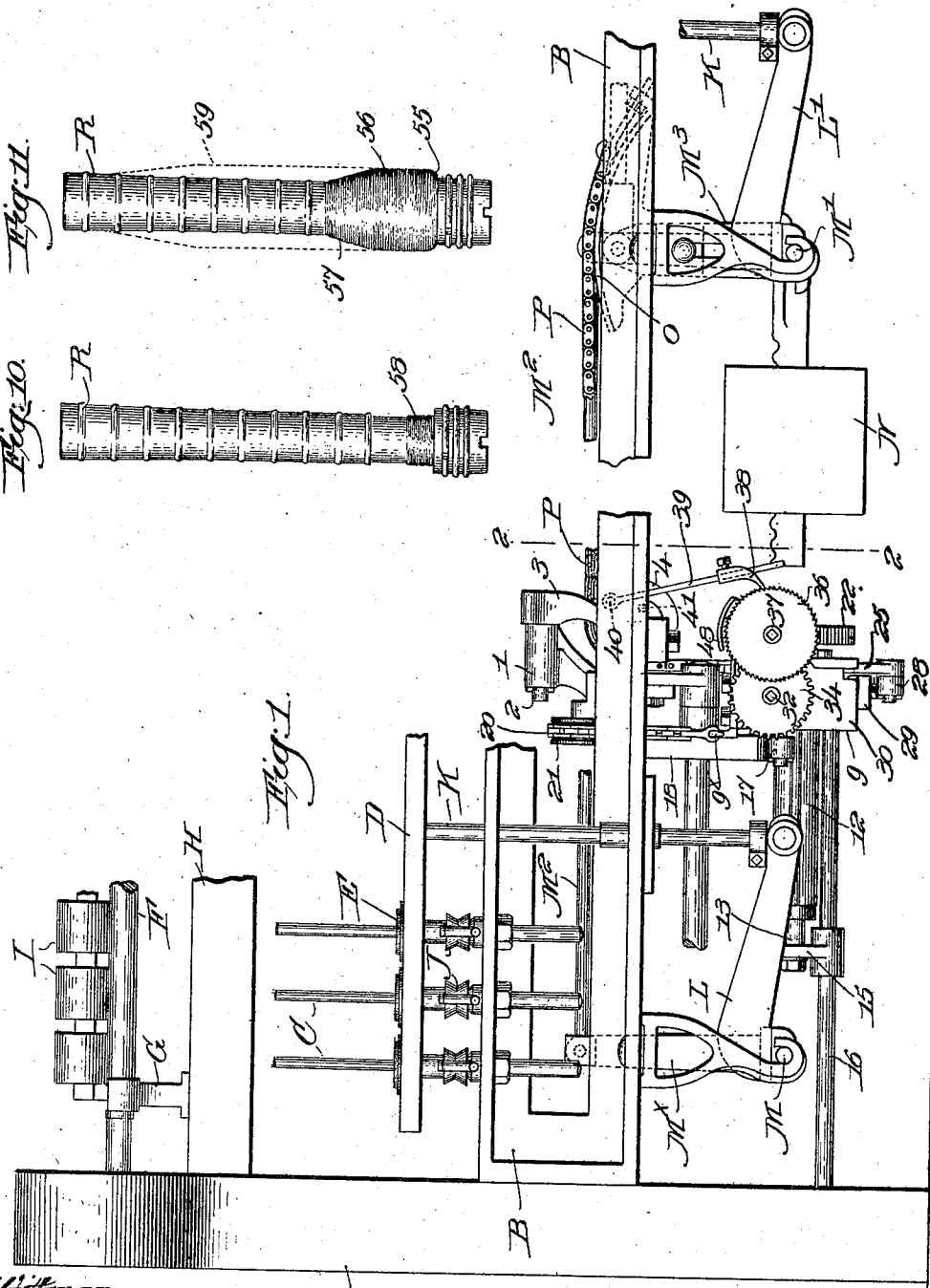


A. E. RHOADES.
 TRAVERSE MOTION FOR YARN SPINNING OR TWISTING APPARATUS.
 APPLICATION FILED APR. 5, 1911.

1,013,846.

Patented Jan. 2, 1912.

3 SHEETS—SHEET 1.



Witnesses,
 Edward P. Allen,
 Joseph M. Ward.

Inventor,
 A. E. Rhoades,
 by Edward H. Smith,
 Attorney.

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Fig. 2.

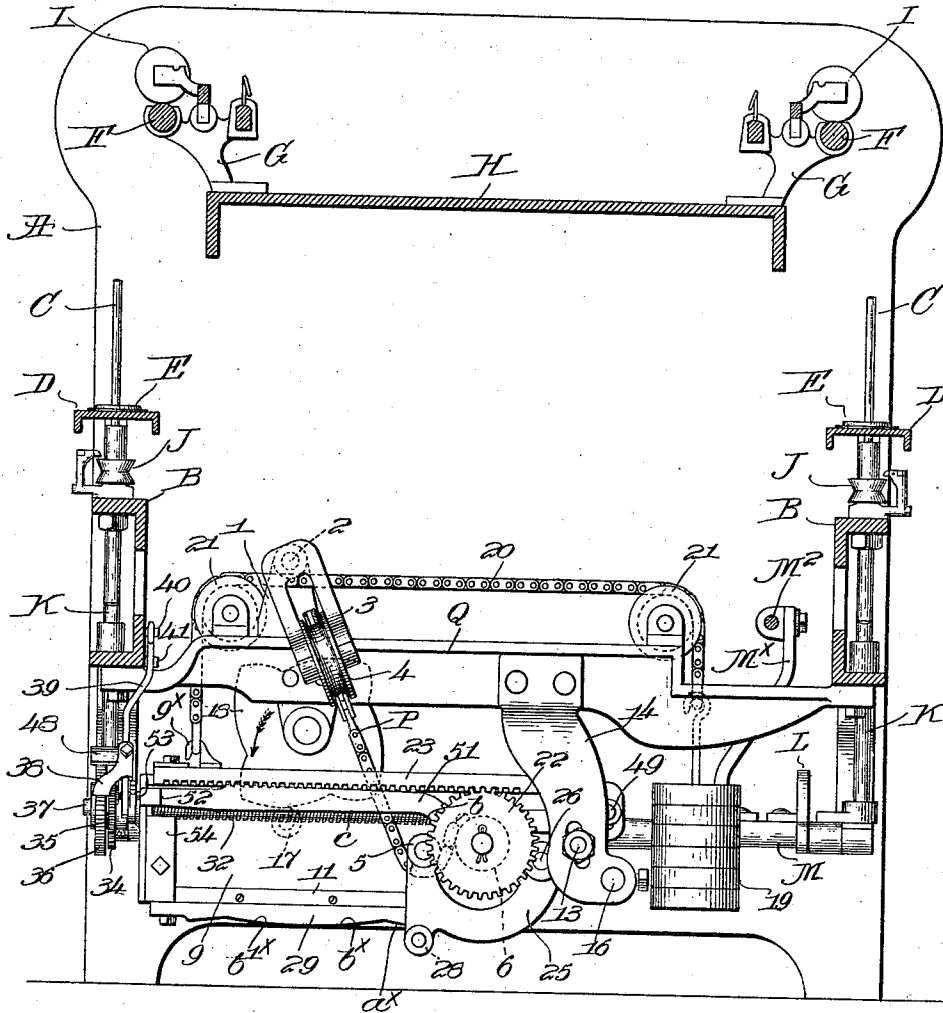
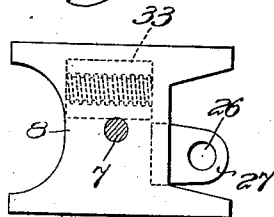


Fig. 9.



Witnesses,
 Edward C. Allen,
 Joseph M. Ward.

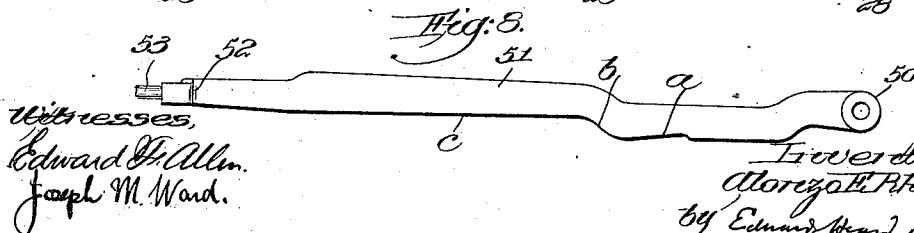
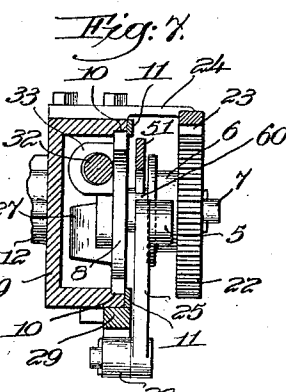
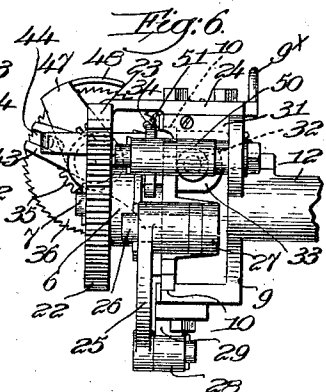
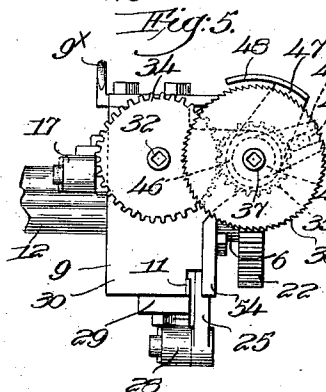
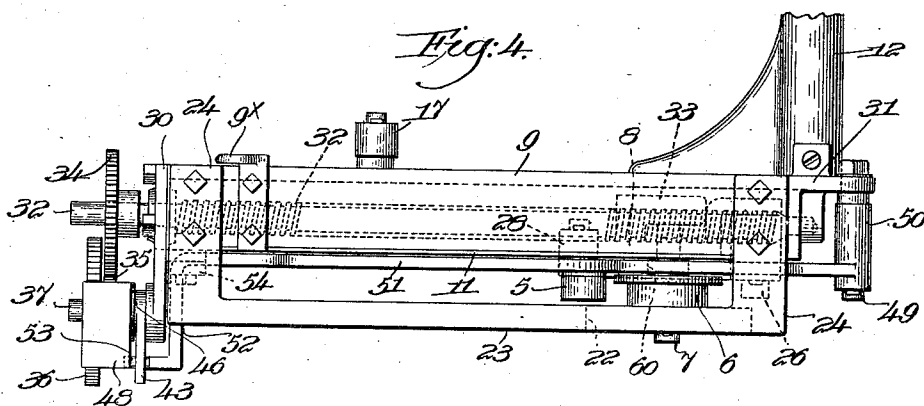
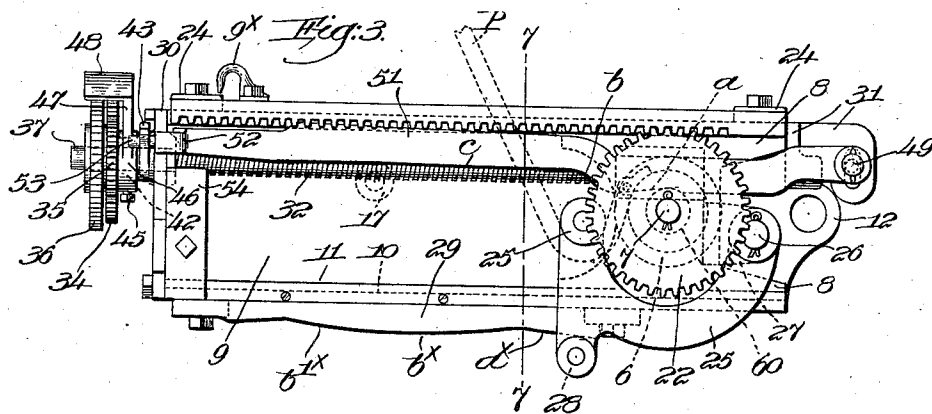
Inventor,
 George E. Rhoades,
 by Edward Howard Smith,
 atty.

A. E. RHOADES.
TRAVERSE MOTION FOR YARN SPINNING OR TWISTING APPARATUS.
APPLICATION FILED APR. 5, 1911.

1,013,846.

Patented Jan. 2, 1912.

3 SHEETS—SHEET 3.



Witnesses,
Edward H. Allen,
Joseph M. Ward.

Inventor,
A. E. Rhoades,
by Edward H. Allen,
Attorney.

UNITED STATES PATENT OFFICE.

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

TRAVERSE-MOTION FOR YARN SPINNING OR TWISTING APPARATUS.

1,013,846.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed April 5, 1911. Serial No. 619,062.

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 Traverse-Motions for Yarn Spinning or Twisting 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 has for its object the production of a novel transverse motion for use in connection with apparatus for spinning or twisting yarn, the traverse motion comprising various features of construction and arrangement whereby the yarn is laid upon the yarn-receiver or bobbin in such manner that the base of the yarn mass is well built out thereat to a substantially cylindrical form, rather than tapered or conical.

With some types of feeler mechanism, used in automatic looms to effect replenishment of the running filling prior to complete exhaustion thereof, it is found in practice that a better action of the feeler is secured with a yarn mass of the shape previously mentioned than if the yarn mass is tapered at its base, and as more yarn can be laid when the base of the yarn mass is built out the desired form has this added advantage. Such yarn masses are not novel in themselves, but the traverse motion forming the subject of this invention and which is designed to produce such a yarn mass has various new features whereby the desired objects are attained, as will appear in the subjoined specification, and such features will be particularly pointed out in the following claims.

Herein I have shown my invention as applied to a twister, as a matter of convenience, for the invention can be readily used for effecting the traverse of the ring-rail in a spinning frame if so desired.

Figure 1 is a front elevation of a portion of a twister, partly broken out, with a transverse motion applied thereto embodying my present invention, the rising ring-rail being about half way up at the beginning of the winding; Fig. 2 is a transverse sectional

view through the frame, on the line 2—2, Fig. 1, looking toward the left; Fig. 3 is an enlarged side elevation of the builder-arm and the parts carried thereby; Fig. 4 is a top plan view thereof, the hub of the builder-arm being broken off to save space; Fig. 5 is a left-hand or front end elevation of the builder-arm and its adjuncts; Fig. 6 is a right-hand or rear end elevation thereof; Fig. 7 is a transverse sectional view taken through the builder-arm on the line 7—7, Fig. 3, looking toward the right; Fig. 8 is a detached view inside elevation of the member of the traverse motion which governs the rate at which the traverse shifter or carriage is moved longitudinally of the builder-arm, and by or through such movement controls the "gain" of the traverse; Fig. 9 is a view of the traverse-shifter or carriage detached from the builder-arm; Fig. 10 is a side elevation of the yarn-receiver or bobbin with the small portion of yarn laid thereon initially by one or two traverses of the ring-rail with the minimum traverse; Fig. 11 is a similar view, but showing in full lines the finished base portion of the yarn mass, the outline of the completed yarn mass being indicated by dotted lines, the gradual increase in the traverse from the beginning to the end of the winding operation being very clearly apparent by comparison with Fig. 10.

The box-like end frame A, Figs. 1 and 2, which in practice incloses some of the gearing, the side rails B in which the twisting spindles C are rotatably mounted, the vertically-reciprocating ring-rails D provided with suitable rings E, the lower delivery-rolls F, their stands G carried by the top-board H, the top-rolls I, and the spindle-whirls J for the reception of suitable driving bands (not shown) are and may be all of well known construction and operate in usual manner.

The lifter-rods K attached to and depending from the ring-rails cooperate at their lower ends with suitable rolls on rocker-arms L, L', Fig. 1, attached to the usual transverse rock-shafts M, M', the former having an upturned arm M² connected by a link M² with a similar arm M³ on the shaft M'. The rock-shaft M' has the usual coun-

terbalancing weight N and the arm M³ has an attached segment O to which is secured a flexible connection or chain P leading to the builder-arm, and as is usual in twist-
 5 the ring-rail rises when the builder-arm descends, and vice versa.

Referring to Fig. 2 the cross-girth Q of the main frame carries a bracket 1 on which is fulcrumed at 2 a swinging yoke
 10 3 provided with a guide-sheave 4 over which the chain P is led, the chain passing thence under an automatically governed roll 5 to a winding drum or barrel 6. The drum is ro-
 15 tatably mounted on a stud 7 extended horizontally from a carriage 8, shown separately in Fig. 9, and arranged to move longitudi-
 nally along the builder-arm 9, the latter for the greater part of its length being I-
 20 shaped in cross-section, Figs. 6 and 7, the parallel flanges thereof being grooved to form longitudinal guideways 10 for the carriage, which is held in place by plates 11. As will appear hereinafter the carriage acts
 25 as a traverse-shifter or changer, to increase the traverse of the ring-rail as said carriage is moved from the inner toward the outer end of the builder-arm. A long sleeve-like
 hub 12 extends laterally from the inner end of the builder-arm, and is mounted to rock
 30 on a fulcrum bar 13 rigidly attached at one end to a hanger 14 depending from the cross-girth Q and at its other end to a short arm 15 fast on a horizontal shaft 16 carried by the end frame A and the hanger 14, sub-
 35 stantially as shown in my Patent No. 989,050, dated April 11, 1911. The builder-arm 9 has a roller or other stud 17 which coöperates with and serves as a follower for an actuator shown in Fig. 2 as a four-point
 40 traverse-cam 18, the follower being held in engagement with the cam by a suitable counterbalancing weight 19 attached to a hook 9* on the builder-arm by a chain 20,
 traveling over guide-sheaves 21 on the cross-
 45 girth Q. As the builder-arm has a constant stroke it follows that the farther the traverse-shifter 8 is moved from the fulcrum 13 of the builder-arm the greater will be the
 length of traverse of the ring-rail, and if
 50 the winding operation is started with the traverse-changer at its extreme inward position, Figs. 2, 3 and 4, the minimum traverse will be given to the ring-rail.

The drum 6 has attached to or forming a
 55 part of it a concentric gear 22 which meshes with a rack-bar 23 attached rigidly to the top of the builder-arm by lateral brackets 24, so that movement of the carriage 8 longi-
 60 tudinally of the builder-arm will, through the rack-bar and gear 22, cause the said gear and the drum 6 to be rotated. Refer-
 ring to Fig. 3, as the carriage is moved out-
 ward, or to the left, the drum 6 will be re-
 65 volved from left to right, to wind up the connecting chain P.

The general shape of the builder-arm, the carriage movable longitudinally thereon, the drum thereon, and the rack-bar and gear for revolving the drum, as well as the feed-shaft for said carriage (yet to be referred to) are
 70 very similar to corresponding parts in my Patent No. 941,649 dated November 30, 1909, but herein the drum is revolved to gradually take up the chain P, while in said patent it
 is revolved oppositely to let off the corre-
 75 sponding chain. Such reversal of operation is due to the fact that herein the builder-arm and ring-rail move in opposite direc-
 tions, common in twist-ers, while in the patent said arm and rail move in the same di-
 80 rection, as is generally the case in spinning frames.

The roll 5, previously referred to, is mounted on a curved carrier 25 fulcrumed at
 85 its rear end on a horizontal stud 26 extended from an ear 27 mounted fixedly on the carriage 8, the carrier having a follower roll 28 which coöperates with the irregular lower
 edge of a controlling cam 29 fixedly attached to the bottom flange of the builder-arm.

From Fig. 2 it will be apparent that as the traverse-shifter 8 is moved outward on the builder-arm the distance between the roll
 5 and sheave 4 decreases as the portion of the chain P between said parts approaches
 95 a vertical line, and thereafter there will be an increase in the distance between said roll and sheave as the traverse-changer continues its outward travel. The decrease in
 such distance results in a decrease in the
 100 "gain," while the subsequent increase in the distance correspondingly increases the gain, and while these variations are in practice
 small I utilize them in my present invention, first by a modification of such initial gain,
 105 then by a practical neutralization of the variation in the gain due to the angular change in the position of the chain, such modifica-
 tions being effected by the changes in the vertical position of the roll 5 due to the
 110 modifying cam 29, as will be explained.

End plates 30, 31 fixedly attached to the builder-arm provide bearings for an elongated, spirally threaded feed shaft 32 which
 115 passes through and engages a threaded hole in a boss 33 on the back of the carriage 8, whereby rotation of the shaft will slide the carriage longitudinally along the builder-
 arm. The outer end of the feed shaft projects through the plate 30 and has an at-
 120 tached gear 34 in mesh with a smaller gear 35 fixedly connected with a ratchet 36 and rotatably mounted on a stud 37 carried by plate 30 parallel with the shaft 32. Said
 ratchet is intermittently engaged and ro-
 125 tated step by step by a pick-pawl 38 mounted on a rod 39, Figs. 1 and 2, pivoted at its upper end at 40 on one of the rails B, so that on each up-stroke of the builder-arm
 said pick-pawl will engage and advance the
 130

ratchet and through the gears 35, 34 slowly revolve the feed-shaft 32 to effect outward movement of the carriage 8. A stop 41 co-operates with the pawl rod 39 when the pawl and ratchet are disengaged and limits movement of the pawl toward the center of the ratchet. The pawl is arranged to impart variable advance movements to the ratchet, as will be explained. As the feed shaft gradually moves the traverse-changer 8 along the builder-arm the gear 22 and rack 23 will effect a slow rotation of the drum 6 to take up the chain P and thereby effect the "gain" of the traverse in a familiar manner, and the amplitude of angular movement of said drum is manifestly dependent upon the extent of each advance of the traverse-changer 8 away from the fulcrum 13 of the builder-arm. These advances of the traverse-changer are in turn dependent directly upon the extent to which the feed shaft 32 is turned by each advance of the ratchet by the pick-pawl, so that not only is the rate of change of the traverse, but also the rate of change of the "gain" governed by said drum 6, controlled by the angular advances of the ratchet. The increase in the traverse is effected by small increments, and in order to lay the yarn properly in forming the base of the yarn mass it is desirable to at first accelerate the increase in the traverse, but as this would also effect too rapid an increase in the "gain" to give the desired fullness at the bottom of the base of the yarn mass I modify the increase in gain due to the drum 6, as will appear herein-after.

A collar 42 loose on the stud 37 has a radial arm 43 slotted at 44, and on the collar is clamped by a set-screw 45 the hub 46 of an upturned arm 47 carrying a curved shield 48 which overhangs the ratchet 36 at the left of the pick-pawl, Figs. 1 and 5. By moving the shield to the left or right of the position therein shown the pick-pawl will effect a greater or less angular movement of the ratchet, and the parts governed by such movement will have a corresponding movement imparted to them.

A horizontal stud 49 on the end-plate 31 serves as a fulcrum for the hub 50 of an elongated cam lever 51 which extends lengthwise of the builder-arm in front of the traverse-changer 8, the lower edge of the lever resting upon the hub 60 of the drum 6. The outer end of the lever is turned laterally at 52 and then continued outwardly to form a rounded finger 53 which enters the slot 44 in the arm 43, so that by an upward or downward swing of the cam lever on its fulcrum 49 the finger coöperating with the arm 43 will swing the latter to move the shield 48 to the left or right, respectively. The downward swing of said cam lever is limited by a

stop 54 bolted to the builder-arm at its outer end, and it will be understood by an inspection of Figs. 3 and 8 that as the traverse-changer 8 is moved outward along the builder-arm the hub 60 acting upon the irregular lower edge of the cam lever 51 will impart to the lever a vertical swinging movement dependent upon the contour of the cam edge. This contour comprises a part *a* showing a slight but gradual rise, a succeeding part *b* showing a relatively rapid and extended drop, and a final part *c* constituting a dwell or rest portion. When the hub 60 traverses the part *a* from right to left the outer end of the cam lever is gradually elevated and by the described connections the shield 48 is gradually moved to uncover more and more of the ratchet 36 to the action of the pick-pawl 38, and the amplitude of the angular advances of the ratchet will thereby gradually increase, but quite rapidly. This results, first, in effecting advance of the traverse-changer 8 outwardly along the builder-arm by rapidly increasing increments, to accelerate the increase of the traverse, and second, in effecting a gradually increasing and accelerated "gain" due to the rotative movements of the drum 6. But this "gain" would result in building the base of the yarn mass with a steep taper or conical shape, whereas I desire the bottom of the base to be well built out and rounded, as at 55, Fig. 11, though modified somewhat by the shortening of the length of the chain P between the sheave 4 and the roll 5. That is, while the drum produces a gradually increasing and accelerated gain, and the shortening of the specified length of chain simultaneously tends to decrease the gain, the resultant gain is not small enough to produce the desired yarn base. Hence I bring into action the modifying cam bar 29 and the roll 5 governed thereby. The part *a** of said bar coöperates with the follower 28 contemporaneously with the coöperation of the hub 60 with the part *a* of the cam lever 51, and referring to Fig. 3 it will be seen that the part *a** imparts a gradual rise to the roll 5, practically letting off the chain P while the drum 6 takes it up, but to a much less extent. Consequently the roll 5 now acts with the swing of the chain toward the vertical, and the combined action results in neutralizing enough of the increase in "gain" due to the drum to lay the yarn at the bottom of the yarn base 56 with the built out or convex shape indicated at 55, while its top is coned as at 57, Fig. 11. The initial traverse is indicated at 58, Fig. 10, and it will be seen that it has increased quite rapidly during the building of the yarn base 56, Fig. 11, as evidenced by the length of the traverse indicated by the conical top 57. In both

figures the yarn receiver or bobbin is indicated at R, and it may be of any usual shape and configuration. From now on to the completion of the winding it is desirable that the traverse increase, but more gradually, to its maximum, and that the "gain" shall be substantially uniform, and controlled practically by the drum. When the hub 60 reaches the high point of the cam part *a* the angular advance of the ratchet 36 is at its maximum, and continued rotation of the feed shaft 32 causes the traverse-changer 8 to move outward and bring the drop *b* of the cam lever 51 into engagement with the drum hub 60, thereby effecting a relatively rapid shift of the shield 48 to the right, Figs. 1 and 5. This reduces the amplitude of angular advance of the ratchet, and consequently shortens the advances of the traverse-changer, so that not only is the increase in traverse effected at a slower rate thereafter but the "gain" due to the drum 6 is decreased to the desired extent, that is, to its minimum, when the hub 60 is moving opposite the dwell *c* of the cam lever. The latter now rests at its outer end on the stop 54 and so remains during the remainder of the winding operation, so that the traverse increases gradually and uniformly while the gain is uniform, the completed yarn mass being indicated at 59, Fig. 11. During the cooperation of the hub 60 and the drop *b* of the cam lever the follower 28 leaves the part *a*^{*} of the cam bar 29 and engages the gradual rise *b*^{*}, so that the roll 5 is drawn downward, thereby taking up as much of the chain P as the latter is let off by its gradual approach to the vertical between the said roll 5 and the sheave 4. That is, the part *b*^{*} of the cam bar neutralizes the effect of the angular change in such part of the chain, so far as the gain is concerned, and the drum is practically the sole controlling element for the "gain" of the traverse, and the gain is uniform. After the part of the chain below the sheave 4 moves past the vertical, due to continued movement of the traverse-changer toward the outer end of the builder-arm its tendency is to increase the gain, but now the follower 28 moves along the gradual descent *b*^{*} of the cam bar, permitting the roll 5 to rise gradually, and thereby the tendency of the chain to increase the gain toward the completion of the winding is again neutralized, and the drum continues in full control. The action of the roll 5 upon the bight of the chain passed around it is thus a modifying one at all times, the character and extent of the modifying action being determined by the contour of the cam surface *a*^{*}, *b*^{*}, *b*^{*} as will be obvious.

In the actual operation of the apparatus herein described the traverse increases from

about $\frac{5}{8}$ of an inch at the beginning to about $1\frac{1}{8}$ inches at the end of the winding, and during the formation of the base 56 of the yarn mass the resultant or effective gain is primarily so slight as to its action that the first few layers of yarn seem to be practically superposed at the bottom of the base, after which the increase in the effective gain appears to make itself felt, with the rounding or convexing of the base at its bottom, indicated at 55, Fig. 11.

The yarn masses or bobbins wound by the described mechanism act with entire satisfaction in the loom, so far as the proper operation of the feeler mechanism is concerned, and an increased amount of yarn is provided by the full base of the yarn mass.

The apparatus does not wind what is technically known as a "bunch," but in practice the initial winding of yarn laid upon the yarn-receiver can be utilized in connection with feeler mechanism to perform the functions of a bunch.

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, an oscillating builder-arm having a constant stroke, a winding drum longitudinally movable thereon, a reciprocating ring-rail, a flexible connection between it and the drum to effect the reciprocation of the rail by or through oscillation of the builder-arm, means to effect intermittent movements of the drum away from the fulcrum of said arm to at first gradually accelerate the increase of the traverse, means to effect rotation of the drum by a series of angular movements gradually increasing in amplitude during the formation of the base of the yarn mass upon a receiver, to increase the gain during acceleration of the traverse increase, and an instrumentality including a cam controlled device acting upon the flexible connection to temporarily neutralize a portion of the increase in the gain due to the drum, whereby the bottom of the base of the yarn mass is built out and convexed.

2. In apparatus of the class described, an oscillating builder-arm having a constant stroke, a reciprocating ring-rail, a connection between it and the builder-arm, and controlling means carried by the latter and acting through such connection to effect reciprocation of the ring-rail with an accelerated increase in its traverse at first and thereafter with a gradual and substantially uniform increase, said means including two devices separately acting upon the connection between the rail and builder-arm to effect a resultant gain of the traverse which at first is very small but gradually increasing and thereafter is substantially uniform throughout the remainder of the winding operation, each of said devices having a

bodily movement upon and longitudinally of the builder-arm and one only of said devices having an additional movement transverse to the length of the builder-arm.

5 3. In apparatus of the class described, an oscillating builder-arm having a constant stroke, a winding drum longitudinally movable thereon, a reciprocating ring-rail, a flexible connection between it and the drum to effect the reciprocation of the rail by or
10 through oscillation of the builder-arm, a modifying roll cooperating with said connection between the rail and the drum and movable longitudinally of the builder-arm
15 with the drum, means to effect a series of gradually increasing advances of the drum away from the fulcrum of the builder-arm during the building of the base of the yarn mass, other means to effect a corresponding
20 angular movement of the drum for each advance of the latter along the arm, to increase the gain in accordance with the increase in the traverse, and a controlling cam fixedly mounted on the builder-arm and operatively connected with said modifying
25 roll, to neutralize a portion of the gain due to rotation of the drum during the formation of the base of the yarn mass.

4. In apparatus of the class described, an
30 oscillating builder-arm having a constant stroke, a traverse-changer movable longitudinally on the builder-arm, a rotatable drum carried by said traverse-changer, a reciprocating ring-rail, a connection between it and the drum, to effect reciprocation of the rail by or through oscillation of the builder-arm, a modifying member cooperating with said connection adjacent the drum and movable therewith longitudinally
35 of the builder-arm, a controlling cam on the latter, operatively connected with and to vary the action of the modifying member upon the connection with the ring-rail, means to move the traverse-changer away
40 from the fulcrum of the builder-arm by a series of advances at first rapidly increasing in length and then decreasing to a substantially uniform length, said means including a cam lever to govern such variable
45 advances and the resulting changes in the traverse, and means to effect a partial rotation of the drum at each advance of the traverse-changer, the gain of the traverse effected thereby at first rapidly increasing
50 and then becoming substantially uniform, the modifying member being caused by its controlling cam to partly neutralize the rapidly increasing gain due to rotation of the drum and thereafter causing the gain
60 to be regulated by rotative movement of said drum.

5. In apparatus of the class described, mechanism, including an oscillating builder-arm having a constant stroke, to effect the
65 winding of yarn upon a yarn receiver with

an accelerated increasing traverse during the formation of the base of the winding and thereafter with a gradually and uniformly increasing traverse, separate devices acting contemporaneously to effect a resultant gain
70 of the traverse but slightly increasing during the formation of the base, the gain thereafter being substantially uniform and regulated mainly by one of said devices, and a common actuating instrumentality for
75 said means and devices, combined with the oscillating builder-arm on which said means, devices and actuating instrumentality are mounted, said devices having a simultaneous
80 bodily movement upon and longitudinally of the builder-arm, one of said devices having a variable movement transversely to the builder-arm, and means to control such movement.

6. In apparatus of the class described,
85 means, including an oscillating builder-arm, a member movable longitudinally thereon to effect the winding yarn upon a yarn receiver with an initially accelerated increasing traverse and thereafter with a uniformly
90 increasing traverse, and separate devices carried by said member to govern the gain of the traverse, one of said devices tending initially to rapidly increase the gain while the other device acts contemporaneously to
95 decrease the gain, but to a less extent, whereby during the accelerated increasing traverse the gain is only slightly increased, and mechanism brought into operation by the oscillation of the builder-arm to move
100 said member longitudinally upon the arm.

7. In apparatus of the class described, an oscillating builder-arm, having a constant stroke, a carriage movable longitudinally
105 thereon, a drum and attached gear rotatably mounted on the carriage, a carrier fulcrumed on the carriage and having a roll and a cam-follower, a controlling cam cooperating with the follower and fixedly attached to the builder-arm, a reciprocating
110 ring-rail, a chain connecting it with the drum and passing under said roll, cam-controlled movement of the latter taking up or letting off the chain, a rack on the builder-arm, meshing with the drum gear to rotate
115 the same when the carriage is moved along the builder-arm, means to advance the carriage step by step, and a cam on the builder-arm to govern the operation of said means and regulate the length of each advance of
120 the carriage and thereby govern the amplitude of each corresponding rotative movement of the drum, such movement of the drum always acting to take up the chain, the roll cooperating with the chain at times
125 acting against the drum and at other times with it according to the portion of its controlling cam which is engaged by the follower during movement of the carriage along the builder-arm.
130

8. In apparatus of the class described, an oscillating builder-arm having a constant stroke, a feed shaft thereon, means including a ratchet, a pawl, and a shiftable shield, to effect intermittent rotation of the shaft to an extent determined by the position of the shield, a traverse-changer moved longitudinally along the builder-arm away from its fulcrum by such rotation of the feed shaft to effect increase of the traverse, a winding drum and a modifying member, mounted on said traverse-changer, means whereby longitudinal movement of the latter effects a corresponding rotation of the drum, a reciprocating ring-rail, a chain operatively connecting it and the drum and also coöperating with said modifying member, the specified rotation of the drum taking up the chain and effecting gain of the traverse, a guide for said chain, located above and between the ends of the builder-arm, whereby the outward movement of the traverse-changer causes a variation in the effective length of the chain between said guide and the drum, a cam to govern the action of the modifying member, whereby primarily a portion of the gain due to the drum is neutralized and thereafter the variations in the effective length of the chain are compensated for, a cam lever fulcrumed on the builder-arm and operatively connected with the shield to shift the latter in accordance with the contour of the cam, and a follower on the traverse-changer coöperating with and rocking said cam lever as the traverse-changer moves outward, said cam acting first to successively increase the length of the advances of the traverse changer and thereafter to decrease and maintain a uniform length for such advances, whereby the increase of the traverse is first accelerated and then continued at a uniform and lower rate.

9. In apparatus of the class described, means including an oscillating builder-arm having a constant stroke, to effect a winding of yarn upon a yarn receiver with an increasing and rapidly accelerated traverse at the beginning of the winding and thereafter with a uniformly increasing traverse at a lower rate to the end of the winding, two separate devices to govern the gain of the traverse by their resultant action, both devices being movable bodily upon and longitudinally of the builder-arm and one only of said devices having an independent movement transversely of said arm, and mechanism controlled by the operation of said means to effect the operation of both said devices and cause the latter to act concurrently and effect a small but gradually increasing gain during the accelerated increasing traverse and thereafter to effect a substantially uniform gain to the end of the winding.

10. In apparatus of the class described, in combination, a reciprocating ring-rail, means including an oscillating builder-arm, to control its reciprocation to effect a winding of yarn upon a yarn receiver with an increasing and rapidly accelerated traverse during the formation of the base of the yarn mass and thereafter to continue the winding with a traverse uniformly increasing at a lower rate, a device movable bodily upon and longitudinally of the builder-arm and controlled by or through the operation of said means to effect the gain of the traverse throughout the winding correspondingly with the variations in the traverse, and a modifying device also carried by and movable with and relatively to said builder-arm both transversely and longitudinally thereof and acting automatically to modify the operation of the first-named device, whereby the gain will gradually increase by small increments during the formation of the base of the yarn mass and thereafter will be substantially uniform.

11. In apparatus of the class described, a reciprocating ring-rail, a builder-motion including an oscillating builder-arm and a winding mechanism longitudinally movable thereon and operatively connected with and to control the reciprocation of the ring-rail, means controlling the winding mechanism to effect automatically a rapid increase of the traverse at first and thereafter a substantially uniform increase at a lower rate, said means also causing the winding mechanism to effect corresponding variations in the gain, and a modifying device including a member fixed on the builder-arm and a member controlled thereby but movable longitudinally with the winding mechanism, to modify the action of the latter with relation to the gain, whereby the gain at first is gradually and slowly increased and thereafter maintained substantially uniform.

12. In an apparatus of the class described, a reciprocating ring-rail, an oscillating builder-arm having a constant stroke, winding mechanism bodily movable longitudinally upon the builder-arm, a chain connecting the ring-rail and said mechanism to govern the movement of the rail, means to cause the winding mechanism to vary the length of the chain proportionately to the length of bodily movement of said mechanism upon the builder-arm, to govern the gain of the traverse, means to effect such bodily movement of the winding mechanism by a series of steps at first rapidly increasing in length and then continuing with a uniform but less length, whereby the traverse is first rapidly increased and then diminished to a uniform increase, the winding mechanism tending to vary the gain of the traverse correspondingly, and a modifying device coöperating with the chain and in-

cluding a controlling cam, said device at
first acting upon the chain in opposition to
the action of the winding mechanism, to
effect a resultant gain which at first increases
5 gradually but slowly, the gain thereafter
being uniform and controlled substantially
by the winding mechanism only.

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.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
Washington, D. C."