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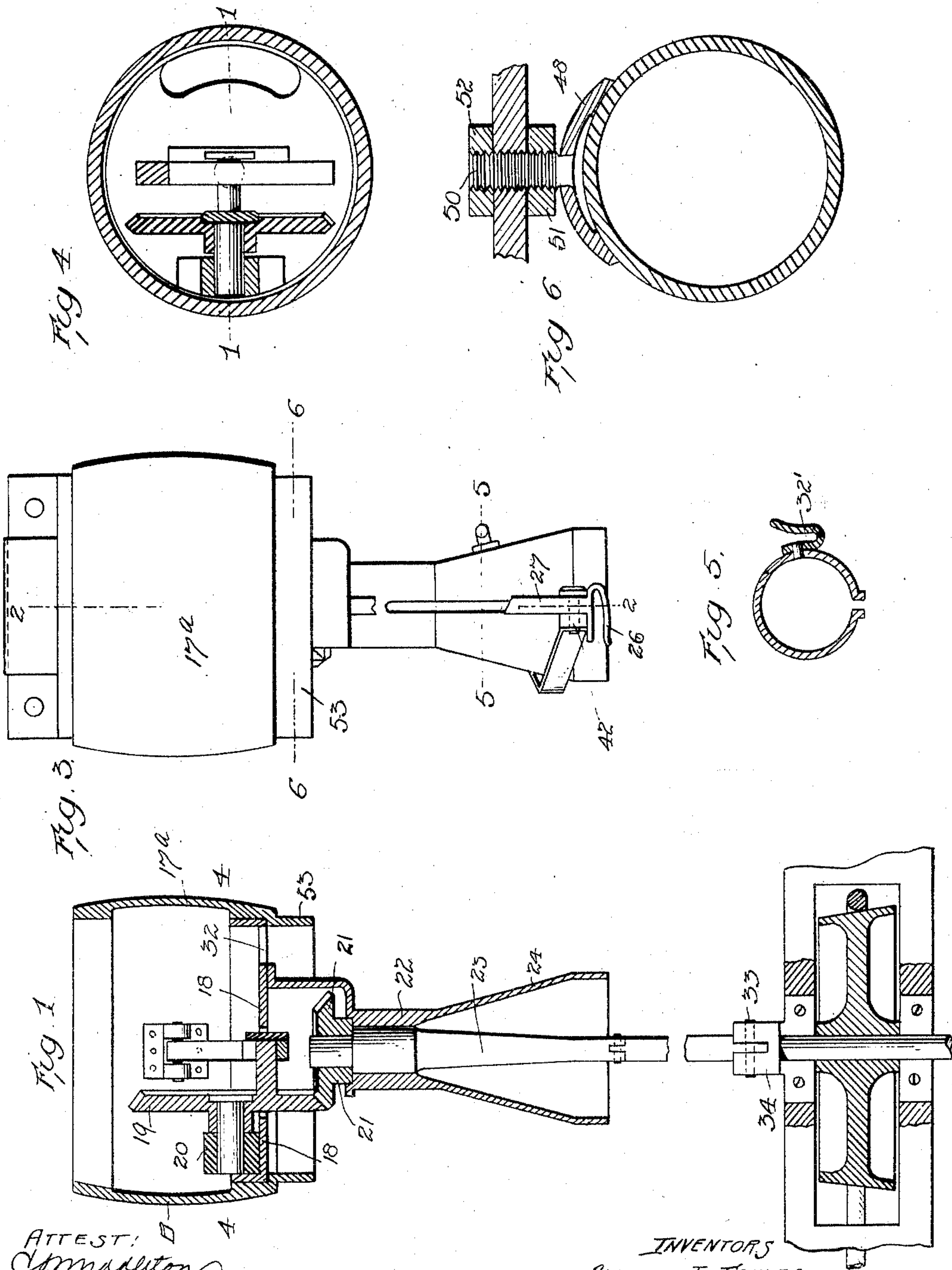
PATENTED NOV. 29, 1904.

A. J. & H. A. FOULDS.  
MACHINE FOR SPINNING AND WINDING YARN.

APPLICATION FILED FEB. 4, 1904.

NO MODEL.

3 SHEETS—SHEET 1.



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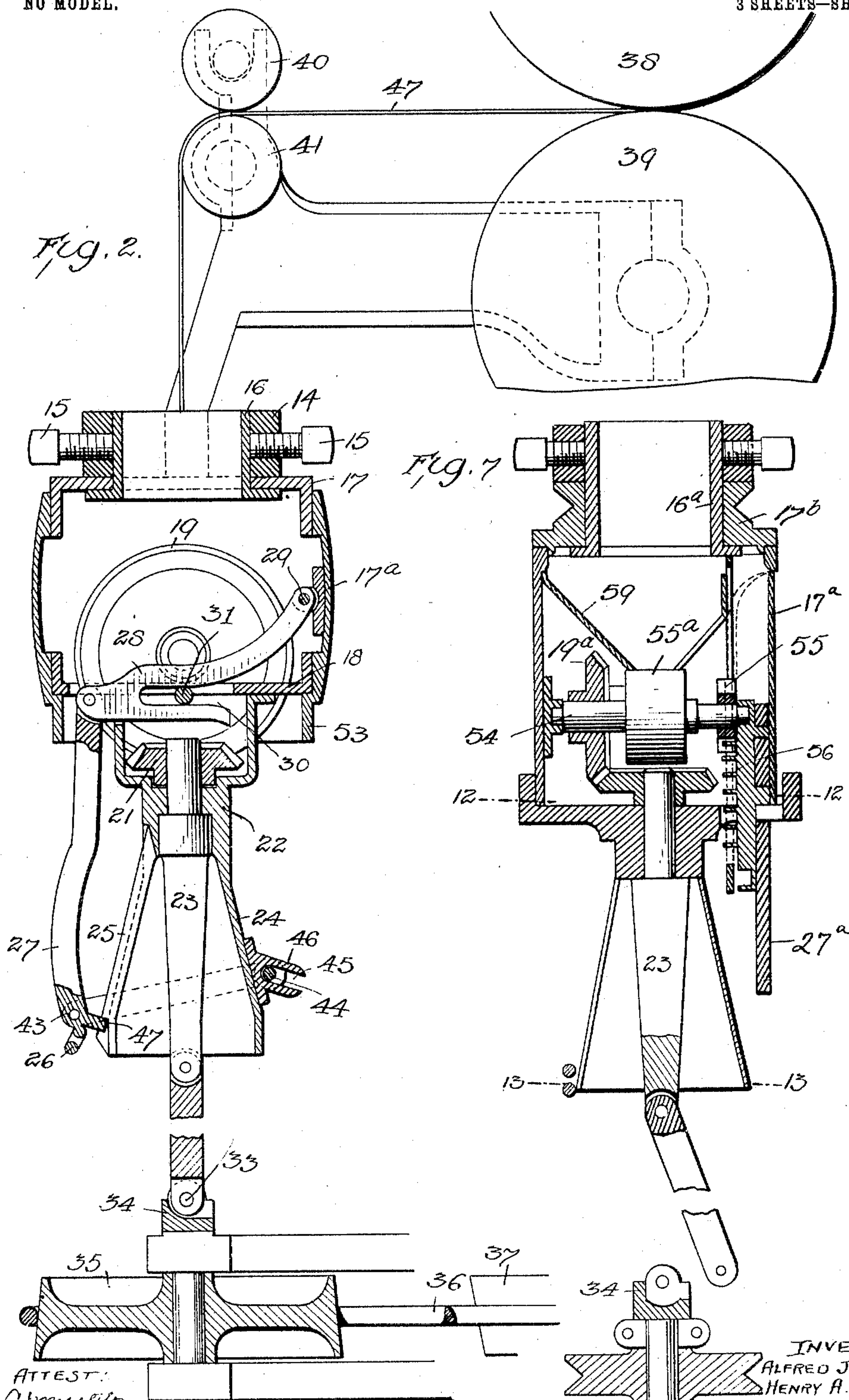
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3 SHEETS—SHEET 2.



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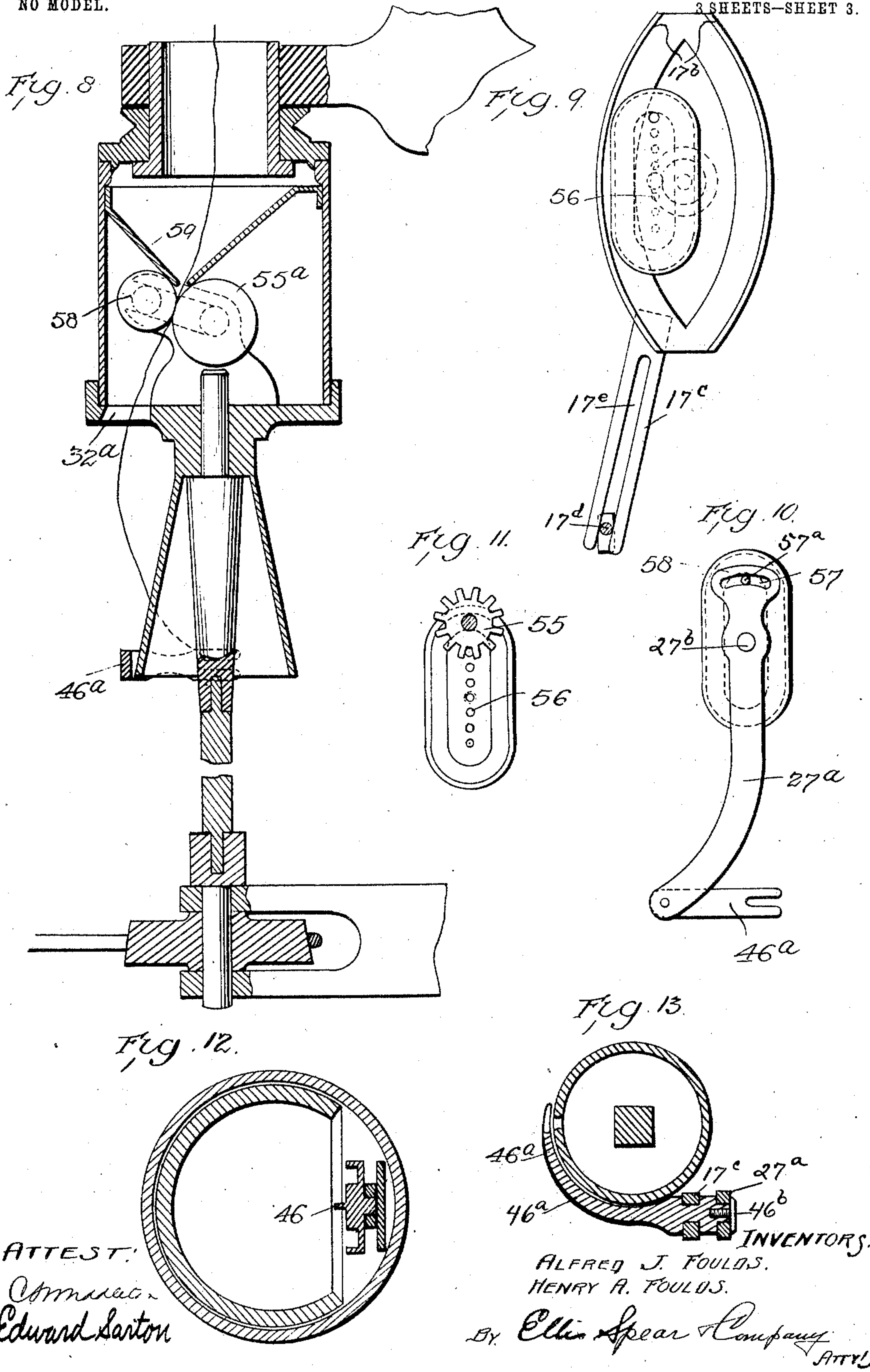
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3 SHEETS—SHEET 3.





# UNITED STATES PATENT OFFICE.

ALFRED J. FOULDS AND HENRY A. FOULDS, OF PHILADELPHIA,  
PENNSYLVANIA.

## MACHINE FOR SPINNING AND WINDING YARN.

SPECIFICATION forming part of Letters Patent No. 776,128, dated November 29, 1904.

Application filed February 4, 1904. Serial No. 192,006. (No model.)

*To all whom it may concern:*

Be it known that we, ALFRED J. FOULDS and HENRY A. FOULDS, citizens of the United States, residing at 164 Sumac street, Wissahickon, Philadelphia, Pennsylvania, have invented certain new and useful Improvements in Machines for Spinning and Winding Yarn, of which the following is a specification.

Our invention relates to a machine for spinning and winding yarn or thread.

The object of the invention is to provide an apparatus or machine by which we may spin yarn and wind it into finished cops ready for the shuttle at one operation, thereby eliminating the trouble and expense of rewinding. We have also aimed to provide a device of simple and durable construction, economical of production, and capable of high speed.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a vertical sectional view on line 1 1 of Fig. 4. Fig. 2 is a similar view on line 2 2 of Fig. 3. Fig. 3 is an elevation. Fig. 4 is a horizontal section on line 4 4 of Fig. 1. Fig. 5 is a section on line 5 5 of Fig. 3. Fig. 6 is a section on line 6 6 of Fig. 3. Fig. 7 is a central vertical sectional view of a modification. Fig. 8 is a similar view, but at right angles to Fig. 7. Figs. 9, 10, and 11 are detail views. Fig. 12 is a section on line 12 12 of Fig. 7. Fig. 13 is a section on line 13 13 of Fig. 7.

In connection with each form it will be understood that for convenience we have shown only the means for spinning a single thread and winding it upon the cop; but of course any number of these may be assembled in a single machine as may be found desirable.

Referring by reference characters to the drawings, the numeral 14 designates the end of the frame, having an opening in which is secured, by means of two set-screws 15, a sleeve 16, on which revolves the upper section or casing or what may be termed the "spinning-section." This portion consists of a casing or shell 17, having formed therewith or secured thereto a pulley-surface 17<sup>a</sup> for driving-belt, (not shown,) the pulley and casing revolving freely on the fixed sleeve 16. The

casing is provided with a base or flooring 18, 50 which supports a bevel-gear 19, journaled in a bearing 20, as shown in Fig. 1. A second lower or horizontal gear 21 is keyed to the top of the upper portion of the broken spindle 23, journaled in the bracket 22. The 55 bracket 22 carries a cone-shaped cop-builder 24, which is preferably formed integral with the bracket, as shown. The cop-builder 24 is provided on one side with a vertically-disposed thread or yarn receiving slot 25, in 60 which the thread is moved vertically to build the cop by a fork or hook 26, carried by a link 27, pivotally connected at its upper end to a lever 28. This lever in turn is pivoted at 29 to the inner wall of the casing or pul- 65 ley, so as to revolve therewith, and has a slotted portion 30, which is engaged by a pin 31, carried by the gear 19. This base 18 has an opening 32 on one side through which the thread passes on its way to the fork 26, being 70 led through a fork or guide or hook 32' on the cop-builder, as shown in Fig. 5. To the short spindle 23, upon which the cop is built, within the cop-builder, is swung the lower or long spindle, (ten to twenty inches long,) which is 75 secured at its lower end by a latch-bolt 33 in the socket-piece 34, which is keyed to the cone-pulley 35, journaled in lower portion of frame. The cone-pulley 35 is connected by a band or 80 belt 36 to a second reverse cone-driving pulley 37, so that by shifting the belt up or down the speed of rotation of the spindle may be varied to compensate for the increasing diameter at the starting of each cop until the cone-builder is filled with yarn, when the regular 85 four inches or thereabout to each coil or wrap is used at each trip of the guide until the cop is completed. This shifting of the belt may be accomplished by any automatic mechanism, which it is not necessary to illus- 90 trate or describe, as it will be obvious to those skilled in the art. It will of course be understood that as the building of the cop progresses the said cop is gradually thrust downward on the spindle until the cop is built to 95 the required size. When the cop is built to the proper length, it is drawn downward so as to be entirely upon the lower spindle,



which is drawn out of socket for the purpose of removing the cop. The large top spool drum or roll 38 on the frame and the lower large drum or carrier 39, which bears on the slubbing, pay out an amount at all times proportionate to the speed of the whole machine, whether the spool is newly filled or nearly exhausted, and the accompanying weighted roller 40 and its carrier 41 need not be further explained, as they are the same and for the same purpose as used in connection with a self-acting mule. In order to guide the arm or link 27 accurately in its vertical movement during the rotation of the cop-builder, we prefer to connect it by a curved link 42, having one end pivoted to the arm 27 at 43 and its other end provided with a pin or projection 44, traveling in a slot 45 in a guiding-bracket 46, carried by or secured to the cop-builder. The cop-builder is provided on each side of the vertical slot with a rib 47, these ribs being engaged by the correspondingly grooved or recessed portion or end of the arm or link 27. In order to sustain the pulley or casing 17 against the lateral pressure of the belt, we may provide a bearing-piece 48, adjustably mounted in the frame by means of a threaded stem 50 and lock-nuts 51 and 52 and having a curved face bearing against a rabbeted portion 53 of the pulley, whereby lateral strain is prevented and an additional vertical support is provided. The face of the bearing-piece may be recessed to receive lubricant, as shown in Fig. 6. The operation of this form of the machine may be explained as follows: The slubbing 47 on being paid out from the spool 38 revolved by its carrier, passes between the roller-weight 40 and its carrier, and descends through the fixed sleeve 16 and opening 32 and around hook or guide 32' to the foot or hook 26, which guides the spun yarn through the slotted opening in the cone-shaped builder, where it is wrapped around the spindle by the differing speeds of the spinning section or casing and the spindle. In order to give about five twists to the inch of yarn and cause the spindle to receive the amount spun, it is necessary to run the parts at the following proportionate speeds: The spinning section or pulley 17, for example, runs at about one thousand revolutions in a given time and the spindle, by its pulley 35, at nine hundred and fifty revolutions in the same time. The difference between the two represents the number of wraps which the faster or spinning section carries around the spindle.

The modification shown in Figs. 7 and 11 embodies the same principle as that above described, but differs in some respects, which will now be explained. In this form the sleeve 16<sup>a</sup> is elongated and a grooved pulley 17<sup>b</sup> provided on the top of the casing for an endless driving-cord. The vertical gear 19<sup>a</sup> is keyed to the shaft 54, which carries a feed-roll 55<sup>a</sup>

and a pinion-wheel 55, as seen more clearly in Fig. 11. This pinion gears with a rack 56, which gives an up-and-down movement to the arm or pitman 27<sup>a</sup>, (see Fig. 10,) which carries the claw or two-pronged foot 46<sup>a</sup>. The pitman is pivoted centrally of the body of the rack at 27<sup>b</sup> and has at its upper end a curved slot 57, into which projects a pin 57<sup>a</sup> from the rack-body. The casing 17<sup>a</sup> has a guide 17<sup>b</sup>, preferably formed by ribs or flanges, (see Fig. 9,) which aids in guiding the rack in its movement, and from the lower edge of said casing projects a guide 17<sup>c</sup>. A reduced portion of the arm 46<sup>a</sup> (indicated at 17<sup>d</sup>, Fig. 9) travels in the slot 17<sup>e</sup> of this guide, and by this guide and the pivotal connections with the rack-body the said rack is caused to move up and down around the gear as the latter rotates. The end of the arm 27<sup>a</sup> is preferably forked and secured to arm 46<sup>a</sup> by a set-screw 46<sup>b</sup>. The inclination of this slotted guide from the perpendicular conforms to the wall of the cone-builder at the point where the opening in said builder permits the yarn to enter and be carried around the spindle by the spinning-section going at greater speed. The feed-roll 55<sup>a</sup> engages with a smaller roller 58. (Shown in Fig. 8.) The pair of rollers carry the yarn downward through a second opening 32<sup>a</sup> in the base. The operation of this form of the machine will be readily apparent, but may be briefly explained as follows: The slubbing, supplied as hereinbefore described, is conducted by the eccentrically-fixed cone-shaped piece or guide 59, which is secured to the casing and so to the feed-rolls 55<sup>a</sup> and 58, whence it passes through the opening 32<sup>a</sup> to the fixed hook 32 and between the prongs of the movable foot 46<sup>a</sup>, which guides the spun yarn through the slotted opening in the cone-shaped builder, where it is wrapped around the spindle by the differing speeds of the spinning-section and the spindle. The differential movement results in the manner described in connection with the first form. The feed-roll makes but fifty revolutions on its own axis, or a number equal to the difference between the spinning and the spindle sections. If the spindle were held stationary while the spinning-section made one thousand revolutions, the feed-roll would also make one thousand revolutions. If the spinning-section and the spindle were revolved at equal speed, the feed-roll would remain at rest so far as turning on its own axis is concerned, but would move with the bevel-gears, the pinion-wheel, and the ratchet in a body carried by the casing and the spindle. Hence when the upper and lower sections are revolved at different speeds the feed-roll, as stated, turns on its own axis at a speed equal to the difference.

In order to obtain some difference in the closeness of the elliptical winding of the cop, it is necessary to have gears with a slight variation in the number of teeth. The circum-



ference of the feed-roll is equal to the amount of yarn required to make one elliptical wrap around the spindle, (about four inches.) This elliptical wind results from the up-and-down movement of the foot along the opening in the cone-shaped builder.

It may be noted that if the speed of spindle be increased to equal that of spinning-section cop-building will cease and only spinning will result. If the speed of spindle be further increased, winding will be resumed; but, in the opposite direction, the proportion or number of wraps around spindle will be as before—that is to say, equal to the difference in the speed of the two sections.

Having thus described my invention, what I claim is—

1. In a combined spinning and cop-winding device the combination with means for feeding the slubbing of a twisting device with means for operating it, a spindle associated with said twisting device with means for rotating it at a speed differing from that of the twisting device, means for guiding the thread to the spindle to build the cop, and means for moving the cop on the spindle as said cop is built, substantially as described.

2. In a combined spinning and cop-winding device the combination with means for feeding the slubbing, of a twisting device with means for operating it, a spindle associated with said twisting device with means for rotating it at a speed differing from that of the twisting device, means controlled by the differential movement of said parts for guiding the thread to the spindle to build the cop, and means for thrusting the cop gradually downward on the spindle as the winding progresses, substantially as described.

3. In a combined spinning and cop-winding device, the combination with the means for feeding the slubbing, of a twisting device with means for operating it, a spindle associated with said twisting device with means for rotating it at a speed differing from that of the twisting device, a cop-builder coacting with said spindle and yarn-guiding means controlled by said differential movement, substantially as described.

4. The combination with means for feeding the slubbing, of a twisting drum or casing, a spindle associated therewith, means for rotating said drum or casing and spindle at different rates of speed, a cone-shaped cop-builder encircling the spindle, and having a slot in its side, and vertically-movable guiding means in proximity to said slot, substantially as described.

5. The combination with means for feeding the slubbing, of a rotary twisting drum or casing, a rotary spindle associated therewith, a cop-builder inclosing the spindle and having a slot in its side, and a vertically-moving thread-guide in proximity to said slot, substantially as described.

6. The combination with means for feeding the slubbing, of a twisting drum or casing, a spindle associated therewith, means for rotating said drum and spindle at different rates of speed, a slotted cop-builder encircling the spindle and arranged to rotate in unison with the casing, a link having a fork at its lower end to coact with the slot in the cop-builder, and means within the casing controlled by the relative movement of the casing and spindle for moving said link, substantially as described.

7. In combination the twisting casing or drum having a passage for the slubbing, a slotted cop-builder carried by said casing, a spindle within the cop-builder, means for rotating said casing and spindle at different rates of speed, a guide associated with the slot of the cop-builder, and means controlled by the relative movement of said casing and spindle for moving said guide, substantially as described.

8. The combination with means for supplying the slubbing, of a twisting device, a spindle structurally associated therewith, and means for rotating the twisting device and spindle both in relation to the slubbing-supplying means and in differential relation to each other, substantially as described.

9. In a device of the class described, a twisting drum or casing with means for rotating it, a cop-builder carried thereby, a spindle rotatably mounted within the cop-builder with means for rotating it, a yarn or thread guide cooperating with the cop-builder, differential gearing between said casing and spindle, and means operated thereby for moving the thread-guide, substantially as described.

10. In a device of the class described, a twisting drum or casing with means for rotating it, a slotted cop-builder carried thereby and rotating therewith, a spindle rotatably mounted within the cop-builder with means for rotating it, a bevel-gear carried by the spindle, a second bevel-gear journaled in the casing and engaging said first-named gear and a yarn-guide cooperating with the cop-builder and operated from said second gear, substantially as described.

11. In combination a twisting casing or drum with means for rotating it, a slotted cop-builder carried by said casing, a spindle rotatably mounted within the cop-builder, a beveled gear carried by the cop-builder, a second beveled gear journaled in the casing, an arm pivoted in the casing having a slot engaged by a crank-pin on the second beveled gear, and a link depending from said arm and having a yarn fork or guide cooperating with the slot in the cop-builder, substantially as described.

12. In combination a twisting casing or drum with means for rotating it, a slotted cop-builder carried by said casing, a spindle rotatably mounted within the cop-builder, a bev-



eled gear carried by the cop-builder, a second beveled gear journaled in the casing, an arm pivoted in the casing having a slot engaged by a crank-pin on the second beveled gear, 5 and a link depending from said arm and having a yarn fork or guide cooperating with the slot in the cop-builder, guiding means carried by the cop-builder and engaging said link and a retaining-link pivoted at one end to said 10 first-named link and having its opposite end loosely supported by the opposite side of the cop-builder, substantially as described.

13. In combination the twisting head or casing with means for rotating it, a rotary spindle associated therewith, change-speed mechanism having a detachable connection with said spindle for rotating it at varying rates of speed, a movable yarn-guide coacting with said spindle and means for moving said guide 20 controlled by the difference in speed between the spindle and casing, substantially as described.

14. In combination with the supporting-frame, a drum or casing rotatably supported 25 therefrom at its upper side and having a passage for the slubbing, a spindle associated

with said casing means for rotating the casing and spindle at different rates of speed, supporting means coacting with the lower edge of the casing, yarn-guiding means coacting with the spindle and differential gear mechanism between the casing and spindle for controlling the movement of the guide, substantially as described.

15. In combination, a twisting drum or casing with means for rotating it, a spindle journaled in proximity thereto, a yarn-guide coacting with said spindle, differential gear mechanism interposed between the spindle and casing for controlling the movement of the yarn-guide, changeable-speed mechanism and a detachable spindle connection between the spindle and the changeable-speed mechanism, substantially as described.

In testimony whereof we affix our signatures 45 in presence of two witnesses.

ALFRED J. FOULDS.  
HENRY A. FOULDS.

Witnesses:

ROBERT GUIE,  
HOMER PARSONS.