No. 731,272. PATENTED JUNE 16, 1903.

E. E. BRADLEY.

COMBINED SPINNING AND TWISTING MACHINE.

APPLICATION FILED MAY 13, 1902.

NO MODEL. 5 SHEETS—SHEET 1.

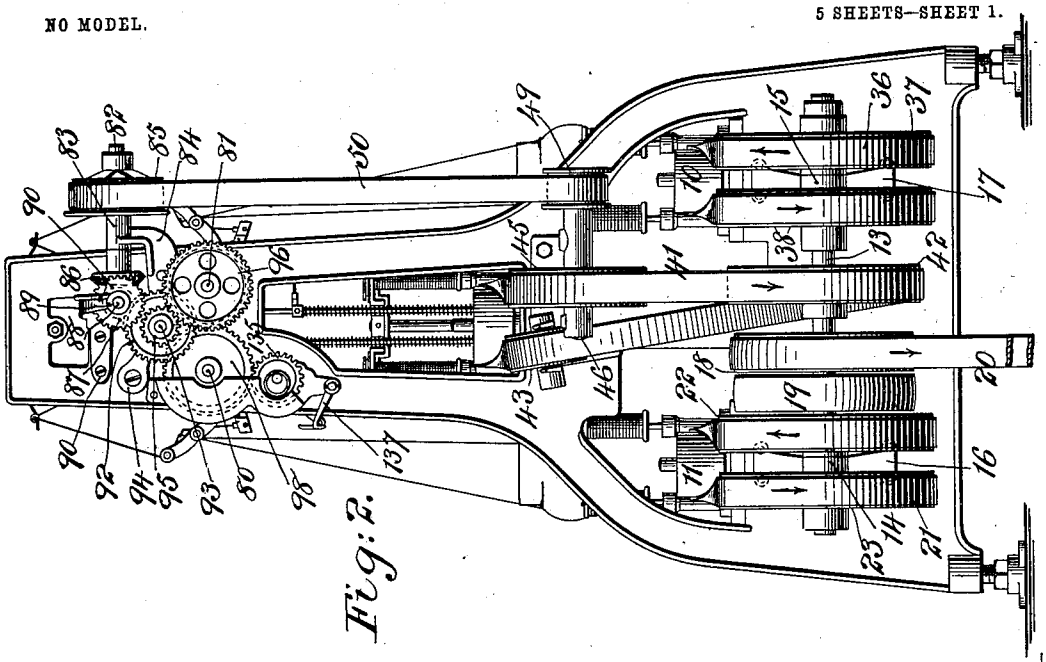


Fig: 2.

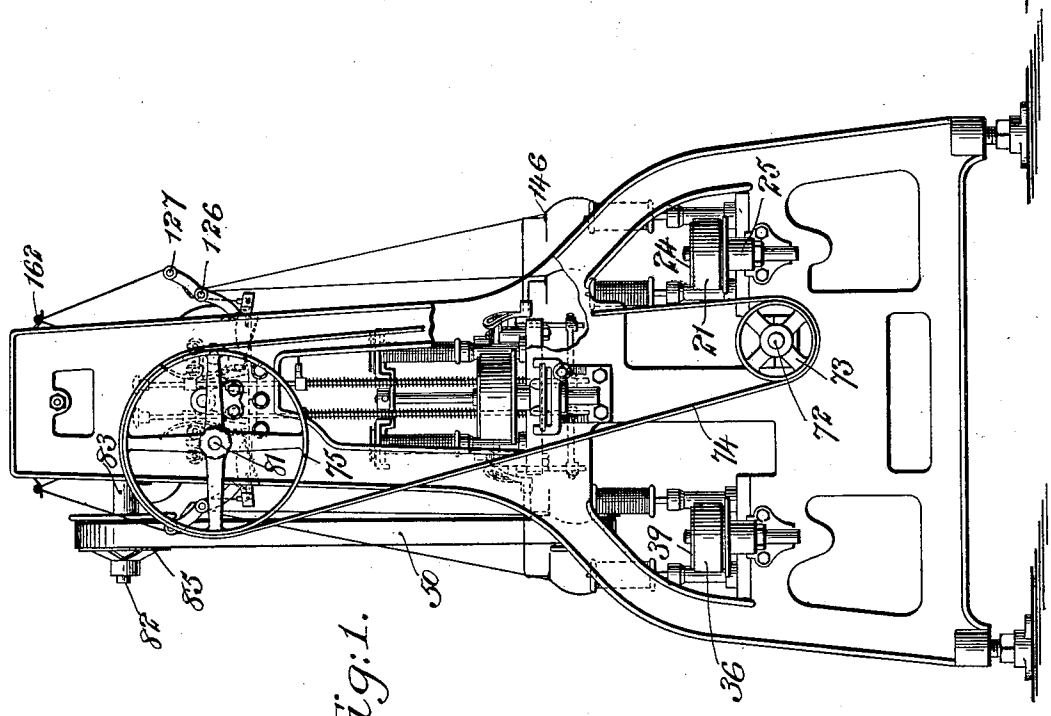


Fig: 1.

Witnesses:
Henry Thieme
George Barry Jr.

Inventor:
Edward E. Bradley
by attorneys
Bonnell & Howard

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

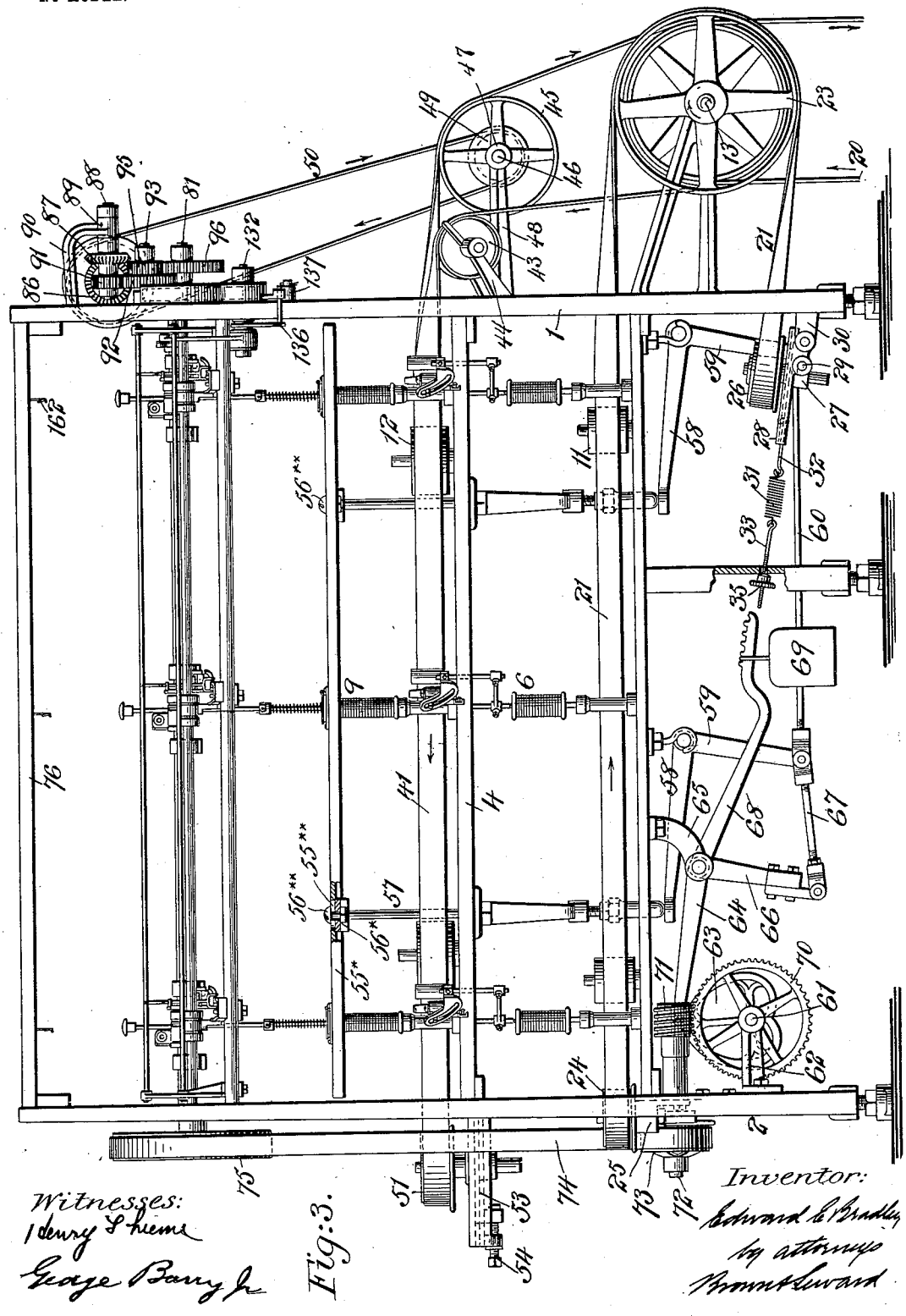
No. 731,272. PATENTED JUNE 16, 1903.

E. E. BRADLEY.

COMBINED SPINNING AND TWISTING MACHINE.

APPLICATION FILED MAY 13, 1902.

NO MODEL. 5 SHEETS—SHEET 2.



Witnesses:
Henry L. Thieme
George Barry Jr.

Fig. 3.

Inventor:
Edward E. Bradley
by attorneys
Brown & Seward

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 731,272. PATENTED JUNE 16, 1903.

E. E. BRADLEY.

COMBINED SPINNING AND TWISTING MACHINE.

APPLICATION FILED MAY 13, 1902.

NO MODEL. 5 SHEETS—SHEET 3.

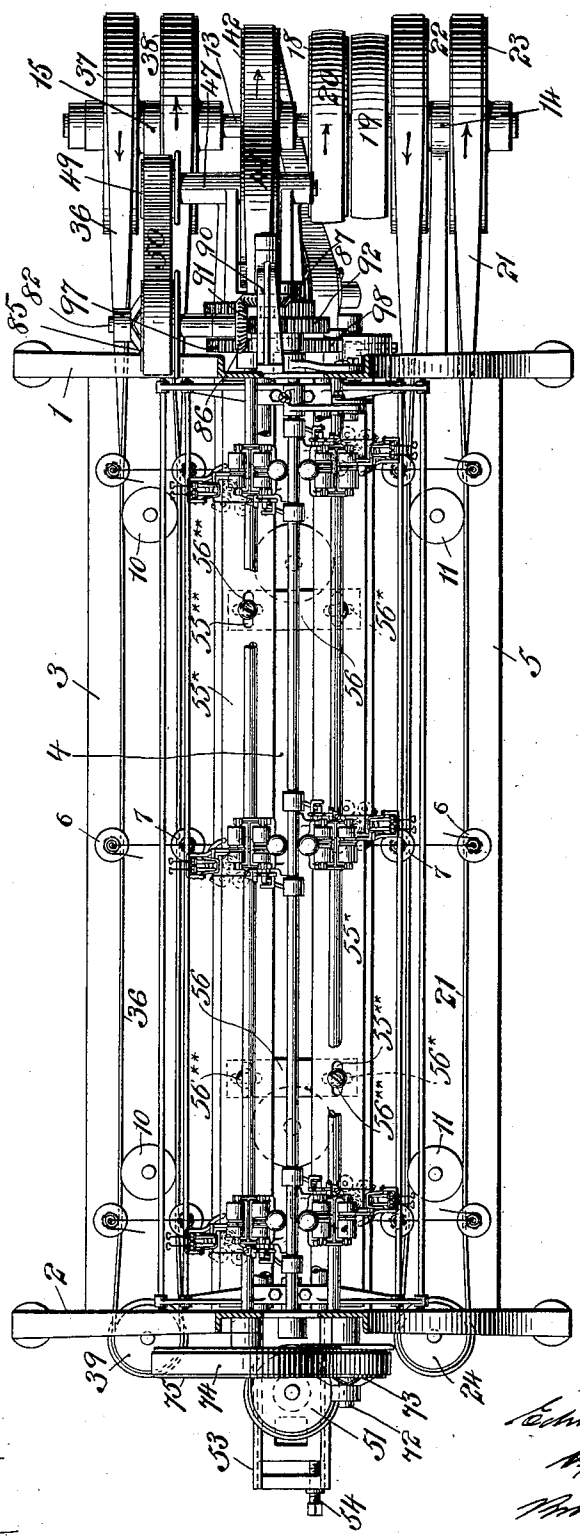


Fig. 4.

Witnesses:
Henry Theime
George Barry Jr.

Inventor:
Edward E. Bradley
by attorneys
Burnett Howard

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 731,272. PATENTED JUNE 16, 1903.

E. E. BRADLEY.

COMBINED SPINNING AND TWISTING MACHINE.

APPLICATION FILED MAY 13, 1902.

NO MODEL. 5 SHEETS—SHEET 4.

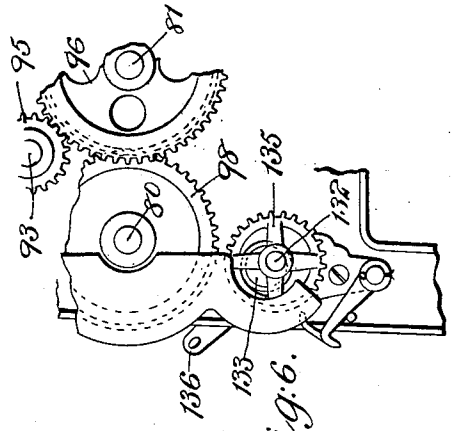


Fig. 6.

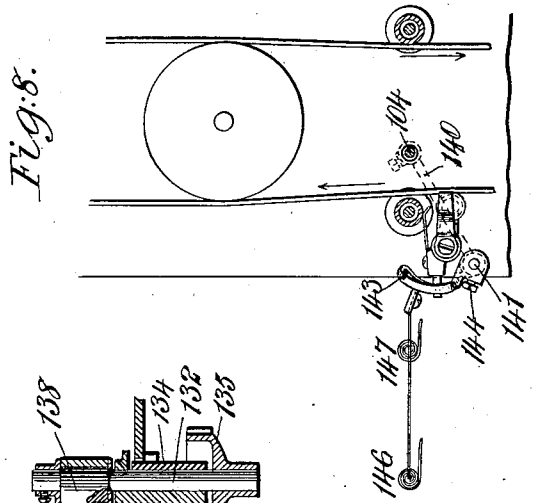


Fig. 8.

Fig. 7.

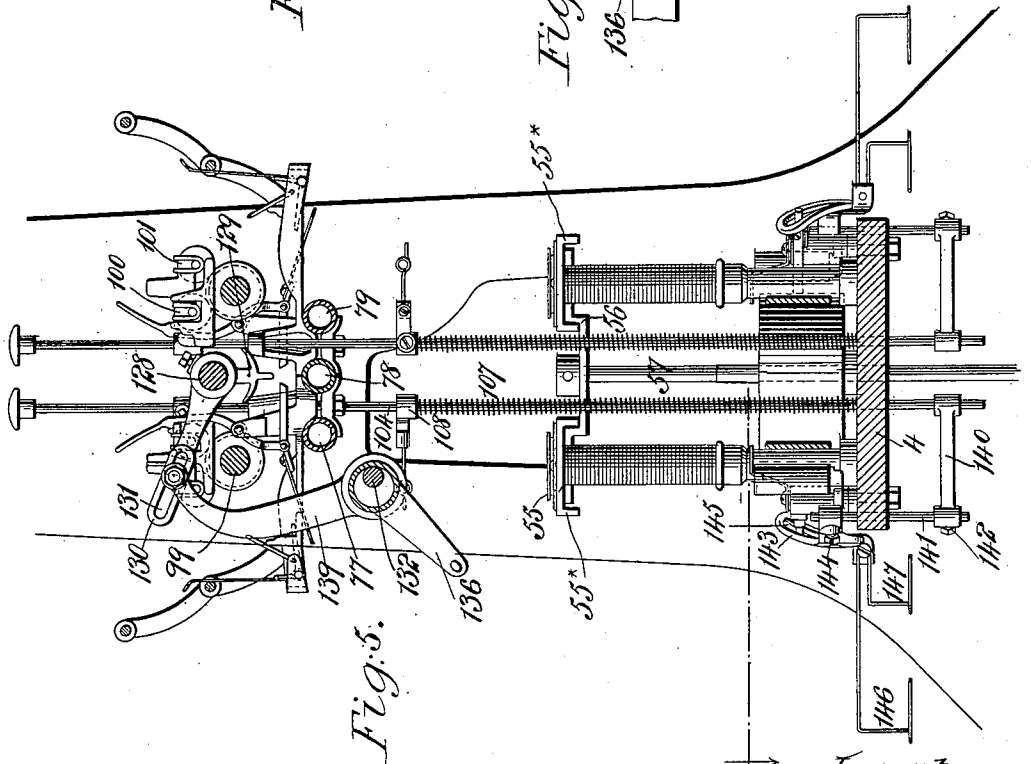


Fig. 5.

Witnesses:
Henry Sheine
George Barry Jr

Inventor:
Edward E. Bradley
by attorneys
Bonnett & Girard

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 731,272. PATENTED JUNE 16, 1903.

E. E. BRADLEY.

COMBINED SPINNING AND TWISTING MACHINE.

APPLICATION FILED MAY 13, 1902.

NO MODEL. 5 SHEETS—SHEET 5.

Fig. 10.

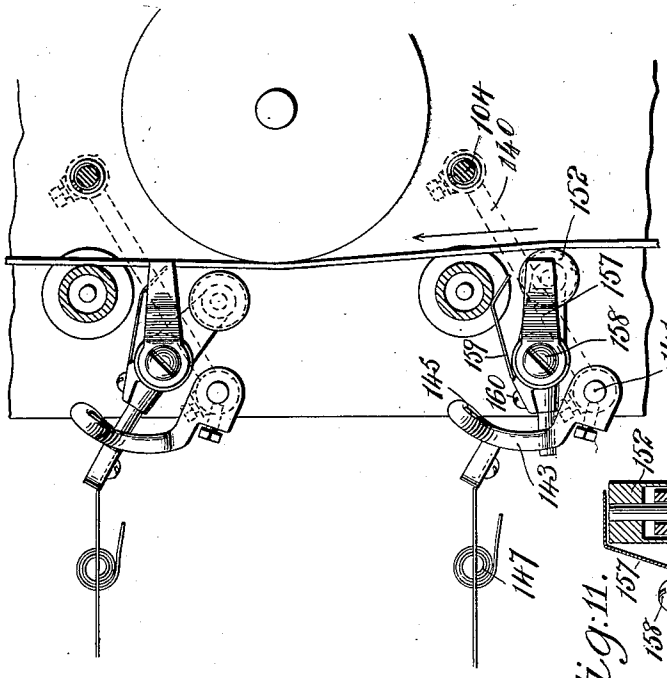
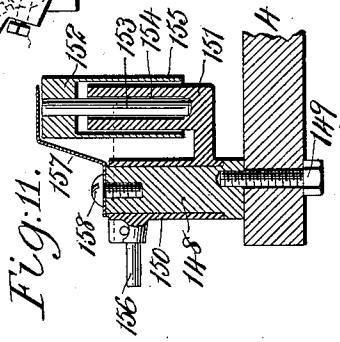


Fig. 11.



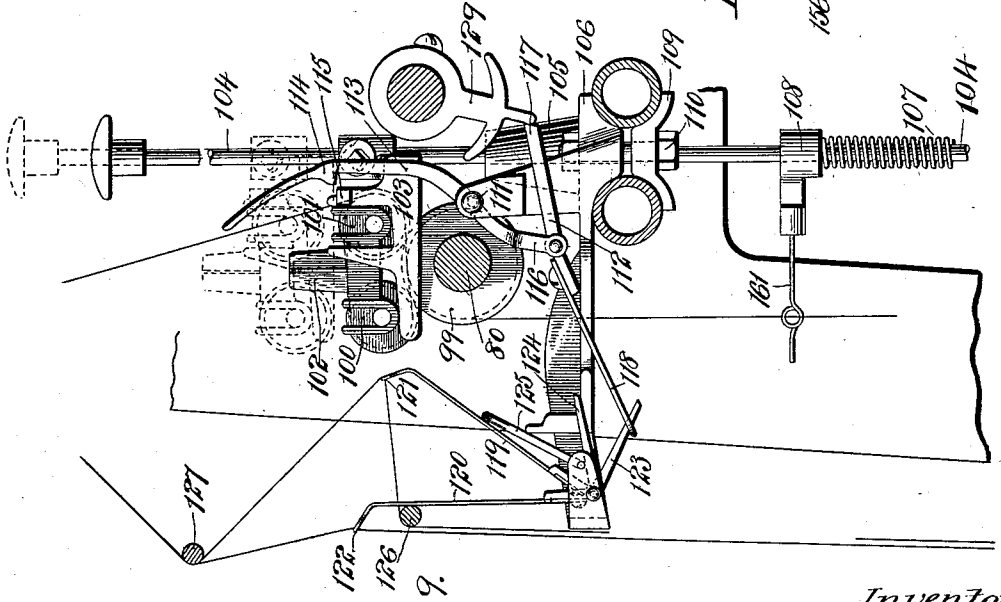


Fig. 9.

Witnesses:
Henry Steine
George Barry Jr.

Inventor:
Edward E. Bradley
by attorneys
Brown & Evans.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 731,272. Patented June 16, 1903.

UNITED STATES PATENT OFFICE.

EDWARD E. BRADLEY, OF STONINGTON, CONNECTICUT, ASSIGNOR TO THE ATWOOD-MORRISON COMPANY, OF STONINGTON, CONNECTICUT, A CORPORATION OF NEW JERSEY.

COMBINED SPINNING AND TWISTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 731,272, dated June 16, 1903.

Application filed May 13, 1902. Serial No. 107,088. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. BRADLEY, a citizen of the United States, and a resident of Stonington, in the county of New London and State of Connecticut, have invented a new and useful Improvement in a Combined Spinning and Twisting Machine, of which the following is a specification.

The object of my invention is to provide certain improvements in the construction, form, and arrangement of the several parts of a combined spinning and twisting machine, whereby the operation of the machine is made more simple and effective and its spindle capacity is materially increased.

A further object is to provide certain improvements in the stop-motion for the twisting or take-up spindles in which the take-up-spindle-driving belt is automatically disengaged from a spindle and the rotation of the spindle stopped when a thread being wound thereon breaks.

A still further object is to provide means under the control of the operator for throwing the rocking tripping device into and out of operation at pleasure.

A practical embodiment of my invention is represented in the accompanying drawings, in which—

Figure 1 is a rear end view of the machine, a portion of the rear end frame being broken away. Fig. 2 is a front end view of the machine. Fig. 3 is a view of the machine in side elevation. Fig. 4 is a top plan view of the same, the top longitudinal spacing-bar being removed to more clearly illustrate the parts beneath the same. Fig. 5 is an enlarged vertical transverse section through the portion of the machine which includes the take-up spindles, the double feed-rolls, and their adjacent parts. Fig. 6 is an enlarged detail view showing the manner of throwing the tripping devices into and out of operation. Fig. 7 is a transverse sectional view of the same with the parts in their operative engagement. Fig. 8 is a detail view of the device for moving the twisting or take-up-spindle driving belt out of engagement with the spindle and the brake for positively stopping the rotation of the spindle. Fig. 9 is an enlarged detail view, in vertical transverse section, through the double feed-rolls, the tripping device, and their adjacent parts. Fig. 10 is a detail top plan view showing two adjacent take-up spindles in horizontal section, one of the spindles being shown in engagement with the driving-belt and the other spindle being shown out of engagement with the driving-belt; and Fig. 11 is a vertical section through the device for moving the driving-belt away from engagement with the take-up spindle.

The framework of the combined spinning and twisting machine which is illustrated herein comprises a front end upright 1 and a rear end upright 2, connected by three spindle-supporting rails 3 4 5, the side rails 3 and 5 being each adapted to support two rows of delivery or spinning spindles 6 and 7, spaced a short distance apart.

The intermediate rail 4 is located between the side rails 3 and 5 a distance above the same, which intermediate rail 4 is fitted to support two rows of twisting or take-up spindles 8 and 9, spaced apart along the same.

In the accompanying drawings I have represented, for illustrating the operation of the driving mechanism, three spindles in each of the rows above referred to. A plurality of idler-pulleys 10 are mounted on the side spindle-rail 3 in position to hold the belt, to be hereinafter described, against the spindles 6 and 7.

A plurality of idler-pulleys 11 are mounted on the side spindle-rail 5 in position to hold the belt, to be hereinafter described, against the spindles 6 and 7, carried by said rail. A plurality of idler-pulleys 12 are mounted on the take-up-spindle rail 4 for the similar purpose of holding the driving-belt therefor against the take-up spindles 8 and 9. A horizontal head-shaft 13 is mounted to rotate in suitable bearings 14 15 in the ends of brackets 16 17, bolted or otherwise secured to the front end upright or frame 1. This head-shaft 13 is provided intermediate the brackets 16 and 17 with a fast pulley 18 and a loose pulley 19, which may be engaged at

pleasure by a driving-belt 20, leading to a source of power, (not shown herein,) which drive-belt is constantly driven in the direction indicated by the arrow thereon.

The belt for driving the two rows of spindles 6 and 7 carried by the side rail 5 is denoted by 21. This belt passes between the two rows of spindles and is held against the same by the drums or pulleys 11, hereinbefore referred to. At the front end of the machine this belt passes around two pulleys 22 23, located on the head-shaft 13 upon opposite sides of the bearing 14, the pulley 23 being fixed to rotate with the shaft, while the pulley 22 is free to rotate in the opposite direction thereon.

At the rear end of the machine the drive-belt 21 passes around an idler-pulley 24, mounted in a bracket 25, secured to the rear end upright or frame 2. After the belt leaves the under sides of the fast and loose pulleys 23 22 on the head-shaft 13 it passes around an idler tightening-pulley 26, which is mounted in a bracket 27, fitted to slide in a rocking frame 28, hinged at 29 to a bracket 30, secured to the front end frame or upright 1.

The idler-pulley 26 is held under adjustable spring tension to keep the required tension on the belt 21 by means of a spring 31, connected at one end through a rod 32 to the sliding bracket 27, and at its other end provided with a screw-threaded rod 33, which passes through an intermediate upright or frame 34. This screw-threaded rod 33 is provided with an adjusting-nut 35, which bears against the rear face of the upright 34. By turning this adjusting-nut 35 the tension of the belt may be accurately adjusted. The two rows of spindles 6 and 7 carried by the side rail 3 are similarly driven to those carried by the side rail 5 by means of a driving-belt 36, which passes between the two rows of spindles and is held in driving contact therewith by the intermediate pulleys or drums 10.

At the front of the machine the driving-belt 36 passes around two pulleys 37 38, located on the head-shaft 13 upon opposite sides of the bearing 15, the pulley 38 being fixed to rotate with the said shaft, while the pulley 37 is loose thereon, so as to permit it to be rotated by the belt in the reverse direction to the shaft.

At the rear end of the machine the belt 36 passes around an idler-pulley 39, mounted in a stationary bracket 40, bolted or otherwise secured to the rear end frame or upright 2. After the belt 36 leaves the under sides of the pulleys 37 38 it passes around a tension device, (not shown herein,) which is constructed, arranged, and operated quite similar to the tension device hereinbefore described in connection with the driving-belt 21.

The two rows of twisting or take-up spindles 8 and 9 carried by the intermediate rail 4 are driven in the opposite direction to the spinning-spindles 6 and 7 by a belt 41, which passes between the two rows of spindles 8 and 9 and is held normally in engagement therewith by the intermediate idler-pulleys or drums 12.

At the front end of the machine the belt 41 passes around a driving-pulley 42, fixed to the head-shaft 13, intermediate the main driving-pulley 18 and the fast pulley 38. The belt 41 is led in the proper direction between the twisting or take-up spindles to drive the spindles in the reverse direction to the spinning-spindles in the following manner: As the belt 41 leads upwardly from the lower side of the driving-pulley 42 it passes around an idler guide-pulley 43, mounted at an angle to the horizontal shaft 13 in a bracket 44, bolted or otherwise secured to the front face of the end frame or upright 1. This pulley 43 is utilized for directing the belt 41 into engagement with the row 9 of take-up spindles. As the belt leaves the rows 8 of take-up spindles at the front end of the machine it passes partially around a large guide-pulley 45, fixed to rotate with a horizontal shaft 46, mounted in suitable bearings 47 in the forward end of a bracket 48, bolted or otherwise secured to the front face of the end upright or frame 1. The belt 41 then passes downwardly from the guide-pulley 45 into engagement with the pulley 42, fixed to the head-shaft. A pulley 49 is fixed to the shaft 46, to which the guide-pulley 45 is fixed, which pulley 49 is engaged with a belt 50, which is used for driving the stop-motion-controlling mechanism, to be hereinafter described.

At the rear end of the machine the driving-belt 41 passes around an idler-pulley 51, mounted in a block 52, fitted to slide longitudinally in a bracket 53, bolted or otherwise secured to the back face of the rear upright or frame 2. This block 52, and thereby the pulley 51, may be adjusted longitudinally for tightening and loosening the belt 41 by means of an adjusting-screw 54, which engages the said block 52 and bracket 53. It will thus be seen that the driving-belt 41 may be adjusted to the required tension at the back of the machine.

If it be desired for certain classes of work that all of the spindles be driven in the same direction, it may be done—as, for instance, by reversing the positions of the fast and loose pulleys 23 22 and the fast and loose pulleys 38 37.

The driving mechanism, constructed and arranged as hereinabove set forth, is extremely simple and one in which the belt can be readily and accurately adjusted to perform to a nicety the work required. Furthermore, the structure is materially simplified by utilizing the horizontal head-shaft with the fast and loose pulleys mounted thereon, as hereinabove described.

The several rows of delivery or spinning spindles may be mounted in suitable stationary or rocking bearings supported by the side

rails 3 and 5. The two rows of take-up spindles are mounted in stationary bearings carried by the intermediate rail 4.

A thread-guide ring 55 surrounds each one of the vertically-disposed take-up spindles 8 and 9, which thread-guide rings are carried by two guide-ring rails 55*, located above the spindle-rail 4. These guide-ring rails are longitudinally adjustable on a common support formed by branches 56, the outer ends of which are connected to the guide-ring rails by a bolt-and-slot connection. The guide-ring rails have elongated slots 55**, the branches 56 have elongated slots 56* at right angles to the slots 55**, and a bolt 56** passes through each pair of intersecting slots for clamping the rails to the branches in the desired longitudinal and lateral adjustment relative to the take-up spindles. The thread-guide-ring rails 55* are reciprocated vertically for guiding the threads onto the bobbins carried by the take-up or twisting spindles by the following mechanism: A plurality of rods 57 depend from the supporting branches 56, the lower ends of the said rods 57 being engaged with the upper arms 58 of rocking levers, the lower arms 59 of which are connected by a connecting-rod 60, so that the two levers are caused to rock in unison.

A cam-shaft 61 is mounted in a suitable bracket 62, bolted or otherwise secured to the rear upright 2 of the machine. A cam 63, carried by the shaft 61, engages one arm 64 of a rocking lever mounted in a bracket 65, secured to the under sides of the side rails 3 and 5. Another arm 66 of the last-named lever is connected through a rod 67 to the lower arm 59 of the adjacent rocking lever, which engages one of the depending rods 57. A third arm 68 of the cam-lever is provided with a counterbalance-weight 69, which serves to substantially counterbalance the weight of the guide-ring rails 55*, so as to permit an easier reciprocation of the said rails 55*.

A gear 70 is fixed to the cam-shaft 61, which gear meshes with a worm 71, carried by a worm-shaft 72, mounted in suitable bearings in the rear upright 2 of the machine. This worm-shaft 72 has fixed thereto a driving-pulley 73, which is driven by means of a belt 74, leading from a pulley 75, fixed to one of the shafts which carry the friction driving-drums, to be hereinafter described.

The tops of the end uprights 1 and 2 are spaced apart by a longitudinal bar 76. The end uprights 1 and 2 are also spaced apart between the take-up-spindle rail 4 and the top bar 76 by means of three tubular bars 77 78 79, which also serve as supports for portions of the tripping mechanism.

The means for operating the tripping mechanism for simultaneously throwing the double feed-rolls and the take-up spindles out of operation is constructed and arranged as follows: Two longitudinal shafts 80 81 are mounted in suitable bearings in the end uprights 1 and 2 above and adjacent to the three tubular bars or braces 77 78 79. A horizontal cross-shaft 82 is mounted in bearings 83 of a bracket 1 near the top of the machine. This shaft 82 has fixed thereto a pulley 85, which is driven through the belt 50, leading from the pulley 49, fixed to the shaft 46, hereinbefore described.

By causing the belt which drives the take-up spindles to engage the pulley 45 of the shaft 46, which drives the feed-roll-driving shafts, I am enabled to accurately adjust the speed of the spindles and feed-rolls with respect to each other, as there will be no slip between the belt and the pulley. This could not be done if the feed-roll-driving mechanism were driven directly from a drive-pulley on the head-shaft, as there would always be more or less slipping of the belt and consequent uneven operation of the take-up spindles and feed-rolls. The shaft 82 is further provided with a bevel-gear 86, which intermeshes with a bevel-gear 87, fixed to a stud-axle 88, mounted to rotate in bearings 89, carried by a bracket 90, secured to the front upright 1 of the machine. A spur-gear 91 is fixed to the stud-axle 88, which gear intermeshes with a gear 92, fixed to a stud-axle 93, carried by a bracket 94, secured to the front upright 1. A smaller gear 95 is also fixed to the stud-axle 93, which gear meshes with a larger gear 96, fixed to the longitudinally-extended shaft 81, hereinabove described. The shaft 81 is further provided with a spur-gear 97, fixed thereto, which intermeshes with a spur-gear 98, fixed to the longitudinally-extended shaft 80.

The relation of the several gears is such that the two shafts 80 and 81 may be driven at the required speed relative to the speed of the twisting or take-up spindles.

The rotary shafts 80 81 are provided at intervals corresponding to the number of winding-spindles with grooved rolls 99, upon each one of which normally rest, so as to be driven thereby, the two grooved feed-rolls 100 101. These feed-rolls are loosely hung in bearings in a removable bracket 102, supported by a bracket 103, fixed to a spring-actuated vertically-movable releasing-rod 104. This rod 104 is guided near its upper end in a lug 105, projecting upwardly from a bracket 106, secured to two of the tubular braces 77 78 79, the lower end of the rod being guided by passing through the take-up-spindle rail 4.

A spring 107 is interposed between the intermediate bar 4 and a collar 108, fixed to the bar 104, tending at all times to lift the bar to the limit of its upward movement, the tension of the spring being adjusted by the position of the collar 108 with respect to the rail 4.

The brackets 106, hereinbefore referred to, are clamped to the tubular braces 77, 78, and 79, the brackets along one side of the machine being clamped to the tubular braces 77 78 and the brackets along the other side of the machine being clamped to the tubular braces 78 79. Each bracket 106 is clamped in posi-

tion by means of an under plate 109 and a screw-bolt 110, which is used for driving the bracket 106 and under plate 109 snugly into engagement with two of the tubular braces.

A two-armed hook-lever is hinged at 111 to a lug 112, uprising from the bracket 106, the upper arm 113 of the said lever being provided with a hook 114, which is fitted to normally engage a projection 115 on the bracket 103, which is secured to the vertical rod 104. The lower arm 116 of the hook-lever has hinged thereto a two-armed lever, the inner arm of which is heavier than the outer arm 118, so that when the parts are in their normal position the end of the arm 117 will be at the limit of its downward movement, out of the path of the oscillating tripper, to be hereinafter described.

The bracket 106 has hinged thereto two thread-controlled levers, the upper arms 119 120 of which are provided with eyes 121 122, through which the two threads from the delivery or spinning spindles pass. The lower arms 123 124 of the said levers are weighted, so as to normally swing the levers inwardly when the levers are released by the slackening or breaking of the threads. These lower arms 123 124 of the levers rest upon the forwardly-extended arm 118 of the trip-lever. A loop-stop 125 is carried by the bracket 106 in position to limit the inward movements of the thread-controlled levers. The upper arms 119 120 are normally held against a rod 126, extending from the front to the rear upright of the machine, by the tension of the threads leading from the bobbins on the spinning-spindles, which threads pass around a second longitudinally-extended bar 127, located above the bar 126, and a little farther out than the bar 126.

A rock-shaft 128 is mounted in suitable bearings in the end uprights 1 and 2 and extends along the middle of the machine adjacent to the tension device hereinbefore described. This rock-bar is provided with a plurality of trippers 129, fixed thereon, one tripper being utilized for operating the two adjacent take-up spindle and feed-roll controlling mechanisms upon opposite sides of the machine. These trippers 129 are so arranged that they will engage the inner arms 117 of the trip-levers when the arms have been raised by the depression of the outer arms 118 by the release of one or both of the thread-controlled levers.

The rocking movement of the shaft 128 is sufficient to release the hook-lever from its engagement with the bracket 103, fixed to the vertically-reciprocating rod 104, when the tripping-lever is in the path of the tripper carried by the said shaft. This shaft 128 is operated as follows: An arm 130 is fixed to the shaft near the front upright, which arm is provided with a slot 131.

A shaft 132 is mounted to rotate in eccentric bearings 133, which in turn are mounted in a bearing 134, secured to the end upright 1 of the frame. This shaft 132 has fixed thereto a spur-gear 135. An arm 136 projects from the eccentric bearing-sleeve 133. As this arm is swung it will move the shaft 132 bodily up or down to bring its gear 135 into or out of engagement with the gear 98, fixed to the rotary shaft 80. A latch 137 is hinged to engage the arm 136 for holding the shaft 132 in its geared connection with the shaft 80. The shaft 132 has an eccentric 138, which eccentric is connected to the arm 130 by a link 139, the lower end of which embraces the eccentric, and the upper end of which is adjustably secured to the arm 130 along the elongated slot 131.

Beneath the rail 4, which supports the take-up spindles, I secure an outwardly-extended arm 140 to the lower end of the vertically-reciprocating bar 104. The outer end of the arm 140 has an uprising bar 141, adjustably secured thereto by means of a set-screw 142. This bar 141 is fitted to slide vertically through the rail 4. A cam-plate 143 is adjustably secured to the upper end of the bar 141 by means of a clamp-screw 144. This plate 143 has a diagonally-arranged cam-groove 145 therein. Spiral thread-tension devices 146 147 are secured to the cam-plate 143 in position to engage the strands of thread as they leave the bobbins on the spinning-spindles. Each pair of tension devices comprises a wire having a coil formed therein near each of its ends, the number of winds in the coil being more or less as the tension on the thread is required to be greater or less.

The device controlled by the cam-plate for disengaging the driving-belt from the take-up spindle is constructed and arranged as follows: A vertical stud-axle 148 is adjustably clamped to the spindle-rail 4 by a screw-bolt 149, which eccentrically engages the said stud-axle, so that when the bolt 149 is loosened the said axle may be swung around into different positions relative to its adjacent spindle and the belt. A rocking roller-supporting bracket 150 is mounted on the stud-axle 148, which bracket is provided with an L-shaped arm 151, the vertical branch of which forms a bearing for an idler-roller 152. In the present instance this idler-roller 152 is provided with a centrally-arranged pin 153, which is supported in a socket 154 in the vertical branch of the arm 151. The roller 152 is further provided with a depending flange 155, surrounding the vertical branch of the L-shaped arm 151. This roller 152 is positively swung into engagement with the belt for forcing it away from the take-up spindle by means of a pin 156, secured to the bracket 150, which pin is located in the cam-slot 145 in the plate 143. A roller-retaining plate or guard 157 is secured to the top of the stud-axle 148 by means of a screw 158, which guard is so located that the roller will be swung beneath the same when engaged with the belt for preventing the roller from escaping from its supporting-bracket.

To stop the rotation of the take-up spindle

immediately after the belt has been released from its engagement therewith, I provide a spring-actuated brake-arm 159, which is secured to the roller-supporting bracket 150 by means of a screw 160, so that the free end of the brake-arm 159 will be swung into and out of engagement with the said spindle as the bracket 150 is swung into and out of engagement with the belt.

The collar 108, which is secured to the vertically-reciprocating rod 104 for forming a stop for one end of the extension-spring 107, also has secured thereto a thread-guide 161, through the eye of which the double thread is led from the feed-rolls to the ring guide of the take-up spindles. The two strands of the thread are led from the bobbins on the spinning-spindles separately through the thread-tension devices 146 147. From thence they are led upwardly through the eyes 121 122 of the thread-controlled levers. From thence they are led outside of the bar 127 through eyes 162 in the top bar 76 of the machine. The threads are then led together down to the feed-rollers 100 101. The thread is caused to pass several times around these feed-rollers and from thence partially around the friction driving-roller 99. The thread is led from this friction driving-roller downwardly through the thread-guide 161 to the ring guide 55, carried by the supporting-bar 56, which ring guide serves to lay the thread accurately along the bobbins of the take-up spindles as the bar is reciprocated.

The operation of the device is as follows: After the machine has been threaded and started the feed-roll-tripping means is thrown into operation by swinging the arm 136 downwardly into engagement with the latch 137. As long as the strands of the threads do not break the trippers 129 will rock back and forth above the arms 117, controlled by the thread-controlled levers. Should one of the strands of the thread brake, it would release its lever, as shown in Fig. 9, thus throwing the weighted arm 117 up into the path of the tripper, so that when the tripper swings it will release the hook-lever 113 and permit the bar 104 to slide upwardly and carry the double feed-rolls 100 101 out of engagement with their driving-roller 99. This upward movement of the bar 104 will also cause the cam-plate carried thereby to positively rock the roller 152, which it controls, into engagement with the driving-belt for forcing the belt away from the take-up spindle. As the roller forces the belt away from the spindle the brake-arm 159 will be brought into engagement with the spindle for positively stopping it. The belt will tend to hold the roller in engagement therewith until the roller is positively swung away therefrom, because the roller is moved in the same direction as the belt is driving, as the roller is brought into engagement with the belt. Also as the roller is swung into engagement with the belt it will be swung under the retaining plate or guard 157 to prevent the roller from being thrown out of its bearing. If it is desired to stop the winding of the thread upon any one of the take-up bobbins by hand, it may be done by swinging the upper arm 113 of the hook-lever rearwardly sufficiently to release the bracket 103, secured to the vertically-reciprocating rod 104, thus permitting the rod to slide upwardly to simultaneously lift the double feed-rolls 100 101 away from their driving mechanism and force the driving-belt away from the take-up spindle. When the two strands of the thread have been mended and drawn through the eyes 121 and 122 of the thread-controlled levers, the said levers will permit the arm 118 of the rocking lever carried by the hook-lever to rise as the arm 117 drops down by gravity out of the path of the tripper 129. The bar 104 is then depressed until the hook 114 on the hook-lever engages the projection 115 on the feed-roll-supporting bracket. This operation will again start the winding of the thread upon its bobbin.

It will be seen that the parts constructed and arranged as above set forth may be very quickly and readily interchanged. It will also be seen that the operation of the parts is extremely simple and effective.

What I claim is—

1. A suitable frame, feed-roll devices along the opposite sides of the frame, driving means therefor, a common oscillating tripper, and levers under the control of the tension of the threads for permitting the tripper to release the feed-roll devices when the thread breaks.

2. A feed-roll device comprising a friction driving-roll, feed-rolls normally driven thereby and means for automatically lifting the feed-rolls away from the friction driving-roll when the thread breaks comprising a spring-actuated rod, the roll-supporting bracket fixed thereto, a hook-lever and an oscillating tripper arranged to release the hook-lever from the bracket.

3. A feed-roll device comprising a friction driving-roll, feed-rolls normally driven thereby, a spring-actuated rod, a roll-supporting bracket carried thereby, a hook-lever, an oscillating tripper and thread-tension-controlled levers arranged to cause the oscillating tripper to release the hook-lever from the roll-supporting bracket when the thread breaks.

4. A feed-roll device comprising a friction driving-roll, feed-rolls normally driven thereby, a spring-actuated rod, a feed-roll-lifting bracket carried thereby, an oscillating tripper, a hook-lever, a two-armed lever carried thereby and thread-tension levers arranged to bring the said two-armed lever into the path of the oscillating tripper for causing it to release the hook-lever from engagement with the feed-roll-lifting bracket.

5. A feed-roll device comprising a friction driving-roll, feed-rolls normally resting thereon, a spring-actuated rod, a feed-roll-lifting bracket carried thereby and a bracket in which the feed-rolls are mounted, the said

bracket being removable from the roll-lifting bracket.

6. A suitable framework, having end uprights and braces connecting the same, a feed-roll-controlling device comprising a bracket secured to the said braces, a hook-lever hinged thereto, a two-armed lever hinged to the hook-lever, thread-tension levers hinged to the bracket in position to swing the inner arm of the two-armed lever upwardly, an oscillating tripper arranged to engage the inner arm of the two-armed lever when swung upwardly, a friction driving-roll, feed-rolls normally driven thereby, a spring-actuated rod and a feed-roll-lifting bracket secured thereto, normally held depressed by the said hook-lever.

7. Spinning-spindles, means for driving them, take-up spindles, means for driving them, an interposed feed-roll device, means for operating it, a tripper-carrying rock-shaft and independent means for starting and stopping the tripper-carrying rock-shaft.

8. A feed-roll device comprising a rotary shaft, a friction driving-roll thereon, feed-rolls normally driven thereby, a tripper-carrying rock-shaft and means for connecting and disconnecting the rock-shaft and friction-roll-driving shaft.

9. A feed-roll device comprising a rotary shaft, a friction driving-roll thereon, feed-rolls normally driven thereby, a tripper-carrying rock-shaft and means for connecting and disconnecting the rock-shaft and friction-roll-driving shaft comprising a stud-shaft, an eccentric bearing therefor, a gear carried thereby, a gear carried by the friction-roller-driving shaft, an eccentric connection between the stud-shaft and the rock-shaft and means for connecting and disconnecting the said gears.

10. A feed-roll device and its operating means having a friction-roll-driving shaft, a tripper-carrying rock-shaft and means for connecting and disconnecting the two shafts comprising a stud-shaft, a gear carried thereby, a gear carried by the friction-roll-driving shaft, a connection between the tripper-carrying rock-shaft and the stud-shaft and an eccentric bearing for the stud-shaft whereby its gear may be moved into and out of engagement with the gear carried by the friction-roll-driving shaft.

11. A feed-roll device and its operating means having a friction-roll-driving shaft, a tripper-carrying rock-shaft and means for connecting and disconnecting the two shafts comprising a stud-shaft, a gear carried thereby, a gear carried by the friction-roll-driving shaft, a connection between the tripper-carrying rock-shaft and the stud-shaft, an eccentric bearing for the stud-shaft whereby its gear may be moved into and out of engagement with the gear carried by the friction-roll-driving shaft and means for removably holding the said gear connected.

12. A spindle, a driving-belt therefor, a roller-supporting bracket arranged to swing in a horizontal plane into and out of engagement with the belt, and means for positively swinging the bracket in both directions.

13. A spindle, a driving-belt therefor and means for forcing the belt away from the spindle comprising a roller-supporting bracket arranged to swing in a horizontal plane into and out of engagement with the belt and a cam-plate for positively swinging the bracket in both directions.

14. A spindle, a driving-belt therefor and means for automatically forcing the belt away from the spindle and positively stopping the spindle, comprising a roller-supporting bracket arranged to swing in a horizontal plane into and out of engagement with the belt and a brake-arm carried by the bracket arranged to engage the periphery of the spindle when the bracket is swung into engagement with the belt.

15. A spindle, a driving-belt therefor and means for automatically forcing the belt away from the spindle and positively stopping the spindle, comprising a roller-supporting bracket arranged to swing in a horizontal plane into and out of engagement with the belt and a spring-actuated brake-arm carried by the bracket arranged to engage the periphery of the spindle when the bracket is swung into engagement with the belt.

16. A spindle, a driving-belt therefor and means for automatically forcing the belt away from the spindle and positively stopping the spindle comprising a roller-supporting bracket arranged to swing into and out of engagement with the belt, a cam-plate for positively swinging the bracket and a brake-arm arranged to engage the spindle when the bracket is swung into engagement with the belt.

17. A spindle, a driving-belt therefor, means for automatically forcing the belt away from the spindle comprising a stud-axle, a roller-supporting bracket hinged thereon, and a cam-plate arranged to swing the bracket into and out of engagement with the belt.

18. A spindle, a driving-belt therefor and means for automatically forcing the belt away from the spindle comprising a stud-axle, means for adjusting the axle toward and away from the belt, a roller-supporting bracket hinged on the axle and a cam-plate arranged to swing the bracket into and out of engagement with the belt.

19. A spindle, a driving-belt therefor and means for automatically forcing the belt away from the spindle comprising a hinged bracket, a roller supported thereby, means for swinging the roller into and out of engagement with the belt, and a stationary guard arranged to prevent the removal of the roller when the roller is swung into engagement with the belt.

20. A spindle, a driving-belt therefor and means for automatically forcing the belt away from the spindle comprising a swinging roller-supporting bracket, a cam-plate arranged to swing the bracket into and out of engage-

ment with the belt and a spring-actuated rod connected to the cam-plate.

21. A plurality of rows of take-up spindles, means for driving them, guide-rings for the spindles, a common support and a plurality of guide-ring rails carried thereby and independently adjustable longitudinally along the support.

22. A plurality of rows of take-up spindles, means for driving them, guide-rings for the spindles, a plurality of guide-ring rails, a common support for the rails and means for adjusting the rails longitudinally and laterally on their support.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 21st day of April, 1902.

EDWARD E. BRADLEY.

Witnesses:
H. W. LANPHEAR,
FRED A. ALLEN.