E. E. KILBOURN, W. E. SMITH & I. W. KILBOURN.

TOPPING MACHINE.

APPLICATION FILED JAN. 29, 1909.

1,035,601. Patented Aug. 13, 1912.

17 SHEETS—SHEET 1.

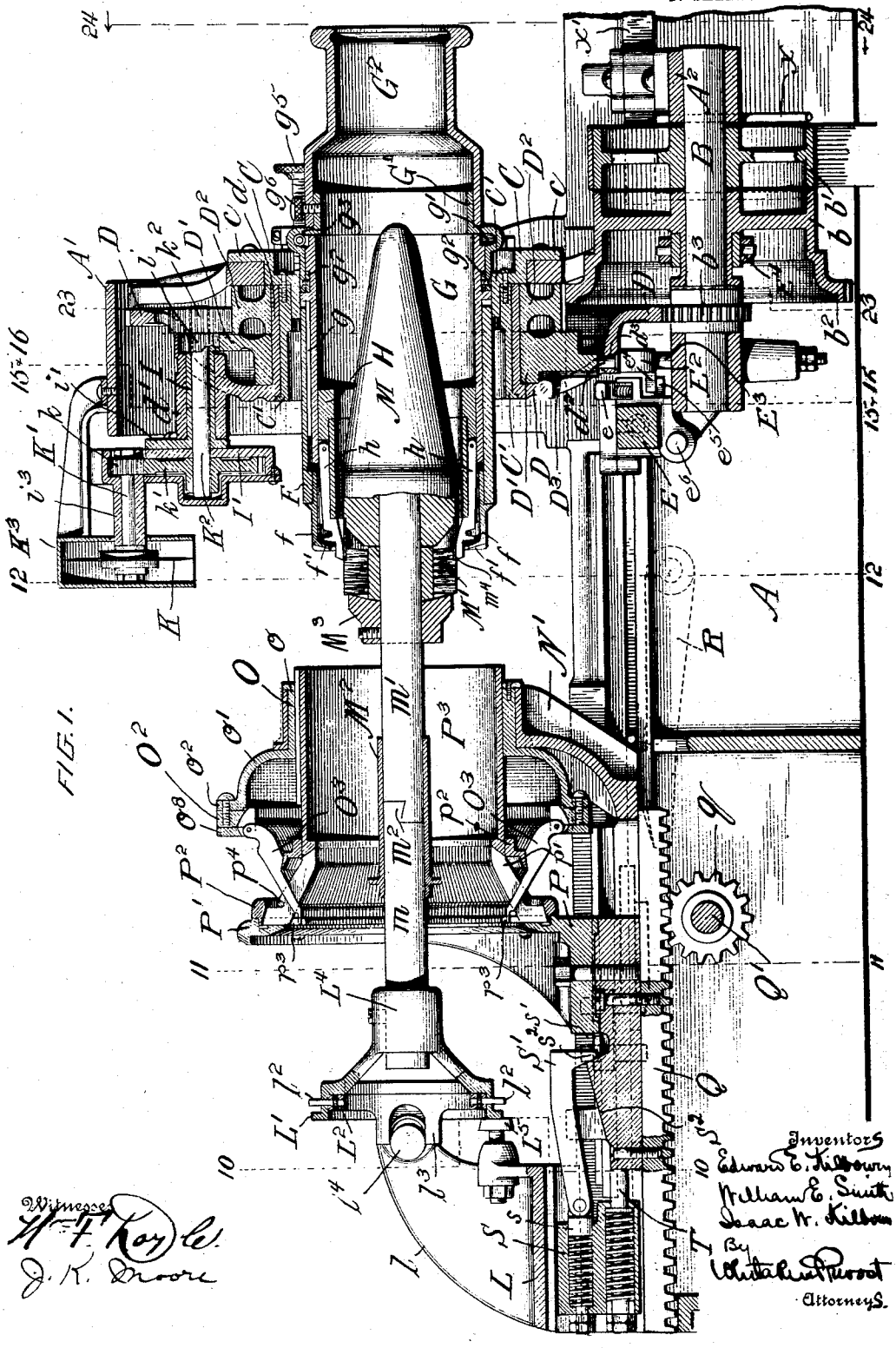

FIG. 1.

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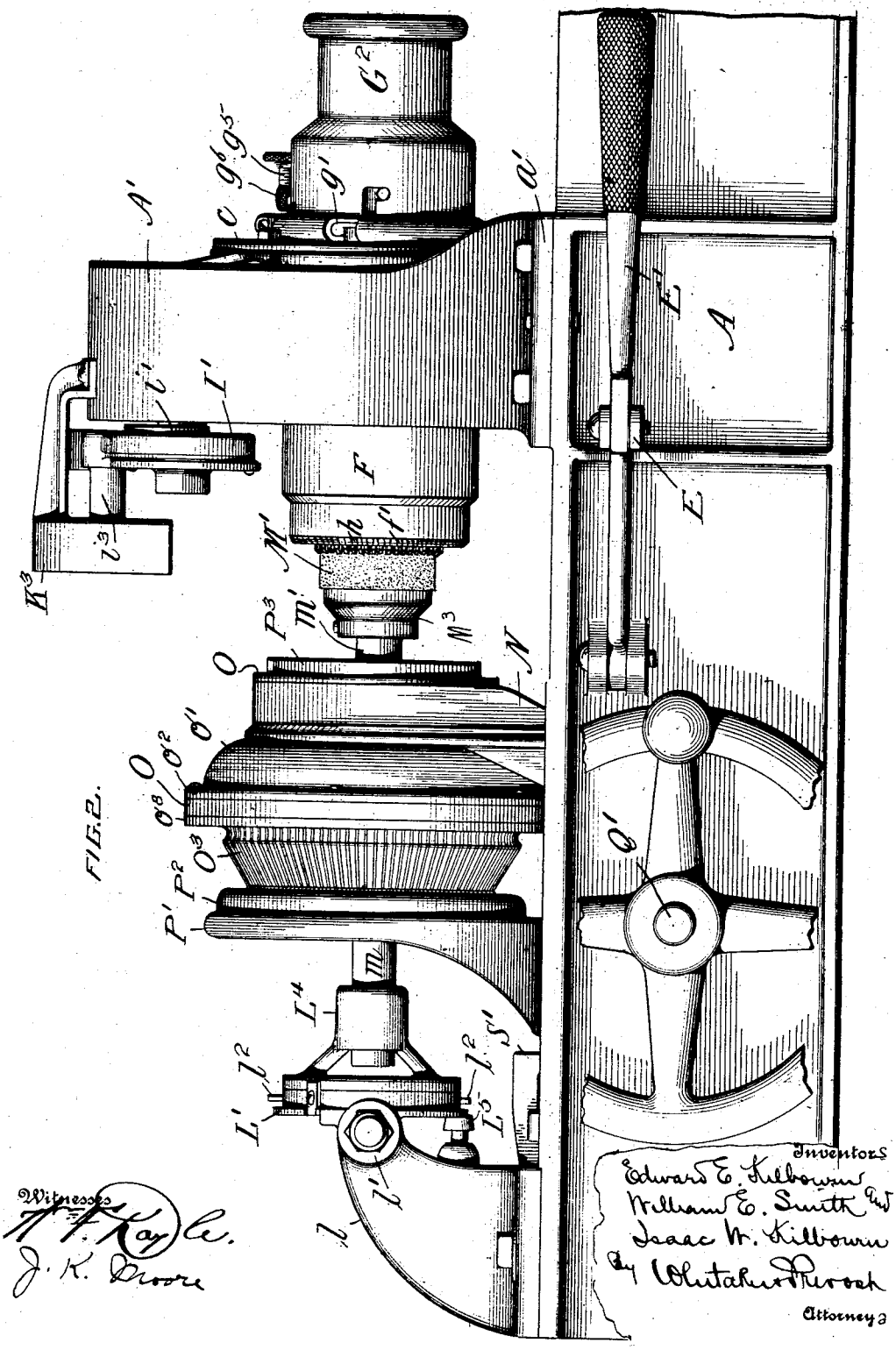

FIG. 2.

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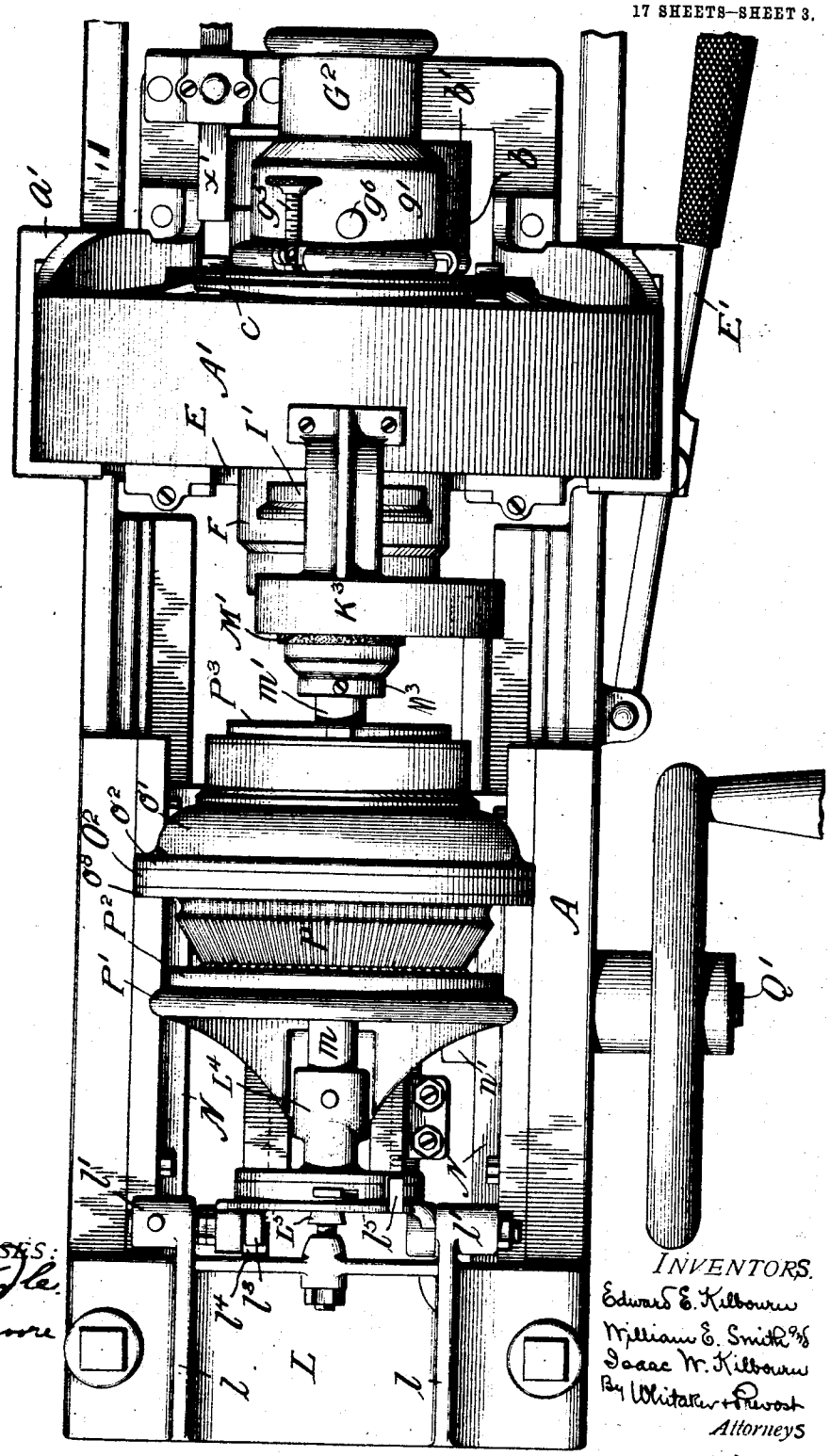

FIG. 3.

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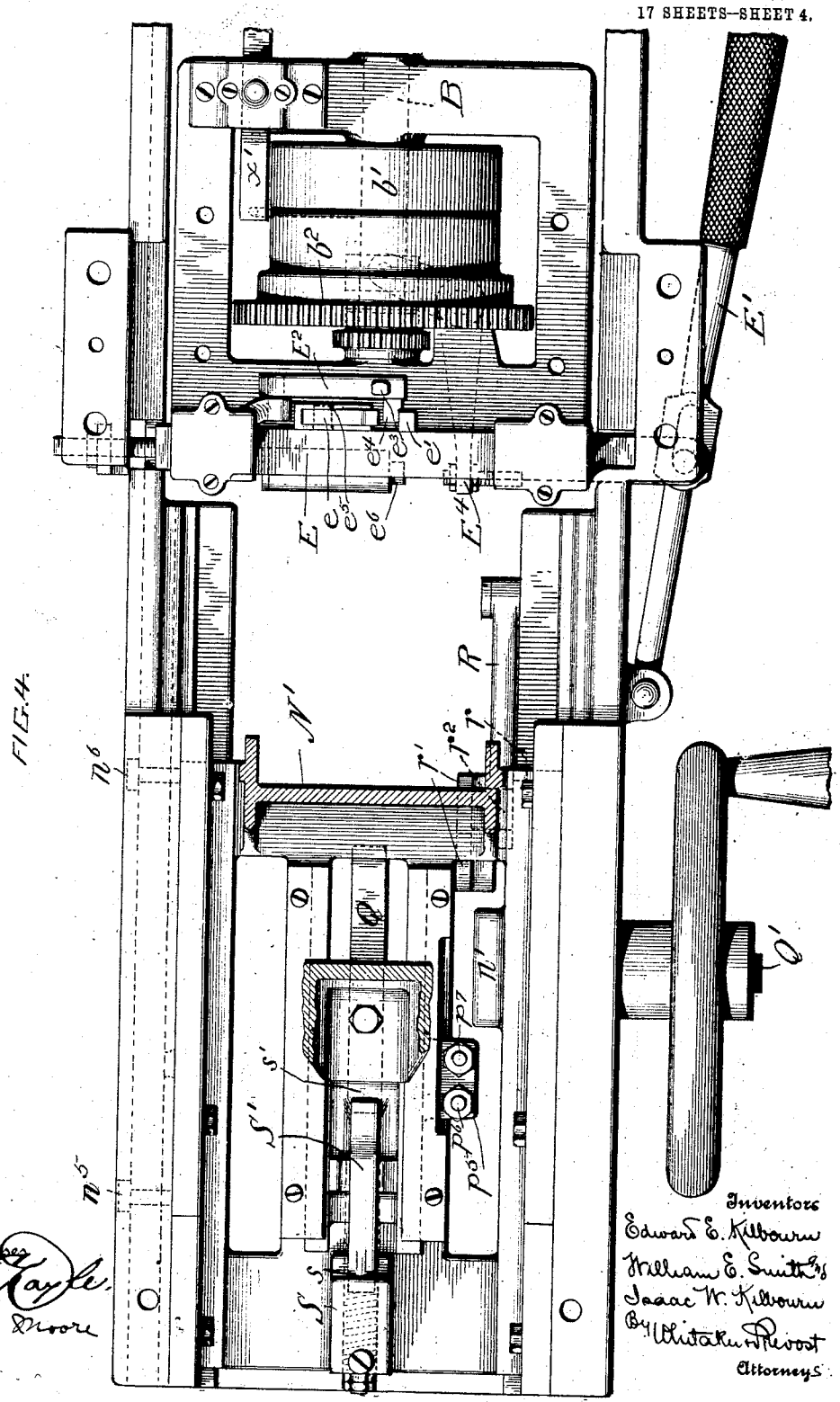

FIG. 4.

Witnesses
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TOPPING MACHINE.

APPLICATION FILED JAN. 29, 1909.

1,035,601.

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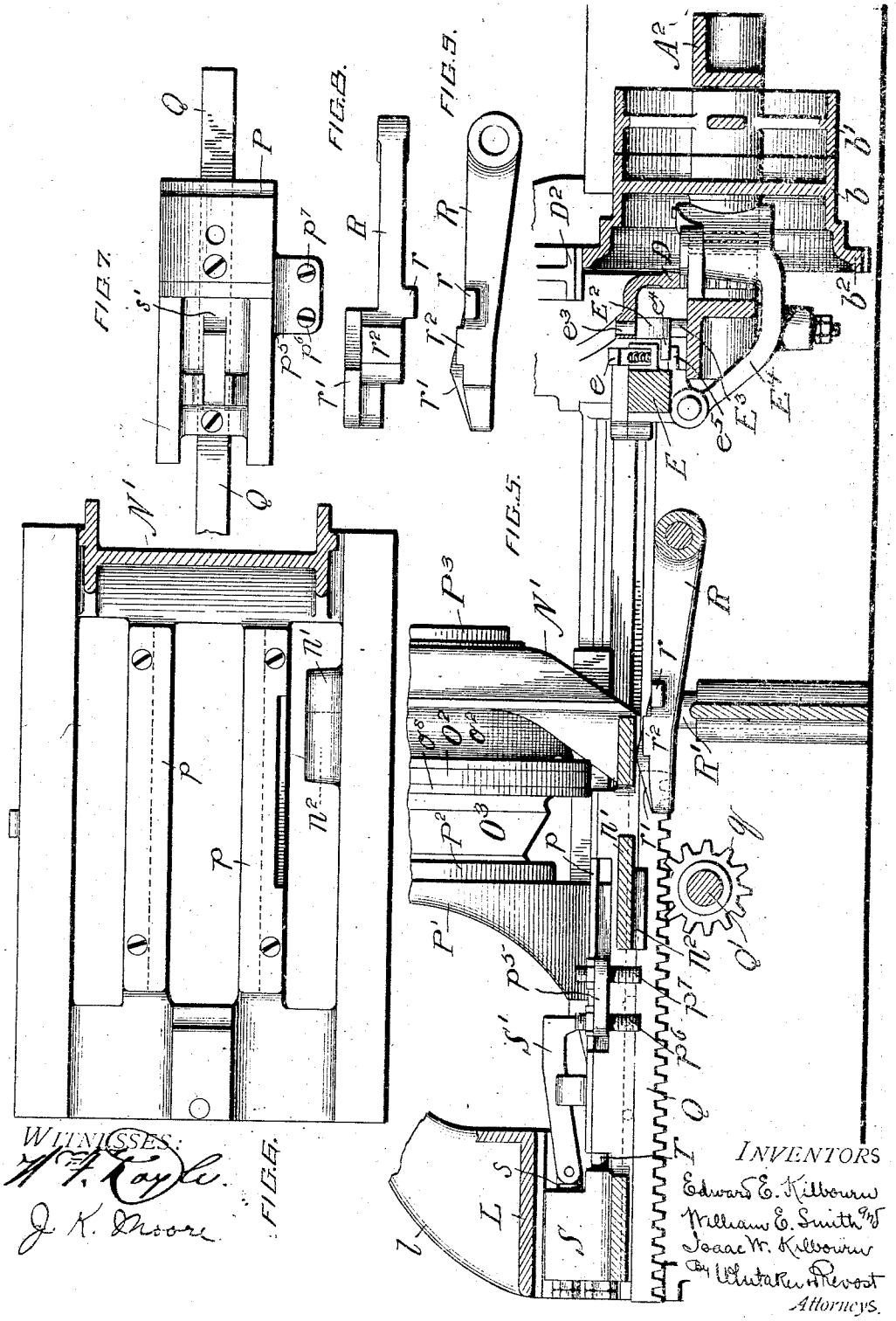
17 SHEETS—SHEET 5.



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Patented Aug. 13, 1912.

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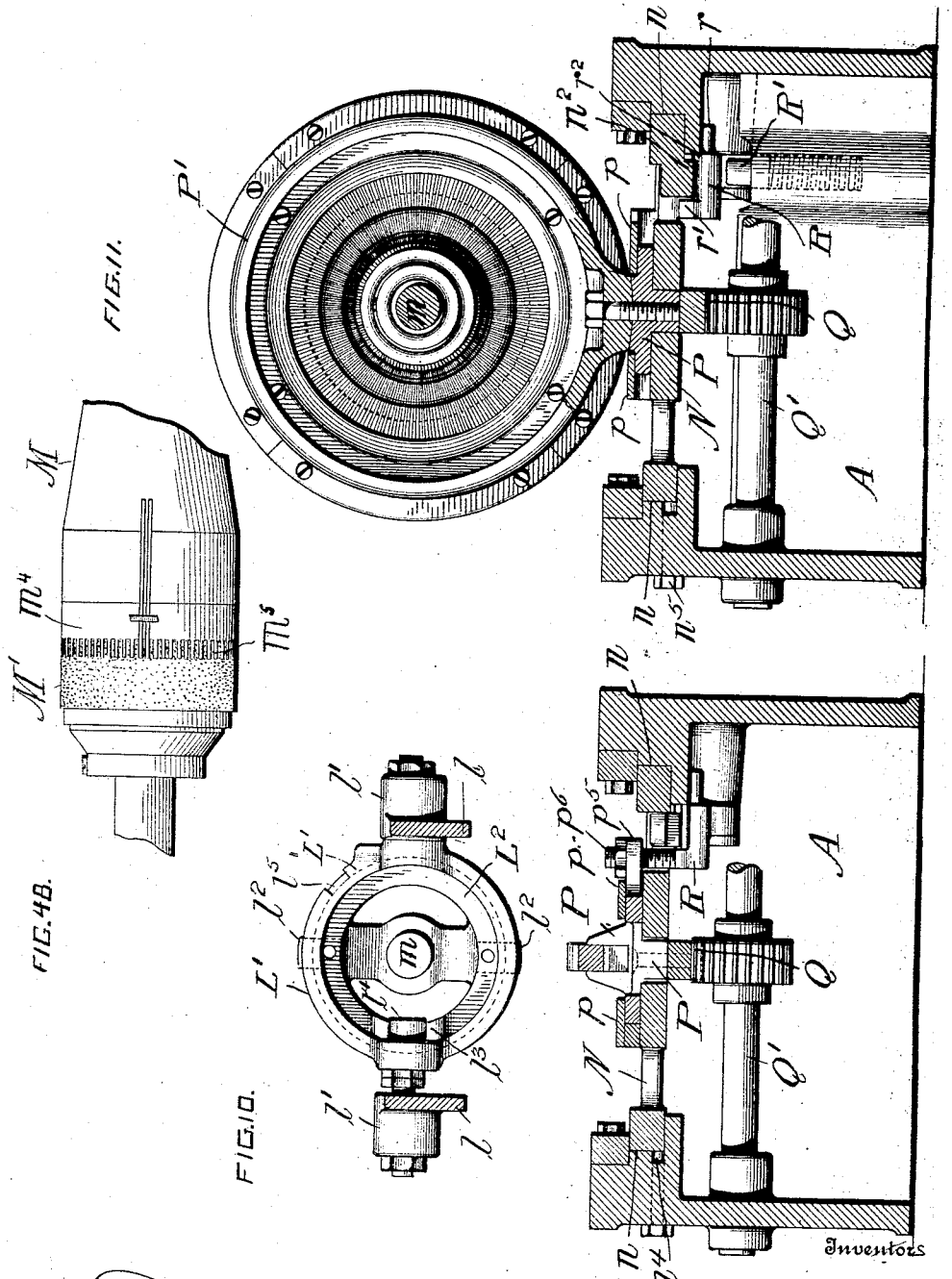

Witnesses
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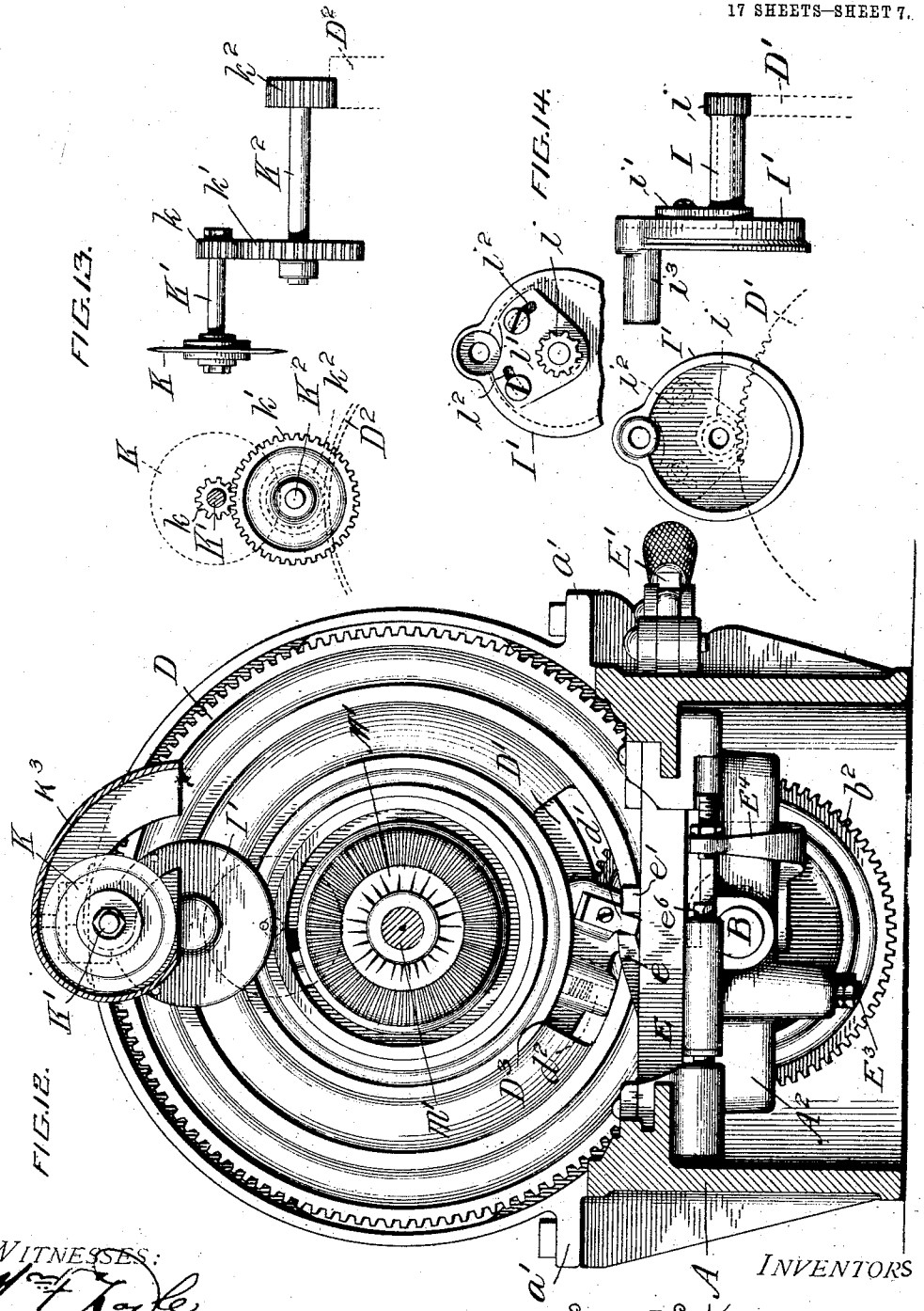

FIG. 12.

FIG. 13.

FIG. 14.

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17 SHEETS—SHEET 8.

FIG. 18.

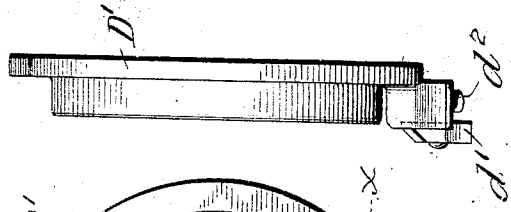


FIG. 17.

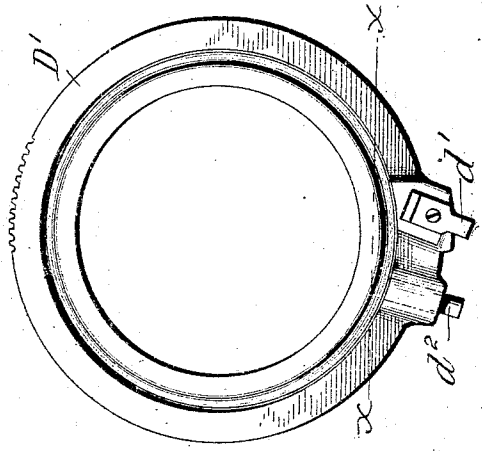


FIG. 19.

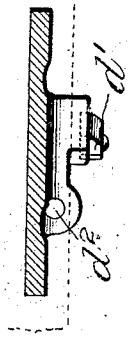
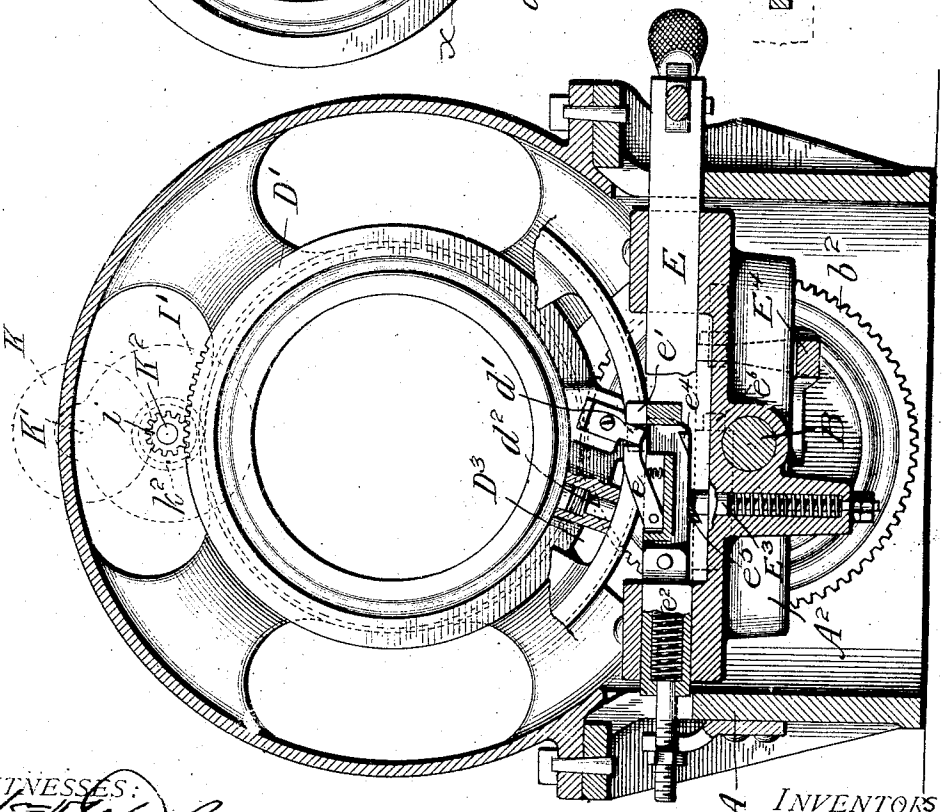


FIG. 15.



WITNESSES:

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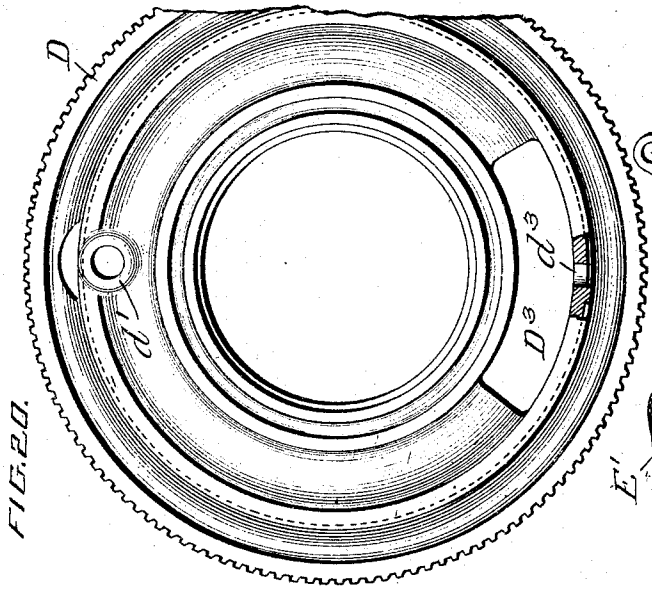

FIG. 20.

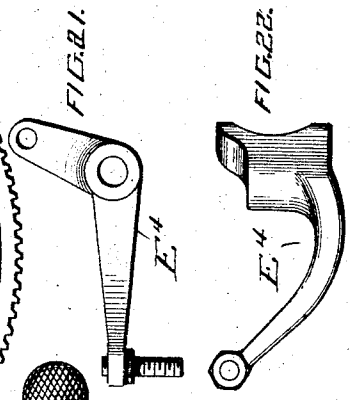

FIG. 21.

FIG. 22.

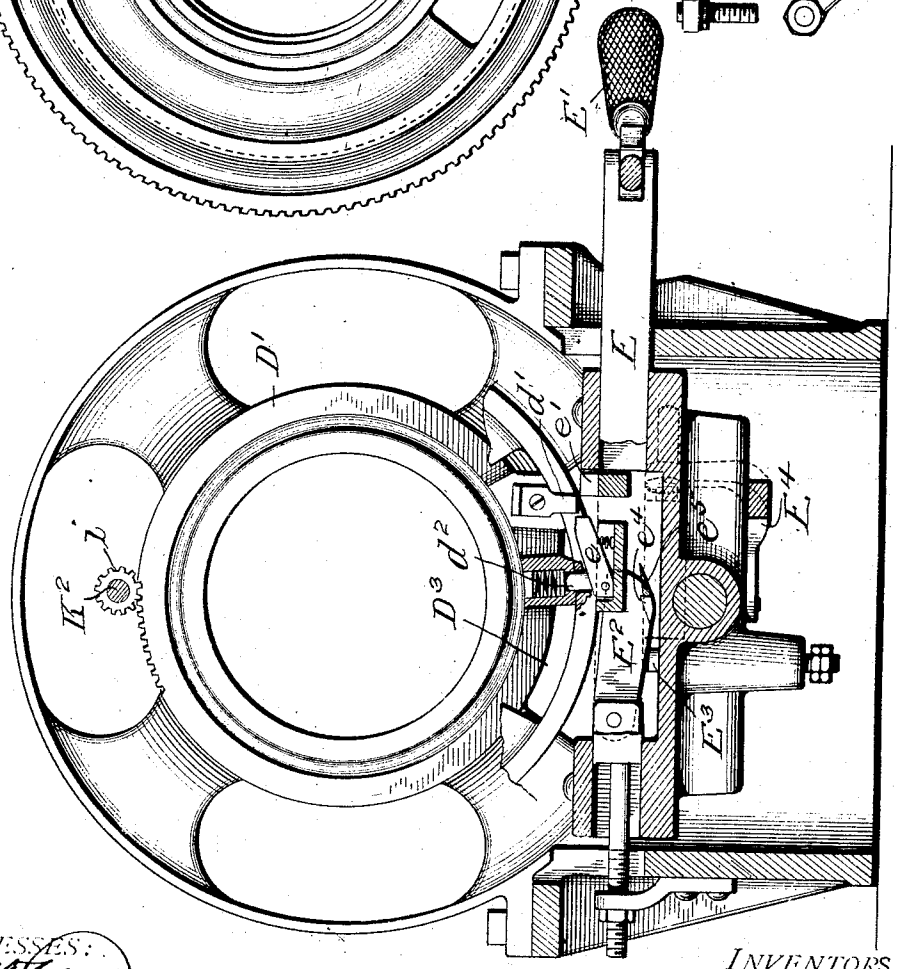

FIG. 16.

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TOPPING MACHINE.

APPLICATION FILED JAN. 29, 1909.

1,035,601.

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17 SHEETS—SHEET 10.

FIG. 24.

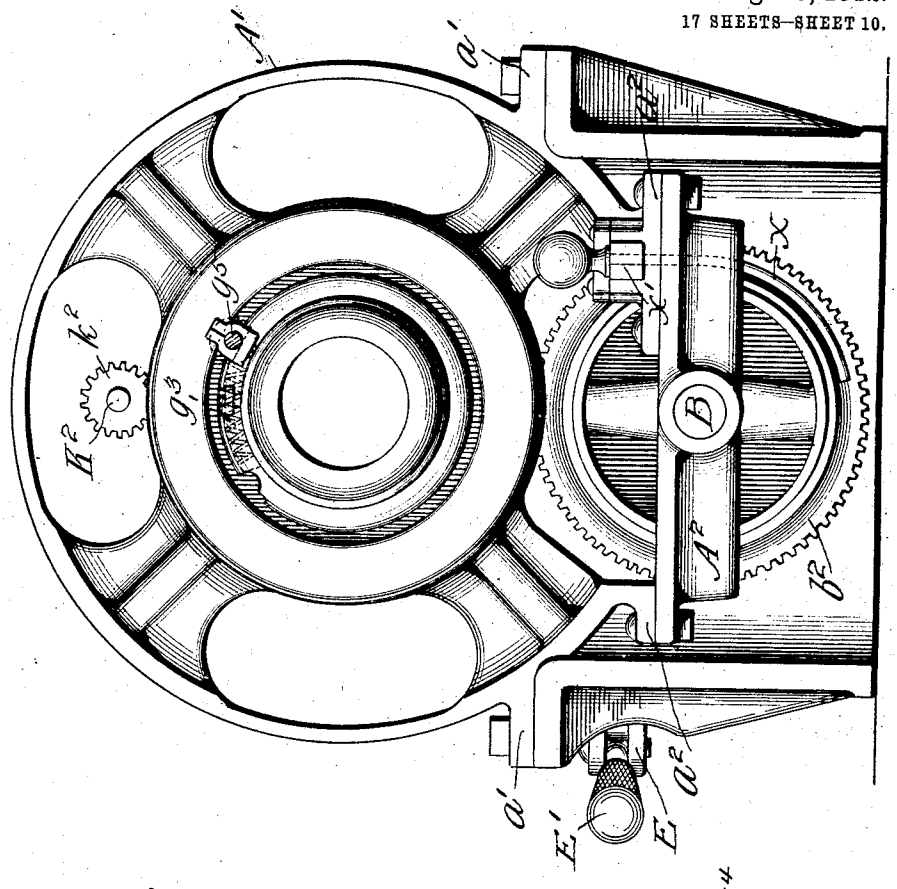
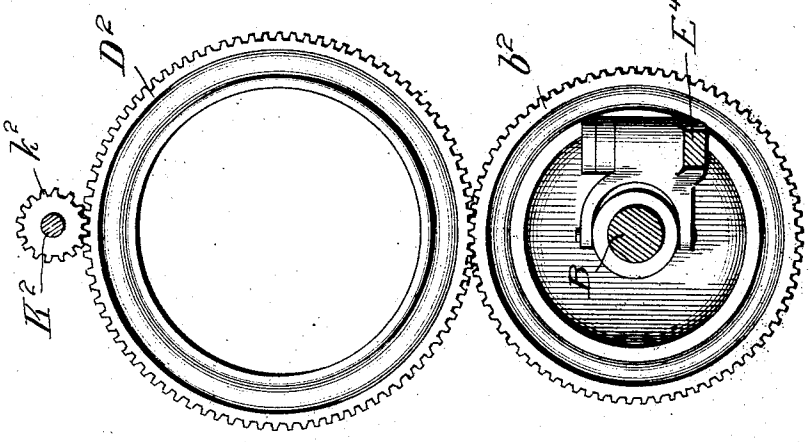


FIG. 23.



WITNESSES:

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TOPPING MACHINE.

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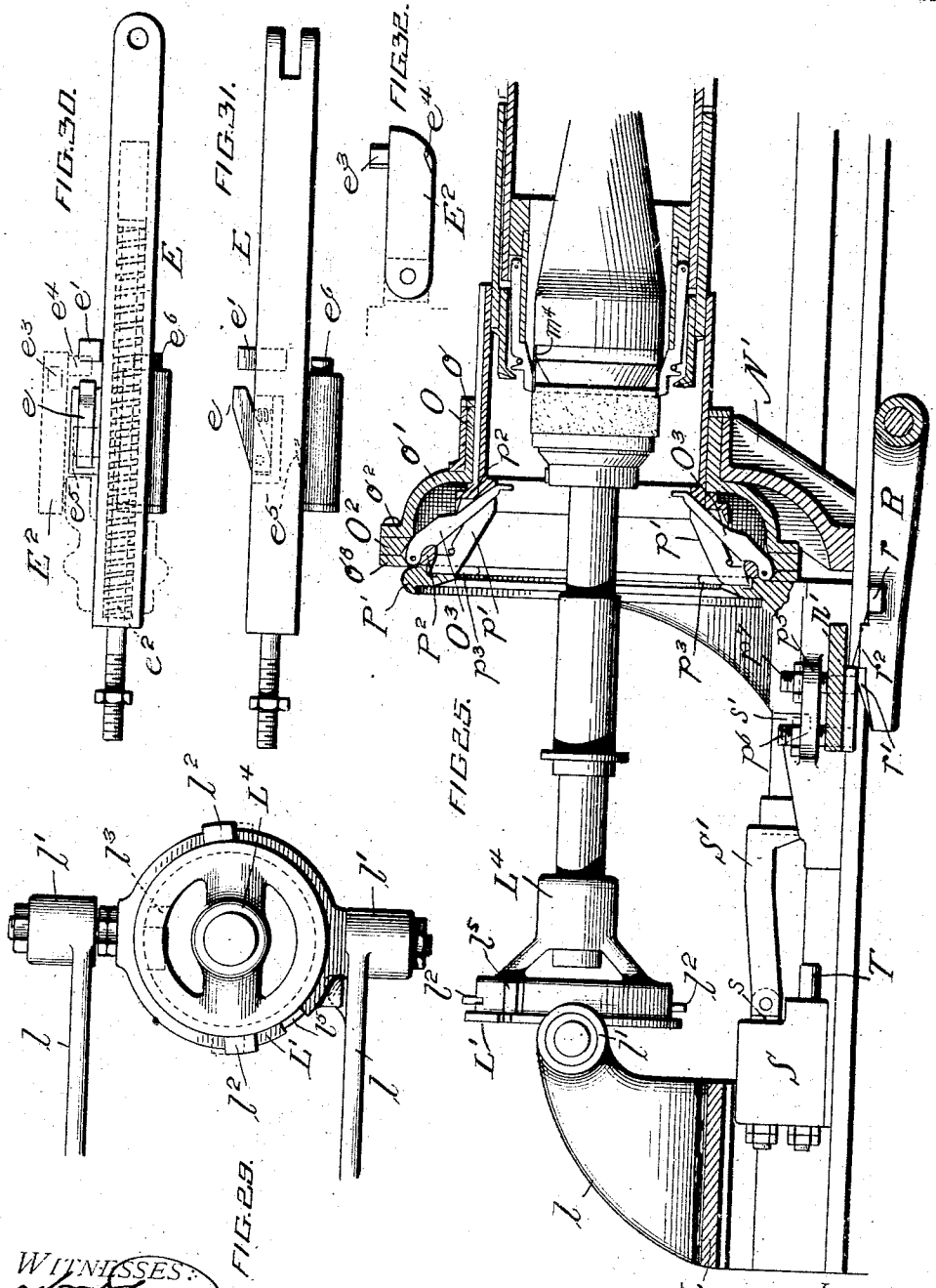
1,035,601.

Patented Aug. 13, 1912.

17 SHEETS—SHEET 11.



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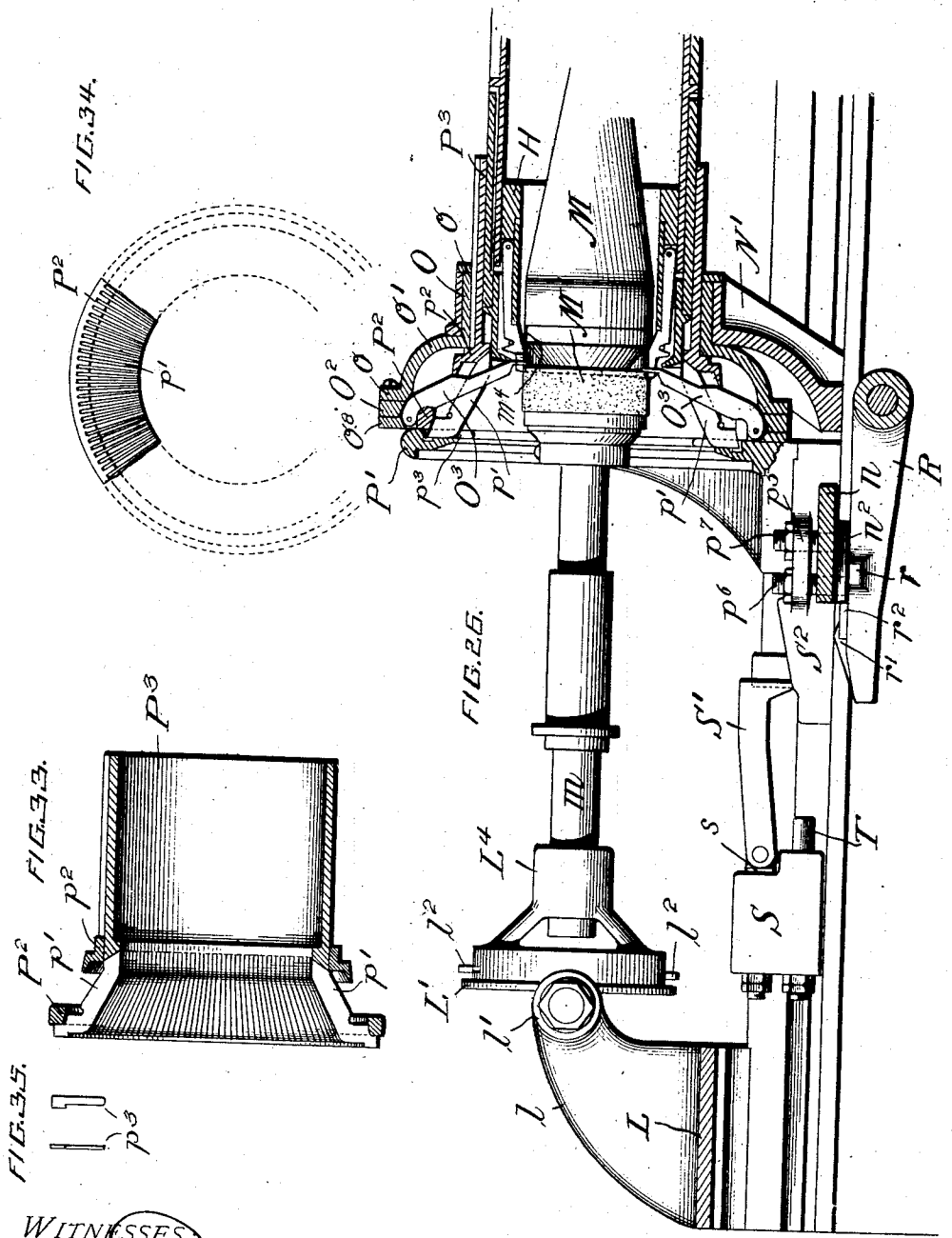
TOPPING MACHINE.

APPLICATION FILED JAN. 29, 1909.

1,035,601.

Patented Aug. 13, 1912.

17 SHEETS—SHEET 12.



WITNESSES:

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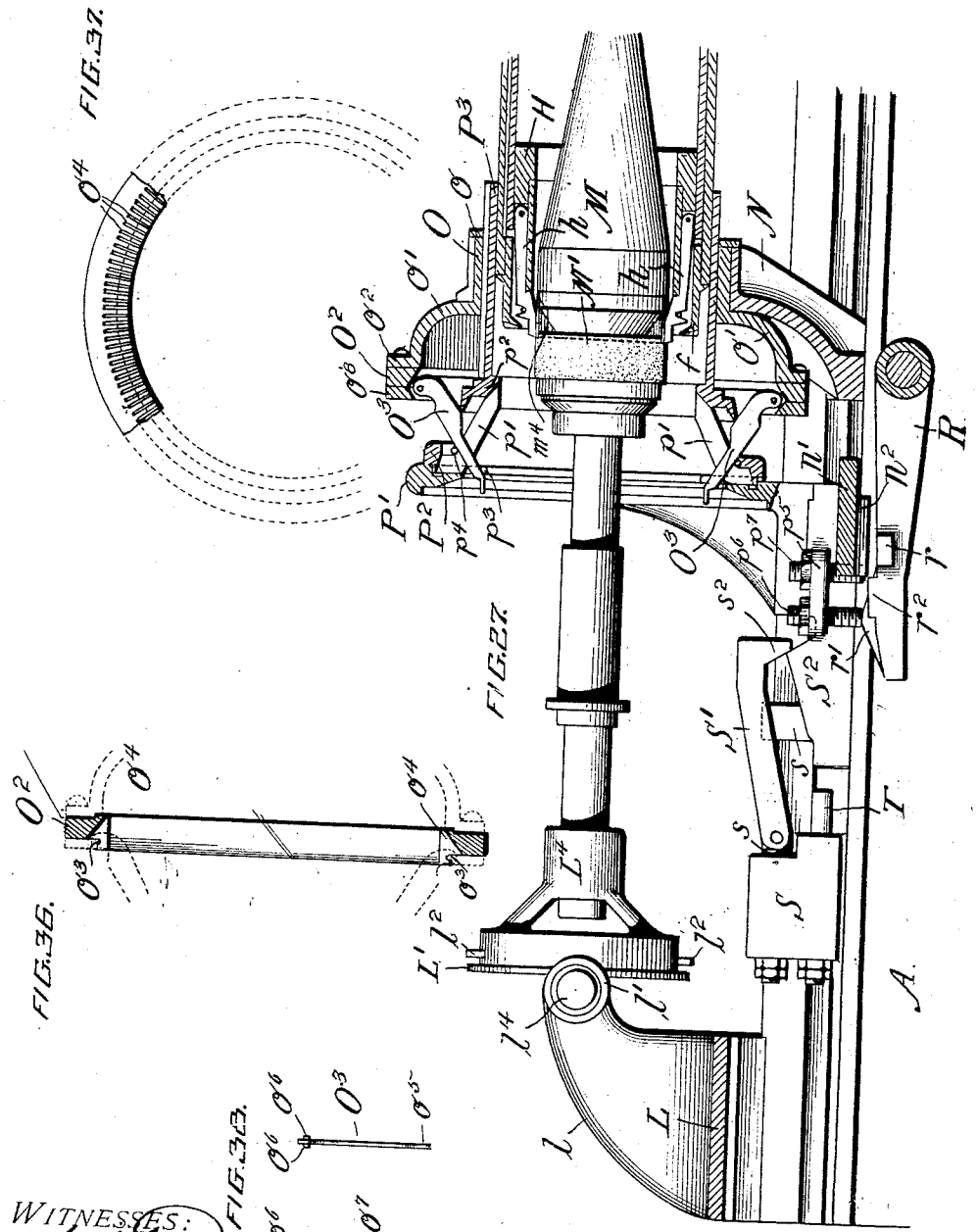
TOPPING MACHINE.

APPLICATION FILED JAN. 29, 1909.

1,035,601.

Patented Aug. 13, 1912.

17 SHEETS—SHEET 13.



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TOPPING MACHINE.

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17 SHEETS—SHEET 14.

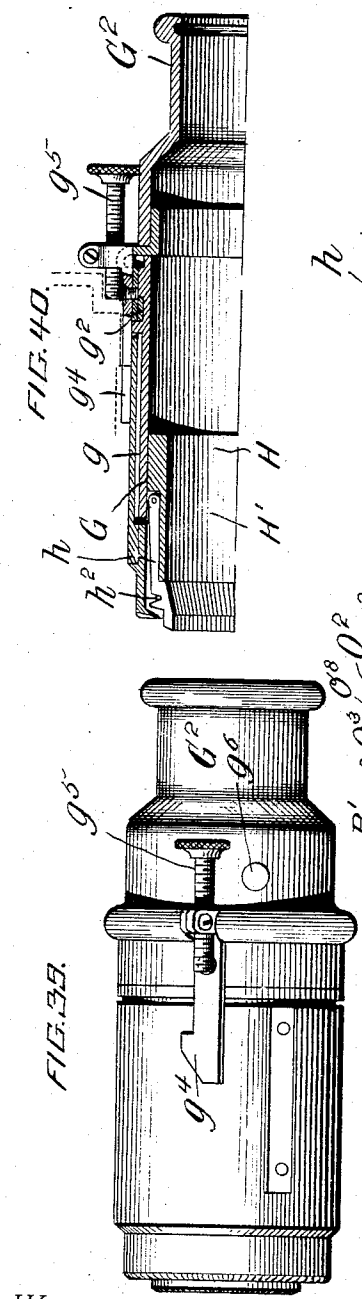

FIG. 40.

FIG. 39.

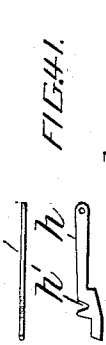

FIG. 41.

FIG. 28.

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APPLICATION FILED JAN. 29, 1909.

1,035,601. Patented Aug. 13, 1912.

17 SHEETS—SHEET 15.

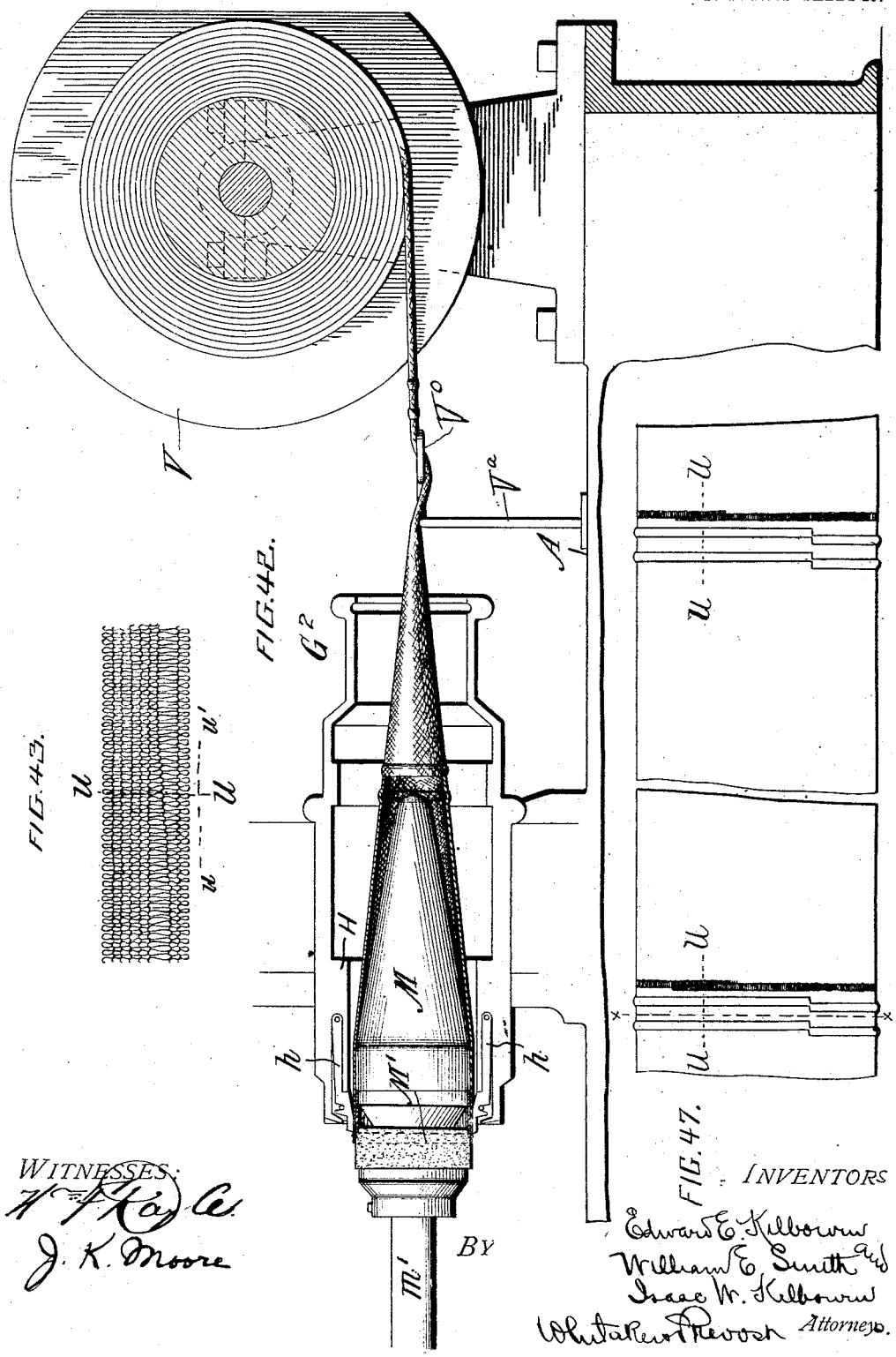

FIG. 42.

FIG. 43.

FIG. 47.

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TOPPING MACHINE.

APPLICATION FILED JAN. 29, 1909.

1,035,601.

Patented Aug. 13, 1912.

17 SHEETS—SHEET 16.

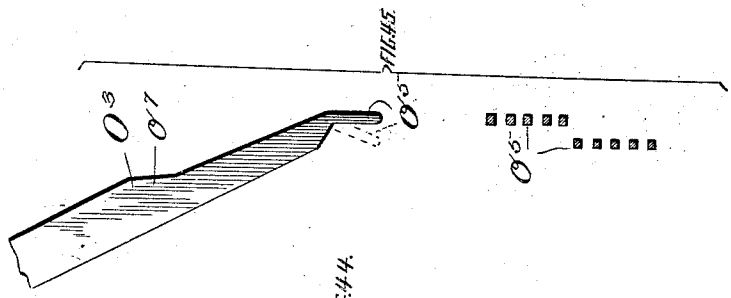


FIG.44.

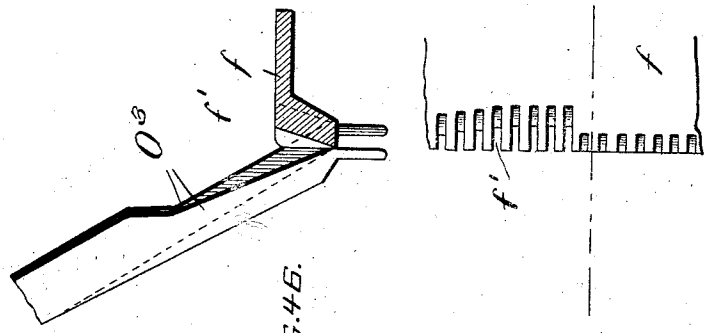
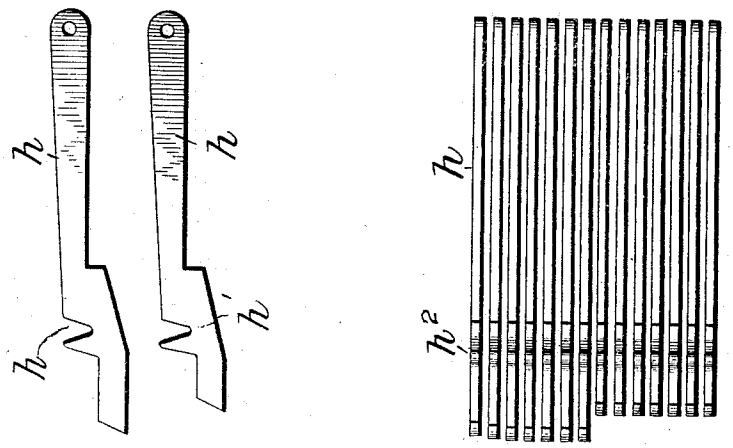


FIG.46.



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TOPPING MACHINE.

APPLICATION FILED JAN. 29, 1909.

1,035,601. Patented Aug. 13, 1912.

17 SHEETS—SHEET 17.

FIG. 49.

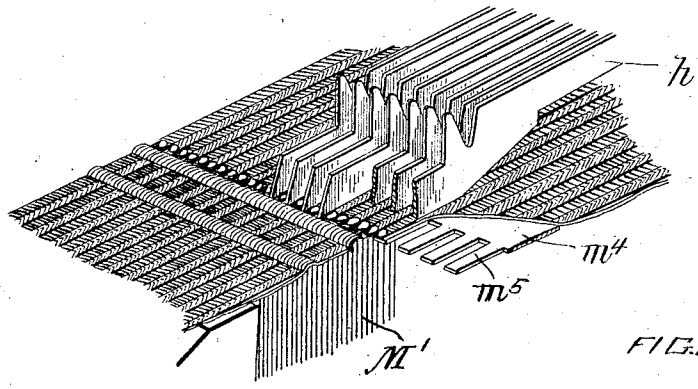


FIG. 51.

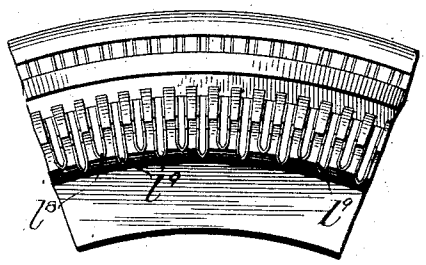


FIG. 50.

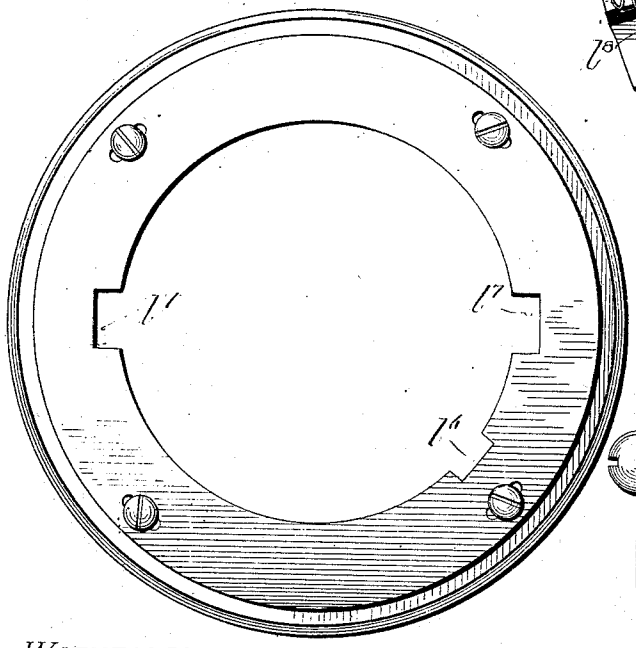
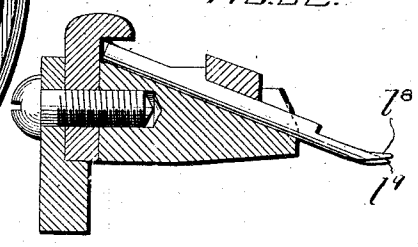


FIG. 52.



WITNESSES:

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INVENTORS

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UNITED STATES PATENT OFFICE.

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TOPPING-MACHINE.

1,035,601. Specification of Letters Patent. Patented Aug. 13, 1912.

Application filed January 29, 1909. Serial No. 474,953.

To all whom it may concern:

Be it known that we, EDWARD E. KILBOURN, WILLIAM E. SMITH, and ISAAC W. KILBOURN, citizens of the United States, residing at New Brunswick, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Topping-Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

Our present invention is a machine for running on knitted fabrics and consists in certain improvements upon the machine for this purpose devised by Mr. W. D. Butz of Norristown, Pa., and patented to him Mar. 19, 1901 under No. 670,308.

The objects of our invention, briefly stated are principally as follows: to provide for the ready introduction of the web into the machine and for its free and unobstructed continuous passage through the same when acted upon by the devices for feeding the web; to insure a more perfect alinement of the wales of the fabric in approaching the point at which it is engaged by the transfer levers; to provide for accurately placing the stitches of the course to be "run on" in exact position so that the transfer levers may engage the proper stitches with the greatest possible certainty; to provide means for firmly clamping and holding the web when it is positioned as above stated during the cutting or severing of the web and thereafter until the transfer levers are engaged with the appropriate stitches of the course to be run on.

The further objects of our invention are disclosed in the following description of the construction in which we have embodied our invention.

In the accompanying drawings we have shown the best form in which we have contemplated embodying our said invention and the said invention is described in the specification and more particularly pointed out in the claims.

In the drawings, Figure 1 is a longitudinal vertical section of a machine embodying our invention. Fig. 2 is a side elevation of the main portion of the same. Fig. 3 is a plan view of the parts shown in Fig. 2. Fig. 4 is a plan view of the main frame with the parts above the same removed. Fig. 5 is a longitudinal section of the main frame and parts beneath the same. Figs. 6, 7, 8 and 9 are details of parts shown in Figs. 4 and 5, hereinafter referred to. Fig. 10 is a vertical transverse section on line 10—10, Fig. 1. Fig. 11 is a similar section on line 11—11, Fig. 1. Fig. 12 is a like section on line 12—12, Fig. 1. Figs. 13 and 14 are views of details of parts shown in Fig. 12. Figs. 15 and 16 are sectional views on line 15—15, 16—16 Fig. 1. Figs. 17 and 18 are face and side views of the knife depressing ring. Fig. 19 is a horizontal sectional view on line *x*—*x*, Fig. 17. Fig. 20 is a face view of the knife carrying gear. Figs. 21 and 22 are views of the clutch controlling lever. Fig. 23 is a face view of the knife revolving gearing. Fig. 24 is a view looking to the left of line 24—24, Fig. 1. Fig. 25 is a sectional view showing the parts approaching the point at which the stitches of the web are engaged. Fig. 26 is a sectional view of the same parts just after the transfer levers have engaged the stitches of the web. Fig. 27 is a like view of the same parts a short time thereafter. Fig. 28 shows the same parts in close proximity to the transfer ring. Fig. 29 is a top or plan view of the transfer ring holder turned to the position in which the transfer ring is applied or removed. Figs. 30 and 31 are top and side views of the sliding bar for controlling the action of the knife. Fig. 32 is a detail of a part coöperating therewith. Fig. 33 is a sectional view of the cylinder carrying the grid and cam ring for actuating the transfer levers. Fig. 34 is a front view of such parts. Fig. 35 shows the pressing off fingers ccacting with the transfer levers. Figs. 36 and 37 are sectional and partial front views of the ring to which the transfer levers are pivoted. Fig. 38 shows a side and edge view of a transfer lever. Fig. 39 is a plan view of the tubular web inclosing and guiding casing. Fig. 40 is a partial section of the same. Fig. 41 is a side and edge view of one of the bits or web guiding fingers. Fig. 42 is a sectional view showing the manner in which the web enters and passes through the machine to the transfer levers. Fig. 43 is a diagrammatic view showing the joining ends of the course of loose stitches.

Fig. 44 is a partial view of the nosing which depresses the transfer levers applied to conform to the loose course of the stitches and the manner in which the levers are affected thereby. Fig. 45 is a view of a transfer lever having its point bent to conform to the course of loose stitches. Fig. 46 shows the arrangement of the bits to enable a circular series of transfer levers to engage the course of loose stitches. Fig. 47 is a view of the flattened web showing the arrangement of welts and the open stitch course. Fig. 48 is a view of the tapered body of the mandrel showing the brush and the ring with the rigid fingers. Fig. 49 is a diagrammatic view in an isometric perspective showing the manner in which the registering bits engage the web between the wales and clamp the same upon the fingers of the mandrel ring. Fig. 50 is a view in elevation of the base of the transfer ring. Fig. 51 is a front elevation of a section of the same. Fig. 52 is a transverse sectional view of such ring.

In the making of half hose and other articles, a portion or portions are knitted on a separate machine, generally on a rib machine, and in a web of considerable length. Such web is thereafter cut up into the proper lengths and the stitches of each section are applied to the needles of a knitting machine and the remainder of the article knitted on the applied portion.

In knitting seamless half hose, the tops of the stockings are knitted in the form of a tubular web. This web, made on a rib machine, is usually cut into sections of the desired length and the stitches of one course of the ribbed section are applied to a circular knitting machine. When this was first done the stitches of the "top" were run on the needles of the machine for finishing the stocking by the operator. At the present time the stitches of the web to be applied to the machine in most cases are first placed upon the quills or points of a ring, commonly designated a "transfer ring", the points or "quills" of the ring being equal in number to the stitches of the leg of the stocking to be knit and equal to the number of needles of the machine upon which the stocking is to be completed. The stitches of the top or ribbed portion of the stocking are, in most cases, placed upon the transfer ring by hand and a slack course or a course of loose or longer stitches is knit around the web in order to facilitate doing this. The machine herein described and claimed is designed to do this work in lieu of doing it by hand, and our invention consists of improvements on an existing type of such machines for rendering the operation thereof more certain and efficient.

A is the main frame or base of the machine. At the extreme left of this frame a plate L is secured to the top of the main frame, see Figs. 1, 3 and 10 with the central part of this plate a short distance above the top of the main frame. The plate L is provided with two upwardly extending arms l l. These arms are curved and the upper ends of the same extend to the right beyond the plate L. The outer ends of the arms l l are provided with bosses l' l'. In these are mounted two gudgeons upon which a ring L′ is journaled to turn in a vertical plane. The ring L′ has an interior annular recess and in this recess is movably mounted a smaller ring L^2, see Figs. 1 and 10. This ring L^2 is provided with two locking projections l^2 l^2 that extend outwardly through slots in the ring L′. It is also provided with the bifurcated projection l^3 the two arms of which embrace the eccentric or cam l^4 secured to one of the gudgeons upon which the ring L′ is pivoted. The gudgeon is rigidly secured in its boss and as the ring L′ is turned from one position to another the ring L^2 is partially turned in its recess by the eccentric and the locking projections thereby moved in the slots in the ring L′ to effect the locking of the transfer ring upon the ring L′ upon which it is mounted. The exterior of the ring L′ is made to easily engage the interior of the transfer ring L^3, see Figs. 28 and 50 and is provided with a spline or bar l^5 which engages a recess l^6 in the transfer ring and holds it from turning, the transfer ring being also provided with openings l^7 to permit the locking projections to pass through the outer ring of the same.

The ring L′ is provided with the hub L^4 and in this hub is mounted a part m of the mandrel. The plate L between the arms l l is provided with the adjustable stop L^5 which engages the ring L′ when it is turned to a vertical position and holds the same in position with the section of the mandrel m in a horizontal plane. The right or free end of the mandrel section m is cut away to form the reduced portion with the inclined shoulder m^2. A rod or bar m' forming a continuation of the mandrel is provided with a correspondingly reduced portion and a sleeve M^2 is movably mounted upon the section m so that when the two shoulders are brought together and the sleeve slipped over the meeting ends of the two parts they will be firmly secured together. A larger cylindrical body M is secured to the other end of the rod or bar m'. The left hand end of the cylinder is composed of the brush portion M′ which is held in place against the main body by the collar M^3.

It is deemed important to the proper operation of the machine that the mandrel should be supported from one end and that this support should be from the delivery end of the machine. The main or larger

portion of this part of the mandrel is, therefore, made of some light material in order that it may be easily supported in position. The part M is, in this instance, made of wood and polished and terminates at the right in a bluntly tapered form. Adjacent to the brush the body M is provided with the ring m^4, see Fig. 48, which has its left end slotted to provide the rigid fingers m^5. In number these fingers equal one-half of the stitches of each course of the web to be transferred and they extend beyond the left end of the wooden body and over the brush M'. The parts m, m' and M form a mandrel over which the web is drawn as it passes through the machine, and this term will for convenience be used to designate this assemblage of parts. When the web is introduced into the machine it is drawn over the tapered end of the mandrel and expanded to a diameter suitable for the operation of the registering bits or finges h hereinafter described.

The left end of the main frame is provided with guide ways n, see Figs. 10 and 11 in which is mounted the sliding frame or carriage N, see also Figs. 4 and 6. To the right hand end of this carriage is secured an upwardly extending ring shaped standard N' surrounding the mandrel and in the ring of this standard is secured the transfer lever carrier O. This lever carrier also surrounds the mandrel and is composed of the sleeve o secured in the standard N' and the outwardly curving or disk shaped portion o' having the flattened face o^2. To this flattened face is secured the ring O^2 of the form best seen in Figs. 36 and 37. The inner or central portion of this ring projects slightly beyond the main portion of the ring and is provided with the groove o^3 extending entirely around the projecting portion. The projecting portion of the ring O^2 and the ring itself adjacent thereto are provided with the radial cuts or grooves o^4, one for each transfer lever.

The number of transfer levers O^3 one of which is shown in Fig. 38, is one-half the number of stitches in a single course of the web arranged to engage each alternate stitch of the course. Each lever has the stitch engaging point o^5, the trunnions o^6, o^6 and the inclined surface o^7, and these levers are inserted in the grooves of the ring O^2 with their trunnions in the groove o^3. The transfer levers are held in place by a securing ring o^8 which is also provided with cuts or grooves for the levers, the part between these grooves or cuts extending over the groove o^3 and holding the trunnions of the levers therein.

The carriage N is provided with guide ways p p in which is mounted a slide P which is provided with upright P', the upper part of which forms a ring or annulus and this ring or annulus also surrounds the mandrel M. To the right side of this standard is secured a ring P^2 and a grid p' connects this ring with a hollow cylinder P^3 which extends through and is supported by the sleeve o. The cylinder P^3 is splined to the sleeve o so that the two are independently movable lengthwise of the mandrel but are held against rotary movement in respect to each other. The cylinder P^3 adjacent to the grid is provided with a ring p^2 which for convenience may be termed a cam ring. The transfer levers extend through the spaces of the grid p'. Close to the ring P there are provided fingers p^3 which extend inwardly beyond the members of the grid and in alinement therewith. Near the ring P^2 the grids are provided with a notch in which is placed an endless coiled spring p^4 which at the close of the transfer movement acts to quickly withdraw the levers from their fully expanded position.

To the under side of the slide P is secured the rack Q, the teeth of which mesh with the teeth of the spur gear q on the shaft Q' mounted transversely of the main frame A. This shaft may be operated by means of a crank or hand wheel secured to the shaft outside of the frame A. The frictional engagement of the slide P with the carriage or frame N is sufficient to cause the two to move in unison when the shaft Q' and gear q are actuated unless the carriage N is restrained from movement.

Pivoted to the front side of the frame is a lever R best seen in Figs. 5, 8 and 9. This lever on its front side is provided with the projection r to engage with the underside of the lower member of the guide way n and limit its upward movement. The lever is normally held in this upper position by the spring plunger R'. The upper face of the free end of this lever is provided on its rear side with the double incline r' and on the front side of this incline with the upwardly extending projection r^2 having a vertical shoulder at each side.

The carriage or frame N is provided with the inwardly extending projection n' and secured to the underside of this projection or forming a part thereof, is a block n^2 in the normal plane of the projection r^2 of the lever R. The slide P is provided with the arm p^5, in this instance, extending forwardly through an opening in the guide way p, see Figs. 5, 6, 7 and 10. Just forward of the guide way it is provided with two screws p^6, p^7 in the same vertical plane as the double incline r' of the lever R and these screws act as tappets to depress the lever by engaging such incline.

The frame N is provided with a projection N^3 which engages and moves in a groove n^4 in the guide way n, see Fig. 10, and the movement of the carriage to the left is

limited by the engagement of said projection with the stop or screw n^5 extending into said groove, while its movement in the opposite direction is limited by a like screw n^6.

A′ is a circular supporting and inclosing frame which is secured to the right of the center of the machine, to the sides of the base frame A by bolts or screws passing through outwardly extending flanges a' (see Fig. 24). The frame A′ is provided with downwardly and outwardly extending flanges a^2 to which is secured a supplemental frame A^2. In this latter frame is mounted the driving shaft B and in these frames A and A^2 are mounted the main devices actuated from the shaft B and their coöperating parts. On the shaft B are mounted a fast pulley b and a loose pulley b'.

x is the belt shifter which may be of any preferred construction. In this instance it is shown as secured to a sliding bar x' by which it is operated.

The frame A′ is provided centrally with a large circular opening and in this opening is inserted the ring C having an outwardly extending flange c by which it is secured to the frame A′. The inwardly extending portion of this ring is provided with the angular flange c' which may be made integral with the ring or be composed of parts secured thereto. To this ring is secured the outer end of the hollow cylindrical journal C′. Upon this journal is revolubly mounted the gear wheel D which is provided with the outwardly extending hub d. The gear D is of concavo-convex form and its toothed periphery is in a vertical plane between the inner and outer ends of the hub d. Upon this hub d are mounted the knife depressing ring D′ and the spur gear D^2.

A spur gear b^2 is rigidly connected to or formed integrally with the fast pulley b on the shaft B and meshes with the gear D^2. A pinion b^3 is loosely mounted on said shaft, and meshes with the teeth of the gear D. The pulley b instead of being rigidly secured to the shaft B is splined thereon so as to be capable of longitudinal movement. The hub of this pulley is elongated and extends to the left in close proximity to the pinion b^3. The end of the hub is provided with a friction surface by which when forced strongly against the pinion b^3 the latter will revolve in unison with the pulley.

Secured within the flange c' of the ring C or made integral therewith is the cylinder F to the left hand end of which is secured the nosing f having at its outer end a series of cuts or gains equal in number to the number of the transfer levers of the machine. These cuts or gains are located between the stationary fingers m^5 on the mandrel. At its opposite end the cylinder F is provided interiorly with a longitudinally extending groove which is engaged by a spline g on the outside of a cylinder G. Near the right hand end of the same this cylinder G is provided with a circumferential groove, and a sleeve G′ having the annular groove g' is secured to segmental bands g^2 lying in said groove of the cylinder G (see Figs. 1 and 40). This permits the sleeve G′ to be moved or turned upon the cylinder G but unites the two for longitudinal movement. A spring g^3 located in the groove g' of the sleeve G′, tends to hold the two parts in one normal position. The sleeve G′ is provided with and carries a latch g^4 and a set screw g^5. The inner end of the flange c' of the ring C is provided with a notch to admit the latch and the screw bears against the outwardly extending flange c of the ring C.

In placing the cylinder G in position the spline g is made to engage the interior groove of the cylinder F, the extreme end of the latch entering the notch in the ring C. On forcing the cylinder to the left the spring g^3 will yield to permit the sleeve G′ to turn so that the latch will pass the ring C, after which the spring will turn the sleeve to cause the latch to engage the inner edge of the ring and holds the parts together. The cylinder G is made movable in respect to the cylinder F and its extent of movement can be adjusted by the set screw g^5.

Upon the outer or right hand end of the sleeve G′ is secured the hollow cylinder or tubular body G^2 which has a portion of reduced diameter as shown, the larger end being secured to the sleeve G′ by screws g^6 or in any other preferred manner.

In the interior of the left end of the hollow cylinder G is placed the ring H, which has its outer or left end slotted to receive the registering bits or fingers h, equal in number to the spaces between the exterior wales of the web to be transferred or applied by the machine. These fingers or bits are pivoted at their inner or right hand ends to the ring H and are held inward by the coiled spring h^2 that encircles the bits and engages the notches h' therein, as shown (see Figs. 1, 40 and 41). These bits are the same in number as the fingers m^5. The bits are in alinement with the fingers and each bit bears upon a finger against which it is drawn by the spring h^2.

The web to be acted upon is usually supplied in pieces of considerable length and is introduced through the hollow cylinder G^2 and over the tapered mandrel M between said mandrel and the bits h. The advance of the web is effected by the movement of the transfer levers and their carrier toward the left end of the machine after the levers have engaged the stitches of the web. When the web has been brought into position for the transfer levers to again engage the stitches of the web, the portion carried by the transfer levers is severed from the web by a cut-

ting operation or by pulling out a clearing course or in any other desired manner. In this instance we have shown for this purpose knife K which is mounted and controlled as follows, see Figs. 1, 13 and 14. The wheel D on its convex side is provided with the boss d^x. Through this boss extends a sleeve I which at its right hand end, is provided with the pinion i and at its opposite end with the bracket or plate i' in which are slots i^2, i^2. A housing I' is secured to this bracket by screws passing through the said slots. The housing I' is provided with a boss i^3 extending toward the left end of the machine. In this boss is journaled the shaft K' on which is mounted the circular knife K. On the opposite end of the shaft and within the housing is a pinion k that meshes with a spur gear k', also within the housing. The gear k' is secured to the shaft K^2 which is journaled in the sleeve I and is provided at its opposite end with the pinion k^2, which meshes with the gear D^2 revolubly mounted on the hub of the gear D as before described.

k^3 is a hood covering the knife K when in its elevated position.

When the machine is in operation the belt is thrown upon the pulley b and in consequence the knife is in constant rotation.

The teeth of the pinion i mesh with the teeth of a short toothed section on the knife depressing ring D', see Figs. 15, 17 and 18. To a projection from the side of the ring D' is secured the short arm d' extending outward beyond the periphery of the ring. This ring is also provided with the spring pressed bolt d^2, see Figs. 17, 18 and 19. The gear wheel D' is provided with the opening D^3, see Figs. 12 and 20, and the bolt d^2 extends into this opening in line with the outer wall of the same, while the arm d' extends through the opening and projects beyond the wheel.

A sliding bar E, see Figs. 4, 12, 13, 30 and 31, is mounted transversely of the machine and is provided with the spring pawl e and the rigid projection or arm e'. The arm d' of the knife depressing ring extends into the space between the pawl e and projection e' at such times as the knife K is in its elevated position above the web. The bar E is normally held in its rearward position by a spring e^2 (Fig. 15) but can at any time be drawn forward when it is desired to do so. In this instance it is shown as connected to the hand lever E' for that purpose.

To the right of the bar E is the pivoted detent arm E^2, see Fig. 32, which is normally kept in a raised position by a spring plunger E^3 that bears upon the under side of the same. The arm E^2 is provided with the upwardly extending pin or projection e^3 and when the knife is at rest engages an opening d^3 in the outer wall of the opening D^3 of the gear wheel D', as best seen in Figs. 1 and 20. The arm E^3 is provided with the cam projection e^4 extending toward the bar E and the latter is also provided with a cam projection e^5 to engage the projection e^4 to depress the arm E^2 on the forward movement of the bar.

The sliding bar also serves to move the pulley b into position to actuate the pinion b^3 and the gear D. A lever E^4 has one arm bifurcated and engaging the trunnions of a ring b^4 on the hub of the pulley b, see Figs. 1 and 4. The other arm extends to the left under the slide E in position to be engaged by the spring plunger e^6 carried by the bar E. This end of the lever is provided with a screw engaging a threaded aperture in the lever to contact with the plunger e^6 and this screw is secured by a cramp nut in a well known way. This construction provides for adjusting the parts so that the contact between the plunger e^6 and the lever may take place at the proper moment and the spring plunger, therefore, effects the contact of the parts constituting the friction clutch by a spring or yielding pressure.

Upon the left end of the carriage N is mounted the block S. In the upper part of said block is mounted the plunger s (Fig. 1) normally forced to the right by a spring. To the right hand end is pivoted the cam arm S' extending toward the slide P and held in a right line by projections engaging it on each side. The slide P is provided with the incline S^2 in line with the cam arm S' in which there is the notch s' having its left side inclined as shown. The free end of the lever S' is provided with the downwardly extending nose or projection s^2, the left side of which is also inclined. In the block S is also mounted the spring actuated rod or plunger T which engages the left end of the slide P as hereinafter explained.

A difficulty is experienced in the use of machines for taking up and applying the stitches of a knitted tubular web from the fact that each course instead of forming a true circle, is one of a number of courses forming a slow spiral. If any one will start at a given place in the web on a course of stitches and follow this course around the web, he will find that the course he has followed, at the point of beginning is one stitch away from that on which he started. This is true of the slack course with the difference that the point of meeting the two ends of the course do not form an abrupt jog or offset but gradually increase and decrease. Notwithstanding this there is a point as at U in Fig. 43, where the two ends of the course are practically the length of one stitch apart. In order to cause the transfer levers to take the stitches with certainty we prefer to bend the points of the transfer levers, so that they shall conform to the po-

sition of the stitches of the web on both sides of the line U, as indicated in Fig. 45. We have also accomplished the same result by making the cuts or gains in the nosing *f* of such depth as to correspond to the position of the stitches as shown at the right and left of the line U, see Fig. 44. We have also successfully accomplished the taking up of the stitches by making the registering bits or fingers that engage the fabric on the right of the line U a little longer than those that engage the web on the left side of such line as shown in Fig. 46. It will be seen by referring to Fig. 47 that while the welts have an offset or jog, this offset is not in alinement with the offset of the slack course of stitches. These bits engaging the welt of the web in advance of the shorter ones draw the slack stitches on that side of the line U into substantial alinement with the other parts of the course. This is effected by a movement of the cylinder G and its connected parts. This cylinder is arranged to have a short movement longitudinally. The operator by grasping the cylinder G^2, can move the same a short distance to the right and then return it to position. The time of this movement is when the welt, just in advance of the slack course, has been drawn under the registering bits *h*. By the movement to the right the bits are drawn in that direction until they pass the welt when the cylinder G is moved to the left. This movement causes the ends of the bits to engage the welt and move the web until the registering bits have been returned to their position over the stationary fingers m^5 of the mandrel.

The registering bits acting in conjunction with the fingers m^5 of the mandrel, constitute an important feature of the present invention. The registering bits engage the depressions between the exterior wales of the fabric and when the slack course is brought to the proper position for the transfer levers to take the stitches of such course, the web is firmly held with a stitch of the slack course intervening between the bits entirely around the web.

We employ but half as many transfer levers as there are stitches in a course of the web to be transferred and these levers, being positioned between the registering bits so that the ends of the same will engage the cuts or gains *f'* in the nosing *f*, will be guided directly inward midway between the bits. It follows, therefore, that they will engage the stitches held between the bits with entire accuracy.

When a transfer lever is employed for each of the stitches of the web, the registering bits after placing the slack course in position must be withdrawn back of the line on which the transfer levers are to engage the stitches, for otherwise each bit would cover one stitch and prevent one-half of the levers from taking their appropriate stitches. In drawing them back to this position, the position of the slack course is liable to become disarranged from the friction of the bits upon the web. It will also be seen that as the bits engage the welt and move the web to bring the slack course into position, the web is subjected to some drawing or strain. When the bits are with drawn there is more or less recoil in the web owing to its elasticity, which also has a tendency to displace or disarrange the slack course of stitches. Further than this, the act of severing the web, which takes place after withdrawing the bits where a transfer lever is used for each stitch of a course, has also a tendency to distort and displace the slack course by its pressure upon the web and the drawing character of the cut. In our construction we employ but one-half as many registering bits as there are stitches in a single course of the web and arrange these to engage alternate stitches of the web, and also employ a like number of transfer levers and arrange them to engage the stitches of the web between the bits. It is, therefore, unnecessary to withdraw the bits before causing the transfer levers to engage the web, as such levers pass between the bits and engage the stitches of the slack course held between them.

It has been found that the operation of the machine is greatly facilitated and its accuracy and efficiency increased by using a specially prepared web knit with two welts; one in the location of the usual welt to form the top of the stocking and one close to but in advance of the slack course of stitches. This second welt is designed to be engaged by the registering bits to draw the slack course of stitches accurately into position for the operation of the transfer levers, and the web is to be severed between the two welts.

In the case where one welt alone is used the action of the knife in severing the fabric sometimes effects a loosening of the stitches of the course or two in advance of the slack course, so that the transfer levers when expanding the web after taking the stitches, will cause the web to ravel in places or the stitches to "run down," as it is commonly stated, which results in imperfect work. This is avoided by the second welt, for, while the welt can be raveled from the direction of the preceding welt, it does not ravel as easily as the plain knit portions and it cannot be raveled from the side of the slack course of stitches, hence the strain of the transfer levers in expanding the web has no effect in the direction of loosening or raveling the stitches between them and the severed edge of the fabric. As this second welt when advanced by the registering bits

is always short of the point at which the web is severed, such bits when a knife is employed, do not interfere with the operation thereof. From this fact and from the fact that the number of bits and the number of transfer levers are each equal to one-half of the number of stitches and alternate with each other we are enabled to advance the web by causing the bits to engage the second welt and when the web is moved to the position in which the web is severed, the slack course of stitches will be in position for the operation of the transfer levers and the web will be clamped and firmly held during the operation of cutting and the taking of the alternate stitches of the web by the transfer levers. This clamping of the web is, as before stated, effected by the registering bits pressing the alternate stitches of the web against the fingers m^5 of the mandrel ring under the strain or force of the spring h^2.

We are aware that it has been proposed to employ a long mandrel, supported at each end, in this class of machines. Such construction has been found objectionable, for the reason that the web must be crowded or bunched upon the mandrel between the operative parts of the machine and the mandrel support at the end of the machine at which the web is introduced, or if the web be fed in a continuous manner the weight of the mandrel upon the web between the mandrel and its support will act to retard the feeding of the web on the underside of the same. In such a case there is a greater strain upon the underside of the web than at other points around the web and on a withdrawal of the registering bits this strain will cause a distortion of the slack course. In the former case the proper alinement of the wales is seriously interfered with and in the latter there is an unequal feeding around the web distorting the symmetry of the slack course of stitches, both resulting in an impairment of the accuracy and efficiency of the machine. In our improved machine we employ a mandrel supported at one end only, to wit, the end toward which the web is fed, thus permitting the web to be drawn freely onto and along the mandrel. The registering bits, pressing upon the web around the mandrel exert an equal pressure on all sides of the mandrel and such retarding effect as these may exert, being substantially equal at all points around the mandrel, an equal feed at all points around the mandrel is secured. While the bits under the influence of the spring h^2 have the effect stated, they do not and are not intended to form a support for the mandrel. To secure this equal feed and to secure the results sought to be attained by adaptation of the machine to the spiral form of the stitch courses, we prefer to have the web knit and wound as knit upon a reel V, see Fig. 42, in the form of a doubled flat web with the wales running longitudinally thereof and the dividing line u of the slack course as nearly in one fixed position as possible with respect to the folded edges of the web. A reel filled with this web is then mounted on a stand V^a preferably connected with the frame of the machine. The web is then passed through the tension device V^c, which also serves to hold it in its flattened form, and run into the machine. So long as the web is fed in this flattened form, there is practically no liability of the wales of the web becoming twisted or otherwise moved out of place. For this reason the enlarged and tapered part of the mandrel is made as short as is consistent with the ready feeding and expanding of the web. We, therefore, construct the mandrel so that it shall first engage the web within the cylinder G and within a short distance of the point at which the transfer levers are to engage the web.

It will be seen that in consequence of the spiral character of the courses of the stitches, there is a jog or decided offset in the welt or welts. In knitting the web care should be taken to see that this offset of the welts is at a little distance to one side of the dividing line U.

The general operation of the machine is as follows: The web having been drawn from the reel through the tension device, is passed into the machine and over the mandrel until the welt nearest the slack course comes beneath the registering bits, with the dividing line U of the slack course properly positioned and each registering bit in place between two wales. The operator then grasps the hollow cylinder G^2 and draws the hollow cylinder G and connected parts back to the right until the ends of the registering bits have passed over the welt. The cylinder G is then moved to the left until the ends of the registering bits are approximately even with the fingers m^5 of the mandrel. In doing this the ends of the bits will be forced into contact with the extra welt, and the web will move with them into the desired position. This exactly positions the stitches of the slack course and enables the bits to hold the alternate stitches of such course with the web slightly expanded, as before described. Supposing the parts to be in the position shown in Fig. 25, the shaft Q′ will be turned to carry the frame N and slide P to the right until the transfer levers engage the cuts or gains in the nosing f, when the levers will be deflected inwardly and the points forced inward between the registering bits and through the stitches held between said bits. They then pass between the fingers of the mandrel into a space beneath. The registering bits

pressing upon the web and clamping it between said bits and the fingers m^5, hold the web firmly against the thrust of the transfer levers. The levers thereafter pass forwardly and upwardly through the brush. When in this position the block n^2 of the carriage N will have passed to the right of the projection r^2 of the lever R. The motion of the shaft Q' will now be reversed, and the rack Q and slide P will be moved to the left. The block n^2 engaging with the projection on the lever R, the carriage N will be held from movement. As the slide P moves to the left, the cam ring p^2 will engage the transfer levers and swing them to the left expanding the web. This independent movement of the slide P will continue until the screw or tappet p^6 has reached the highest point of the double inclined projection of the lever R when the lever R and its projection r^2 will be depressed, and the slide P and carriage N will move together. The parts will then be in the position shown in Fig. 27. In this position it will be noticed that the downwardly extending projection or nose of the cam lever S' has just entered the notch s' of the slide P and the transfer levers are brought into contact with the spring p^4. The joint movement of the carriage N and slide P will continue until the web adjacent to the next slack course of the web is brought under the registering bits, as before described, then the hollow cylinder G will be first moved to the right and then to the left to bring the next slack course in position for the transfer levers. The lever E' will then be pulled outward drawing the bar E forward. As the bar E moves the pawl e will engage the arm d' of the knife depressing ring and give said ring a short rotative movement causing the sleeve I to turn in the boss of the wheel D sufficient to bring the knife downward to a position in which it will engage the web. This movement also causes the cam lug or projection e^5 of the bar to engage the projection e^4 of the arm E^2 forcing the same downward and withdrawing the projection e^3 from the aperture d^3 in the gear wheel D. When this position is reached the spring bolt d^2 will have been brought to and engaged the aperture d^3 locking the knife in its depressed position. At the same time the spring plunger E^2 will have engaged the arm E^4 and forced the hub of the pulley b into such contact with the pinion b^3 that motion is imparted to the wheel D and the knife is carried around the mandrel. As the pulley b and the knife K through its connections are constantly rotated, the web is entirely severed by this rotation of the wheel D. During the operation of the knife the web is held by the bits and the fingers of the mandrel and is also sustained somewhat by the brush, thus insuring the complete severance of the web. The brush serves to hold the web to the left of the fingers m^5 against the pressure of the knife, and yet does not present any such contact with the cutting edge as to dull the same. As the wheel approaches the completion of its rotation the arm d' of the ring D' engages, depresses and passes the pawl e, and comes in contact with the projection e'. As the ring D' and the gear wheel D are locked together by the spring bolt e^3 the motion of both is arrested, the friction clutch permitting this without shock. The hand lever is then released and it is drawn backwardly by its spring e^2. The first slight movement releases the arm E^2 and it is forced upward by its spring actuated plunger and as this spring is stronger than the spring actuating the bolt d^2, the projection e^3 is forced upward into the aperture d^3 removing the spring bolt b^2 and unlocking the ring D' from the gear D. The projection e' then engages the arm d^3 and turns the ring backward causing the teeth of the same to reversely turn the sleeve I and return the knife to its inoperative position.

The slide P and carriage N remain stationary during the operation of cutting the web, but as soon as that operation has been completed are again moved toward the left. As the block S passes under the plate L the cam arm S' comes in contact with the underside thereof and is forced downward causing its nose to move downward in the notch s'. The block S is secured to the carriage N and the notch is on the slide P and as the cam arm S' is moved downward to the same point at each movement of the carriage to the left, the carriage and the slide are by this means brought to one certain relation at this point of each operation. The further movement of the shaft Q' moves the slide P and carriage together, causing the points of the transfer levers to engage the grooves in the quills of the transfer ring near their points. The web being expanded by the outward movement of the transfer levers, the stitches will be elongated and their width increased, and as nearly the whole of this opened stitch is on the inside of the lever, the stitches engaged by the transfer levers are passed over the points, while the stitches between the levers having been in like manner expanded and being held midway between the transfer levers pass over the intermediate quills or points of the transfer ring. At this stage of the operation the movement of the carriage N is arrested by the projection n^3 of the carriage coming in contact with the stop or screw n^5, and the cam ring passes on to the inclined surfaces o^7 of the transfer levers. At the

same time the fingers p^3 engage the web and force the stitches off of the levers and further upon the points or quills of the transfer ring. As the cam ring comes against the cam surface o^7 of the levers, were not the transfer levers engaging the bottom of the grooves of the quills or points of the transfer ring, they would be drawn inward by the spring p^4. At this point the shaft Q' is made to cease from movement and the spring plunger T immediately moves the slide P and carriage together to the right, the spring p^4 causing the points of the transfer levers to maintain their position in the grooves of the quills by means of which they are withdrawn from the stitches leaving them upon the quills of the transfer ring.

While we have successfully applied the stitches of the web to a transfer ring of ordinary construction, we propose to use with our machine a transfer ring in which the points of the quills, intermediate the quills engaged by the transfer levers, are arranged in a slightly smaller circle than the others. This is shown in Figs. 51 and 52 in which the quills engaged by the transfer levers are indicated by the reference letter l^8 and those engaging the intermediate loops by the reference letter l^9. The purpose of this will be at once understood by calling the attention to the fact that when the web is expanded by the transfer levers of our machine, the stitches of the web do not form a circle but form a polygon with as many sides as there are transfer levers, the stitches between the levers lying in a straight line drawn from one lever to the next adjacent lever. Hence, arranging the points of the quills in the two circles as described will enable the quills of the transfer ring intermediate those engaged by the transfer levers to more certainly engage the intermediate stitches. The employment of a transfer ring of the character just described in connection with our construction and arrangement of transfer levers and the arrangement of registering bits co-acting with the fingers on the mandrel ring, secure the utmost accuracy in the work of the machine.

While we have described the use of the fingers p^3 for forcing the stitches from the transfer levers, the construction and operation of the transfer levers is such that they will effect the transfer without the fingers p^3 and the additional independent movement of the slide P. The transfer levers as shown, have a broader portion from which the stitch engaging points project and a shoulder is formed at the junction of the point with the main body of the lever. This shoulder of itself would force the stitches upon the quills or points of the transfer ring. Such points or quills are of greater size than the points of the transfer levers and when the stitches are forced as far as the said shoulders will carry them, the strain upon the stitches by reason of the expansion of the web is transferred to the points or quills of the transfer ring. As soon as the cam ring reaches the inclines o^7 of the transfer lever and the retrograde movement of the levers is begun the spring p^4 will hold the points of the levers at the bottom of the grooves of the quills or points of the transfer ring and they will be withdrawn from the stitches, the stitches of the web ordinarily engaging the quills with sufficient force to permit this to be done without displacing the stitches. The fingers p^3 are employed only as an additional safeguard to insure the greatest possible certainty in this portion of the operation of the machine.

After the movement effected by the spring plunger, the shaft Q' is reversed and the slide and carriage are moved together to the right until the block n^2 of the carriage engages the projection r^2 of the lever R. Thereupon the carriage N will be held from movement until the ring P^2 shall have engaged the transfer levers and turned them inward to the position shown in Fig. 25. By this time the screw p^7 will have reached the highest point of the double incline r' of the lever R and depressed said lever permitting the carriage N to again move with the slide P. The sleeve M^2 is then moved to the left past the joining of the bars m, m', the ring L' turned to a horizontal position and the transfer ring with the portion of the web engaging its quills removed, another transfer ring is then placed upon the ring L' and the ring turned to a vertical position, the bars or rods m, m' again brought together and secured by the sleeve M^2 and the operation repeated. While the bars m, m' are separated, the enlarged portion of the mandrel will be held in place by the pressure of the bits upon the work surrounding the body of the mandrel.

Our construction also enables us to make a machine applicable to the finest grades of goods, which cannot be done where a lever for every stitch is employed, as in such case the levers have to be made so small and of such thin material that they have little strength and durability. This feature of our invention also enables us to make a cheaper machine, that will be at the same time stronger and more durable, as aside from reducing the number of levers by half, the levers themselves and their supporting parts can be made at a reduced cost.

What we claim and desire to secure by Letters Patent is:—

1. In a machine for running on knitted web, the combination with means for receiving all of the stitches of a single course of

the web, of means for engaging less than the entire number of stitches of a single course of the web to be transferred and applying the stitches of said course to the stitch receiving means.

2. In a machine for running on knitted web, the combination with means for receiving all of the stitches of a single course of the web, of means for applying the stitches of a single course of the web to said stitch receiving means, said applying means comprising means for engaging each alternate stitch of the course applied, substantially as described.

3. In a machine for running on knitted web, the combination with means for receiving each stitch of a single course of the web, of a series of transfer levers of one-half the number of the stitches of a single course of the web to engage each alternate stitch of the transfer course, and apply all of the stitches of said transfer course to the stitch receiving means.

4. In a machine for running on knitted web, the combination with the main or supporting frame, of a horizontal mandrel for receiving and expanding the said web, said mandrel being supported by having one end thereof only connected with said frame.

5. In a machine for running on knitted web, the combination with the stitch receiving means, of means for applying the stitches of the transfer course to the stitch receiving means and a mandrel, said stitch receiving means and said mandrel being connected to and wholly supported by the same part of the machine, substantially as described.

6. In a machine for running on knitted web, the combination with a stitch receiving means, of means for engaging the stitches of the web and applying them to the stitch receiving means and a tapered mandrel for first engaging the web within a short distance of the point at which the stitches are engaged.

7. In a machine for running on seamless knitted web, the combination with stitch receiving means, of means for engaging the stitches of a web and applying them to the stitch receiving means, of a tapering mandrel and a cylinder surrounding said mandrel, the said mandrel engaging said web within said cylinder and within a short distance from the stitch engaging point.

8. In a machine for running on seamless knitted web, the combination with stitch receiving means, of means for engaging stitches of the web for applying the stitches of a single course to the stitch receiving means, a mandrel for engaging and expanding the web, a cylinder surrounding the mandrel, said mandrel engaging the web within a short distance from the stitch engaging point.

9. In a machine for running on knitted web, the combination with means for receiving all of the stitches of a single course of the web, of means for engaging less than the entire number of stitches of a single course and applying all the stitches of the course to the stitch receiving means.

10. In a machine for running on a seamless knitted web, the combination with stitch receiving means, of means for applying the stitches of a single course to said stitch receiving means, a mandrel for engaging and expanding the web, said mandrel first engaging the web within a short distance of the stitch engaging point.

11. In a machine for running on knitted web, the combination with means for receiving all the stitches of a single course of the web, of means for engaging less than the entire number of the stitches of a course of the web and applying the entire number of stitches of a course of the web to the receiving means, said stitch engaging means including means causing the stitch engaging means to engage a spiral course of stitches, substantially as described.

12. In a machine for running on knitted web, the combination with stitch receiving means, of means for engaging stitches of the web and applying all the stitches of a single course of the web to the stitch receiving means, a hollow cylinder for receiving and guiding said web, and a tapered mandrel for engaging said web and expanding the same, the smaller end of the mandrel lying and engaging said web within a short distance from the switch engaging point.

13. In a machine for running on seamless knitted web, the combination with stitch engaging means, of means for engaging less than the whole number of stitches in a single course of the web and registering bits for engaging the stitches of the course not engaged by the said stitch engaging means, substantially as described.

14. In a machine for running on seamless knitted web, the combination with stitch engaging means for engaging less than the entire number of stitches of a single course of the web, a mandrel for engaging the interior of the web and spring pressed registering bits surrounding the mandrel for engaging the stitches of the transfer course not engaged by the stitch engaging means, said bits engaging the outside of the web and pressing the stitches engaged thereby against the mandrel, substantially as described.

15. In a machine for running on seamless knitted web, the combination with transfer levers for engaging less than the entire number of stitches in a single course of the web, a mandrel supported from the delivery end of the machine for engaging the interior of the web, and a series of spring pressed registering bits surrounding the mandrel for

engaging the stitches of the transfer course not engaged by the transfer levers, said bits engaging the outside of the web and pressing the stitches engaged thereby against said mandrel, substantially as described.

16. In a machine for running on seamless knitted web, the combination with a series of transfer levers equal in number to one half of the stitches of a single course of the web, for engaging an equal number of stitches of the web, of a mandrel for engaging the interior of the web, a series of spring pressed registering bits surrounding the mandrel, said levers and bits being adapted to engage alternate stitches of a single or transfer course of the web, substantially as described.

17. In a machine for running on seamless knitted web, the combination with a mandrel for engaging the interior of the web, said mandrel having a series of fingers, of a series of spring pressed registering bits one for each finger surrounding the said mandrel, each bit registering with one of the said fingers and adapted to press the web against said fingers.

18. In a machine for running on seamless knitted web, the combination with a mandrel for engaging the interior of the web, said mandrel being provided with a series of fingers equal in number to one-half of the number of stitches in a single course of the web, of a series of registering bits surrounding the mandrel equal in number to the number of said fingers and registering with said fingers, said construction including an elastic means pressing said bits inward to clamp the web between said bits and fingers.

19. In a machine for running on seamless knitted web, the combination with a mandrel having a series of fingers equal in number to one-half of the stitches of a single course of the web, of a series of spring pressed registering bits equal in number to the said mandrel fingers and registering therewith, said bits surrounding said mandrel and adapted to clamp the web upon said fingers and a series of transfer levers adapted to engage the web between the points held by said bits and fingers.

20. In a machine for running on seamless knitted web, the combination with a mandrel having a series of fingers equal in number to one-half of the stitches of a single course of the stitches of the web, of a series of spring pressed bits equal in number to the mandrel fingers and surrounding the said mandrel, said bits registering with said fingers and adapted to clamp each alternate stitch of a single course of stitches of the web, and a series of transfer levers equal in number to the bits and fingers and adapted to engage the stitches of the web between the fingers.

21. In a machine for running on seamless knitted web, the combination with a mandrel to engage the interior of the web supported at one end only and provided between its ends with a series of fingers equal in number to one-half of the stitches of a single course of the web to be transferred, of a series of spring pressed bits equal in number to the mandrel fingers, surrounding the said mandrel, said bits registering with said fingers and adapted to clamp each alternate stitch of the web, the free end of the mandrel being tapered and extending only a short distance from the fingers toward the receiving end of the machine.

22. In a machine for running on knitted web, the combination with a hollow cylinder, of the registering bits pivoted at one end to the cylinder, each of said bits having a notch near the free end of the same and a coiled spring engaging the notches of all of said bits, substantially as described.

23. In a machine for running on knitted web, the combination with a hollow cylinder, of bits for engaging and guiding the web having the ends of the same nearest the web receiving end of the cylinder pivoted to the cylinder and a spring or elastic means engaging and pressing the free ends of said bits inwardly, substantially as described.

24. In a machine for running on a seamless knitted web, the combination with a mandrel for engaging the interior of the web, of a series of spring pressed bits for engaging the web between the wales of the web on one side thereof and a series of fingers for engaging the opposite side of the web to receive the pressure of said bits.

25. In a machine for running on seamless knitted web, the combination with a mandrel to engage the interior of the web, of a cylinder surrounding said mandrel, one of said parts being provided with spring pressed bits to engage the web between the wales thereof on one side of the web and the other provided with fingers equal in number to said bits and registering therewith to engage the other side of the web and receive the pressure of said bits.

26. In a machine for running on seamless knitted web, the combination with a mandrel for engaging the interior of the web, of a cylinder surrounding the mandrel, one of said parts being provided with spring pressed bits to engage the web on one side of the same between the wales thereof, and the other provided with fingers equal in number to said bits and registering therewith to engage the opposite side of the web and receive the pressure of said bits, and a series of transfer levers alternating with said fingers to engage the stitches of the web between the stitches held by said bits and fingers.

27. In a machine for running on seamles

knitted web, the combination with a stitch receiving means, of stitch engaging means for engaging stitches of the web and applying the appropriate stitches of a single course of the web to the stitch engaging means, said construction including provision for engaging a spiral course of stitches.

28. In a machine for running on seamless knitted web, the combination with stitch receiving means, of stitch engaging means for engaging and applying stitches of a single course of the web to the stitch receiving means, said stitch engaging means being constructed to engage a spiral course of stitches.

29. In a machine for running on seamless knitted web, the combination with stitch receiving means consisting of a transfer ring provided with quills for receiving all of the stitches of a single course of the web, of means for applying the stitches of a single course of the web to the quills of said transfer ring consisting of means for engaging one-half of the stitches of the transfer course, such means being adapted to register with one-half of the quills of the transfer ring and apply the stitches engaged thereby to the quills of the transfer ring with which they register, the other quills of the transfer ring having their points located slightly nearer the center of the ring to receive the unengaged stitches.

30. In a machine for running on seamless knitted web, the combination with means for engaging less than the whole number of a single course of stitches of the web, of a stitch receiving means provided with quills having their points arranged in two concentric circles in close proximity to each other.

31. In a machine for running on seamless knitted web, the combination with stitch engaging means for engaging one-half of the stitches of a single course of stitches of the web, of a stitch receiving means consisting of a ring having quills to receive all of the stitches of a single course of said web, the points of one-half of said quills being located slightly inward of the points of the remaining quills.

32. In a machine for running on seamless knitted web, the combination with a transfer ring having quills to receive all of the stitches of a single course of the web, of a series of transfer levers equal in number to one-half of the stitches of a course of the web and adapted to engage each alternate stitch of the web, and to engage each alternate quill of the transfer ring and apply a stitch thereto, the points of the quills not so engaged being located slightly nearer the center of the ring than the others.

33. A transfer ring having the points of its quills arranged in two concentric circles, the point of each alternate quill being located in the inner or smaller circle as and for the purpose specified.

34. A transfer ring provided with quills to receive the stitches of a seamless knitted web, the point of one-half of said quills being located in a straight line drawn from one to the other of the points of the next adjacent quills as and for the purposes set forth.

35. In a machine for running on seamless knitted web, the combination with a series of transfer levers equal to one-half of the stitches of a single course of the web, for engaging one half of the stitches of a single course of the web and applying all the stitches of that course to a stitch receiving means, of a stitch receiving means consisting of a ring provided with quills equal in number to the entire number of stitches of a single course of the web, the points of one-half of such quills being located slightly within the circle of the points of the remaining quills.

36. In a machine for running on tubular knitted web, the combination with a mandrel for engaging the interior of the web provided with rigid fingers, of a series of spring pressed registering bits for engaging the exterior of the web and pressing the web against the fingers of the mandrel, and a cutter revoluble about the mandrel for severing the web when held by the bits and the mandrel fingers, substantially as described.

37. In a machine for running on knitted fabric, the combination with a horizontally disposed mandrel having one end connected with and supported from a stationary part of said machine, of stitch engaging means and spring pressed registering bits surrounding said mandrel and means for supplying the web to the free end of the mandrel, substantially as described.

38. In a machine for running on seamless knitted fabric, the combination with a horizontally disposed mandrel supported from the discharging end of the machine and extending toward the receiving end, of stitch engaging devices and registering bits surrounding said mandrel and devices for supplying the web in a flattened form to the machine and maintaining it in such form to within a short distance of the stitch engaging devices.

39. In a machine for running on knitted web, the combination with means for receiving the stitches of a single course of the web, of means for engaging stitches of said course and applying the stitches of said course to the stitch receiving means, said stitch engaging means consisting of a less number of stitch engaging parts than the stitch receiving means.

40. In a machine for running on knitted

web, the combination with means for receiving the stitches of a single course of the web, of means for applying the stitches of a single course of the web to said stitch receiving means, said applying means comprising stitch engaging parts for each alternate stitch receiving part of the stitch receiving means.

41. In a machine for running on knitted web, the combination with means for receiving each stitch of a single course of the web, of a series of transfer levers of one half the number of the means for receiving the stitches of the web to engage each alternate stitch of the transfer course, and apply all the stitches of said transfer course to the stitch receiving means.

42. In a machine for running on knitted web, the combination of stitch engaging means, with means for causing registry of the same with the offset or spiral slack course of the web.

43. In a machine for running on knitted web, the combination of stitch engaging devices, and means for causing a spiral disposition of said stitch engaging devices with an offset to accord with the natural disposition of the stitches of the slack course of the web.

In testimony whereof we affix our signatures in the presence of two witnesses.

EDWARD E. KILBOURN.
WILLIAM E. SMITH.
ISAAC W. KILBOURN

Witnesses:
JOHN ERICKSON,
THEODORE ZOUSE.