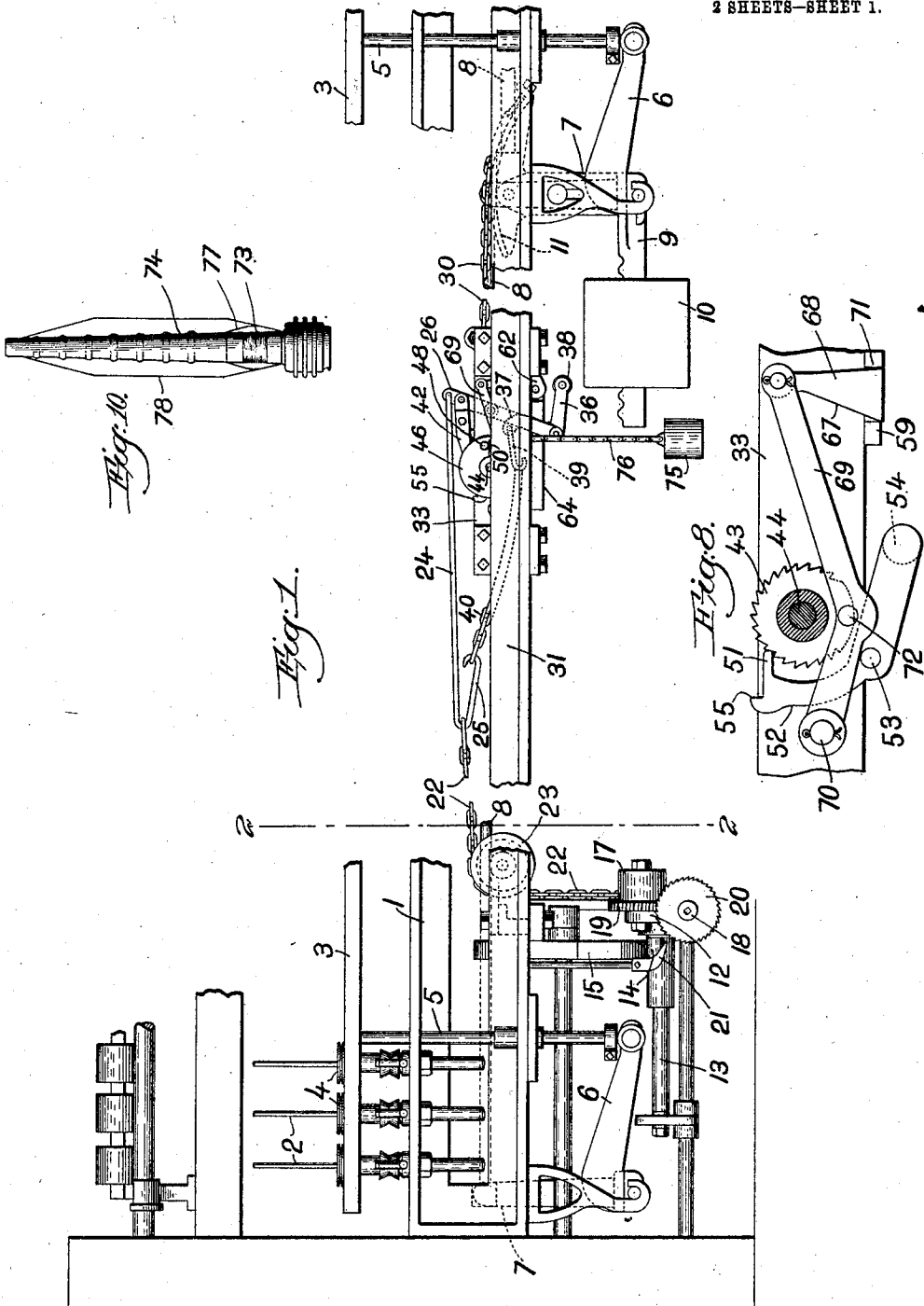


A. E. RHOADES.
YARN SPINNING APPARATUS.
APPLICATION FILED FEB. 19, 1912.

1,037,318.

Patented Sept. 3, 1912.

2 SHEETS—SHEET 1.



Witnesses
Edward H. Allen.
Thomas J. Drummond.

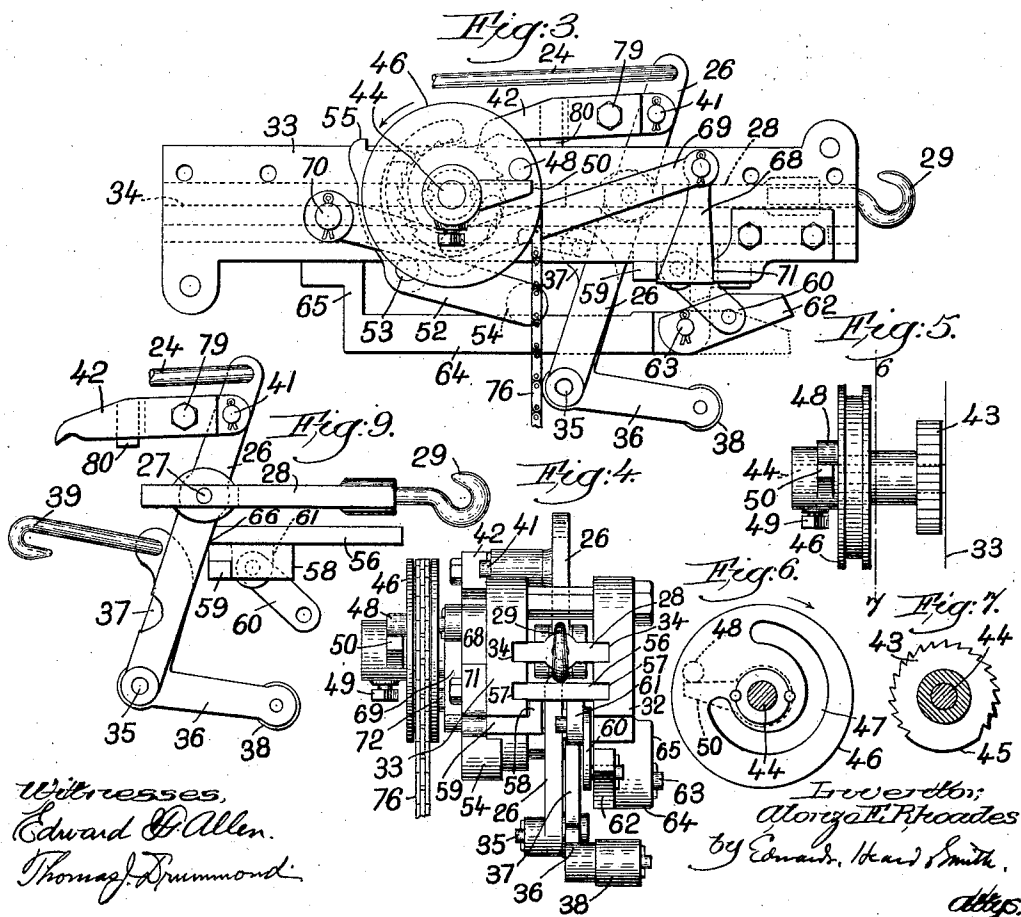
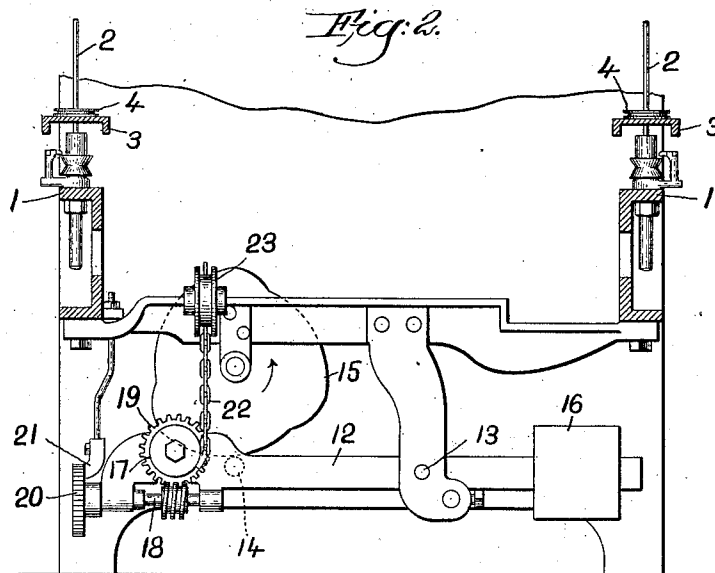
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2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

ALONZO E. RHOADES, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO DRAPER COMPANY, OF HOPEDALE, MASSACHUSETTS, A CORPORATION OF MAINE.

YARN-SPINNING APPARATUS.

1,037,318.

Specification of Letters Patent.

Patented Sept. 3, 1912.

Application filed February 19, 1912. Serial No. 678,687.

To all whom it may concern:

Be it known that I, ALONZO E. RHOADES, a citizen of the United States, and resident of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Yarn-Spinning Apparatus, of which the following description, in connection with the accompanying drawing, is a specification, like characters on the drawing representing like parts.

This invention relates to apparatus constructed and arranged to effect the winding of a preliminary portion, or bunch, of yarn upon a yarn-receiver or bobbin and thereafter to lay a main or service winding of yarn, bobbins so wound being thereafter used in the shuttles of "feeler" looms.

The preliminary winding or bunch provides a sufficient quantity of yarn to maintain continuity of the filling when a change in the operation is brought about by or through the feeler mechanism.

When the bobbin is in the shuttle the yarn must draw off freely during weaving, in order that yarn breakage may be avoided, and if care is not taken in laying the yarn upon the bobbin there will often be a tendency to breakage when the yarn catches over the inner end of the bunch.

Various forms of apparatus have been devised to lay the yarn in such manner that the bunch will not present an obstacle to the free drawing off of the yarn thereover, and my present invention has for its object the production of novel means for laying the preliminary winding, in apparatus of the character specified, in such manner that the yarn will not catch during the weaving off when the bobbin is in the shuttle of the loom.

By the mechanism embodying my present invention the bunch is laid with a minimum traverse, at the proper place upon the barrel of the bobbin, and the traverse is gradually increased while the "gain" is so controlled that the rail rises slightly higher and descends slightly lower, stroke after stroke, until maximum traverse is attained. This gives tapered or conical ends to the preliminary winding or bunch, so that the yarn will not catch thereupon, and when maximum traverse is reached the winding of the yarn is completed therewith, that is, with a uni-

form traverse, the gain then being controlled by the winding mechanism of the builder-motion.

Means is provided for regulating the amount of yarn to be laid in the preliminary winding or bunch.

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

Figure 1 is a front elevation, broken out, of a portion of a spinning-frame showing the builder-motion and the connections between it and the ring-rail embodying my present invention, the rail being shown at about mid-stroke and the apparatus as a whole in readiness to effect the formation of the preliminary winding or bunch; Fig. 2 is a transverse section on the line 2-2, Fig. 1, looking toward the left, showing the builder motion and builder cam; Fig. 3 is a greatly enlarged detail in front elevation of the means for shifting or changing the traverse whereby the shorter and gradually increasing traverse with which the preliminary winding is laid is shifted or changed automatically at the proper time so that the winding thereafter will be laid with a uniform traverse of maximum length; Fig. 4 is a right hand elevation of the mechanism shown in Fig. 3, the adjacent supporting portions of the main frame being omitted in Figs. 3 and 4; Fig. 5 is a detail view of the rotatable cam member and its attached ratchet by which is determined the amount of yarn to be laid in the preliminary winding; Figs. 6 and 7 are views of the opposed faces of the cam member and ratchet, taken on the line 6-7, Fig. 5, looking to the left for Fig. 6 and to the right for Fig. 7; Fig. 8 is a front elevation of some of the parts of the traverse shifting means shown in Figs. 2 and 3, and partly in section on the line 6-7, Fig. 5; Fig. 9 is a detail in elevation of the rocking member which controls the traverse, some of the adjacent cooperating parts of the mechanism also being shown; Fig. 10 is an enlarged view in elevation of a bobbin showing thereon the start of the preliminary winding, the completed bunch, and the completed main or service winding.

The spindle-rail 1, rotatable spindles 2,

the vertically reciprocating ring-rail 3 provided with usual rings 4, the lifter-rods 5, rockers 6 cooperating with the feet of the lifter-rods, the upturned arms 7 fixedly attached to said rockers and connected by the transmitting links 8, partly shown in Fig. 1, may be and are all of well known and usual construction, one of the rockers having an attached arm 9 for the counter balancing weight 10, the adjacent upturned arm 7 having the usual segment 11.

Rocking motion is imparted to the rockers 6 by means of the builder-motion, to effect through the lifter-rods the vertical reciprocation of the ring-rail, and herein the builder-arm arises as the ring-rail descends, and vice versa.

The builder-motion comprises the builder-arm 12, Fig. 2, fulcrumed at 13, and provided with a follower 14 cooperating with an actuating or traverse-cam 15 of a familiar shape, a weight 16 maintaining the follower and cam in engagement, the builder-arm having a constant stroke, as will be apparent.

The winding mechanism, for the most part carried by the builder-arm, comprises the winding drum 17, pick-shaft 18 having a worm to rotate the worm-gear 19 attached to the drum, to effect gradual rotation of the latter, the ratchet or pick-wheel 20 on said shaft, and the actuating pawl 21. Said builder-motion is of itself well known, and herein the gradual rotation of the drum 17 winds up the attached chain or other connection 22, fixedly attached at one end to the drum and at its other end connected indirectly with the ring-rail, as will be described, to effect the gain of the traverse.

The chain 22 leads over a guide-sheave 23 supported on the main frame and is attached to a bridle consisting of a rod bent to present long and short legs 24, 25, said long leg being pivotally connected with the upper end of a traverse shifting or changing member, shown as a lever 26, Figs. 3 and 9, mounted to swing in an upright plane and pivoted at 27 on a carriage 28. The right hand end of said carriage, Figs. 3 and 9, has a hook 29 to which is attached one end of a flexible member or chain 30, the other end thereof being secured to the segment 11, Fig. 1, whereby as said carriage is reciprocated horizontally the chain 30 will act through the segment and intervening devices to effect the vertical reciprocation of the ring-rail.

The girder 31 of the main frame has rigidly mounted upon it an open stand comprising elongated, upright and opposite sides 32, 33, Fig. 4, fixedly spaced apart, the inner faces of said sides having horizontal guideways 34 formed therein in which the carriage 28 is adapted to be reciprocated.

The lower end of the traverse shifter 26

has pivotally mounted upon it at 35 a bell-crank 36, 37, the arm 36 carrying a roll 38 while the upturned arm 37 has a hook 39 connected by a flexible member or chain 40 with the short leg 25 of the bridle, see Fig. 1, the construction of these parts being clearly shown in Figs. 3, 4 and 9 on a large scale. Upon the upper end of said traverse shifter 26 I mount at 41 the hub of a pawl 42 offset with relation to the side 33 of the stand and arranged to cooperate with and effect step by step rotation of a ratchet 43 rotatably mounted on a stud 44 extended frontward from the stand. Said ratchet has a portion of its periphery smooth, as at 45, Fig. 7, and the ratchet hub has rigidly attached to its outer end a peripherally grooved disk 46 provided on its inner face with a cam groove 47, Fig. 6, and with a stop lug 48 on its outer face.

At its extreme outer end the stud 44 has adjustably fixed upon it by a set screw 49 a hub provided with a radial arm 50, the angularly adjusted position of which at the beginning of the winding determines the amount of yarn to be laid in the primary winding or bunch.

Taking the position shown in Fig. 3, if the arm 50 is elevated the amount of yarn in the bunch will be diminished, because the arc through which the disk 46 is to be turned will be decreased, whereas if the arm 50 is set lower the disk will travel through a greater arc, and the amount of yarn laid in the bunch will be increased, as will be more readily understood hereinafter.

A detent pawl 51 cooperates with the ratchet 43, said pawl being formed on the upper end of a lever 52 pivoted at 53 on the side 33 of the stand, the lower end of the lever being weighted at 54 to maintain the pawl in operative position, Fig. 8, said pawl having a releasing lug 55 for a purpose to be described.

A shiftable fulcrum member 56 for the traverse shifter 26 is mounted to slide in guideways 57 in the stand, below the carriage 28, the left hand end of said member 56, viewing Fig. 9, serving as a fulcrum upon which the traverse shifter 26 rocks during a portion of the winding operation.

Viewing Figs. 3, 4 and 9, a depending ear 58 on the shiftable fulcrum member has a lug 59 projecting frontward beneath and beyond the stand side 33, and a short link 60 pivotally attached to a second depending ear 61 on the fulcrum member 56 is pivoted at its free end to a switch 62. Said switch is pivoted at 63 to one end of a horizontal track 64 below the stand side 32 and connected rigidly therewith by branches 65, the lower edge of said switch forming a continuation of the track when the switch is in dotted line position Fig. 3, and manifestly the movement of the fulcrum member 56 to the

right, Figs. 3 and 9, will act through the link 60 to depress the switch to operative position.

The pull transmitted through chain 30 to the traverse shifter 26 draws the latter against the fulcrum edge 66 of the member 56, and hence the latter at such time has a tendency to move to the right, Figs. 3 and 9, resisted by the engagement of the lug 59 with the inclined edge 67 of a substantially upright controlling cam 68 pivotally connected with and suspended from the free end of a bent lever 69, Fig. 8, fulcrumed at 70 on the side 33 of the stand, the straight upright side of the cam resting against the vertical face of a fixed abutment 71 on the stand. The lever 69 has a lateral follower 72 which enters the cam-groove 47 in the disk 46, the shape of the cam-groove being such that as the disk is rotated step by step the free end of the lever 69 will be lowered gradually, and as the controller or cam 68 descends the fulcrum member 56 will move gradually to the right, Figs. 3 and 9, from the position shown therein. At such time the chain 40, Fig. 1, between the short bridle-leg 25 and the bell-crank 36, 37 is slack, so that there is no tendency to turn the bell-crank on its pivot 35, that is, relatively to the traverse shifter 26, the weight of the roll 38 tending to keep the bell-crank in substantially the position shown.

At the beginning of the bunch winding the various parts are positioned substantially as shown in Figs. 1, 3, 8 and 9, and at each oscillation of the builder-arm 12 the connection between it and the traverse shifter 26 (acting through the long leg 24 of the bridle) operates to rock said traverse shifter, but as the fulcrum member 56 is held stationary the shifter 26 rocks thereon about the edge 66. The vertical distance between said fulcrum edge and the carriage 28 is short, as clearly shown in Fig. 9, hence said carriage is given a very short stroke back and forth, and through the connections the ring-rail is reciprocated vertically with a very short traverse, to lay the preliminary winding, or bunch. The traverse shifter 26 is oscillated at each oscillation of the builder-arm, hence the pawl 42 will engage the ratchet 43 on each stroke to the left, Fig. 3, effecting an angular advance of the disk 46. This step by step rotation of the disk in turn acts through the lever 69 to depress the controller 68 intermittently, and as it descends the fulcrum member 28 is moved slowly to the right, Figs. 3 and 9.

Inasmuch as the winding mechanism of the builder-motion is gradually taking up the chain 22 it will be obvious that the traverse shifter 26 will gradually assume a position more nearly vertical than that shown in Fig. 9, (this change also being assisted by the movement of the fulcrum mem-

ber 56 to the right) and as the lower end of the shifter 26 moves to the right the connection 40 will gradually tighten. Thereby the bell-crank arm 36 will finally be elevated enough to cause the roll 38 to assume a position tangent to the plane of the horizontal track 64.

Remembering that while the roll 38 is being elevated relatively to the traverse shifter 26 the fulcrum member 56 is moving gradually to the right, Figs. 3 and 9, it will be apparent that the link 60 will during such movement gradually depress the switch 62 to dotted line position, Fig. 3, forming a continuation of the track 64, and hence in position to engage the roll 38 when the upper end of the shifter 26 is swung to the left.

During the first part of the bunch winding the uplifted switch will be kept out of the way of the roll 38 when the traverse-shifter swings it upward at each descent of the builder-arm. When, however, the switch is operatively positioned and is engaged by the roll 38, due to the taking up of the slack in the chain 40, the continued oscillation of the builder-arm will operate to effect a bodily reciprocation of the traverse-shifter 26 and its carriage 28, but without any rocking movement of the shifter. That is, the pull of chain 40 keeps the roll 38 against the horizontal face of the track, so that the bell-crank is held from any rocking movement on the pivot 35, and the bodily reciprocation of the traverse-shifter is accomplished without any rocking motion thereof, precisely as if the two legs of the bridle were connected directly with the shifter above and below its point of connection 26 with the carriage 28. Thereby a longer stroke is given to said carriage than before, when the traverse-shifter was rocked upon the fulcrum-member 58, and the correspondingly longer traverse is imparted to the ring-rail, this longer and uniform traverse being continued to the end of the main or service winding, completing the bobbin. As the chain 22 is taken up by the winding mechanism while this uniform, maximum traverse is in action the traverse-shifter and carriage will be moved gradually to the left, Figs. 1 and 3, to effect the requisite gain, and the length of the track 64 provides for the travel thereupon of the roll 38. Thus while the traverse starts at the minimum when beginning the winding of the bunch it is gradually increased during such winding, until the fulcrum member 56 has completed its movement to the right, Fig. 3, when the controller or cam 68 has been fully depressed, and the switch 62 has been operatively positioned, and thereafter the traverse is uniform and of maximum length.

The winding of the bunch is started at some distance above the butt of the bobbin, and in Fig. 10 the first layer of yarn is indi-

cated at 73, on the barrel of the bobbin 74. In the present instance, in winding the bunch, the increase in the traverse is divided substantially equally between the high and low points of the strokes of the ring-rail. That is, as the traverse increases the rail descends a little lower on each down stroke, and is raised a little higher on each up stroke, than on the preceding traverse. The increment on the down stroke of the rail is provided for by the step by step movement of the fulcrum member 56, for thereby the carriage 28 is permitted on such stroke to move to the right slightly, viewing Fig. 3, and the increment on the up stroke of the rail is provided for by the taking up of the chain 22 by the winding mechanism of the builder-motion.

If the fulcrum 66 were fixed the taking up of the chain would cause the ring-rail to rise a little higher on each up stroke, and to descend not quite so low as before on each down stroke, and the length of the traverse would be uniform, while the bunch would be increased in length by additions at its upper end. The fulcrum 66 is shifted, however, and to such an extent that there results a neutralization, or overcoming, of the decrease in the descent of the ring-rail and a slight continued or additional descent thereof.

As a result of the action of the two operations the successive bottom points of the ring-rail are gradually lower and lower while the successive top points of the rail are gradually higher and higher, the overlaps of one layer of yarn over and beyond the upper and lower ends of the preceding layer being substantially equal, so that the gradual increase in the length of the traverse is practically equally divided between the up and down strokes. This results in practice in the winding of the bunch with a gradual and equal taper from its central portion to each end thereof, as is desired. After the maximum traverse is reached, when the traverse-shifter and its supporting carriage are reciprocated bodily practically as a unit, the fulcrum member 56 has no further function to perform, and the gain of the traverse throughout the remainder of the winding is due altogether to the taking up of chain 22 by the winding mechanism.

On each stroke of the feed pawl 42 to the left, Fig. 3, whether during or after bunch winding, it advances or feeds ahead the ratchet 43 and the cam disk 46, the detent pawl 51 holding such advances, until the smooth part 45 of the ratchet is engaged by the feed pawl, which occurs when the descent of the controller 68 has been completed. Thereafter the feed pawl will ride back and forth over such smooth part of the

ratchet face until the bodily step by step movement of the traverse-shifter 26 causes the pawl 42 to engage the lug 55 of the detent pawl 51, and thereby disengage the latter from the ratchet. When the ratchet is thus released a weight 75 on the end of a chain 76 attached to the disk 46 operates to turn said disk and ratchet backward until the stud 48 brings up against the stop 50, such retrograde rotation of the disk acting through the cam groove 47, follower 72 and lever 69 to raise the controller 68 to the position shown in the drawings, thereby resetting the fulcrum member 56 in readiness for beginning the winding of a new set of bobbins. The re-setting of the fulcrum member operates through the connecting link 60 to return the track switch 62 to full line position, Fig. 3.

In Fig. 10 the completed bunch is indicated at 77, tapered from its central portion to each end thereof, the last layer of yarn being laid in the bunch just as the maximum traverse for the rest of the winding is to begin, the ring-rail having then descended to the extreme low point, so that in practice the first layer of yarn laid with the maximum traverse begins practically at the lower end of the bunch. In Fig. 10 the shape of the completed yarn mass is indicated in outline at 78.

By the apparatus herein described a large bunch can be made without danger of the yarn catching and breaking when weaving off in the shuttle down to a point very near the bunch, for the gradual swell of the bunch prevents the yarn catching thereon even when drawing off between the head of the bobbin and the center of the bunch.

The bunch is located at a desirable position on the bobbin, and where it is most efficient with relation to the feeler when the bobbin is in the shuttle of a loom.

In practice the feed pawl 42 is made adjustable longitudinally, by forming it in two parts and holding said parts in adjustment by an adjusting bolt 79, such adjustment of the pawl increasing or decreasing the amplitude of angular advance of the cam disk 46 on each feed stroke of the pawl, according to the character of the bunch to be made. Said pawl is also provided with a foot 80 which is arranged to travel upon the upper edge of the stand side 33 and prevent improper positioning of the pawl as it is moved back and forth by the rocking or bodily movements of the traverse-shifter.

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

Having fully described my invention,

what I claim as new and desire to secure by Letters Patent is:

1. In apparatus of the class described, a reciprocating ring-rail, two separate means
 5 operating concurrently to control its reciprocation to effect a primary winding of yarn upon a yarn-receiver with an initially short but gradually increasing traverse, one
 10 of said means effecting an increase of the traverse on the upward stroke, and the other means effecting an increase on the downward stroke, of the ring-rail, whereby the traverse is gradually increased in length during the primary winding, the first-named
 15 means thereafter acting, during the formation of a secondary winding with a long and uniform traverse, to effect the gain of the long, uniform traverse, and an instrumentality acting automatically to render the
 20 second-named means inoperative when the gradually increasing traverse has attained its maximum length.

2. In apparatus of the class described, a reciprocating ring-rail, a builder-motion
 25 provided with a winding mechanism, intervening connections between it and the ring-rail, means coöperating with said connections during the formation of a primary winding of yarn upon a yarn-receiver to lay the yarn
 30 with an initially short traverse and to increase the length of the traverse gradually on one stroke of the ring-rail, said winding mechanism effecting a substantially equal increase in the length of the traverse on the
 35 opposite stroke, whereby the total length of each traverse is gradually increased during the primary winding, and an instrumentality to render said means inoperative when the traverse has reached a predetermined
 40 length, the builder-motion thereafter effecting reciprocation of the ring-rail with a uniform traverse of maximum length while the winding mechanism continues in action and effects the gain of the uniform traverse.

3. In apparatus of the class described, a builder-motion, a reciprocating ring-rail, connections between it and the builder-motion to effect reciprocation of the ring-rail and lay a primary winding of yarn upon a
 0 yarn-receiver, separate means co-acting at such time with said connections to effect, respectively, a gradual increase in the traverse at opposite ends of the stroke of the ring-rail until the traverse has attained a
 5 predetermined length, whereby the primary winding is increased in length at each end and tapered uniformly toward each of its ends, an instrumentality to render inoperative one of such means when the predetermined length of traverse is attained, whereby the winding is continued and completed with a uniform traverse of such
 10 length, the other of said means acting during the continued winding to effect the gain of the uniform traverse, and means to vary

the time at which said instrumentality is brought into action.

4. In apparatus of the class described, a builder-motion, a reciprocating ring-rail, a connection between it and the builder-motion, including a rocking and bodily movable member, said member being rocked by
 70 the builder-motion to effect a short traverse of the ring-rail, a fulcrum about which said member rocks, means to shift said fulcrum
 75 intermittingly to thereby increase gradually the traverse on the down stroke of the ring-rail, other means acting through said member to increase gradually the traverse on the up stroke, whereby such increases combine
 80 to effect a gradual increase in the total length of each successive traverse up to a predetermined length, an instrumentality to govern the shifting of the fulcrum and stop it when the traverse has increased to a predetermined length, and means governed by
 85 shifting movement of the fulcrum to cause bodily movement of said rocking member independently of the fulcrum when the predetermined length of traverse has been
 90 reached, to continue the reciprocation of the ring-rail with such traverse.

5. In apparatus of the class described, a builder-motion, a ring-rail operatively connected therewith and reciprocated thereby,
 95 and different means operating in alternation to gradually increase by substantially equal increments the length of the traverse at opposite ends of the stroke of the ring-rail, thereby to effect the formation of a primary
 100 winding of yarn upon a yarn-receiver with a traverse gradually increasing in length, tapering said winding toward each end and increasing the length thereof by additions at both ends, combined with an instrumentality
 105 actuated step by step during such increase of traverse to render one of said means inoperative when the traverse has attained a predetermined length, the other of said means continuing to act during the remainder
 110 of the winding to impart the requisite gain to the uniform traverse effected by continued operation of the builder-motion.

6. The combination, with a builder-motion and a winding mechanism, and a reciprocating ring-rail, of a carriage operatively
 115 connected therewith and reciprocated by the builder-motion, a traverse-shifter pivotally mounted on the carriage and connected with the builder-motion, a shifting fulcrum on
 120 which the traverse-shifter is adapted to rock during short traverse, the operation of the winding mechanism and shifting of said fulcrum acting conjointly through the traverse-shifter to gradually increase the traverse by
 125 substantially equal amounts at each end of the stroke of the ring-rail up to a predetermined maximum, means to shift the fulcrum automatically until such maximum traverse length is attained, the connection between
 130

the builder-motion and traverse-shifter thereafter operating to reciprocate said traverse-shifter and carriage as a unit to impart uniform traverse of maximum length to the ring-rail during the remainder of the winding, the winding mechanism providing the requisite gain for the uniform traverse, and a device to re-set automatically the shifting fulcrum in readiness for the next winding operation.

7. The combination, with an oscillating builder-arm having a constant stroke, a winding mechanism thereon, and a reciprocating ring-rail, of a carriage connected with the ring-rail, a traverse-shifter connected with the builder-arm and pivotally connected with the carriage, a fulcrum member on which said traverse-shifter is adapted to be rocked to impart a short traverse to the carriage and connected ring-rail, means to shift said fulcrum member step by step to thereby increase gradually the length of traverse at one end of the stroke of the ring-rail, a similar increase being effected at the other end of the stroke by the winding mechanism, whereby the traverse is gradually increased in length as oscillation of the builder-arm rocks the traverse-shifter, and means to prevent rocking movement thereof when shifting of the fulcrum member ceases and the maximum length of traverse is attained, whereby the builder-arm thereafter reciprocates the carriage and traverse-shifter as a unit and imparting to the ring-rail uniform traverse of the maximum length previously attained, the continued operation of the winding mechanism providing the gain for the uniform traverse.

8. The combination, with an oscillating builder-arm having a constant stroke, a winding mechanism thereon, and a reciprocating ring-rail, of a carriage connected with the ring-rail, a traverse-shifter connected with the builder-arm and pivotally connected with the carriage, a fulcrum member on which said traverse-shifter is adapted to be rocked, to impart a short traverse to the carriage and connected ring-rail, means to shift said fulcrum member step by step to thereby increase gradually the length of traverse at one end of the stroke of the ring-rail, a similar increase being effected at the other end of the stroke by the winding mechanism, whereby the traverse is gradually increased by substantially equal additions at each end thereof as oscillation of the builder-arm rocks the traverse-shifter, means to determine the amount of yarn to be laid on a yarn-receiver with the gradually increasing traverse, and a device governed by shifting of the fulcrum member to prevent rocking of the traverse-shifter after shifting of the fulcrum member ceases, whereby the builder-arm thereafter effects reciprocation of the traverse-shifter and car-

riage as a unit and causes the ring-rail to be reciprocated with a uniform traverse to complete the winding.

9. The combination with a builder-arm oscillating with a constant stroke, a winding mechanism, and a reciprocating ring-rail, of a carriage adapted to be reciprocated by the said builder-arm, an operating connection between said carriage and the ring-rail, to reciprocate the latter by movement of the carriage, a traverse-shifter pivotally supported on said carriage, a direct connection between the winding mechanism and the upper end of said traverse-shifter, an indirect connection between said mechanism and the lower end of the traverse-shifter, a shifting fulcrum member about which the traverse-shifter is rocked by or through said direct connection, to effect a short traverse of the carriage and ring-rail, the winding mechanism acting to increase gradually the length of traverse on the up stroke while the shifting fulcrum member acts to increase the traverse gradually on the down stroke, whereby the total length of successive traverses is gradually increased up to a predetermined length, the indirect connection at such time being inactive, means to shift the fulcrum member step by step until the traverse has attained a predetermined length, at which time both the direct and indirect connections operate to reciprocate the traverse-shifter and carriage as a unit with the traverse uniform, and a device controlled by the shifting fulcrum member to render the indirect connection operative when the gradually increasing traverse has attained the predetermined length, the winding being thereafter completed with uniform traverse of the predetermined length, said winding mechanism acting through both the direct and indirect connections with the traverse-shifter to impart the requisite gain to the traverse.

10. The combination, with a builder-motion having a winding mechanism, and a reciprocating ring-rail, of a carriage reciprocated by or through the builder-motion and connected with the ring-rail, a traverse-shifter pivotally supported on the carriage and having a bell-crank pivotally mounted on its lower end, a direct connection between the winding mechanism and the upper end of the traverse-shifter, an indirect connection between said mechanism and the traverse-shifter through said bell-crank, a fixed track having a primarily inoperative switch, to cooperate with the bell-crank during the secondary winding; a shifting fulcrum member for the traverse-shifter, an operating connection between said fulcrum member and the switch, and means, including a controller, to govern step by step movement of the shifter, the direct connection acting to rock the traverse shifter on said fulcrum

member to lay a primary winding of yarn with a short, gradually increasing traverse, the winding mechanism increasing the traverse at one end of the stroke of the ring-rail while the shifting fulcrum member lengthens the traverse at the other end of the stroke, until a predetermined length of traverse is attained, movement of the shifting fulcrum member operating to operatively position the switch when such traverse length is attained, the track and switch thereafter coöperating with the bell-crank to cause both direct and indirect connections with said winding mechanism to reciprocate the traverse-shifter and carriage as a unit to impart uniform traverse of the predetermined length to complete the secondary winding of yarn.

11. The combination with a builder-arm oscillating with a constant stroke, a winding mechanism, and a reciprocating ring-rail, of a carriage adapted to be reciprocated by the said builder-arm, an operating connection between said carriage and the ring-rail, to reciprocate the latter by movement of the carriage, a traverse-shifter pivotally supported on said carriage, a direct connection between the winding mechanism and the upper end of said traverse-shifter, an indirect connection between said mechanism and the lower end of the traverse-shifter, a shifting fulcrum member about which the traverse-shifter is rocked by or through said direct connection, to effect a short traverse of the carriage and ring-rail, the winding mechanism acting to increase gradually the length of traverse on the up stroke while the shifting fulcrum member acts to increase the traverse gradually on the down stroke, such increases of each traverse being substantially equal, the indirect connection at such time being inactive, means to shift the fulcrum member step by step until the traverse has attained a predetermined length, at which time both the direct and indirect connections operate to reciprocate the traverse-shifter and carriage as a unit with the traverse uniform, a

device controlled by the shifting fulcrum member to render the indirect connection operative when the gradually increasing traverse has attained the predetermined length, the winding being thereafter completed with uniform traverse of the predetermined length, said winding mechanism acting through both the direct and indirect connections with the traverse-shifter to impart the requisite gain to the traverse, and means to re-set automatically the shifting fulcrum member and the device controlled thereby after the reciprocation of the traverse-shifter and carriage as a unit has been instituted.

12. The combination, with a ring-rail, a builder-motion, and a carriage reciprocated thereby and operatively connected with the ring-rail, of two separate means acting concurrently to effect a gradually increasing stroke to the carriage, said two means lengthening the stroke of the ring-rail at the opposite ends thereof, respectively, by substantially equal amounts, until the traverse reaches a predetermined length, to lay a primary winding of yarn upon a yarn-receiver, said winding tapering uniformly from its central portion toward each end, an instrumentality operating automatically to render one of said means inoperative after such length of traverse is attained, whereby the other means remains in sole control of the reciprocation of the carriage, to complete the winding with a uniform traverse of the predetermined length, and a device becoming operative when one of said means is rendered inoperative to insure the reciprocation of the carriage with a uniform stroke in accordance with the operation of the builder-motion.

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

ALONZO E. RHOADES.

Witnesses:

FRANK H. FRENCH,
E. D. OSGOOD.