No. 675,396. Patented June 4, 1901.

G. H. MILWARD.

MACHINERY FOR SPINNING AND DOUBLING.

(Application filed July 3, 1900.)

(No Model.) 5 Sheets—Sheet 1.

FIG. 1.

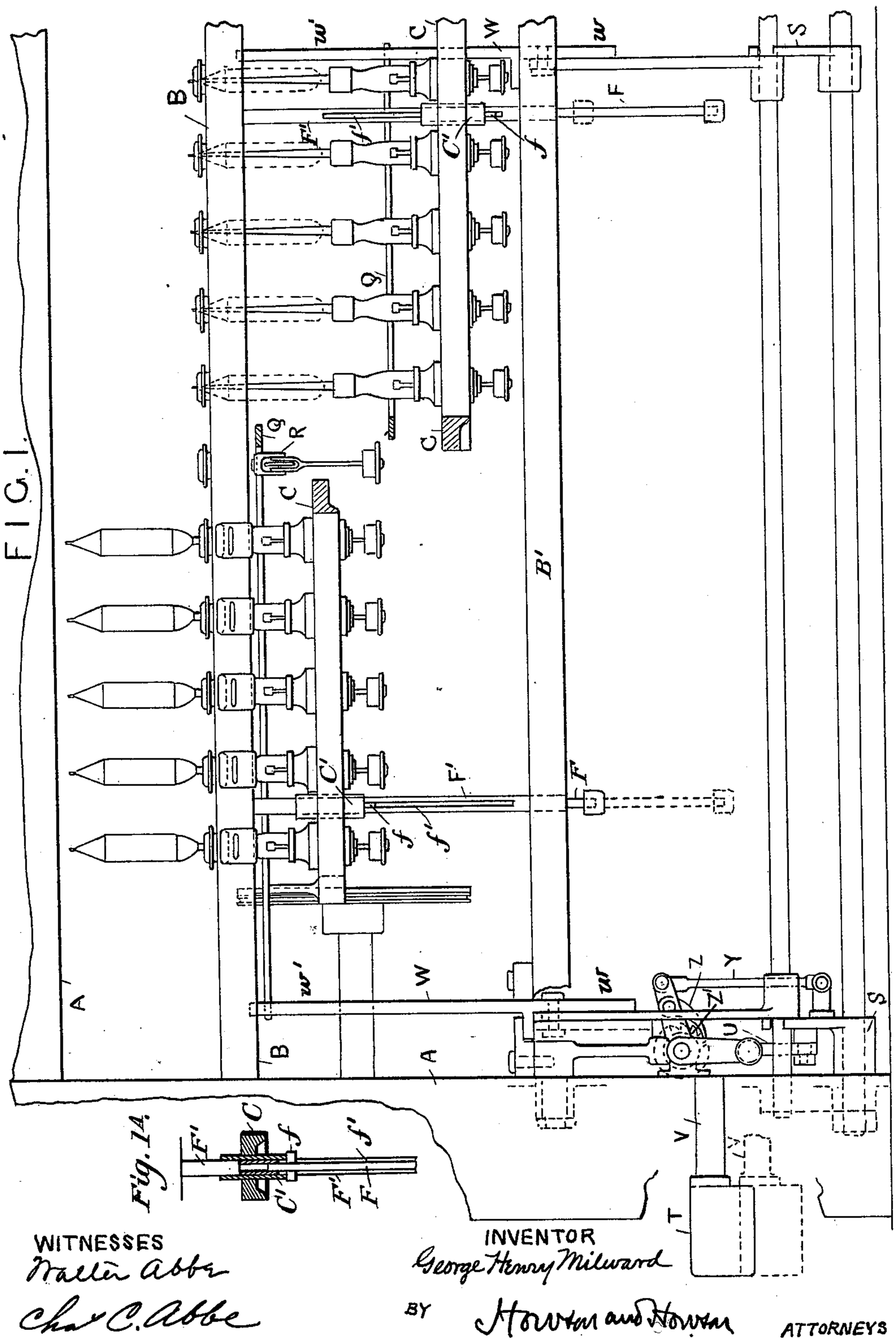


Fig. 14.

WITNESSES
Nellie Abbe
Chas C. Abbe

INVENTOR
George Henry Milward

BY Howson and Howson ATTORNEYS

No. 675,396. Patented June 4, 1901.

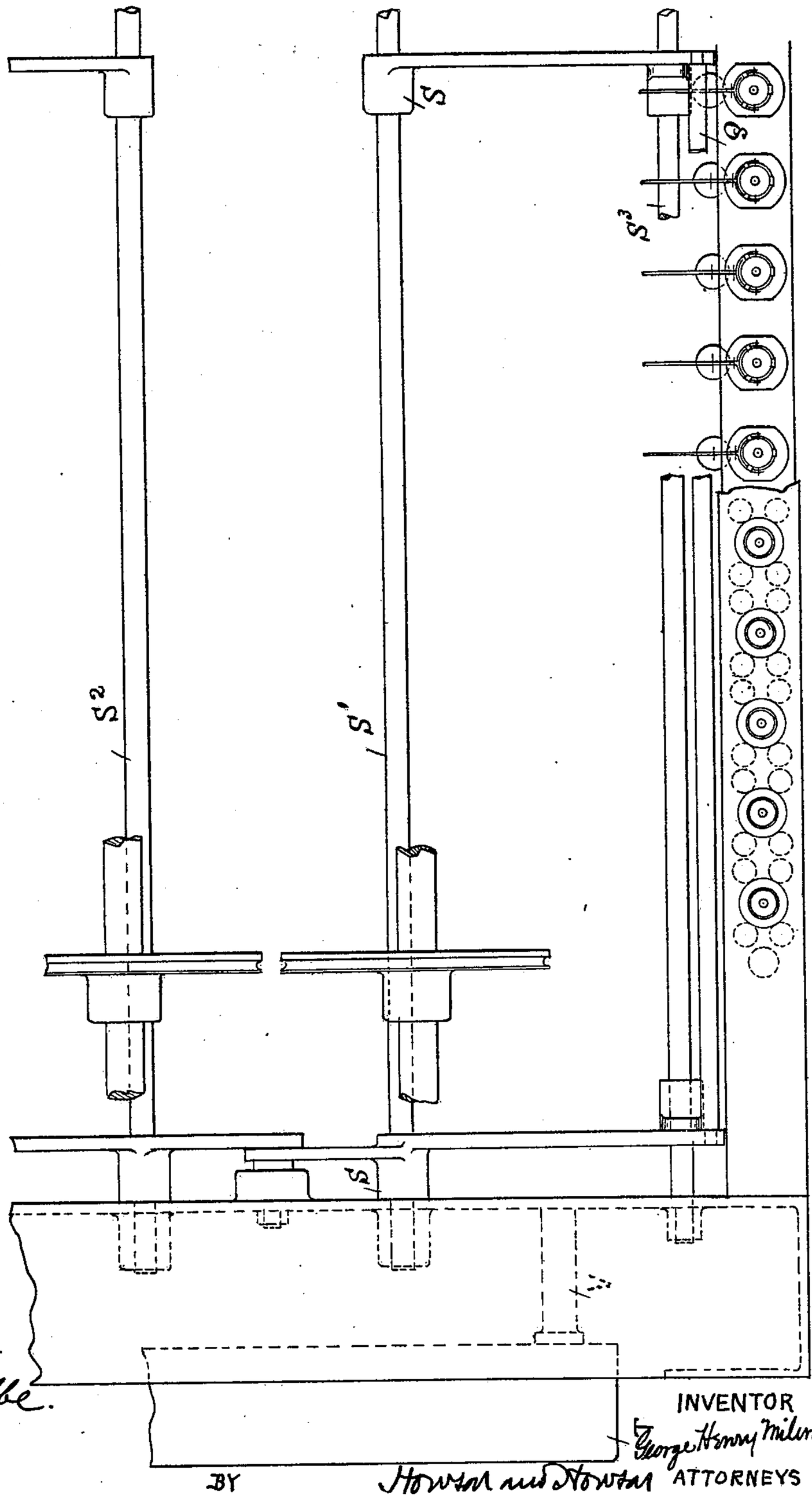
G. H. MILWARD.

MACHINERY FOR SPINNING AND DOUBLING.

(Application filed July 3, 1900.)

(No Model.) 5 Sheets—Sheet 2.

FIG. 2.



WITNESSES

Walter Abbe

Chas C. Abbe.

INVENTOR

George Henry Milward

BY Howson and Howson ATTORNEYS

No. 675,396. Patented June 4, 1901.

G. H. MILWARD.

MACHINERY FOR SPINNING AND DOUBLING.

(Application filed July 3, 1900.)

(No Model.) 5 Sheets—Sheet 3.

FIG. 3.

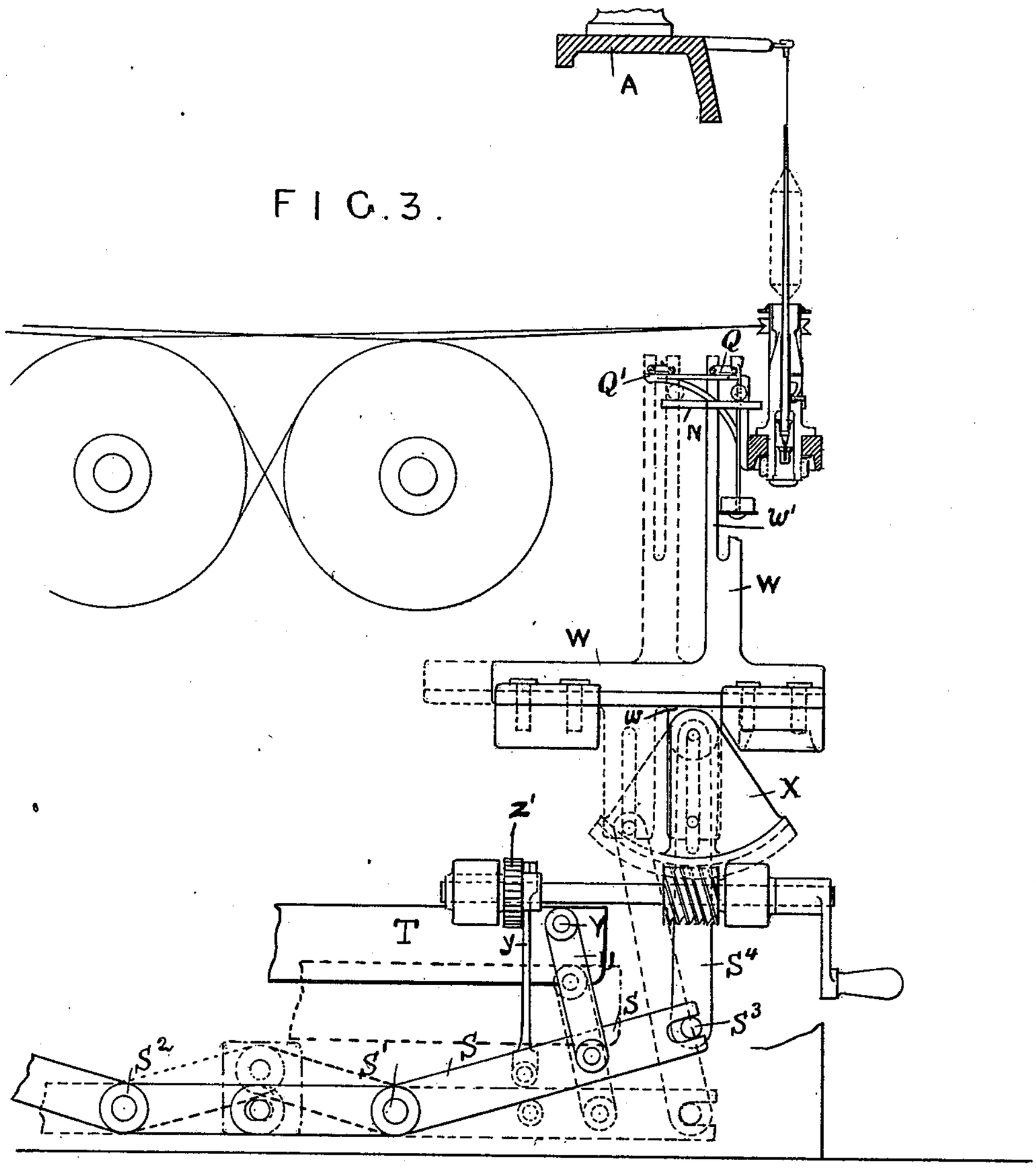
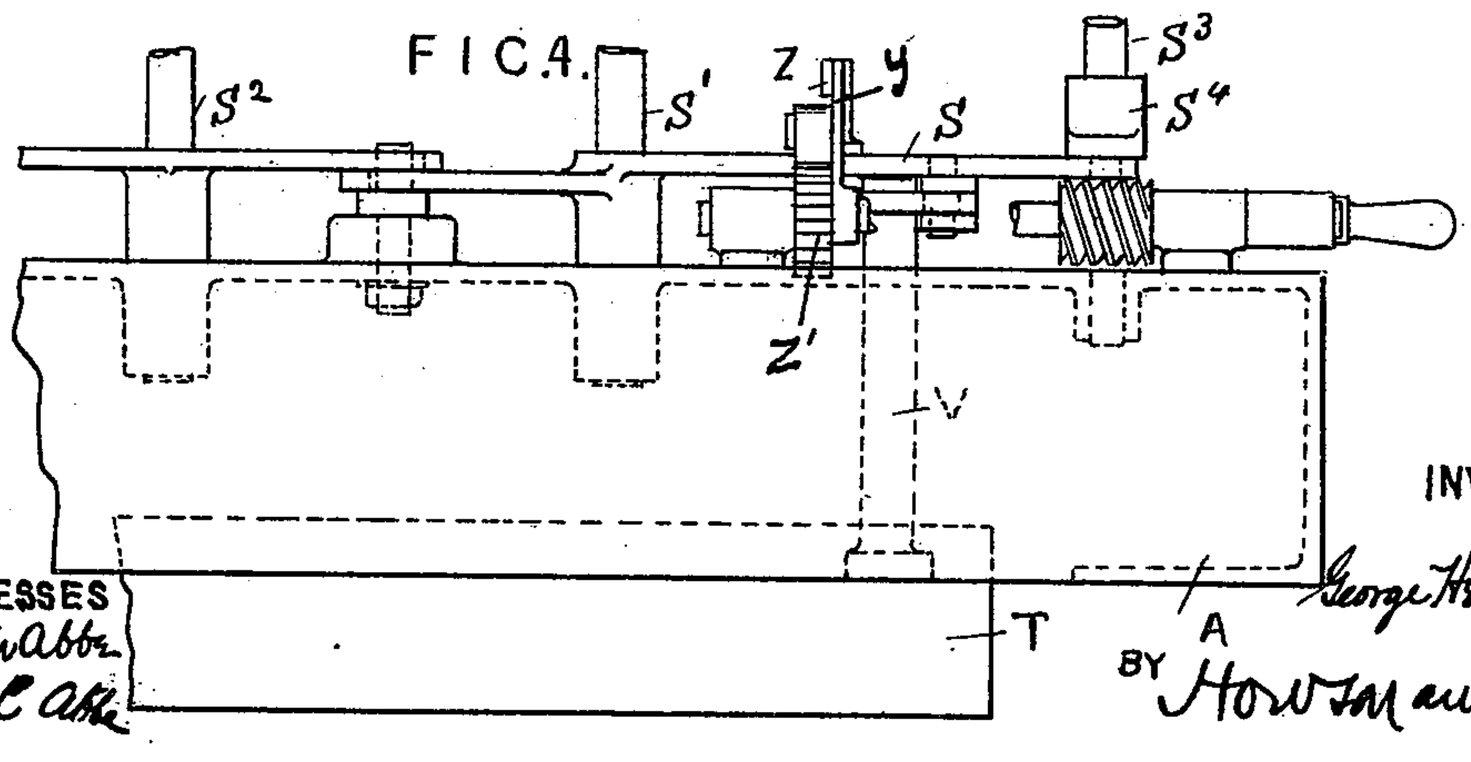


FIG. 4.



WITNESSES
Walter Abbe
Chas C Able

INVENTOR
George Henry Milward
BY Howson and Howson
ATTORNEYS

No. 675,396. Patented June 4, 1901.

G. H. MILWARD.

MACHINERY FOR SPINNING AND DOUBLING.

(Application filed July 3, 1900.)

(No Model.) 5 Sheets—Sheet 4.

FIG. 5.

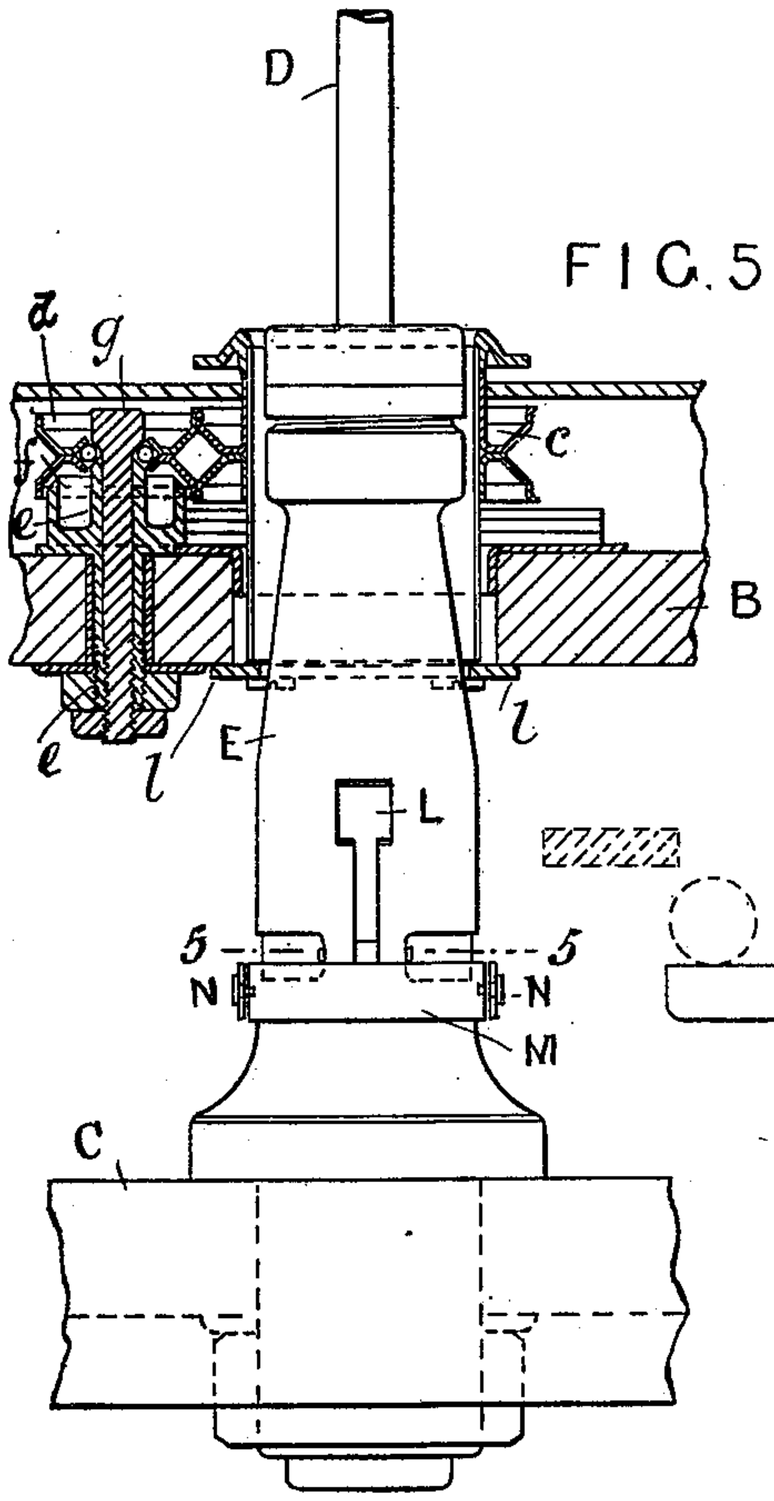


FIG. 5A

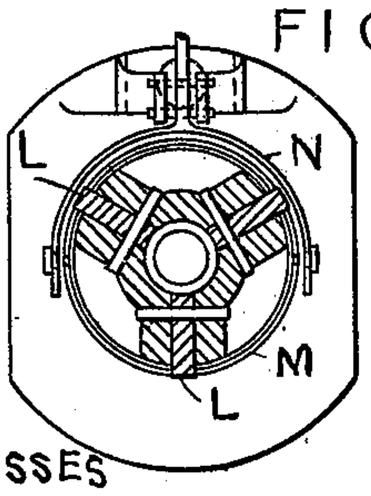
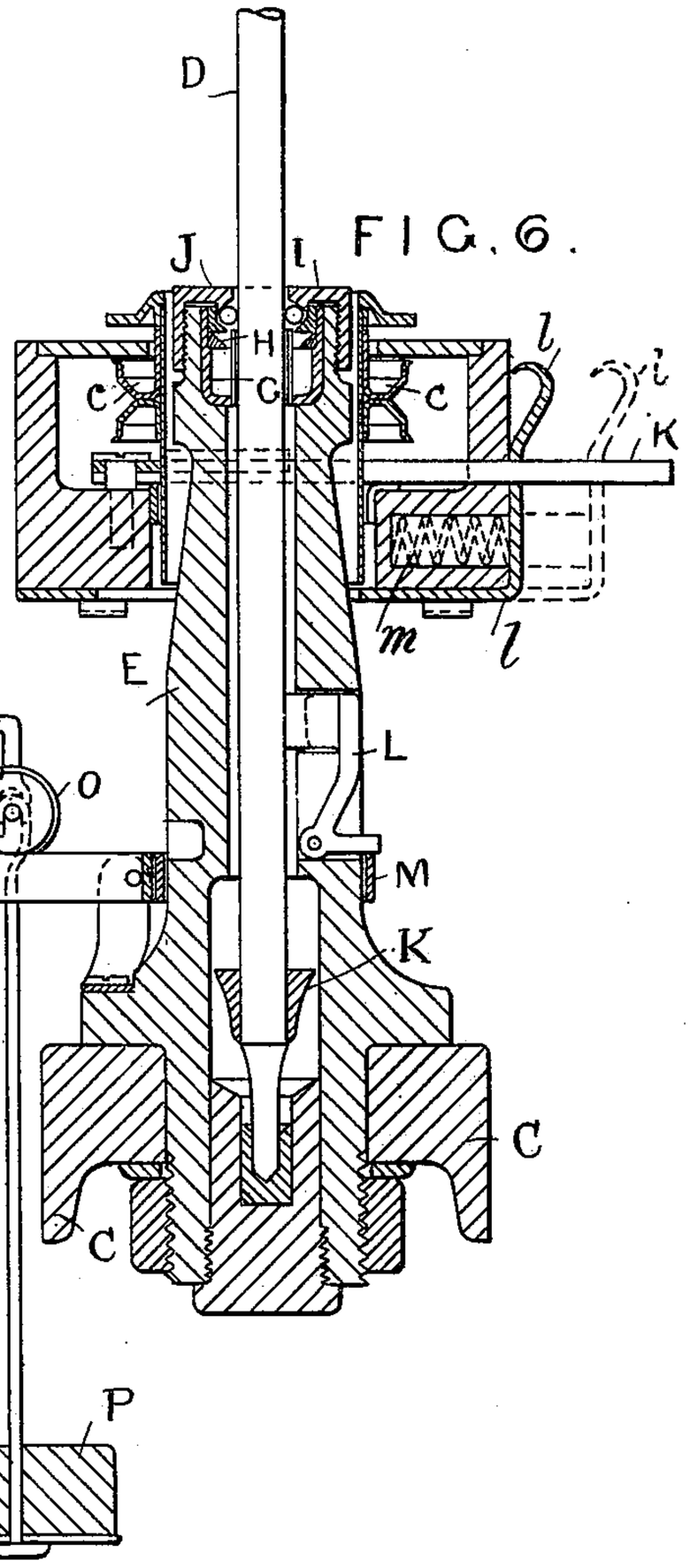


FIG. 6.



WITNESSES

Walter Abbe

Chas C. Abbe

INVENTOR

George Henry Milward

BY Howson and Howson

ATTORNEYS

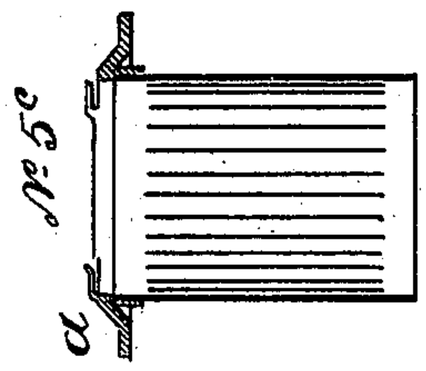
No. 675,396. Patented June 4, 1901.

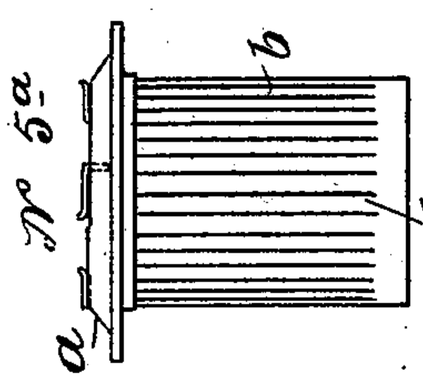
G. H. MILWARD.

MACHINERY FOR SPINNING AND DOUBLING.

(Application filed July 3, 1900.)

(No Model.) 5 Sheets—Sheet 5.





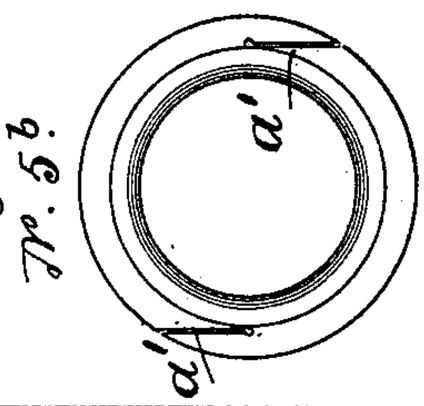
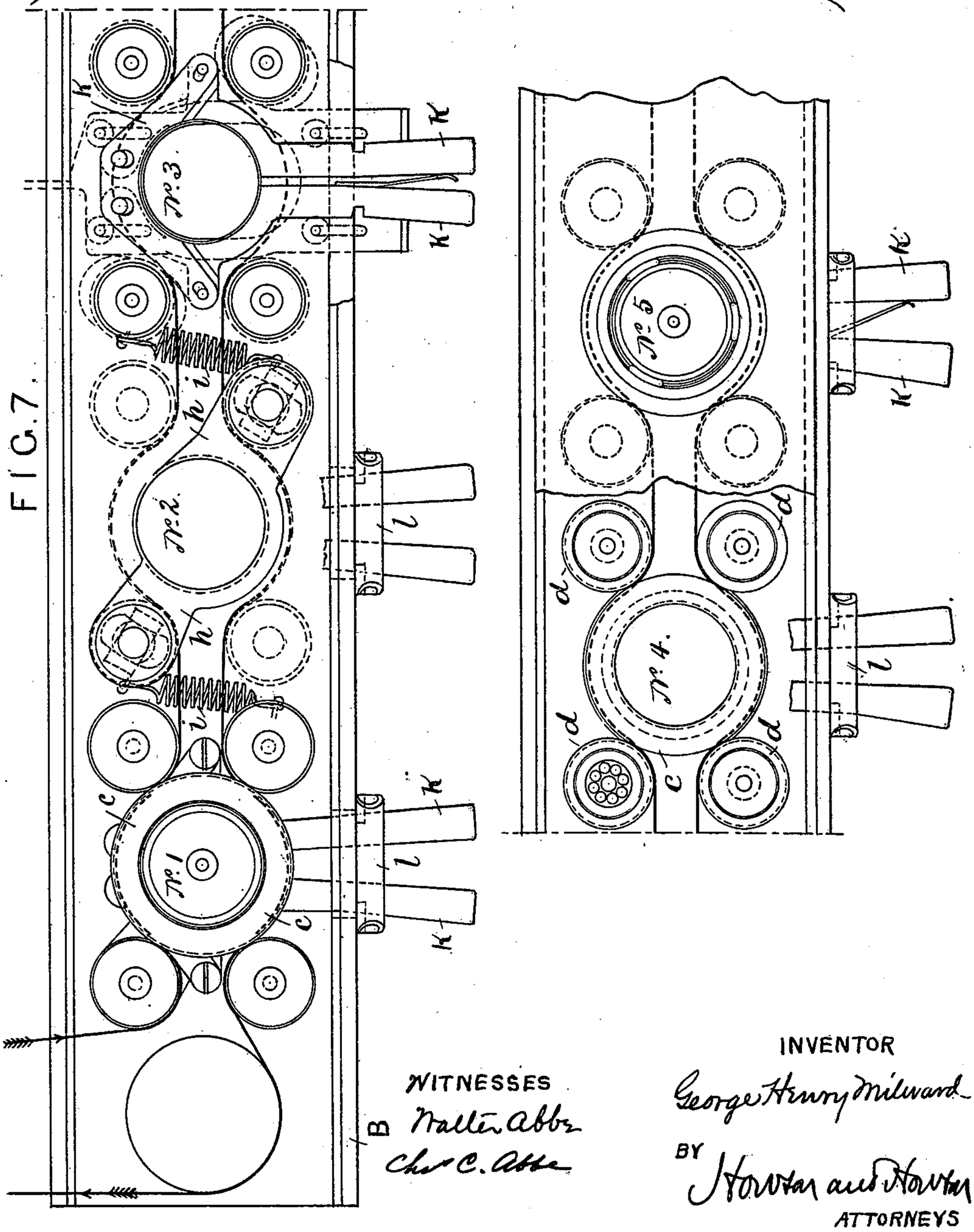


FIG. 7.



WITNESSES

B Nellie Abbe
Chas C. Abbe

INVENTOR

George Henry Milward

BY Howson and Howson

ATTORNEYS

UNITED STATES PATENT OFFICE.

GEORGE HENRY MILWARD, OF NOTTINGHAM, ENGLAND.

MACHINERY FOR SPINNING AND DOUBLING.

SPECIFICATION forming part of Letters Patent No. 675,396, dated June 4, 1901.

Application filed July 3, 1900. Serial No. 22,437. (No model.)

To all whom it may concern:

Be it known that I, GEORGE HENRY MILWARD, a subject of the Queen of Great Britain, residing at Agnes Street Meadows, Nottingham, in the county of Nottingham, England, have invented new and useful Improvements in Machinery for Spinning and Doubling Cotton, Wool, and other Fibrous Substances, of which the following is a specification.

This invention relates to improvements in machinery for spinning and doubling cotton, wool, and other fibrous substances, more especially by the process known as "ring" or "continuous" spinning, in which the "traveler" or ring is driven, the yarn carrying around the spindle to which the "drag" is applied, the ring-rail remaining stationary, and the "copping" motion being given to the spindle-rail.

The drawings annexed hereto show so much of a ring-frame with my improvements applied thereto as is necessary to make them clearly understood.

Figure 1 is a front elevation to scale of part of the frame from the gearing end to the first spring-piece, showing the spindle-rail divided and the position of the same on the left hand at the top and on the right hand at the bottom of the lift. Fig. 1[A] is a sectional view of a detail. Fig. 2 is a plan view of the above, showing part of the ring or ring-traveler rail, also part of the spindle-rail, with levers, weights, and means for applying the drag to the spindles. Fig. 3 is an end elevation to the same scale with the gearing end removed and shows the mechanism for moving the drag-weights and the connection to the builder and the way in which the gradually-increased movement of the weight as the cop-bottom increases in diameter is obtained. Fig. 4 is a plan of the above, showing more clearly the coupling of the levers to the builder, the rails being removed. Fig. 5 is a front elevation, full size, of a complete spindle and bolster shown in position at the top of the lift, together with a section of the ring or ring-traveler, the center wharve, carrier or guide and stud, and rail, with a sectional plan, Fig. 5[A], through the bolster and bell-crank levers, taken on line 5 5 in Fig. 5. Fig. 6 is a sectional elevation, full size, showing the lever for carrying the drag-weight, the rod for moving the same, and the attachment thereto for the bell-crank levers. Fig. 7 is a plan, full size, of the ring-traveler rail with five openings, each one showing a different part or section. No. 1, counting from the left hand, shows the wharve and four carriers or guides with the ring-traveler removed and the manner of carrying the driving-band to the drum or pulley. No. 2 shows a plan of the plate in which the two swiveling carriers or guides are fixed and the manner of attaching the springs for taking up the slack of the driving-band and keeping it at a uniform tension, there being one of these plates to each traveler. No. 3 is a plan of the clips or compressor for gripping or stopping the traveler as required. No. 4 has one carrier or guide in section through the ball-race and the wharve in section through the center. No. 5 has the covering-plate in position and shows the traveler with wire loops or guides for carrying the yarn, also the traveler in elevation, and the way the body is slit or cut for forming the spring. Nos. 5[a], 5[b], and 5[c] are detached views of the traveler-ring hereinafter referred to.

A is part of the frame, B the stationary ring-rail, and C the spindle-rail. This spindle-rail has sleeves C′, by which it is guided upon vertical tubular rods F′, connecting the stationary rails B B′, and the pokers F slide within the tubular rods F′ and have at their upper ends keys *f*, projecting through the slots *f′* in the tubular rods F′ and supporting the sleeves C′ of the spindle-rail C, as shown in Figs. 1 and 1[A]. The spindle-rail is shown at the left of Fig. 1 as in the elevated position and at the right of Fig. 1 as in the lowered position.

For the purposes of my invention the spindle D (see Figs. 5, 5[A], and 6) is carried or revolves in an upright pillar or bolster E, fixed in the lifter or spindle rail C, which is carried on the "pokers" F, attached to the building motion, in contradistinction to the ring-plate, as in the ordinary ring-frame. The top of this pillar E is recessed, the body of the pillar being bored larger or clear of the spindle D. In this recess a bush G is placed, in which is formed a chamber for the lubricant. The inside of the chamber has a shoulder on which a light ring H is placed, the in-

side face of which is beveled, thus forming a space or division. On the top of the above-mentioned ring H a bush I, of hardened steel or other material, is placed, this bush being bored in such a way as to form a ball-race or antifriction-bearing, the balls being adjustable to the spindle by a cap J, screwed and carried on a fine thread cut on the outside of the pillar or bolster E and secured in position by a locking-nut on the under edge, the inside of the cap being formed correspondingly to the bore of the said steel bush and forming the top side of the ball-race, as the bush I forms the bottom. The balls may be placed around the spindle. The bottom or foot of the spindle is made parallel and the end coned. The diameter of this foot may be one-third that of the spindle or less.

For producing the necessary drag on the yarn or fiber being spun a variable friction is applied to the spindle in the following manner: In the space between the foot and top bearing of the spindle, and preferably about the middle of its length, the pillar or bolster E is slotted in two or (preferably) three equally-divided spaces from the outside to the interior bore, the said slots being of suitable length, in which are placed small bell-cranks or levers L, (see Figs. 5, 5^A, and 6,) these levers being pivoted or carried on pins drilled through the body of the pillar or bolster E. The top end of each of these bell-crank levers is slotted or grooved to carry a friction-pad, of leather, felt, or other suitable material, which is made to grip the spindle centrally and with equal pressure, the bottom or shorter leg of these bell-crank levers L projecting from the body of the pillar E horizontally and resting on a ring M, which is free to slide on the outside of the pillar or bolster. This ring M is pivoted directly across its center to a forked lever N, the center or fulcrum being carried on the flange or foot on which the pillar or bolster E stands. On the outer end of these levers or lever N, which projects horizontally from the back of the pillar or bolster E and toward the inside of the frame, and on the top edge is placed a roller or grooved pulley O, from which is suspended a weight P, adapted to the drag required, this roller and weight being moved backward and forward and gradually farther from the fulcrum or center at every rise and fall of the bolster-rail until the full diameter of the cop is attained. This movement is then continued until the cap being finished and the rail lowered the operation is recommenced.

The movement of the pulley O and weight P along the lever or levers N is obtained in the following manner: From the back of the bolster or spindle rail C and at suitable distances in the length of the frame projects a series of arms or brackets, which carry a light rod or bar Q, running the whole length of the frame. From this rod a light loop or fork R embraces the ends of the pivot of each roller or pulley O, keeping them all in line.

It will be seen on Figs. 1, 2, 3, and 4 that the lever S on the rocking shaft S′ is connected to the builder T by the link U and stud V. The motion of the lever S, and consequently the movements of the drag-weights P, will thus synchronize with the movement of the spindle-rail C and the laying of the yarn. The movement of the levers S, being coupled together, as shown, is dependent on the position of the stud V on the builder and the distance of the link U from the rocking shaft S′, which, with the shaft S^2, runs the whole length of the frame. Whatever the movement decided upon it does not vary, and the same applies to the shaft S^3, which is carried in the ends of the levers S at intervals in the length of the frame, preferably at every spring-piece, the shaft S^3 being continuous and coupled together in lengths and sliding in slots in the spring-pieces. The shaft S^3 has at the gearing end and at every spring-piece a lever S^4. The stud in the upper end of the lever S^4 at the gearing end passes through the slot in the pendent leg *w* of the slide W and into the slot in the geared quadrant X. The slide W will have no movement as long as the slot in the quadrant X is in a vertical position, in which it is placed at the commencement of the cop; but at each lift of the builder T the rod Y, with the lever and pawl Z, will move the ratchet-wheel Z′ and worm, thus moving the slot in the quadrant X gradually to the position shown in dotted lines, when the pawl is thrown off the ratchet-wheel by a catch-plate fixed in a suitable position on the quadrant. (Not shown on the drawings.) The position of the slot in the quadrant X will now correspond to the full diameter of the cop-bottom which has been formed, and the movement of the slides W will continue until the whole of the cop has been built. The rise and fall of the rod Q, which is carried on brackets Q′, (see Figs. 1 and 3,) placed at intervals in the length of the spindle-rail C, the said rod Q sliding freely on the brackets and rising and falling in the slot of the upper leg *w*′ of the slides W with the rise and fall of the spindle-rail, thus moving the drag-weight P along the levers N and varying the drag from bare spindle to full diameter of the cop, the movements or position of the weight corresponding to the part of the chase on which the yarn is being laid, whether rising or falling. The ratchet-wheel may be replaced and varied in number of teeth to correspond with the counts of yarn being spun and the number of layers required to form the cop-bottom. The slotted leg of the slide W may be made movable on the slides, so that the drag may be increased or diminished by making the movement of the weights farther from or nearer to the spindles, thus putting more or less twist in the yarn and altering the drag without the necessity of altering the whole of the weights.

The traveler or traveler-ring (see Nos. 5, 5^a, 5^b, and 5^c) is made in the form of a cir-

cular plate or flange *a* and fixed on the end of a short length of steel tubing *b*, the orifice or bore of which is large enough to admit the full cop passing easily through. From the edge of this plate or flange *a* and at right angles to the diameter to near the edge of the bore and opposite to each other two slits *a'* are cut, (see No. 5[b],) from either of which the yarn passes to the spindle, or, preferably, the upper face may carry two, or it may be three, loops or guides of wire *a*[2]. (See Nos. 5 and 5[a] and Fig. 7.) The steel tube *b* is of sufficient length to pass through the driving-wharve *c*, the body of such tube being perforated or slit in the direction of its length and to within a short distance of each end by a series of slits or cuts in such a way as to allow of the body being compressed in the manner of a spring. (See Nos. 5[a] and 5[c].) The driving-wharve *c* is made to admit of this tube or spring *b* being easily pressed into it and yet gripping it sufficiently so as to be carried around by it. The outer circumference of the wharve *c* is formed into a groove for the driving-band, leaving at each side of the groove a square edge, and projecting beyond these square faces a slight beveled rim is formed. (See Figs. 5 and 6.) This driving-wharve may be driven by the ordinary band, being placed in the center of four other carriers or guides *d*, the band passing from the carriers or guides of one wharve *c* to the next, and so on around a complete box of spindles or number of boxes, as shown by the thick line on Fig. 7. The said carriers or guides *d*, Fig. 5, have flat or square edges on each side of the band-groove and just in contact with the square edges of the driving-wharve *c* and sufficiently wide to come easily within the slight beveled rim aforesaid. These square edges on the carriers or guides *d* and the driving-wharve *c* must be in the same exact proportion to each other as the bottom of the relative band-grooves, so that we have a perfect rolling contact in one case and a driving-surface without slip in the other.

The bearing or stud *e*, on which the carriers or guides run, (see Fig. 5,) is made in the following manner: The stud is formed with a collar which stands on the ring plate or rail, being held in position by a nut on the bottom end. In this collar a recess *f* is formed, in which the lubricant is placed, the body of the stud being bored through and having a thread inside at the bottom, the top end being beveled. A pin *g*, having the head of the same diameter as the stud, (the under side of the head beveled to correspond,) fits in the bore of the stud *e*, the bottom of the pin being screwed or threaded and projecting beyond the bottom of the stud sufficient to carry a lock-nut. The carriers or guides *d* are made from flat sheet-steel and put together in halves in such a way as to leave a beveled groove inside the hole or bore corresponding to the groove formed by the end of the stud and the under side of the head of the center-pin and also perfectly true and dispensing with any turning or machine work. We have now a frictionless and adjustable ball-bearing which is lubricated in the following manner: Through the top end of the stud *e*—that is, from the inside of the recess formed in the collar and immediately below the beveled end—two small holes are drilled side by side into the bore, and from the end of the stud inside the bore a shallow groove is cut into each hole. The center wharve *c* may be made in the same manner of thin sheet-steel in halves. The left-hand back stud and the right-hand front one may be fixed in a plate *h*, (see No. 2, Fig. 7,) having the hole in the plate or rail C as a center, the plate *h*, with the studs and carriers, being free to move, the plate always maintaining the studs and carriers at the same distance from the center, the studs being drawn together by spiral springs *i*, attached to each alternate set. The other two studs are placed in radial slots, and can thus be readily adjusted so as to maintain the center wharve *c* in a defined central position perfectly free to revolve without friction and maintained in a horizontal position by the small beveled edge overlapping the four carriers.

For stopping the traveler or ring *a* to piece the broken end or other required purpose I pivot at the back of the center hole in the ring plate or rail C (and in the space between the bottom of the driving-wharve *c* and the inside of the rail C) a pair of clips or levers *k*, the ends or handles of which project through a slot in the front of the plate or rail C. A catch *l*, Figs. 5 and 6 and No. 1, Fig. 7, may be fixed on the front of the rail, which being pressed forward by a spring will retain the clips in position and with the traveler stationary and free from friction standing in the center of the driving-wharve and leaving both hands of the tenter at liberty for the quicker picking up of the broken ends or other purposes.

I claim as my invention—

1. In a ring-spinning or doubling frame, the combination with a spindle with a vertical supporting pillar or bolster, a lubricating-cup in the upper end of the pillar and a ball-bearing over the cup, the balls bearing directly against the spindle, substantially as described.

2. In a ring-spinning or doubling frame, the combination of a spindle with a supporting pillar or bolster, three bell-crank levers pivoted to the pillar and having padded ends to bear against the spindle, a ring upon which the horizontal arms of the said levers bear, and a weighted horizontal lever supporting said ring, substantially as described.

3. In a ring-spinning or doubling frame, the combination of a spindle, a supporting pillar or bolster, bell-crank levers having padded ends to bear on the spindle, a supporting ring and lever for the bell-crank levers and a movable weight on said support-

ing-lever, with the builder and means connecting the builder with the weight whereby the position of the latter on its lever is automatically varied by the action of the builder, as and for the purpose set forth.

4. In a ring-spinning or doubling frame, the combination of a spindle, a supporting pillar or bolster, and bell-crank brake-levers acting against the spindle, a supporting ring and lever for such bell-crank levers, a movable weight upon such supporting-lever, and means for connecting such weight with the "builder," whereby the amount of friction against the spindle is kept in exact correspondence with the particular part of the chase of the cop upon which the yarn is, at the time, being wound, substantially as described.

5. A traveler-ring provided with a vertical split spring-tube in combination with a circular wharve into which the split spring-tube is fitted, substantially as described.

6. In a ring-spinning or doubling frame wherein the spindle is free and the traveler-ring is driven, the combination with the said traveler-ring of a grooved wharve fitted thereto, with grooved carriers supporting the ring on all sides, a driving-band passing around the grooved carriers and wharve, and driving the ring at a uniform speed, and spring means to act on the carriers to keep the band taut, substantially as above described.

7. In a ring-spinning or doubling frame wherein the spindle is free and the traveler-ring is driven, the combination with the said traveler-ring of a grooved wharve having square driving edges in contact and of grooved carriers supporting the wharve by its rim and driving the same, the proportions between the driving edges in contact and the grooves in which the driving-band runs being the same, as and for the purpose described.

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

GEORGE HENRY MILWARD.

Witnesses:
GEORGE DAVIES,
JNO. HUGHES.