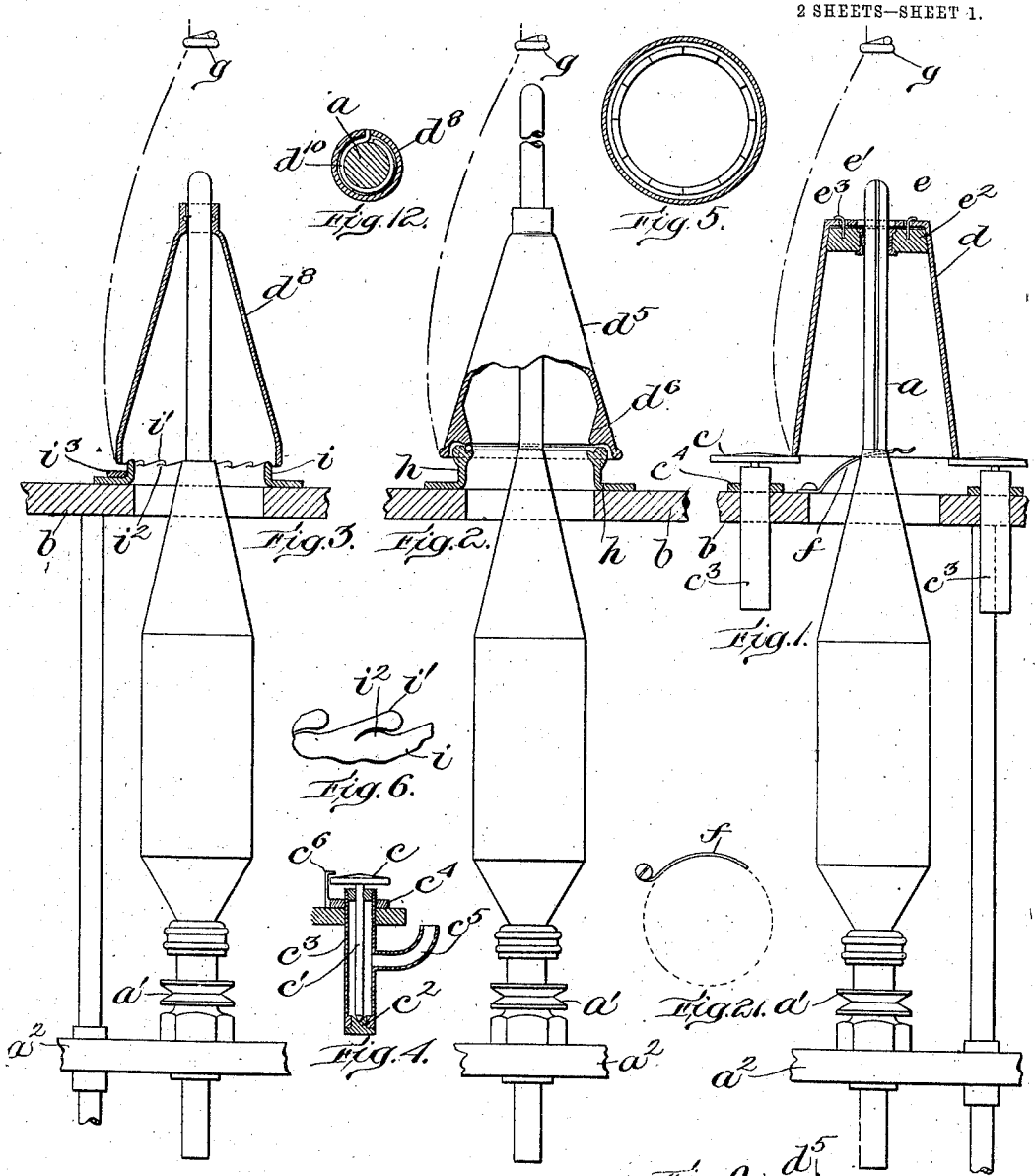
V. BÉLANGER.

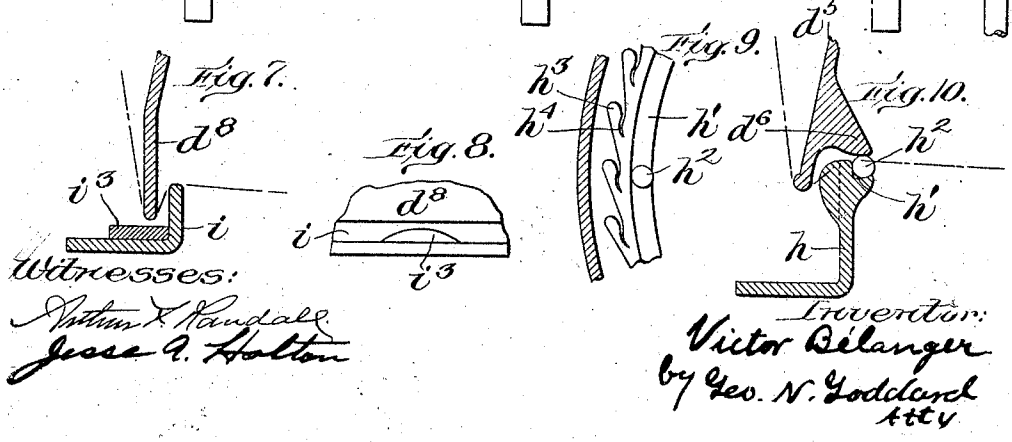
DEVICE FOR SPINNING AND TWISTING YARN.

APPLICATION FILED DEC. 2, 1910.

1,020,179. Patented Mar. 12, 1912.

2 SHEETS—SHEET 1.





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DEVICE FOR SPINNING AND TWISTING YARN.

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2 SHEETS—SHEET 2.

Fig. 16.

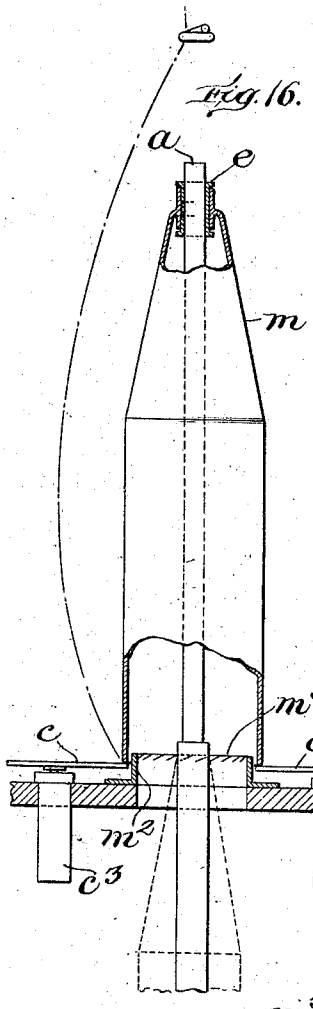


Fig. 17.

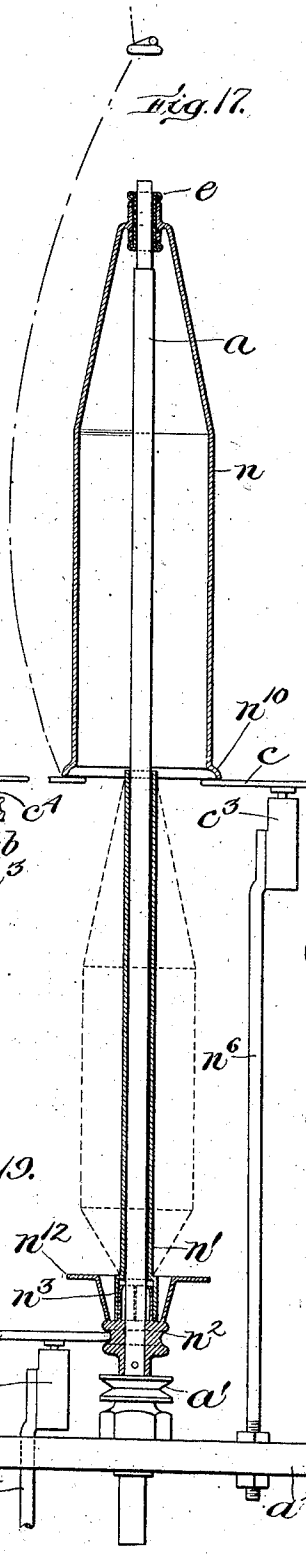


Fig. 13.

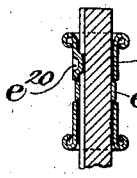
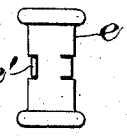


Fig. 14.



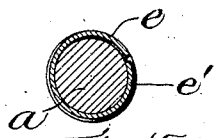
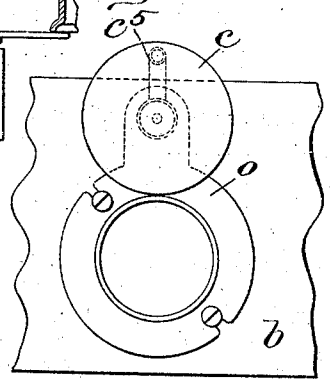


Fig. 15.

Fig. 18.



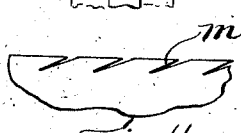
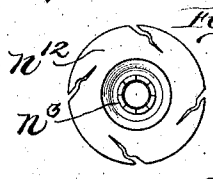


Fig. 11.

Fig. 19.



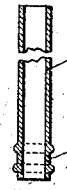


Fig. 20.

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UNITED STATES PATENT OFFICE.

VICTOR BÉLANGER, OF MARSHFIELD, MASSACHUSETTS, ASSIGNOR TO NEW ERA SPINNING CO., OF BOSTON, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

DEVICE FOR SPINNING AND TWISTING YARN.

1,020,179. Specification of Letters Patent. Patented Mar. 12, 1912.

Application filed December 2, 1910. Serial No. 595,187.

To all whom it may concern:

Be it known that I, VICTOR BÉLANGER, a citizen of the United States, and resident of Marshfield, county of Plymouth, Massachusetts, have invented certain new and useful Improvements in Devices for Spinning and Twisting Yarn, of which the following is a specification.

This invention relates to the spinning, twisting or doubling of yarn whether of wool, cotton, silk or other fibers and is intended to provide a simple and efficient construction by which either warp or filling yarns of the coarsest or finest counts may be spun, so as to produce a strong elastic and even yarn comparatively free from breakages and from scraping of the yarn by the traveler or other like device.

In my invention I employ a cap or inverted cup, yet the principle of my invention differs from cap spinning as heretofore practiced, in that the cap is loosely mounted on the spindle member and is rotated thereby to assist in revolving the yarn about the spindle member. Furthermore by my invention I make it possible to use a cap much shorter than the length of the full cop since the cap need only be of an effective length corresponding approximately to the length of the cone or "chase" of the cop. These and other distinctive features characterizing the present invention will be fully explained in this specification, and will be clearly defined in the claims appended thereto.

In the accompanying drawings I have shown a view of the forms under which the principles of this invention may be embodied.

Figures 1, 2 and 3 show side elevations, partly in section, illustrating three different modes of embodying the aforesaid invention. Fig. 4 is a detail central section view showing one of the cap supporting members. Figs. 5 to 11 are enlarged detailed views showing different forms of tension and copping members. Figs. 12 to 15 show enlarged detail views of the device for loosely clutching the caps or cops to the spindle members. Figs. 16 and 17 are side elevations partly in section of further modifications embodying my invention. Fig. 18 is a plan view of the holder carrying a cap supporting member and the doffing finger. Fig. 19 is a plan view of a disk forming a modified form of yarn holder for doffing. Fig. 20 is a vertical section of a cop tube. Fig. 21 is a plan view of the doffing finger.

Heretofore it has been the usual practice in cap spinning frames to provide a vertical fixed spindle to the upper end of which was secured, in effect rigidly, and inverted cup or cap, which had to be of sufficient length to extend downward to overlap the entire length of the completed cop. A cop tube was rotatably mounted on the spindle and was positively driven by a band passing over a whirl or pulley connected with the cop tube. The cop tube was given a vertical traverse on the spindle inside of the cap in order to build up the cop. The cap being held against rotation, acted by the friction of its lower end on the yarn as a drag to retard the revolution of the yarn about the spindle. The strain of the yarn on the lower edge of the long cap and the vibration of the cap itself as well as the troubles caused by the moving of the cop tube up and down on the spindle, not only made it necessary to run the bobbins at comparatively low speeds relative to the ring frames and mule spindles, but in practice led to other difficulties which have prevented the very general use of the cap spinning frames in lieu of mules and ring spinning frames, particularly in cotton spinning.

By the application of the principles of this invention it is possible to produce all counts of yarn advantageously on a cap frame, that are now produced on ring frames or on mules.

In the following specification the word spindle member embraces equally a bare spindle upon which the cop is built directly or a cop tube or bobbin fitted over the spindle to rotate therewith, since the two devices are functionally identical, it being optional whether the yarn is wound directly on the bare spindle, or on a surrounding cop tube, it being also optional whether the rotating cap be mounted on the bare spindle or on the cop tube or bobbin.

In the practice of my invention according to the form shown in Fig. 1, I employ a rotating spindle member a driven by a whirl a' and mounted in the spindle rail a^2. The spindle is preferably cylindrical and passes through a copping or lifting rail b which is capable of vertical movement or traverse in order to build the cop on the

spindle. This copping or lifting rail b is provided with a central orifice, as in the case of a ring rail to permit the spindle member and the cop to pass through the rail. Adjacent to the spindle apertures are located a series of rotary bearing or supporting members, which as shown in Fig. 4 comprise a disk or head c preferably slightly convex or cone shaped on its upper face, the said disk or wheel being mounted on a central shaft or pintle c' whose lower end is conical, and is seated in a conical seat or step bearing c^2 at the bottom of the oil tube or reservoir c^3. This tube c^3 may be supported directly in the rail by means of a clamping nut c^4 which permits its vertical adjustment and preferably has the oil duct c^5 projecting out beyond the supporting rail to permit the introduction of oil. A spring keeper of spring metal c^6 serves to prevent the wheel from being accidentally pulled out of its bearing support or step tube. The disk or wheel c may be made of any suitable material, but I prefer raw hide, compressed fiber, or lignum vitæ. The cap d itself in this form of the invention has the shape of a truncated cone whose top or horizontal wall is provided with perforations appreciably larger than the diameter of the spindle member which passes through it. The cap is loosely mounted on the spindle by means of an intermediate connecting member forming a clutch device or coupling member the object being in this case to permit the cap to move freely up and down on the spindle, when the spindle is rotating, while at the same time causing the cap to rotate by reason of its engagement with the rotating spindle. I therefore provide a coupling member which embraces an annular coupling tube e of cylindrical form, in which is formed a spring tongue e' which is bent inwardly to engage a groove or keyway in the spindle member, the construction being such as to permit the free movement vertically on the spindle member. In this form of the invention the clutch is fitted snugly inside of a circular block or disk e^2, which is of a size to fit the interior of the cap, so as to leave a small space between the top of the cap and the top face of the block, the block being pinned or secured to the cap by holding pins e^3 which prevent it from dropping down inside of the cap. By this construction and arrangement a slight movement of the cap with relation to the axis of the spindle is permitted, so that the cap is free to center itself or adjust itself to the pressure exerted by the yarn which it engages. It may not always be necessary or desirable to use this loose connection of the spindle member, and I have shown other forms in the invention in which no substantial arrangement is employed to permit this play of the cap. The lower yarn-engaging edge of the cap should, of course, be made smooth without sharp corners or edges and rests lightly upon the supporting members or disks c, which may be arranged in positions intermediate of two adjacent spindles so as to form a support for two adjacent caps, or may be mounted at the rear of the spindle or orifice, as shown in Fig. 18, one for each cap, so that the spindle and the bearing disk both lie in substantially the vertical or longitudinal plane of the driving-band. In order to hold a length of yarn when doffing sufficient to wind around the empty bobbin or spindle, I provide a retaining or doffing finger f, which is made of wire and is supported by the rail adjacent to the spindle orifice, whose curvature it approximately follows, the free end of this wire doffing finger extending in the direction in which the yarn revolves around the spindle when spinning, so that when the spindle is rotated a few turns, to back-off a sufficient length of yarn for doffing purposes the yarn will be caught and held between the doffing finger f and the adjacent portion of the rail. In practice the frame is started with the rail b lowered to the point where it is desired to begin the building of the bottom or base of the cop, the cap being placed over the spindle so as to rest upon the bearing support carried by the rail. Upon starting the frame the spindle member begins to rotate and its rotary movement is imparted to the cap, by reason of the engagement between them, and the yarn, which passes through the pig tail or guide eye g beneath the edge of the cap of the spindle or bobbin is impelled forward both by the draft of the rotating bobbin or spindle to which it is connected, and by the frictional engagement of the cap with the yarn. In practice the yarn passes between the lower edge of the cap and the member which supports the cap without the slightest detriment to the yarn or without adversely affecting the tension. By regulating the feed of the delivery rolls the tension may be regulated, but it will of course be understood that the "ballooning" of the yarn itself and the resistance of the air tends to act as a drag or retarding means on the yarn.

In Figs. 2 and 3 I have shown modified forms of the invention, in which I employ a stationary drag or retarding member to regulate or increase the tension on the yarn. As shown in Fig. 2 this tension member is in the form of a vertical ring or annulus h, provided at its upper inside edge with an annular groove or trough h' which forms a race way for the bearing ball h^2 which is free to roll around in said trough. The outer face or periphery of said ring is formed with a series of corrugations or teeth h^3, shown on an enlarged scale in Fig.

The spindle member whether comprising the bare spindle alone or the bobbin compounded with it, acts to rotate or revolve the yarn by its tangential pull and also to wind the yarn. The cap acts to assist the rotation of the yarn and also acts as a building member by reason of the relative axial movement between the cap and the winding member. The controller, when used, acts by reason of its retardation of the revolving yarn primarily as a tension device or regulator its action in this respect varying according to the degree of relative elevation of the bearing wheel secured by the adjustment of its clamping or supporting nut e^4.

The various details of construction and arrangement may be greatly varied to suit different conditions of work.

The facility or ease with which the relative traverse between the yarn-engaging cap and the spindle member is effected is due primarily to the fact that the cap has a two-fold support, namely, an interior point of support against the spindle and an exterior support upon or against the peripheral bearing wheel, which results in dis-engaging the two members sufficiently to prevent binding. This result is further facilitated by the use of an intermediate coupling member e^2 which admits a very slight vertical play between the coupling member and the cap.

It will be observed that the cap member and its coöperating bearing member perform a composite or complex function in the operation of the device. Not only does the cap member assist the rotation of the yarn about the spindle, but it also acts as a cop builder so as to properly wind the yarn on the bobbin or spindle member in the form of a cop. The bearing member serves not only as a support to receive the axial thrust or weight of the cap, but it also acts to steady the cap when rotating at high speed, so as to prevent excessive quivering or chattering of the cap, and further acts to prevent the clutching of the cap upon the spindle. In this last function it is assisted by the loosely mounted interior coupling member which forms the connection between the cap and the spindle. This connection is intended to prevent absolute rigidity at this point and yet should not be loose enough to permit any substantial oscillation of the cap in relation to the inner coupling member. To this end the wires e^3 maintain a tension holding the two members together, beside forming an interlocking means by which the rotation of the spindle and the coupling member is imparted to the cap. As shown, these members are held so closely together that the very slight play between them is not perceptible to the eye, when the device is running. The slight oscillation of the cap relative to the spindle is due to the fact that the inside bushing, surrounding the spindle, is slightly larger than the spindle member or bobbin itself, just enough larger to permit easy reciprocation of the cap on the spindle.

It will be observed that the hollow cap or yarn-engaging member is wholly included within the "ballooning" yarn, that is that portion of the revolving yarn extending from the over head thread guide around the lower edge of the cap to the spindle member; and it will also be observed that the bearing member is outside of this revolving or "ballooning" portion of the yarn that is being twisted, so that the revolving yarn passes at each revolution between the bearing member and the interiorly disposed cap.

What I claim is:

1. A device for spinning and twisting textile fiber embracing in combination a rotary spindle member, a surrounding rotary cap and a rotary bearing member, the cap having support interiorly against the spindle and exteriorly against the bearing member, substantially as described.

2. In a spinning apparatus the combination with a rotary spindle member, of a surrounding positively driven rotary cap formed to have circumferential slipping engagement with the yarn so that the yarn may lag behind in its rotation about the spindle, and an external bearing member forming a support to sustain the axial thrust of the rotary cap, substantially as described.

3. In a spinning device the combination of a yarn-rotating and winding member, a cup-like yarn-engaging and yarn-rotating member having connection with said winding member by which it is driven, said cup-like member being formed with a yarn-engaging edge to assist the rotation of the yarn about its axis while allowing the yarn to slip or lag behind, and an anti-friction member arranged to support the axial thrust of said cup-like member, substantially as described.

4. The combination with the rotary spindle member of a surrounding cap member driven by its engagement therewith, and an anti-friction bearing member forming a support beneath the overhanging portion of the cap to sustain the weight of said cap, substantially as described.

5. In a spinning device the combination of a rotary spindle member, a surrounding rotary cap member engaging said spindle member one of said members having axial reciprocation relative to the other, and a rotary bearing element forming a supplemental support for the cap to keep it disengaged from clutching upon the rotary spindle member, substantially as described.

6. The combination with a rotary spindle member, of a rotary cap having frictional engagement with the yarn by which it assists the revolution of the yarn about the

, and between the teeth are formed a series f narrow notches h^4 to engage the yarn hen the spindles are reversely rotated to ack-off the yarn preparatory to doffing. hese notches h^4 act in a manner similar to he doffing finger f in Fig. 1. The series of onvolutions or projections h^3 are made perectly smooth, and rounded so that the yarn ill readily slip over their outside surface, nd it is seen that that act is successive to reate a drag on the yarn as it passes beeath the edge of the cap d^5 and over the op of the tension member h on its way to he bobbin or spindle. The cap d^5 is formed ith a projecting annular shoulder d^6 dapted to rest on the bearing ball which erves the same purpose as do the disks c in ig. 1.

In Fig. 3 I have shown a modified form of ension member i in which irregularities or nclined teeth i' are formed on the top sure or edge of the ring i instead of on the side as in Fig. 2, the ring being provided neath the teeth or projections i' with ots i^2 to engage and hold the yarn for offing purpose, as already explained. In is form of the invention the lifting deice for engaging the lower edge of the cap onsists of a curved or cam like piece of whide i^3 secured to the ring immediately eneath the edge of the cap.

The caps d^5 and d^8 are provided with anular spring clutches d^{10} as shown in Fig. , which are made of spring metal seated an annular groove in the hub of the cap d normally contracted upon the spindle ember a, while being free to expand unr centrifugal action.

Although I prefer to use the short cap rresponding to the length of traverse or chase" of the cop since the leverage is uch less than in the long cap extending e whole length of the cop, yet I have own in Figs. 16 and 17 how a long cap ay be advantageously used.

In Fig. 16 the cap m is mounted snugly the internal clutch member c which fricnally engages the spindle member a, the wer end of the cap resting upon rotary p supporting members which engage the ttom edge of the cap, and which serves raise the cap on the spindle member, as the case of the form shown in Fig. 1. In s form, too, I have shown a tention member whose upper edge is rounded and smooth, thout any projecting teeth. This ring , however, may be formed with inclined ts m^3, as shown in the enlarged scale in g. 11 to engage the yarn for copping purse.

n Fig. 17 I have shown a form of the inntion applicable when it is desired to raise cop tube on the spindle instead of movthe cap up and down the spindle to ld the cop. In this form of the invention the cap n is connected with the spindle a by means of a suitable clutch member e and a separable cop tube n' is secured to the whirl n^2 by means of an expansible clutch n^3 which passes inside the lower end of the cop tube to grip the same, the whirl n^2 being keyed or splined to the spindle, so as to rotate therewith, while being free to move vertically on the spindle. In order to lift the cop tube with the minimum amount of friction, I provide an anti-friction disk c, like those shown for supporting the cap, the same being attached to a vertical moving lifting rod n^5, and being so located that its periphery engages the annular groove of the whirl n^2. The cap may be supported by the bearing disks c mounted upon suitable brackets n^6, carried by the spindle rail a^2 which sustain the weight of the rotating cap and steady it. In order to facilitate doffing, the lower edge of the cap is provided with a concavo-convex annular lip n^{10}, and the whirl n^2 is provided with a slotted disk n^{12}, shown in Fig. 19 which when raised inside of the said lip will, upon the reverse rotation of the spindle, engage and hold the yarn for doffing purpose.

Instead of mounting the anti-friction bearing member c vertically in the rail this may be mounted in an annular holder o, as shown in Fig. 18. It will be understood that the bearing wheel c acts by constant engagement with the edge of the cap to keep the spindle or shaft and the cap from being clutched together by centrifugal action or gyration so that the cap is always free to drop of its own weight when the supporting wheel descends.

In Fig. 20 I have shown a modified form of cop tube to be used in the form of my invention shown in Fig. 17, such cop tube p being formed with an annular groove p' under its bottom to be engaged by the lifting member or disk c, the bobbin receiving its rotation by means of frictional engagement with the spindle.

Instead of relying upon the spring engagement shown in Figs. 3 and 12 or on the key alone to rotate the cap, the clutch portion of the cap may be provided with both a spring tongue and a fixed key z^{20} (shown in Fig. 13) which engages the longitudinal groove or keyway in the spindle or bobbin.

It will be understood that the retarding or tension member may be used in connection with any or all forms of the invention, this use being optional and depending upon the conditions in the particular case.

While the forms in Fig. 16 and Fig. 17 are made to adapt the device to the "long traverse" yet in most cases I prefer to use the short traverse in connection with the short cap, in which case the cap need only be of sufficient length to overlap the cone of the cop.

spindle member, means engaging said cap to move it axially of the spindle member a distance equal to the axial length of the cone of the yarn-engaging cop in order to properly build the cone, substantially as described.

7. In a spinning apparatus, the combination with the rotary spindle member of a positively driven yarn-rotating and cop-building member whose annular edge has circumferentially slipping engagement with the revolving yarn and means engaging said building member peripherally to cause it to reciprocate axially, substantially as described.

8. In a spinning apparatus, the combination with the rotary spindle member of a surrounding rotary reciprocatory cap having a sliding engagement with the spindle member and a rotary supporting member engaging the edge of said cap while permitting the revolving yarn to pass between itself and the cap at each revolution, substantially as described.

9. The combination with a rotary spindle member, of a rotary yarn-engaging cap loosely mounted thereon, a traverse rail and an anti-friction bearing member carried by the traverse rail in position to engage and support the open end of the rotating cap, substantially as described.

10. In a spinning apparatus the combination of a rotary spindle member, a rotary cop-building cap mounted upon and surrounding the spindle member, and cap-supporting means engaging the periphery of the cap at one side thereof to disengage the cap from centrifugal clutching on the spindle member while permitting the revolving yarn to pass between, substantially as described.

11. The combination of a rotary spindle member, a hollow cop-building yarn-rotating member surrounding said spindle member the two members being slidingly connected together to rotate in unison and means for reciprocating one member axially of the other member, substantially as described.

12. The combination of a rotary spindle member, a yarn-engaging and rotating cap loosely mounted thereon to rotate therewith, a rotary supporting member engaging the cap said rotary member being disposed to the rearward of the spindle member, substantially as described.

13. The combination of a rotary spindle member, a yarn-engaging cap loosely mounted thereon to rotate therewith and a rotary supporting member engaging the cap, the axes of the spindle member and of the supporting member lying substantially in the longitudinal plane of the spindle driving band, substantially as described.

14. The combination of a rotary spindle member, a surrounding rotary cap member loosely mounted thereon and wholly included within the cone described by the ballooning yarn and a rotary bearing member mounted outside of said ballooning cone and engaging said cap peripherally, substantially as described.

15. The combination of a rotary spindle member, a hollow reciprocatory cap driven by its engagement therewith, a rotary bearing wheel engaging said cap and a traverse rail forming a support for said bearing wheel, substantially as described.

16. The combination of a rotary bearing member, a hollow cap member loosely mounted on said spindle member and rotated thereby, said cap having a smooth annular lower edge and having an inside depth substantially equal to the length of the cone of the yarn-cop to be formed and a rotary bearing member forming an anti-friction support for the lower edge of said cap, substantially as described.

17. A cap for a spinning frame comprising a cup-like member whose inside axial length is substantially equal to the length of the chase of the cop in order to receive within, the whole conical part of the cop, and a spindle-engaging portion having means to slidingly engage the spindle by which it is caused to be rotated with the spindle and a yarn-engaging portion for frictionally engaging the yarn and guiding it to the spindle member, substantially as described.

18. A cap for a spinning fame embracing a cup-like member, a coupling member c^2 loosely mounted in the upper end thereof and having its interior formed to slidingly engage the spindle, said cap having a smooth yarn-engaging lower edge, substantially as described.

19. A cap for a spinning frame embracing in its construction, a cup-like hollow member having a smooth lower edge for frictionally engaging the yarn and having loosely mounted in its upper end a concentric coupling member, said coupling member being provided with an interior spline for engaging the groove of a central spindle member while allowing it to reciprocate thereon, substantially as described.

20. The combination of the rotary spindle a reciprocating rotary cap surrounding said spindle, an interior coupling member loosely mounted within the upper portion of said cap and having interior sliding engagement with the spindle member, the coupling member being formed with a conical peripheral surface adapted to engage the surrounding portion of the cap, substantially as described.

21. The combination with the spindle member a, the rotary cap d, the interior coupling member c^2 having connection in-

teriorly to engage the spindle and be rotated thereby and a pin e^3 for interlocking the cap and the coupling member rotatively together, substantially as described.

22. The combination of a rotary spindle member, a yarn-engaging cap surrounding said spindle member to rotate therewith, a rotary member for axially supporting said cap and a doffing device located adjacent to the yarn-engaging edge of said cap in position to engage the reversely rotated yarn, substantially as described.

23. The combination of a rotary spindle, a rotary yarn-rotating and cop-building cap mounted on and reciprocated axially of said spindle, an annular retarding device arranged to normally engage and retard the yarn adjacent to the lower edge of said cap, substantially as described.

24. The combination of the rotating spindle, the rotary reciprocating yarn-engaging cap and the retarding member provided with a series of projections or teeth arranged to engage the yarn between the cap and the spindle, substantially as described.

25. The combination of the rotating spindle member, a yarn-engaging cap mounted thereon and rotated thereby, a tension device arranged to engage the yarn adjacent to the yarn-engaging edge of the cap, a supporting member for axially supporting the cap and adjusting means whereby the relative elevation of the tension member and of the cap may be varied in order to vary the tension of the yarn, substantially as described.

26. The combination of the rotary spindle member, the cap mounted thereon and rotated thereby and having an annular yarn-engaging edge, a bearing member for axially supporting the cap, a yarn-retarding device for frictionally engaging the revolving yarn adjacent to said yarn-engaging edge and means whereby the relationship axially of the spindle between the bearing member and the retarding device may be varied in order to vary the tension of the yarn.

27. The combination of the rotary spindle member, the rotary cap mounted thereon, a retarding device arranged to engage the revolving yarn, a bearing member arranged to engage and support the cap, said bearing member being adjustable axially of the spindle in order to vary the relationship between the cap and the retarding device in an axial direction, substantially as described.

28. In a spinning device the combination of the spindle member, the reciprocating rotary hollow cap and an intermediate coupling member having sliding spindle engagement with the spindle member and having interlocking connection with the cap by which the cap is caused to rotate while allowed to adjust itself slightly in relation to the spindle in order to assume its natural relationship to the spindle under the action of centrifugal force, substantially as described.

29. The combination with the rotary spindle of a reciprocating rotary cap driven thereby, and a rotary bearing member comprising a head provided with a beveled face to engage the edge of the cap, and a central supporting shaft or pintle, substantially as described.

In witness whereof, I have subscribed the above specification.

VICTOR BÉLANGER.

In the presence of—
G. A. ROCKWELL,
GEO. N. GODDARD.