing the support including an actuating element and means responsive to the presence of a bobbin in said loading position to render said element ineffective.

9. In a bobbin replenishing mechanism for looms having a magazine with a plurality of bobbin holders thereon and movable with a step-by-step motion to carry said holders into and out of a predetermined loading position, means for delivering a bobbin to each magazine holder presented to said magazine including a reciprocatory support having a series of bobbin holders, a drive mechanism for advancing the support including a ratchet wheel and a pawl for actuating the same, and means responsive to the presence of a bobbin in said loading position to render said pawl ineffective to actuate the ratchet wheel.

10. In a bobbin replenishing mechanism for looms having a magazine with a plurality of bobbin holders thereon and movable with a step-by-step motion to carry said holders into and out of a predetermined loading position, means for delivering a bobbin to each magazine holder presented to said magazine including a reciprocatory support having a series of bobbin holders, a drive mechanism for advancing the support including a ratchet wheel and a pawl for actuating the same, means responsive to the presence of a bobbin in said loading position to render said pawl ineffective to actuate the ratchet wheel, a spring energized in the movement of the support, a holding pawl for the ratchet, and mean operable in the advancing movement of said support to disengage said holding pawl from the ratchet.



11. In a bobbin replenishing mechanism for looms having a magazine with a plurality of bobbin holders thereon and movable with a step-by-step motion to carry said holders into and out of a predetermined loading position, means for delivering a bobbin to each magazine holder presented to said magazine including a reciprocatory support having a series of bobbin holders, a drive mechanism for advancing the support including a ratchet wheel and a pawl for actuating the same, means responsive to the presence of a bobbin in said loading position to render said pawl ineffective to actuate the ratchet wheel, a spring energized in the movement of the support, a holding pawl for the ratchet, means operable in the advancing movement of said support to disengage said holding pawl from the ratchet, means operating substantially concurrently with the release of said holding pawl to retain said support in position with a bobbin in said loading position, and means operative in response to the movement of said bobbin out of loading position to disengage said holding means for the support.

12. In a bobbin replenishing mechanism for looms having means for individually receiving and supporting a wound bobbin for movement from a loading position to a delivery position, a movable support for a plurality of wound bobbins releasably supporting the bobbins in spaced parallel relation, power driven means for actuating said support to carry the wound bobbins thereon into said loading position successively, and means for effecting the return movement of the support from a final advanced position for delivery of the last bobbin thereon to said loading position including spring means energized in the advancing movement of the support by said power driven means, means releasably holding said support in its said final position, and means responsive to the movement of said last bobbin out of loading position to release said support to the action of said spring means.

13. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, a loading device having a series of receptacles supporting a series of bobbins in spaced relation, means for advancing said loading device to carry said bobbins into said loading position successively including an actuating mechanism and a feeler for controlling the same operative in response to the movement of a wound bobbin out of said loading position to effect the transfer of another bobbin to said loading position, and a second feeler operating in response to the movement out of loading position of the last bobbin in said row to effect the return of the loading device to its initial position.

14. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement to a predetermined loading position, means for supplying bobbins to the last mentioned means including a support having a plurality of bobbin receptacles, and means for actuating the support in a direction to carry said bobbins one-by-one to said loading position, means for returning the support to a retracted position after the delivery of the last bobbin thereon to said loading position, and means operative automatically upon the return of the support to its retracted position to supply new bobbins to said receptacles.

15. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement to a predetermined loading position, means for supplying bobbins to the last mentioned means including a rack having a row of bobbin receptacles, and means for actuating the rack in a direction to carry said bobbins in said row one by one to said loading position, means for returning the support to a retracted position after the delivery of the last bobbin thereon to said loading position, means for movably supporting a bobbin carrier having a plurality of holders thereon individually supporting rows of bobbins in spaced parallel relation, and means operative upon the return of the rack to its retracted position to advance said carrier whereby to deliver a new row of bobbins to the rack.

16. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring bobbins to the last mentioned means including a rack having a series of bobbin receptacles arranged for movement successively into said loading position, said rack having an initial retracted position, and means for supplying wound bobbins to said rack when in its said retracted position.

17. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring bobbins to the last mentioned means including a rack having a row of laterally opening bobbin receptacles, means for advancing said rack from an initial retracted position, and means for supplying a new row of bobbins to the rack when in such retracted position including means for supporting a bobbin carrier for movement toward said rack transversely thereof, and means operative in such retracted position of the rack to advance the carrier.

18. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring bobbins to the last mentioned means including a rack having a row of bobbin receptacles, means for advancing said rack with a step-by-step movement, means for effecting return of the rack to a retracted position when the last bobbin in the row has been moved into said loading position by the rack, a support for a bobbin carrier having a plurality of rows of bobbins releasably held thereby, and means operable upon the return of the rack to its retracted position for transferring a new row of bobbins from said carrier to said rack receptacles.

19. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring bobbins to the last mentioned means including a rack having a row of bobbin receptacles, means for advancing said rack with a step-by-step movement, means for effecting return of the rack to a retracted position, a support for a bobbin carrier having a plurality of rows of bobbins releasably held thereby and means for imparting advancing movements to the carrier to present a new row of bobbins to said rack receptacles including a control device responsive to the return of the rack to its retracted position, said control device being conditioned for operation by the rack in advancing the last bobbin in the row to said loading position.

20. In a bobbin replenishing mechanism for looms having means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring bobbins to the last mentioned means including a rack having a row of bobbin receptacles, means for advancing said rack with a step-by-step movement, means for effecting return of the rack to a retracted position, a support for a bobbin carrier having a plurality of rows of bobbins releasably held thereby, and means for imparting advancing movements to the carrier to present a new row of bobbins to said rack receptacles including an escapement device actuated in timed relation to the return of the rack to its retracted position to release the carrier to the action of said actuating means.

21. In a bobbin replenishing mechanism for looms, a loading rack having a series of receptacles for receiving and retaining a row of bobbins, means for advancing said rack to carry the bobbins one by one into a predetermined loading position and thereafter returning the rack to its initial position, means supporting a carrier having a row of bobbins thereon for movement into said receptacles, means yieldably urging the bobbin carrier toward said rack and an escapement device controlling the advance of the carrier by the last mentioned means including a holding pawl operative in the movement of the rack in one direction and a releasing pawl operative in the movement of the rack in the opposite direction.

22. In a bobbin replenishing mechanism for looms having a rotary magazine with a plurality of bobbin holders arranged in circumferential series, a loading rack mounted for endwise movement substantially radially of the magazine and having a series of receptacles releasably supporting a row of bobbins, and means for advancing said rack step-by-step to effect the successive transfer of the bobbins therein to said magazine holders.

23. A bobbin replenishing mechanism for looms having, in combination, a rotary magazine with a plurality of bobbin holders adapted to receive wound bobbins in a predetermined loading position and to move the same out of such position, a loading rack mounted for movement radially of the magazine at said loading position and having a series of receptacles releasably supporting a row of bobbins, means for imparting a stepping movement to the rack including a pawl and ratchet drive means and a feeler responsive to the movement of the last bobbin in the row into and out of said loading position to render said drive means effective, and manually operable means for actuating said drive means.

24. A bobbin replenishing mechanism for looms having, in combination, a rotary magazine with a plurality of bobbin holders adapted to receive and support wound bobbins in a predetermined loading position and move the same out of such position, a loading rack mounted for movement radially of the magazine at said loading position and having a series of laterally opening receptacles releasably supporting a row of bobbins, means for imparting stepping movements to the rack, means for returning the rack following delivery of the last bobbin in the row to the magazine, means for delaying the return movement

of the rack until said last bobbin has been moved by the magazine out of said loading position, and means operative automatically upon the return of the rack to its initial position to supply a new row of bobbins to the rack comprising a bobbin carrier having U-shaped string clips releasably holding a row of bobbins at the butt ends thereof, said rack being operative in its advancing movements to transfer one of the bobbins in said row to the magazine and the remaining bobbins from the carrier holder from one row to the next.

25. A bobbin replenishing mechanism for looms having, in combination, a rotary magazine with a plurality of bobbin holders adapted to receive and support wound bobbins in a predetermined loading position and move the same out of such position, a loading rack mounted for movement radially of the magazine at said loading position and having a series of laterally opening receptacles releasably supporting a row of bobbins, means for imparting stepping movements to the rack, means for returning the rack following delivery of the last bobbin in the row to the magazine, means for delaying the return movement of the rack until said last bobbin has been moved out of the magazine out of said loading position, and means operative automatically upon the return of the rack to its initial position to supply a new row of bobbins to the rack and comprising a bobbin carrier having U-shaped spring clips releasably holding a row of bobbins at the butt ends thereof, said magazine holders also comprising U-shaped clips, and said rack being operative in its advancing movements to transfer the lowermost bobbin in the rack to a magazine holder and the remaining bobbins in such row from one clip to the next.

26. A bobbin replenishing mechanism for looms having, in combination, a magazine with a plurality of bobbin holders adapted to receive and support wound bobbins from movement from a loading position to a delivery position, means for effecting the delivery of wound bobbins one-by-one to the magazine, and an end finder controlled by said feeler for movement into and out of operative association with the tip end of a bobbin in said delivery position.

27. A bobbin replenishing mechanism for looms having a magazine with holders for supporting bobbins having end finding coils wound on the tip ends thereof and operable to move said bobbins from a loading position to a delivery position, means for effecting the transfer of wound bobbins one-by-one to holders in said loading position including a loading device, drive means for imparting step-by-step movement to the loading device, an end finder operating in timed relation to the stepping movements of said loading device and arranged for movement into and out of operative association with the tip ends of the bobbins in said delivery position, and means for actuating said finder in timed relation to the stepping movements of the loading device.

28. A bobbin replenishing mechanism for looms having a magazine with holders for supporting bobbins having end finding coils wound on the tip ends thereof and operable to move said bobbins from a loading position to a delivery position, means for effecting the transfer of wound bobbins one-by-one to holders in said loading position including a loading device, drive means therefor and a feeler responsive to the movement of the bobbin out of said loading position to control said drive means, an end finder operating in timed relation to the movements of said loading device and arranged for movement into and out of operative association with the tip ends of the bobbins in said delivery position, and means controlled by said feeler for actuating said finder in timed relation to the stepping movements of the loading device including a member operatively connected with the finder to move it, a push rod controlled by said feeler and operative to move said member in one direction and spring means for returning said member.

29. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for delivering the bobbins to the last mentioned means including a loading device having a plurality of bobbin receptacles, and means for supplying bobbins to said receptacles comprising a support for a bobbin carrier having a row of pins releasably holding a group of bobbins and means for shifting said group of bobbins axially of said pins to disengage them therefrom.

30. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for delivering bobbins to the last mentioned means including a loading rack having a row of bobbin receptacles, and means for supplying bobbins to said receptacles including a support for a bobbin carrier having a row of pins releasably holding a group of bobbins, said carrier being supported at one side of said rack with the pins in axial alinement with the respective receptacles, and means for ejecting the group of bobbins from the carrier to said receptacles.

31. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for delivering bobbins to the last mentioned means including a loading rack having a row of bobbin receptacles, and means for supplying bobbins to said receptacles including a support for a bobbin carrier having a row of pins releasably holding a group of bobbins, said carrier being supported at one side of said rack with the pins in axial alinement with the respective receptacles, and means for ejecting the group of bobbins from the carrier into said receptacles, said rack comprising a frame having receptacle forming means adapted to receive the butt ends of the bobbins and a recessed member for receiving and supporting the tip ends of the bobbins.

32. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for delivering bobbins to the last mentioned means including a loading rack having a row of bobbin receptacles and arranged for movement to deliver the bobbins in said receptacles one-by-one into said loading position, means for returning the rack after the delivery of the last bobbin in the row to the loading position, and means for supplying a new row of bobbins to the receptacles including a support for a bobbin carrier having a row of pins releasably holding a new row of bobbins, and means operative upon the return of the rack to its initial position to transfer said new row of bobbins from the carrier to said rack receptacles com-

prising a plurality of ejector elements, a support therefor, spring means tending to move said support in a direction to carry said elements into engagement with the bobbins, and power driven means for returning said support.

33. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring the bobbins to the last mentioned means including a loading device having a plurality of bobbin receptacles, and means for supplying bobbins to said receptacles comprising a support for a bobbin carrier having a plurality of rows of pins releasably holding a group of bobbins, and cam operated means for advancing said carrier and for shifting said group of bobbins axially on said pins.

34. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring the bobbins to the last mentioned means including a loading device having a plurality of bobbin receptacles, a support for a bobbin carrier having a plurality of rows of pins releasably holding groups of bobbins, means for advancing said carrier to present a group of bobbins opposite said receptacles, a plurality of ejector rods, one for each receptacle of the loading device, and cam means operatively associated with said rods for imparting axial movements to the bobbins whereby to transfer them to said receptacles.

35. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring the bobbins to the last mentioned means including a loading device having a plurality of bobbin receptacles, and means for advancing said device step-by-step and then returning the same to retracted position, and means for supplying bobbins to said receptacles comprising a support for a bobbin carrier having a plurality of bobbin holders, a carrier indexing member, and power driven means for actuating said indexing member in timed relation to the return of said loading device to its said retracted position.

36. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring the bobbins to the last mentioned means including a loading device having a plurality of bobbin receptacles, and means for supplying bobbins to said receptacles comprising a support for a bobbin carrier having a plurality of rows of pins releasably holding groups of bobbins, an indexing member for the bobbin carrier, ejecting means operable to shift the bobbins axially of said pins into said bobbin receptacles of the loading device, means operable in a predetermined position of the loading device to move said indexing member into engagement with the bobbin carrier, and cam means for actuating said indexing member to impart an indexing movement to the carrier and then actuating said ejecting means to shift the bobbins from the carrier into said receptacles.

37. A bobbin replenishing mechanism for looms having, in combination, means for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring the bobbins to the last mentioned means including a loading device having a row of bobbin receptacles, and means for supplying bobbins to said receptacles comprising a support for a bobbin carrier having a plurality of rows of bobbin holders, detent means for holding the carrier against movement, an indexing element for the carrier, means responsive to the movement of the loading device into a predetermined position to disengage said detent means and to render said indexing element effective, and power driven means for actuating said indexing means.

38. A bobbin replenishing mechanism for looms having, in combination, means including a magazine for receiving and individually supporting wound bobbins for movement from a loading position to a delivery position, means for transferring the bobbins to the last mentioned means including a loading device having a plurality of bobbin receptacles, means for imparting a step-by-step movement to the loading device to present successive bobbins to said magazine and for returning said loading device to a predetermined position in retracted relation to the magazine, means movably supporting a bobbin carrier having a plurality of rows of bobbin holders spaced apart in accordance with the spacing of the bobbin receptacles of the loading device, and power driven cam means operable as an incident to the return of the loading device to its retracted position to impart an indexing movement to the carrier whereby to advance a row of bobbins to the loading device.

39. In a bobbin replenishing mechanism for looms, a reciprocatory loading device having a row of bobbin receptacles for individually receiving and supporting a row of bobbins, means for supporting a bobbin carrier having a plurality of bobbin holders thereon arranged in rows and individually supporting bobbins for movement in successive groups to said loading device, an indexing member engageable with the carrier as an incident to the movement of the loading device into a predetermined position, and power driven means for actuating said indexing member operating in timed relation to the movement of the loading device into said predetermined position whereby to move said carrier to deliver a row of bobbins into said receptacles.

40. In a bobbin replenishing mechanism for looms, a reciprocatory loading device having a row of bobbin receptacles for individually receiving and supporting a row of bobbins, means for supporting a bobbin carrier having a plurality of bobbin holders thereon arranged in rows and individually supporting bobbins for movement in successive groups to said loading device, an indexing member engageable with the carrier as an incident to the movement of the loading device into a predetermined position, means operating in timed relation to the movement of the loading device into said position whereby to actuate said indexing member and move said carrier to deliver a row of bobbins into said receptacles, and detent means engageable with the carrier to hold it in its advanced position, said detent means being disengageable from the carrier as an incident to the movement of the indexing member into engagement with the carrier.

41. In a bobbin replenishing mechanism for looms, a bobbin loading device shiftable into a predetermined bobbin receiving position, means for supporting a plurality of carriers having a

plurality of bobbin holders arranged in rows, said loading device having a series of receptacles arranged in a row corresponding to the rows of bobbin holders on the carriers, and means operable when the loading device is in said predetermined position to advance said carriers to move the leading row of bobbins toward said loading device comprising an indexing member for each carrier movable into and out of holding engagement therewith, means operable in the movement of the loading device to its said predetermined position to render said indexing members effective with respect to their carriers, and power driven means for actuating said indexing members.

42. In a bobbin replenishing mechanism for looms, a loading device shiftable into a predetermined bobbin receiving position, means for supporting a plurality of carriers having a plurality of bobbin holders arranged in rows and arranged in end-to-end relation, said loading device having a series of receptacles arranged in a row corresponding to the rows of bobbin holders on the carriers, and means operable when the loading device is in said predetermined position to advance said carriers to move the leading row of bobbins toward said loading device comprising an indexing member for each carrier, a holding detent for each carrier, means operable in the movement of the loading device into said predetermined position to render said detents ineffective and said indexing members effective, and power driven means for actuating said indexing members.

43. A bobbin replenishing mechanism for looms comprising, in combination, a magazine having a plurality of holders for individually supporting bobbins for movement from a loading position to a delivery position, a support for a bobbin carrier having a plurality of pins for releasably holding a group of bobbins, and means for disengaging



the bobbins from said pins and delivering them one-by-one to magazine holders successively presented to said loading position.

44. A bobbin replenishing mechanism for looms comprising, in combination, a magazine having a plurality of holders for individually supporting bobbins for movement from a loading position to a delivery position, a support for a bobbin carrier having a plurality of pins for releasably holding a row of bobbins, and mechanism for shifting said row of bobbins first axially of said pins to disengage them therefrom and then laterally with a step-by-step motion to carry the bobbins into said loading position successively.

45. A bobbin replenishing mechanism for looms comprising, in combination, a magazine having a plurality of holders for individually supporting bobbins for movement from a loading position to a delivery position, a support for a bobbin carrier having a plurality of pins for releasably holding a row of bobbins, and mechanism for shifting said row of bobbins first axially of said pins to disengage them therefrom and then laterally with a step-by-step motion to deliver them one-by-one to magazine holders successively presented to said loading position, said mechanism including a rack having a row of receptacles in spaced relation and power driven means for imparting stepping movements to said rack each of a length corresponding to the spacing of said receptacles.

BURT A. PETERSON.

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