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PATENTED NOV. 12, 1907.

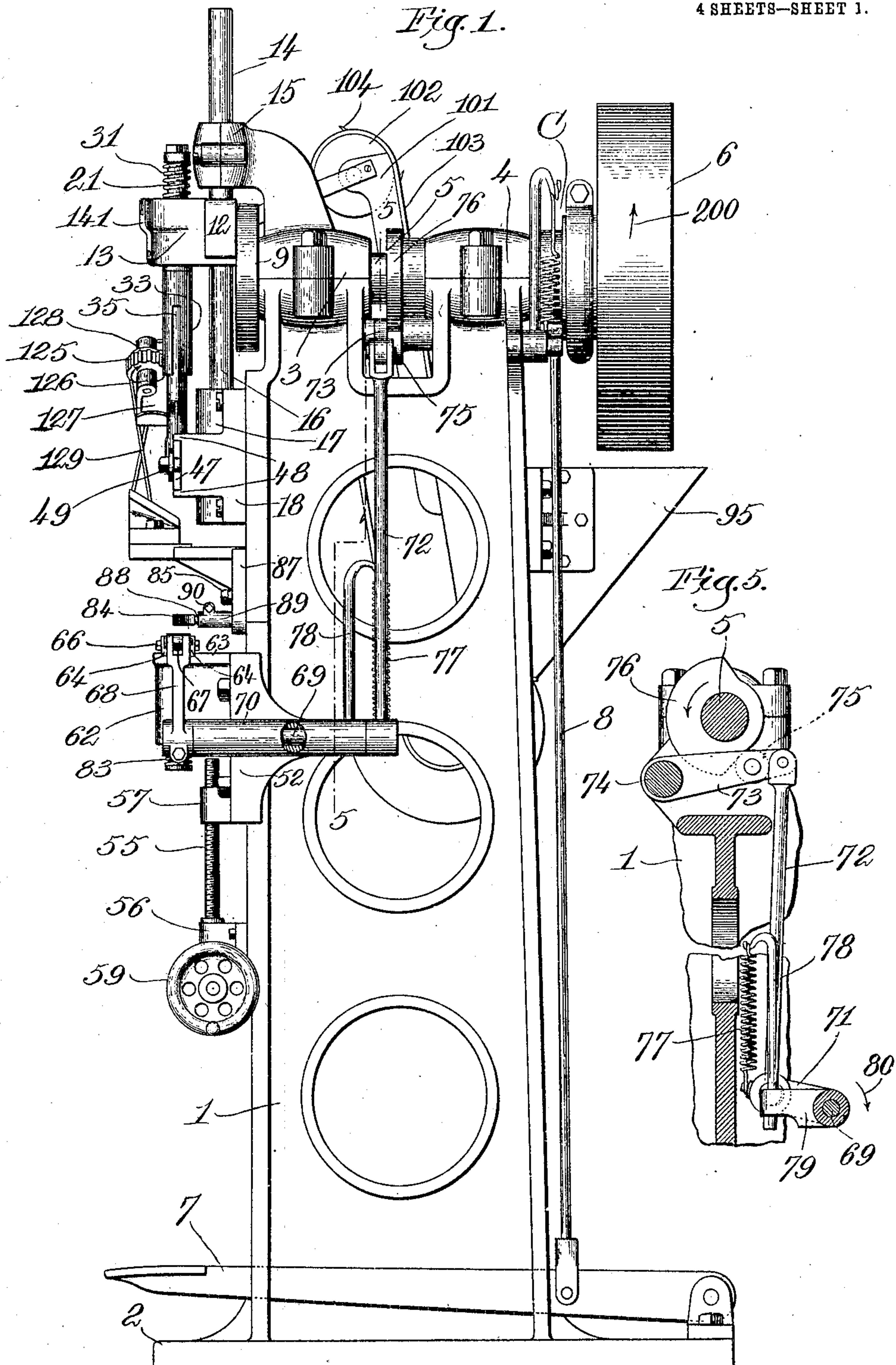
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APPARATUS FOR APPLYING EXPANSIBLE RINGS TO BOBBINS.

APPLICATION FILED SEPT. 7, 1905.

4 SHEETS—SHEET 1.



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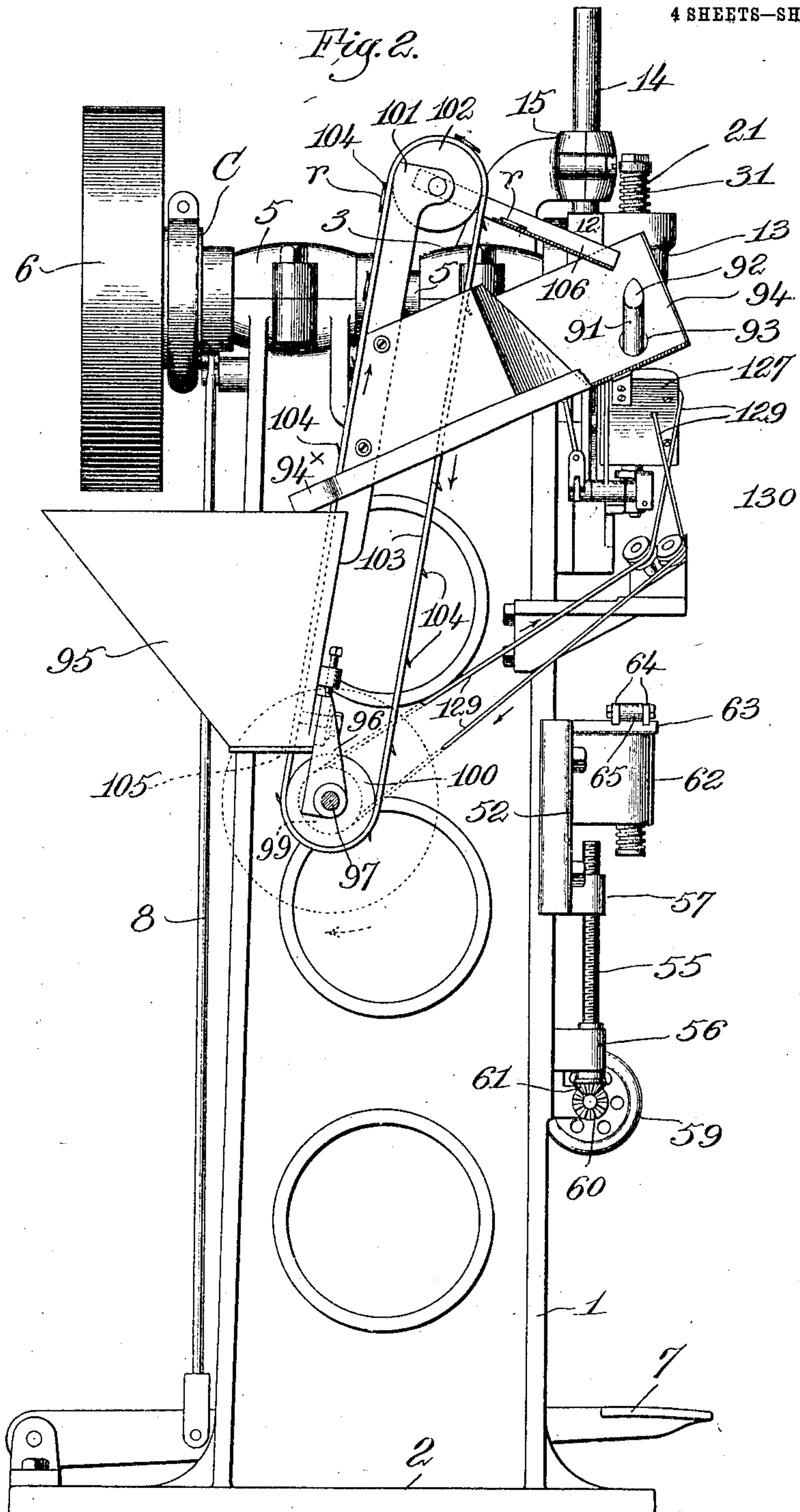
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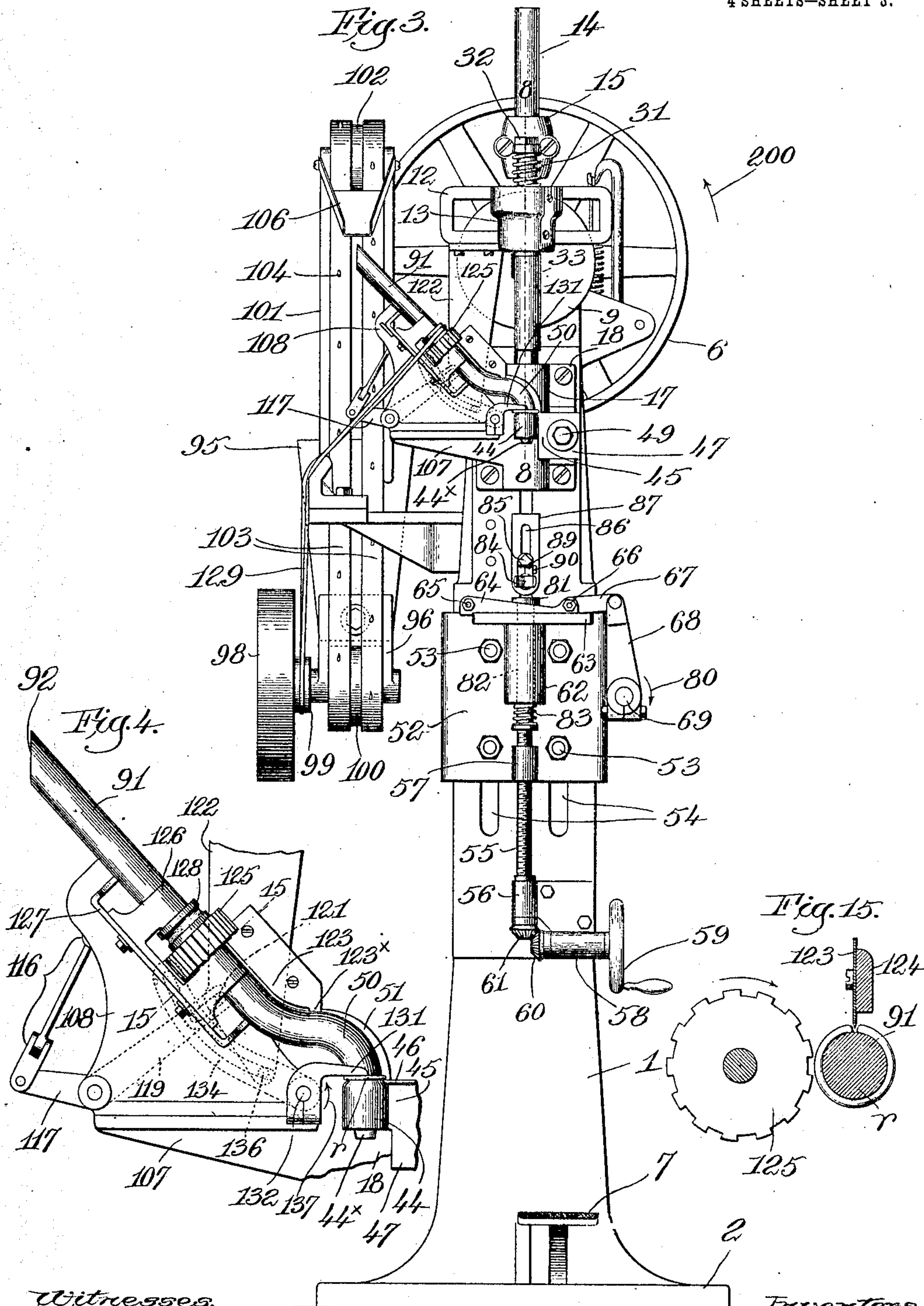
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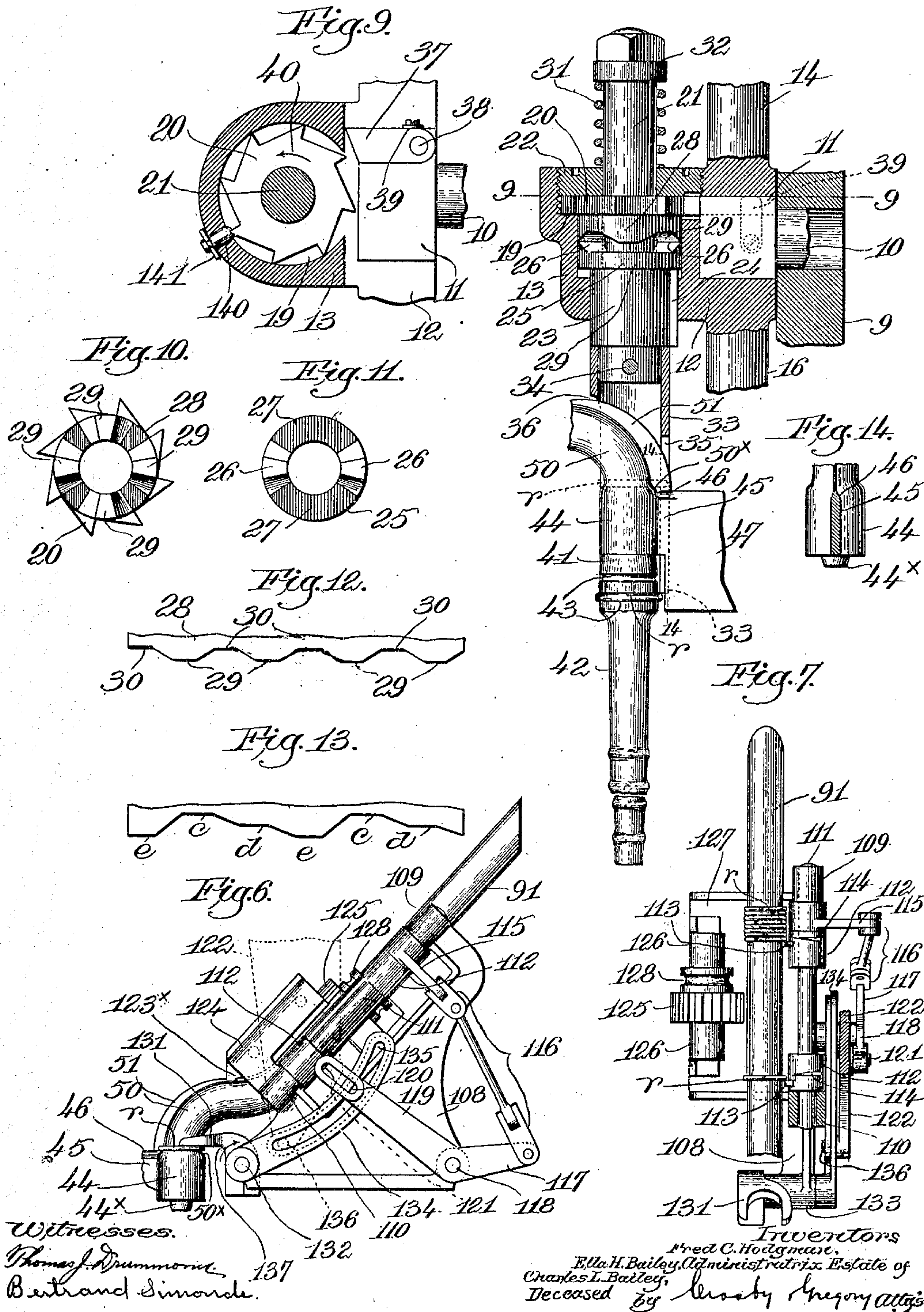
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4 SHEETS—SHEET 4.

Fig. 8.



UNITED STATES PATENT OFFICE.

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APPARATUS FOR APPLYING EXPANSIBLE RINGS TO BOBBINS.

No. 870,960.

Specification of Letters Patent.

Patented Nov. 12, 1907.

Application filed September 7, 1905. Serial No. 277,303.

To all whom it may concern:

Be it known that we, FRED C. HODGMAN, a citizen of the United States, and resident of Hopedale, county of Worcester, State of Massachusetts, and ELLA H. BAILEY, of Waterbury, county of New Haven, State of Connecticut, administratrix of CHARLES L. BAILEY, deceased, have invented an Improvement in Apparatus for Applying Expansible Rings to Bobbins, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention has for its object the production of apparatus for expeditiously applying expansible rings to spinning bobbins, such bobbins being more particularly designed for use in shuttles of automatic filling-replenishing looms of the "Northrop" type, wherein the bobbin with its load of yarn is automatically inserted in the running shuttle, as for instance in United States Patent No. 529940. In such apparatus the rings on the bobbin are engaged and held by suitable jaws carried by the shuttle, and while the primary function of the rings is to provide annular enlargements or projections to cooperate with the jaws such rings have a secondary function of strengthening and protecting the head of the bobbin. So far as concerns the apparatus in which the present invention is embodied, however, it can be used with equal facility for applying rings to bobbins where the sole function of the ring is that of a strengthener. The rings are made of steel, tempered sufficiently to give them the requisite elasticity, and split in order that they may expand during the application of the same to the bobbin, the somewhat enlarged head of the latter being provided with a shallow groove for each ring to be applied thereto, the elasticity of the ring snapping it firmly into its seat in the groove as soon as it reaches the same, and thereafter the ring hugs or grips the bobbin-head with considerable force, sufficient to prevent any relative movement thereon.

We have herein shown the apparatus as arranged to apply two rings to each bobbin by two successive strokes of a reciprocating plunger, which applies or sets the rings in proper position, but as will appear herein-after a slight change in one of the parts provides for the setting of more than two rings.

In the present embodiment of our invention the rings are placed in a hopper in bulk and they are removed therefrom by suitable means and automatically conveyed to a feed raceway, along which they move and on which they are positioned properly for setting.

The rings are governed while on the raceway by a let-off device or escapement which provides for the movement of the rings one by one in readiness to be transferred into position to be engaged by the applying or setting device, all as will be fully described, with other

novel features of our invention, in the subjoined specification and particularly pointed out in the following claims.

Figure 1 is a right hand side elevation of an apparatus for applying rings to bobbins, embodying one form of our invention, the parts being shown in readiness to operate; Fig. 2 is a left-hand side elevation of the apparatus showing the ring hopper and the means for conveying the rings therefrom to the feed raceway; Fig. 3 is a front elevation of the apparatus, showing the feed raceway for the rings, the means for positioning the rings thereon, and the let-off mechanism whereby the rings are released one by one previous to their transfer into position to be applied to a bobbin; Fig. 4 is an enlarged detail in front elevation of the raceway, the ring-positioning means, and the let-off mechanism, and showing the transferrer which transfers the rings singly from the raceway to the combined guide and expander; Fig. 5 is a transverse vertical sectional detail on the irregular line 5—5, Fig. 1, looking toward the right, showing the mechanism for operating the tip-rest or support for the bobbin during the setting of the rings; Fig. 6 is a rear elevation, also enlarged of the feed raceway, ring-positioning means, and let-off; Fig. 7 is a top plan view of the mechanism shown in Figs. 4 and 6, the line of sight being at right angles to the raceway, the latter being broken off at its lower end and the externally acting guide or controlling fin being omitted; Fig. 8 is an enlarged view, partly in elevation and partly in section on line 8—8, Fig. 3, showing the ring guide and expander, the cooperating portion of the ring-applying or setting plunger, and the means for varying the effective stroke of the plunger on successive descents, for a purpose to be described, a bobbin being shown in position ready to receive its second ring; Fig. 9 is a transverse section on the line 9—9, Fig. 8, looking down, showing the operating ratchet for one of the stroke-controlling cams; Fig. 10 is an under-side view of the ratchet and its attached controlling cam; Fig. 11 is a top plan view of the cooperating fixed controlling cam; Fig. 12 is a development of the rotatable cam shown in Fig. 10; Fig. 13 is a development of a fixed cam used for three-ring bobbins, the cam shown in Fig. 11 being used for two-ring bobbins, as will be explained hereinafter; Fig. 14 is a vertical sectional detail on the line 14—14, Fig. 8, looking toward the left, to show the beveled upper end of the ring expander, and Fig. 15 is an enlarged sectional detail on the line 15—15, Fig. 4, to be referred to hereinafter.

Referring to Figs. 1, 2 and 3, a suitably-shaped box-like standard or column 1 is provided with an enlarged base 2 to afford a firm support for the column and the operative parts of the mechanism mounted thereon, the column at its top being bifurcated, see Fig. 1, and

furnished with suitable bearings 3 and 4, for the main operating shaft 5 provided with a loose pulley 6 adapted to be rotated by a belt driven from any suitable source of power, not shown, and arranged to be operatively

5 connected at times with and to rotate the shaft by means of a clutch-mechanism, preferably of the one-revolution type, and indicated as a whole at C, Fig. 1. The clutch mechanism *per se* forms no part of our invention, as one-revolution clutches are well known

10 in the art, and as will appear more fully hereinafter, it is preferable that the main shaft 5 be given a complete rotation and stop, the clutch being thrown into action by the operator by depression of a foot-treadle 7, connected by a link 8 with the clutch mechanism.

15 The front end of the shaft projects beyond the bearing 3, and has a rigidly attached disk 9 provided with a crank-pin 10, see Fig. 8, having loose thereon a squared block 11 which enters with a sliding fit a horizontal guide 12 secured to or forming part of a vertically-
20 reciprocating head 13, the latter being shown as provided with a vertical guide-rod 14, which slides in an overhead bearing 15 forming a part of the main-shaft front bearing 3, and a depending guide-rod 16 is shown sliding in a sleeve-like bearing 17 forming part of a
25 bracket 18 rigidly attached to the front of the column 1.

The guide-rods 14, 16, and the horizontal guide 12 for the crank-pin are all preferably made integral with the reciprocating head 13, each rotation of the main-shaft lowering and raising the head in an obvious
30 manner.

Referring to Fig. 8, the head is cupped out to leave an internal, horizontal shoulder 19 on which rests a ratchet 20, shown in plan Fig. 9, rotatably mounted on a plunger 21 loosely extended upwardly through a
35 retaining cap 22, screwed into the head 13 above the ratchet, so as to prevent any vertical movement of the latter. The lower part of the plunger 21 is enlarged at 23 to slide through the lower portion of the head, and a key 24 prevents any rotative movement of the plunger.
40 At the upper end of the enlargement 23, a cam 25 is fixedly secured, said cam in the present instance having two diametrically opposite high portions 26, see Fig. 11, the high portions being beveled at each side down to the intervening low portions 27, indicated in
45 Fig. 11 by the parallel shading, in order to more clearly distinguish the contour of the cam. The ratchet 20 has rigidly secured to or forming a part of it on its under side a cooperating cam 28 provided with four equi-distant high portions 29, see Fig. 10, the ratchet having
50 eight teeth. The cam 28 is developed in Fig. 12 to show the alternation of the high portion 29 and the low portion 30.

In Fig. 8, the two cams are so set with relation to each other that the high portions 26 of the lower cam cooperate with two of the opposite high portions 29 of the upper or rotatable cam 28, so that at such time the plunger 21 is depressed with relation to the head 13 as far as possible, such depression being resisted by a spring 31 coiled about the upper end of the plunger
60 between the retaining cap 22 and the nut 32 on the upper end of the plunger. If the upper cam 28 be turned one-eighth of a revolution, the high parts of cam 25 will be brought opposite two of the low parts 30 of the rotatable cam, and thereupon the spring 31 will
65 lift the plunger in the head, so that at the next descent

the effective stroke of the plunger will be shorter than the effective stroke when the high parts of the two cams are in cooperation. The utility of this stroke-controlling mechanism for the plunger, which latter serves as a ring-setting or applying device, will be more clearly
70 understood hereinafter. The lower end of the plunger is made tubular, as at 33, preferably by the application of a tubular piece on the plunger and secured thereto, as by a pin 34, see Fig. 8, the tubular portion having a longitudinal slot 35, and an opposite and larger slot 36,
75 both for a purpose to be described. The slot 35 is clearly shown in Fig. 1. The rotation of the rotatable cam and its attached ratchet 20 is herein effected by means of a pawl 37, see Fig. 9, pivotally mounted at 38 in a recessed portion of the loose block 11 on the
80 crank-pin, the pawl being acted upon by a spring 39 fastened to the side of the part 11.

When the rotation of the main shaft, which is in the direction of the arrow 200, moves the crank-pin to the right, viewing Fig. 3, the pawl will click over one of
85 the teeth of the ratchet and on the subsequent movement of the crank-pin to the left, viewing Fig. 3, the pawl will then engage such tooth and will turn the ratchet one step in the direction of the arrow 40, Fig. 9, so that at each step of the plunger, the ratchet and its
90 attached cam will be turned one-eighth of a revolution, in the present embodiment of my invention, so that one effective stroke of the setting plunger will be long, and the next stroke short, and so on.

The rings to be applied to the bobbin are made of
95 properly tempered steel and split, so that they may be expanded, in order to be forced over the butt 41 of the bobbin 42, shown in Fig. 8, the butt of the bobbin being provided with two or more annular, shallow grooves 43, which grooves serve as seats for the rings, the latter
100 by their elasticity firmly clamping themselves upon the butt as soon as they are set in the grooves.

Immediately below the setting plunger, and in the path thereof, we have provided an upright cylindrical guide 44, substantially equal in diameter to the diameter of the bobbin-butt, said guide having at one side
105 thereof a longitudinal rib 45 beveled at its upper end as at 46, to constitute a ring-expander, see Figs. 8 and 14, the rib extending the length of the guide and forming a part of the web 47 rigidly bolted to the bracket 18 here-
110 inbefore referred to between upright, horizontal ears 48, see Fig. 1. The said web 47 is horizontally slotted to receive the attached bolt 49, so that the guide and expander may be brought into absolute and proper alignment with the plunger, the slot 35 in the tubular extension 33 of the plunger receiving the expander 45 as
115 the plunger descends. The upper end of the guide 44 is slightly reduced in diameter and extended to form a curved neck 50, provided with a guide fin 51, the purpose of which is to pass between the two ends of a ring
120 on the neck from the interior of the ring, and to slightly expand the ring, so that when the ring is in position to be set, as shown by dotted lines at *r*, Fig. 8, the opening or slit of the ring will be entered by the beveled upper end of the expander as the plunger descends, the slot 36
125 in the plunger extension at such time embracing the neck 50.

In Fig. 8, the plunger is shown at the lowest point of its long stroke, it having just set a ring in the lower one of the two grooves 43 in the butt of the bobbin. Sup-
130

posing a ring to be in position in readiness to be set, as indicated by dotted lines in Fig. 8, and the plunger raised, when the plunger descends, the portions thereof between the slots 35 and 36 engage the upper surface of the ring and force it down over the guide 44, the ex-
 5 pander 45 spreading apart the ends of the ring, and the quick stroke given to the plunger will carry the ring beyond the bottom of the guide and expander and onto the bobbin-butt, and on the long stroke, the ring will
 10 be carried past the upper groove in the butt, and permitted to snap into the lower groove when the plunger reaches the lowest point of its stroke. The shorter stroke of the plunger is of such length that when the plunger is at its lowest point, the ring will snap into the upper
 15 groove on the butt.

In applying a plurality of rings to a bobbin, the ring nearest to the barrel of the bobbin is set first, and then the other ring, or rings if there are three, will be applied in succession by successive down-strokes of the
 20 plunger.

It is preferable to so apply the rings that the openings will not register with each other on the bobbin, and the operative will give the bobbin a partial turn after the first ring has been set, so that the next ring will be set
 25 with its opening out of line with the opening of the first ring.

We have provided means to clamp the bobbin in position against the bottom of the guide during the setting operation for each ring, and this clamping mechanism
 30 will now be described.

A vertically movable carrier 52 is adjustably secured to the front of the column or standard by bolts 53 extended through slots 54 in the column, see Fig. 3, the said carrier being raised or lowered to accommodate
 35 bobbins of different lengths, by means of a threaded shaft 55 rotatably mounted in a bracket 56 on the column, and engaging a threaded boss 57 on the carrier. The bracket 56 is provided with a horizontal bearing 58 for a short shaft having a hand-wheel 59 secured to it at
 40 one end, and at its other end a beveled gear 60 in mesh with a similar gear 61 on the lower end of the screw-shaft 55. When the nuts 53 are slackened, the operative can, through rotation of the hand-wheel 59, raise or lower the carrier to the desired position. Said car-
 45 rier has a carrier extension 62 provided with a horizontally extended top 63 on which is slidably mounted a two-part wedge 64 rigidly connected at the ends by bolts 65, 66, the latter being connected by a short link 67 with a rocker arm 68 fast on the front end of a shaft 69
 50 mounted in a sleeve-bearing 70 on the right-hand side of the carrier 52, viewing Fig. 3. The rear end of the shaft has a rigidly attached rocker-arm 71, see Fig. 5, pivotally connected with the lower end of a link 72, jointed at its upper end to a vibrating arm 73, fulcrumed on the
 55 column at 74, and carrying a roll or follower 75 which coöperates with a cam 76 fast on the main shaft 5 between the bearings 3 and 4, the shape of the cam being clearly shown in Fig. 5. A strong spring 77 is secured at one end to the rocker-arm 71, and at its upper end to
 60 a sustaining rod 78 fixedly mounted in an extension 79 of the bearing 70, the tension of the spring serving to lift the link 72 and maintain the follower 75 in coöperation with the surface of the cam, such lifting action of the spring also tending to turn the shaft 69 in the direc-
 65 tion of the arrow 80, Figs. 3 and 5.

Viewing Fig. 3 it will be seen that such rotative movement of the shaft 69 will act through the intervening connections to move the two-part wedge 64 to the right, such movement of the wedge acting upon the head 81 of a spring-controlled plunger 82, (slid-
 70 ably mounted in the part 62 of the carrier 52) to lift the plunger against the action of its spring 83. The plunger 82 passes upward between the two-parts of the wedge, the underside of the plunger head or tip-support 81 being beveled to correspond with the in-
 75 clination of the top of the wedge, as clearly shown in Fig. 3. Viewing the parts as shown in said Fig. 3, when the wedge is moved to the right, the tip-support 81 will be elevated, and if a bobbin is interposed between such tip-support and the guide 8, the bobbin
 80 will be clamped in position to receive a ring.

In Fig. 5, the low part of the cam 76 is shown in coöperation with the follower, and the high part of the cam is just about to act to depress the coöperating
 85 arm 73, to lower the link 72 and thereby rock the shaft 69 oppositely to the arrow 80, the action of the high-part of the cam moving the wedge to the left and stretching the spring.

The cam is so timed that it will effect the positive release movement of the wedge after a ring has been
 90 set on the bobbin, and the clamping action of the spring 77 takes place just prior to the descent of the setting plunger, and maintains the bobbin clamped during the setting operation, the spring permitting slight variations in the bobbin-length which are al-
 95 most inevitable.

As shown in Figs. 3, 4, 6 and 14, the lower end of the guide 44 is provided with a short central projection 44^x, which enters the bore of the bobbin and central-
 100 izes the latter with relation to the guide. A vertically adjustable, V-shaped rest or gage 84 is mounted on the column 1, above the tip-support 81, and is held in vertically adjustable position by a clamping bolt
 85, passed through a slot 86, see Fig. 3, in the plate 87 on which the rest 84 is carried, the rest being ar-
 105 ranged to position laterally the tip of the bobbin on the support 81. The rest is not only vertically adjustable as described, but its shank 88, see Fig. 1, is held in a split boss 89 on the plate 87, and clamped
 110 by a bolt 90, so that the rest can be moved horizontally toward or from the front of the machine.

The construction of the rest or gage, and the adjusting means therefor, are clearly shown in Figs. 1 and 3.

The upturned neck 50, extended from the ring-
 115 guide 44, is circular in cross-section, and of such a diameter that the rings will readily pass thereover into the position of the dotted line rings *r*, shown in Fig. 8, it being noted that the diameter of the neck is slightly less than that of the guide, the annular shoul-
 120 der 50^x formed by such difference in diameters serving to temporarily support the ring in position to be set, as is shown in Fig. 6.

The upper end of the neck is secured to or forms part of a cylindrical and upwardly inclined raceway
 125 91, the lower end of the raceway and the neck forming a reversed curve, as clearly shown in Figs. 4 and 6, and at its upper end, the raceway is sharpened or beveled at 92, and is extended through a hole 93, see
 130 Fig. 2, in the side wall of a return-chute 94, the nearer

wall being broken off in Fig. 2 to show the arrangement, and in Fig. 3, the return chute is altogether omitted.

A hopper 95 bolted to the side of the column is adapted to receive the split rings in bulk, and a bifurcated bracket 96 adjustably secured to the lower part of the front wall of the hopper provides bearings for a shaft 97 on which is mounted a large pulley 98, a smaller pulley 99 and a drum 100.

An upturned bracket 101 secured to the upper part of the front wall of the hopper carries at its upper end a drum 102, and an endless conveyer, herein shown as two endless belts 103, is passed around the two drums, the adjustability of the lower bracket 96 maintaining the belts properly taut. These belts are provided with prongs 104, so arranged that on the upper run of the conveyer they will be upturned, as shown in Fig. 2, the upper run of the conveyer passing through a slot 105, see dotted lines Fig. 2, in the bottom of the hopper.

The conveyer is driven through the belt-pulley 98 by suitable belting not shown, and as the upturned prongs 104 travel through the hopper, they pick up rings, the prongs being of such length that only one ring can be carried by any one prong, and as the conveyer passes over the upper drum 102, the rings are discharged onto a delivery chute or trough 106, secured to the upper end of the bracket 101, the trough being inclined forward toward the beveled end 92 of the feed-raceway 91, as clearly shown in Fig. 2. The rings slide down the trough, and as they drop from the open lower end thereof, numbers of the rings will fall in such position as to drop onto the adjacent end of the raceway and slide down the same through the hole 93 in the wall of the return trough. Those rings which do not fall onto the raceway, drop to the bottom of the return chute and slide along by means of the conduit 94^x, Fig. 2, back into the hopper. The bracket 101 is shown in Fig. 2 as supporting the return chute or trough 94.

It will be noticed that the neck 50 forms the sole support for the feed raceway, and were it not for means provided for the purpose, the rings delivered onto the upper end of the raceway would slide by gravity down the latter and onto the neck in various positions, so far as concerns the openings in the rings.

It is necessary for the proper operation of the apparatus not only to present the rings one by one into position to be engaged by the setting means, but it is also necessary that the rings should be made to assume a definite position on the raceway, so that their openings will be entered by the fin 51 on the neck, the latter in turn maintaining the proper position of the rings as they reach the expander.

We have provided a let-off mechanism or escapement to let the rings off one by one from the lower end of the group of rings on the raceway, and we have also provided means to act upon the rings one by one to position them to be engaged by a primary fin or director before the rings pass to the secondary fin 51.

Referring more particularly to Figs. 3, 4, 6 and 7, the bracket 18 is provided with a lateral extension 107 on which is rigidly secured an upturned stand 108, at one side of the raceway, and provided with bearings 109, 110, for a rock-shaft 111, parallel to the raceway. Like

collars 112 are secured to the rock-shaft, each collar having a radial stop-pin 113 and a segmental and sharpened rib 114, slightly above the adjacent stop. When the shaft 111 is in the position shown in Fig. 7, the upper stop 114 is in engagement with the lowermost ring of the series of rings which have been placed upon the raceway by the means described, and the lower stop is in position to sustain a ring which has been previously let off. When the rock-shaft is turned by means to be described, the upper one of the sharpened ribs 114 passes between the last ring and the next adjacent ring of the series, and serves as a temporary support while the stop 113 is moved out of the way of the endmost ring to release it and let it slide down the raceway, and at the same time the lower stop 113 has moved into inoperative position to release the ring it was supporting while the adjacent rib 114 has been moved into position to stop the ring just released from the group. This mechanism constitutes a species of double let-off or escapement, letting off one after another the rings from the group or series and each time releasing from the lower stop 113 a ring previously released from the series. The rock-shaft 111 is provided with a lateral arm 115 connected by a jointed link connection 116 (herein shown as three links) with the short arm 117 of a bell-crank fulcrumed at 118 on the stand 108, the long arm 119 of said bell-crank having a longitudinal slot 120, to receive a pin 121 on a depending web 122, rigidly secured to the cross-guides 12, see Fig. 3. When the said guide descends, it operates through the slot-and-pin connection described to rock the bell-crank, and to turn the shaft 111 to operate the let-off mechanism. When the guide 12 rises the let-off mechanism is restored to the position shown in Figs. 3, 4, 6 and 7.

Remembering that the openings in the series of rings are variously placed as they reach the upper stops of the let-off mechanism, we will now describe the means for positioning each ring as it is let-off from the series, so that its opening can cooperate with the external or primary fin hereinbefore referred to, said fin being shown as a blade 123, extending longitudinally just above the lower portion of the raceway and terminating at the upper end of the secondary fin 51, the blade-like fin 123 being secured to an arm 124, forming a part of the rock-shaft bearing 110 as herein shown. This primary fin is at such a distance above the raceway that its edge will enter the opening of a ring or the slight indentation or recess between the ring ends, if the latter are quite close together, as is sometimes the case, the fin acting externally upon the ring to direct it to the upper end of the fin 51.

Between the two let-off stops 113 we have mounted a rotatable ring-positioner, shown as a transversely ribbed or toothed roll 125, of rubber or other suitable material, having its axis parallel to the raceway and supported in bearings 126 on a lateral shelf 127 secured to or forming a part of the stand 108, a pulley 128 secured to the roll being driven by means of an endless band 129 from the small pulley 99 hereinbefore referred to, the endless band 129 being shown in Figs. 1, 2 and 3, and passing around guide pulleys 130 suitably supported on the column 1. One side of the band is shown as passing through a hole in the shelf, see Fig. 2, and the other side passes around the edge of the shelf. The roll is placed so close to the

raceway that the face of a tooth when nearest the raceway will lightly touch or rub against a ring and give it a partial turn, but when the roll is so positioned that a space or clearance between two teeth is opposite the raceway, as in Fig. 15, a ring will be untouched, and it will be free to slide along the raceway, provided its opening is in position to be entered by the fin 123. The rotation of the flexible roll 125 thus acts intermittently upon the released ring from the series above, and turns the ring until its opening is opposite the upper end of the fin 123, whereupon, as soon as a clearance between two teeth permits, the ring slides down the raceway past the roll while retained in its proper angular position by the fin. Thus the positioning roll serves to angularly position the rings with respect to the fin 123, by engaging the rings by its teeth, and it lets such rings as are properly positioned pass downward by the clearances between the roll teeth. The positioning roll is located adjacent the upper end of the fin 123, as clearly shown in the detail views, to properly position the rings and release them when so positioned. If the released ring should happen to come along with its opening down, or directly opposite to the position it must take to cooperate with the fin, the light taps or engagements of successive teeth on the roll 125 will turn the ring rapidly to bring its opening in proper cooperative relation with the upper end of the fin. The lower end of the fin 123 is downturned to meet the raceway at 123^x so that the ring is stopped at that point, even after it has been released or let off by the lower part of the let-off mechanism, and from such point it is positively moved or transferred along the neck 50 into the position shown in Fig. 6, resting on the shoulder 50^x.

The transferring mechanism consists of a yoke-like transferer 131, see Figs. 4, 6 and 7, secured to one end of a short rock-shaft 132 mounted in a bearing 133 on the stand 108, and the transferer is arranged to swing beneath the neck and the lower end of the raceway and longitudinally thereof, the sides of the transferer loosely embracing the sides of the neck and raceway. The shaft 132 has secured to it a segment arm 134 having a long curved slot 135 entered by a pin or stud 136 on the depending web 122, hereinafter referred to, so that when the plunger descends the descent of the pin 136 will act through the slotted arm 134 to turn the transferer in the direction of the arrow 137, Figs. 4 and 6, until it has passed behind the end 123^x of the fin far enough to permit a released ring to slide down against such part 123^x. Then as the plunger rises the ascent of the pin 136 gradually swings the transferer back to the position shown in Figs. 4 and 6, but the ring previously let off will be engaged by the transferer and pushed forward along the neck 50 onto the shoulder 50^x at the top of the ring-guide, and as the ring is thus forced into position to be set, the secondary fin 51 slightly separates the ring ends, so that they will be further separated and the ring expanded by the expander when the plunger completes its setting movement.

The timing of the parts is such, and the slot 135 is on such a curve, that the transferer 131 will be swung backward out of the way of the tubular end of the setting plunger before the latter reaches the ring on the shoulder 50^x. When the ring has been trans-

ferred to this shoulder, the setting operation follows as has been previously described.

The detailed operation of the various instrumentalities or mechanisms has been so fully described that it is unnecessary to enter into an extended description of the operation of the apparatus as a whole, but a brief résumé of the operation will be given.

The split rings are placed in bulk in the hopper, and are conveyed therefrom by the endless conveyer to the spout or chute 106 from which more or less of the rings fall onto the upper end of the feed raceway 91, and such rings as do fall upon the raceway slide down the same to the uppermost part of the let-off mechanism, from which they are let off one by one, and as they pass the intervening distance to the upper end of the primary fin 123, such rings as are not properly positioned will be brought into position by the roll 125, so that the fin will externally enter the opening between the ring-ends. As such ring is so positioned, it slides along the raceway, while still controlled by the fin, to the lower stop 113 of the let-off mechanism. From this point, the rings are released one by one, such release of a ring taking place just after the transferer 131 has been retracted, and as the setting plunger rises after setting a ring, the transferer positively moves forward the ring just released by the let-off mechanism, and positions it in readiness to be set. The next descent of the plunger causes its tubular extension 33 to engage the upper surface of such ring, pressing the ring downward and causing it to expand as it is forced over the guide 44, and the expander 45, the ring snapping into position in a groove of the bobbin-butt as explained in detail. Prior to the setting operation the tip-support is moved to clamp the bobbin, and after the setting of a ring, the clamp is released so that the bobbin can be turned part way around before the next ring is applied or set. If three rings are to be applied to a bobbin, a different controlling cam would be used in place of the cam 28, a development of such a cam being shown in Fig. 13, where three successive steps *c*, *d*, and *e* are provided, the steps *c* cooperating with the high points of the non-rotating cam, to set the first ring, then the cam is rotated to bring the parts *d* into operative position, and the second ring is set, after which a further turn to the rotatable cam will be given, and the low parts *c* will cooperate with the high parts of the non-rotating cam, and the third ring will be set. Of course it will be understood that with such a change in the cam, a corresponding change would be made in the number of teeth of the attached ratchet, so that the cam would be turned the proper amount for each descent of the setting plunger. To prevent overrunning of the rotatable cam, the notched detent pin 140 is slidably mounted in the head 13 and pressed inward by a spring 141, the notch of the pin engaging the point of one tooth after another, as the ratchet is turned.

We have herein shown one practical embodiment of our invention, and the same may be modified or varied in different details of construction or arrangement without departing from the spirit and scope of our invention.

Having fully described our invention, what we claim as new and desire to secure by Letters Patent is:—

1. In apparatus of the class described, a hopper to receive expansible rings in bulk, setting means to engage

one ring at a time and force it onto a bobbin, a raceway between said means and the hopper, an instrumentality to convey the rings from the hopper to the raceway, and means to positively present the rings singly from the raceway to the action of the setting means.

2. In apparatus of the class described, a hopper to receive expansible rings in bulk, a feed raceway, an instrumentality to convey the rings from the hopper and deposit them on the raceway, means to position the rings during their travel on the said raceway, a ring-expander, means to transfer rings one by one from the raceway into cooperation with said expander, and means to engage the rings so positioned and force them singly into place on the bobbin.

3. In apparatus of the class described, a hopper to receive expansible rings in bulk, a stationary ring guide and expander, means to convey rings thereto from the hopper, a transferrer to engage the rings one by one and positively place them on the guide and expander in readiness to be set, and a reciprocating setting device to force the rings singly past the expander and onto the bobbin.

4. In apparatus of the class described, in combination, means to engage an expansible ring and to expand and set the same on a bobbin, and means to automatically present the rings one by one into position to be so engaged.

5. In apparatus of the class described, in combination, means to engage an expansible ring and set the same on a bobbin, said means including a stationary expander and a reciprocating setting member, and means to present the rings one by one to cooperate with the expander in readiness to be set.

6. In apparatus of the class described, in combination, a stationary expander and guide for the rings, means to clamp a bobbin with its butt against the end of the guide, means to position expansible rings one by one on the guide and in cooperation with the expander, and setting means to force the rings along the guide and expander and onto the butt of the bobbin.

7. In apparatus of the class described, in combination, a stationary cylindrical ring-guide having a longitudinally-extended expander to enter between the ends of and expand a ring, means to present the rings one by one to said guide and expander, a bobbin-clamping device to clamp a bobbin with its butt against the end of the guide, and a reciprocating plunger to engage the rings one by one and force them over the guide and expander onto the butt of the bobbin.

8. In apparatus of the class described, in combination, an upright, stationary cylindrical guide, an attached, longitudinally extended expander tapered at its upper end, and means to engage a split ring and force it over the guide with the expander between and separating the ends of the ring, to thereby apply the ring to a bobbin aligned with the guide.

9. In apparatus of the class described, in combination, a cylindrical guide having a longitudinal rib attached thereto and tapered at its upper end, to enter between the ends of a split ring and expand the same when pushed over the guide, a reciprocating plunger having a non-continuous, annular foot to engage a ring and push it over the guide, to thereby set the ring on a bobbin butted against the lower end of said guide.

10. In apparatus of the class described, an upright, cylindrical ring guide and an adjacent, longitudinally extended expander to enter between the ends of a split ring and expand the same, a feed raceway connected with the upper end of the guide, a fin to direct the rings from the end of the raceway to the guide, means to position the rings on the raceway to cooperate with the fin, and a transferrer to engage one ring at a time and move it, while cooperating with said fin, into position on the guide.

11. In apparatus of the class described, an upright, cylindrical ring guide and an adjacent, longitudinally extended expander to enter between the ends of a split ring and expand the same, said guide having an upturned, curved neck provided with a ring-directing fin, an inclined feed raceway connected to said neck, means to position rings on the raceway to cooperate with the fin, a transferrer to move the rings singly along the neck to the guide while the moving ring is in cooperation with the fin, and

means to release the rings on the raceway one by one to be engaged by the transferrer.

12. In apparatus of the class described, an upright ring-guide having an attached expander tapered at its upper end to enter between and separate the ends of a split ring, said guide having a curved neck provided with a fin in the plane of and terminating at the tapered end of the expander, an inclined raceway connected with the neck and along which the rings move, a primary fin to enter externally the space between the ends of the rings, said fin leading to the neck fin, means to permit rings to pass one by one to said primary fin, a rotatable member to engage the rings as they pass and turn them into position to be engaged by the primary fin, and a transferrer to engage the rings controlled by the primary fin and force them one by one over the neck onto the guide, the neck fin at such time passing between the ends of the ring being transferred.

13. In apparatus of the class described, in combination, a fixed ring-guide and expander, means to clamp a bobbin with its butt against the lower end of the guide, means to position split rings one by one on the guides, a reciprocating plunger to engage a positioned ring and force it over the guide and expander onto the butt of the bobbin, and means to vary the effective stroke of said plunger on successive descents, whereby a plurality of rings can be applied to the bobbin butt at a predetermined distance apart.

14. In apparatus of the class described, in combination, a fixed ring-guide and expander, means to clamp a bobbin with its butt against the lower end of the guide, means to position split rings one by one on the guide, a reciprocating plunger to engage a positioned ring and force it over the guide and expander onto the butt of the bobbin, and means to vary the effective stroke of said plunger on successive descents, whereby a plurality of rings can be applied to the bobbin butt at a predetermined distance apart, said means comprising two cooperating controlling cams, a device to effect intermittent rotation of one cam, to change the relation of their high and low points, and a spring to act upon the plunger and maintain the cams in cooperation.

15. In apparatus of the class described, a reciprocating head, a setting plunger mounted therein and having a rigidly-attached controlling-cam, a cooperating cam concentric with the plunger and rotatable in the head, engagement of the high points of the two cams imparting a greater descent, and engagement of their low points imparting a less descent, to the plunger, means to turn the rotatable cam step by step on successive descents of the plunger, and a spring to lift the plunger in the head when the cams are set for the short stroke.

16. In apparatus of the class described, a reciprocating head having a constant stroke, a ring-setting plunger carried thereby, means to move the plunger relatively to the carrier on successive strokes, to thereby vary the effective stroke of the plunger, means to automatically present split rings one by one in the path of the plunger, and a combined guide and expander to guide and spread each ring as it is driven down by the plunger combined with means to automatically hold a bobbin with its butt against the guide, to receive one or more rings upon its butt.

17. In apparatus of the class described, ring-setting means, a raceway to feed rings thereto, a hopper to receive split rings in bulk, an endless conveyer to lift the rings from the hopper and deliver them onto the upper end of the raceway, a longitudinal fin above the raceway, to enter exteriorly between the ends of and position the rings, a double let-off mechanism to permit rings to pass singly to said fin and move longitudinally beneath it when controlled thereby, and a rotating wiper adjacent the leading end of the fin to turn the rings into position to be controlled by said fin.

18. In apparatus of the class described, ring-setting means, a raceway to feed rings thereto, a hopper to receive split rings in bulk, an endless conveyer to lift the rings from the hopper and deliver them onto the upper end of the raceway, a longitudinal fin above the raceway, to enter exteriorly between the ends of and position the rings, a double let-off mechanism to permit rings to pass singly to said fin and move longitudinally beneath it when

controlled thereby, and a rotating wiper adjacent the leading end of the fin to turn the rings into position to be controlled by said fin, combined with a transferrer to engage each ring as it reaches the end of the fin and move such

5 ring positively into position to be set.

19. In apparatus of the class described, ring-setting means, a raceway to feed rings thereto, a hopper to receive split rings in bulk, an endless conveyer to lift the rings from the hopper and deliver them onto the upper end

10 of the raceway, a longitudinal fin above the raceway, to enter exteriorly between the ends of and position the rings, a double let-off mechanism to permit rings to pass singly to said fin and move longitudinally beneath it when controlled thereby, and a rotating wiper adjacent the leading

15 end of the fin to turn the rings into position to be controlled by said fin, combined with a transferrer to engage each ring as it reaches the end of the fin and move such ring positively into position to be set, and a second fin to pass between the ends of the ring from the interior thereof

20 and maintain the ring in proper position during transfer.

20. In apparatus of the class described, ring-setting means, a raceway to feed rings thereto, a hopper to receive split rings in bulk, an endless conveyer to lift the rings from the hopper, an inclined trough onto which the rings

25 are dropped by the conveyer and from which they drop onto the adjacent end of the raceway, a return chute to conduct back to the hopper rings failing to fall onto the raceway, a double let-off to separate the rings and permit them to pass one by one along a portion of the raceway,

30 means to act upon said separated rings and position them with their openings in a predetermined line, and a transferrer to engage singly the positioned rings and move them positively into position to be set.

21. In apparatus of the class described, means, including a stationary combined guide and expander, to apply or set split rings upon the butt of a bobbin, a tip-support beneath the guide, and means to automatically lift said support to clamp a bobbin between it and the guide during each operation of the ring-setting means.

22. In an apparatus for applying expansible rings to the annularly-grooved butts of bobbins, a fixed guide and expander, a reciprocating plunger to engage rings one by one and force them over said guide and expander onto a bobbin-butt, a tip-support beneath the guide, means to automatically lift it to clamp the bobbin between it and the

45 guide at each descent of the plunger, and means to vary automatically the effective stroke of the plunger on successive strokes, whereby a plurality of rings can be set on each bobbin butt in the grooves thereof.

23. In apparatus of the class described, means to set rings on the butt of a bobbin, said means including a fixed ring-guide, a vertically adjustable tip-support beneath the guide, and a yieldingly-controlled cam to lift the tip-support, and thereby clamp a bobbin between it and the guide, at each operation of the setting means,

55 vertical adjustment of the tip-support providing for varying lengths of bobbins.

24. In apparatus of the class described, an upright cylindrical guide, a ring-expander extending longitudinally of the guide and supporting the same, said expander having a beveled upper end to enter between the ends of a split ring to expand the same, and a reciprocating, tubular setting plunger slotted to clear the expander and adapted to force a ring downward over the guide and

65 expander and onto the butt of a bobbin held beneath the guide.

25. In apparatus of the class described, an upright cylindrical guide, a ring-expander extending longitudinally of the guide and supporting the same, said expander having a beveled upper end to enter between the ends of a split ring to expand the same, and a reciprocating, tubular setting plunger slotted to clear the expander and adapted to force a ring downward over the guide and expander and onto the butt of a bobbin held beneath the guide, combined with means to automatically present the rings one by one to the guide in readiness to be engaged by the plunger and with the ends of the ring positioned to be spread by the expander.

26. In apparatus of the class described, an upright

80 cylindrical guide, a ring-expander extending longitudinally

of the guide and supporting the same, said expander having a beveled upper end to enter between the ends of a split ring to expand the same, and a reciprocating, tubular setting plunger slotted to clear the expander and adapted to force a ring downward over the guide and expander and onto the butt of a bobbin held beneath the guide, combined with means to automatically present the rings one by one to the guide in readiness to be engaged by the plunger and with the ends of the ring positioned to be spread by the expander, and means to clamp a bobbin

90 beneath the guide in position to receive the rings.

27. In apparatus of the class described, an upright cylindrical guide, a ring-expander extending longitudinally of the guide and supporting the same, said expander having a beveled upper end to enter between the ends of a split ring to expand the same, a feed raceway to deliver rings to be set, means to transfer the rings one by one from the raceway to the guide and expander, and a reciprocating, tubular setting plunger adapted to force a ring over the guide and expander and slotted to clear the expander and adjacent portion of the raceway while closely embracing the guide.

28. In apparatus of the class described, a reciprocating plunger to set the rings, a fixed guide and expander, to sustain and expand a ring during its movement by the plunger, a tip-support for the bobbin, and spring-acting means to act through said tip-support and clamp the bobbin between it and the guide during the operation of the setting plunger.

29. In apparatus of the class described, a reciprocating plunger to set the rings, a fixed guide and expander, to sustain and expand a ring during its movement by the plunger, a projection on the bottom of the guide, to center the butt of the bobbin, a vertically-movable tip-support, spring-acting means to move it to clamp the bobbin between it and the guide, and a rest or gage to position the tip of the bobbin on the tip-support.

30. In apparatus of the class described, means to expand and to apply split rings one by one to the butt of a bobbin, including a fixed cylindrical guide, a centering projection on the lower end thereof, a tip-support below and movable toward and from the guide, spring-acting means to intermittently elevate the tip-support to clamp the bobbin between it and the guide, and a vertically and horizontally-adjustable rest or gage to position the bobbin on the tip-support.

31. In apparatus of the class described, a cylindrical guide having an attached ring-expander and through which the guide is fixedly supported, an inclined feed raceway connected at its lower end with and supported wholly by said guide, a reciprocating setting plunger having a tubular end to engage a ring and force it over the guide and expander onto a bobbin, said plunger end being slotted to clear the expander and raceway, and means to transfer rings one by one from the raceway and into the path of the tubular end of the plunger.

32. In apparatus of the class described, means, including a fixed guide, to force expansible rings one by one onto the butt of a bobbin, an inclined feed raceway connected at its lower end with and supported wholly by the guide, means to supply the raceway with rings, and means to effect the movement of the rings one by one along the lower part of the raceway to the guide in readiness to be set.

33. In apparatus of the class described, in combination, a cylindrical guide, a longitudinally extended expander tapered at its upper end, and means to engage a split ring and force it over the guide with the expander between and separating the ends of the ring, to thereby apply the ring to a bobbin abutted against the end of the guide.

34. In apparatus of the class described, in combination, a fixed, upright web, a cylindrical guide connected with and supported by the web, the upper edge of the latter being beveled adjacent the guide, and a reciprocating setting plunger to engage a split ring on the guide and force it along the same onto a bobbin alined with the guide, the beveled portion of the web entering between and separating the ends of the ring to expand the same.

35. In apparatus of the class described, in combination,

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a stationary ring expander and a cylindrical guide over which the expanded ring is forced onto a bobbin, a reciprocating plunger to engage a split ring and force it over the guide and expander, and means to cause the effective stroke of the plunger to vary in length in a predetermined cycle, whereby a plurality of rings may be applied successively to a bobbin.

36. In apparatus of the class described, an inclined feed raceway along which split-rings are adapted to travel, a longitudinal guide fin above the raceway, to enter exteriorly between the ends of the rings and position the same, means to let off the rings one by one as they near the fin, and a rotating, toothed roll adjacent the latter, to turn the rings into position to be controlled by the fin, the clearance between adjacent teeth of said roll permitting a positioned ring to slide past the roll along the raceway.

37. In apparatus of the class described, an inclined, cylindrical feed raceway along which split-rings are adapted to slide, a longitudinal guide-fin adjacent the raceway, to exteriorly enter between the ends of the rings and position the same as they travel, means to let off the rings one by one as they approach the upper end of the fin, and a broad flexible, toothed roll having teeth to lightly engage and turn rings as they move past the roll, to position them with respect to the fin, the clearance between adjacent teeth permitting a ring in cooperation with the fin to slide past said roll and along the raceway.

38. In apparatus of the class described, an inclined feed raceway for split-rings, and let-off mechanism comprising an oscillating shaft parallel to the raceway, and an escapement device near each end of the said shaft, the upper of said devices letting off the rings one by one from the series above it, combined with means between said escapement devices to position the rings with their openings aligned, the lower escapement device releasing one by one the rings so aligned.

39. In apparatus of the class described, an inclined feed raceway for split-rings, and let-off mechanism comprising an oscillating shaft parallel to the raceway, and two escapement devices on the shaft, each having a stop and a separating rib, to permit the escape of the endmost ring of a group at each operation of the escapement, combined with means located between said escapement devices to position the rings on the raceway with their openings in alignment.

40. In apparatus of the class described, setting means to force split-rings one by one onto the butt of a bobbin, a feed raceway for the rings, means to position the rings thereon with their openings in alignment, and means to positively move the rings one by one from the raceway into position to be acted upon by the setting means.

41. In apparatus of the class described, setting means to engage rings and force them onto a bobbin, a feed raceway for and on which are strung the rings, and means to transfer the rings from the raceway into position to be acted upon by the setting means.

42. In apparatus of the class described, setting means to engage rings and force them onto a bobbin, a feed raceway for the rings, a hopper to receive the rings in bulk, an instrumentality to convey the rings from the hopper and string them onto the raceway, and means to engage and positively transfer the rings singly from the raceway into position to be acted upon by the setting means.

43. In apparatus of the class described, in combination, means to position a bobbin, means to engage a ring and set the same on a bobbin, and separate means to automat-

ically and positively present rings one by one into position to be set.

44. In apparatus of the class described, in combination, a stationary ring-guide adapted to have rings threaded thereon, means to hold a bobbin in alignment therewith, and setting means to engage a ring positioned on the guide and push the ring thereover onto the bobbin.

45. In apparatus of the class described, in combination, a stationary ring-guide adapted to have rings threaded thereon, means to hold a bobbin in alignment therewith, setting means to engage a ring positioned on the guide and push the ring thereover onto the bobbin, and means to present rings one by one in position on said guides.

46. In apparatus of the class described, in combination, a cylindrical ring-guide, means to position a bobbin against the end of and coaxially with the guide, a reciprocating setting-plunger to push rings over the guide and onto a bobbin, and means to automatically vary the effective stroke of the plunger in a predetermined sequence, to thereby set a plurality of rings on the bobbin separated by predetermined intervals.

47. In apparatus of the class described, in combination, means to set rings on the butt of a bobbin, said means including a fixed ring-guide, a vertically-movable tip-support below it, and means to lift said tip-support to thereby clamp a bobbin between it and the guide at each operation of the setting means.

48. In apparatus of the class described, in combination, a reciprocating plunger to set the rings, a fixed guide for the ring during its movement by the plunger, a tip-support for the bobbin, and yielding means to act through the tip-support and clamp the bobbin between it and the guide during the setting operation of the plunger.

49. In apparatus of the class described, in combination, means, including a fixed guide adapted to have rings threaded thereon, to push rings one by one onto the butt of a bobbin, a feed raceway connected at its lower end with the guide, and means to effect the movement of the rings one by one along the lower part of the raceway to the guide in readiness to be set.

50. In apparatus of the class described, in combination, means, including a fixed guide, to push rings one by one onto the butt of a bobbin, a feed raceway connected at its lower end with and supported wholly by the guide, means to supply the raceway with rings, and means to effect movement of the rings one by one along the lower part of the raceway to the guide in readiness to be set.

51. In apparatus of the class described, in combination, a stationary, cylindrical guide over which the ring is forced onto a bobbin, a reciprocating plunger to engage a ring and force it over the guide onto the bobbin, and means to cause the effective stroke of the plunger to vary in length in a predetermined cycle, whereby a plurality of rings may be applied successively to a bobbin.

In testimony whereof, we have signed our names to this specification, in the presence of two subscribing witnesses.

FRED C. HODGMAN.

ELLA H. BAILEY,

Administratrix of Charles L. Bailey, deceased.

Witnesses for Hodgman:

ERNEST W. WOOD,

GEORGE OTIS DRAPER.

Witnesses for Ella H. Bailey:

ROBERT A. LOWE,

ROSE A. CLARKIN.