No. 865,048. PATENTED SEPT. 3, 1907.

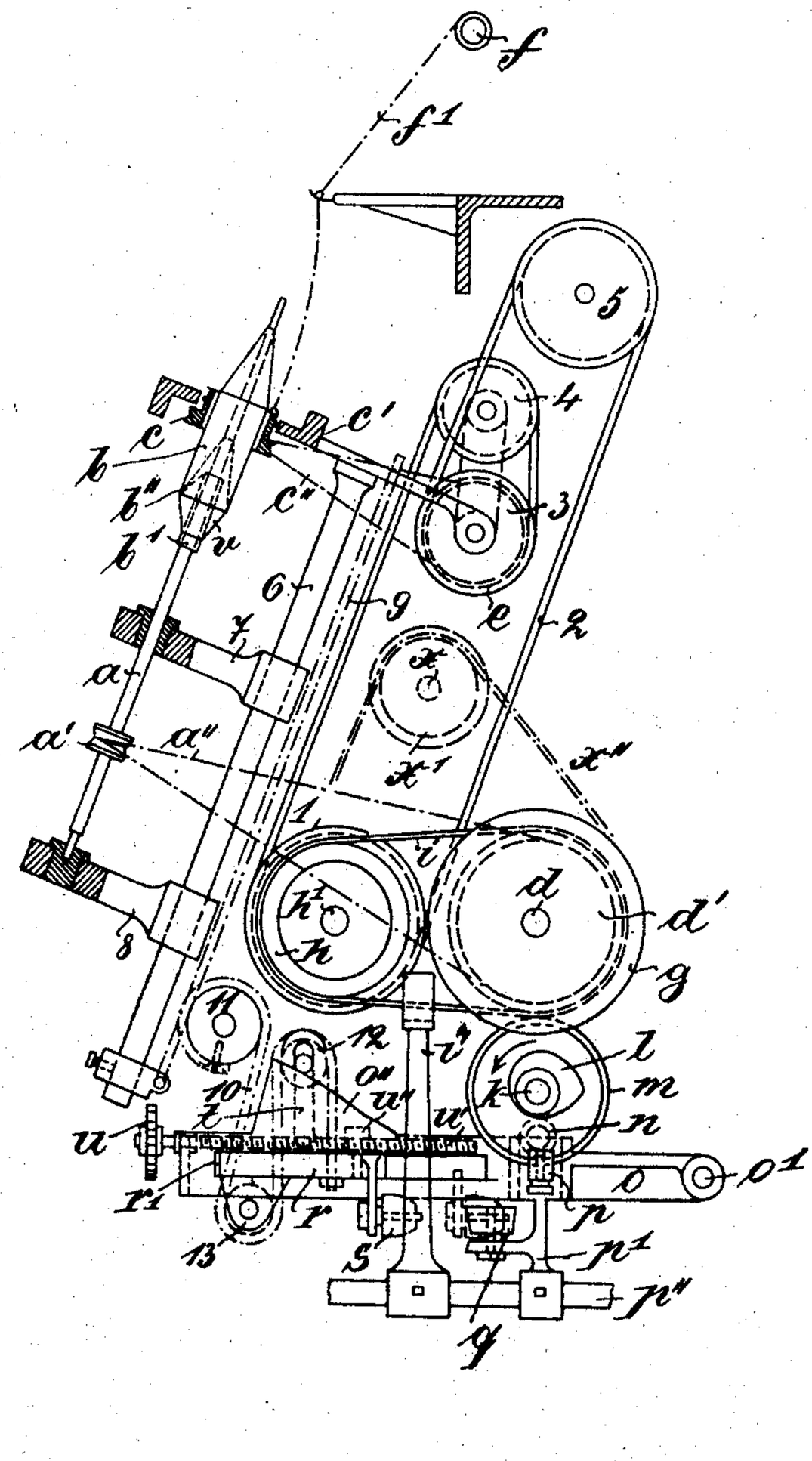
A. KLEIN.

RING SPINNING MACHINE.

APPLICATION FILED MAY 31, 1904.

3 SHEETS—SHEET 1.

Fig. 1.



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3 SHEETS—SHEET 2.

Fig. 2.

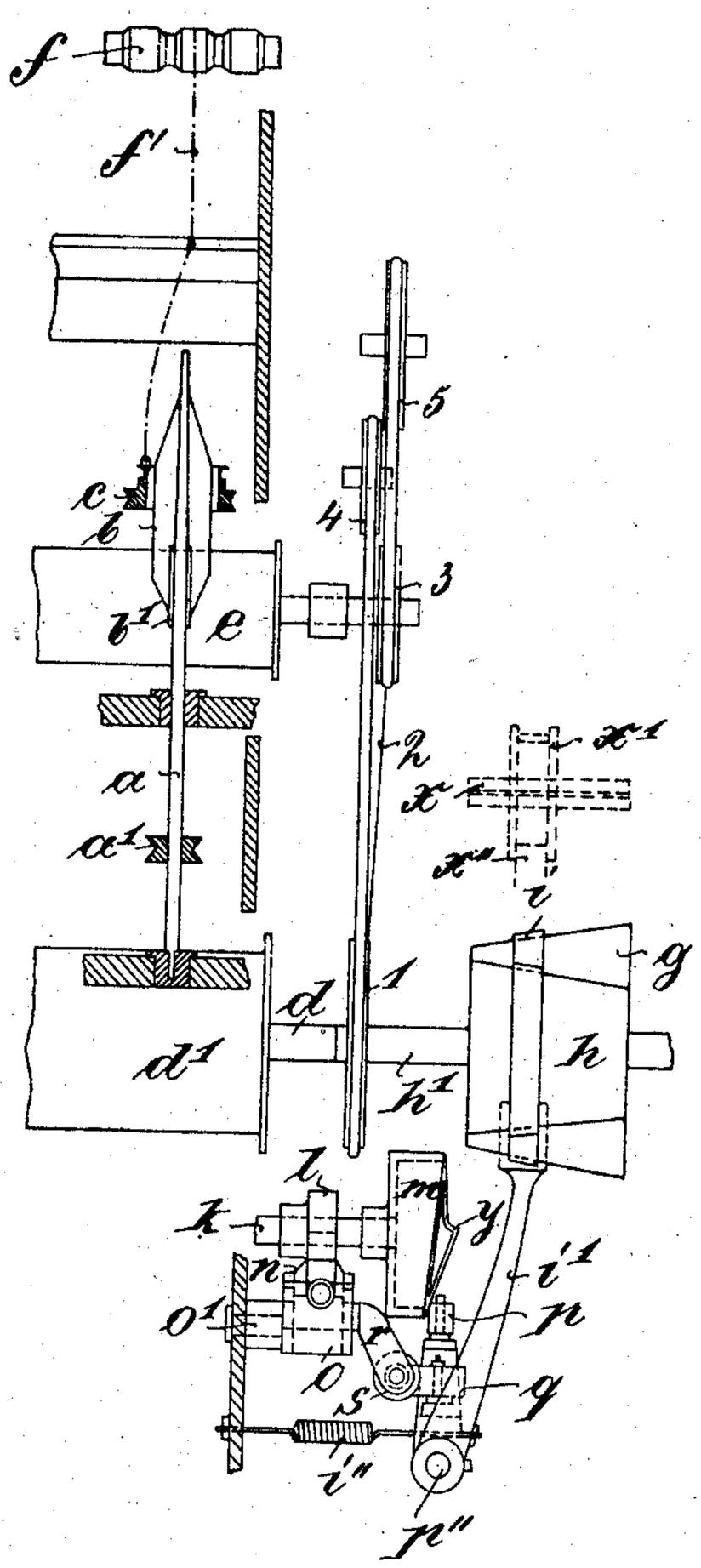


Fig. 3.

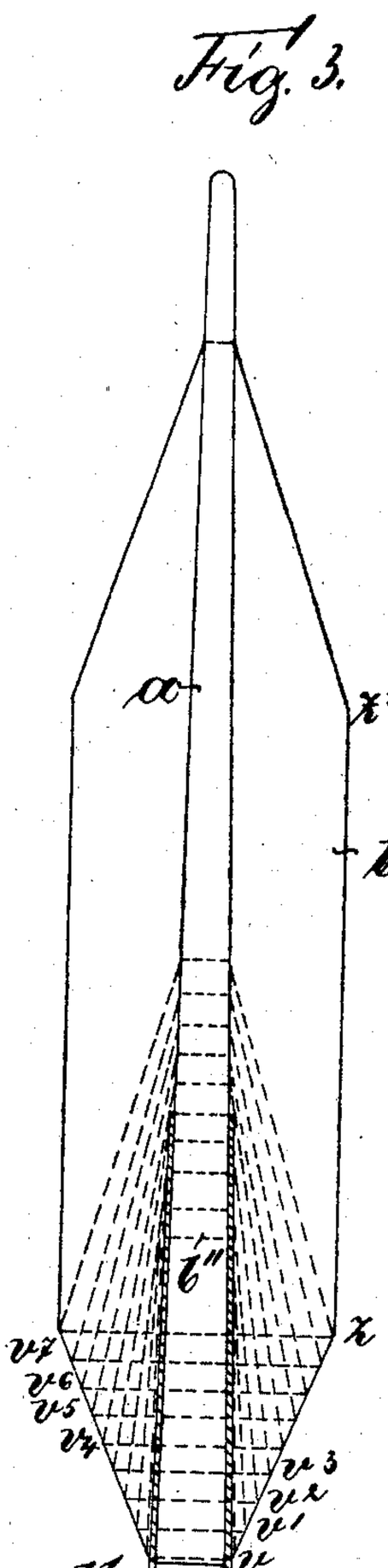
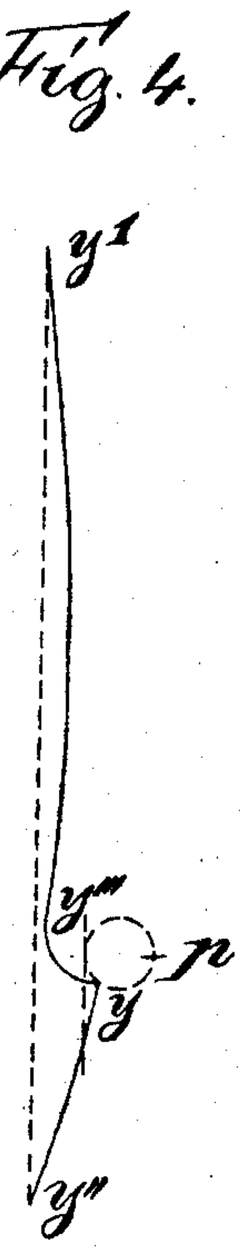


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

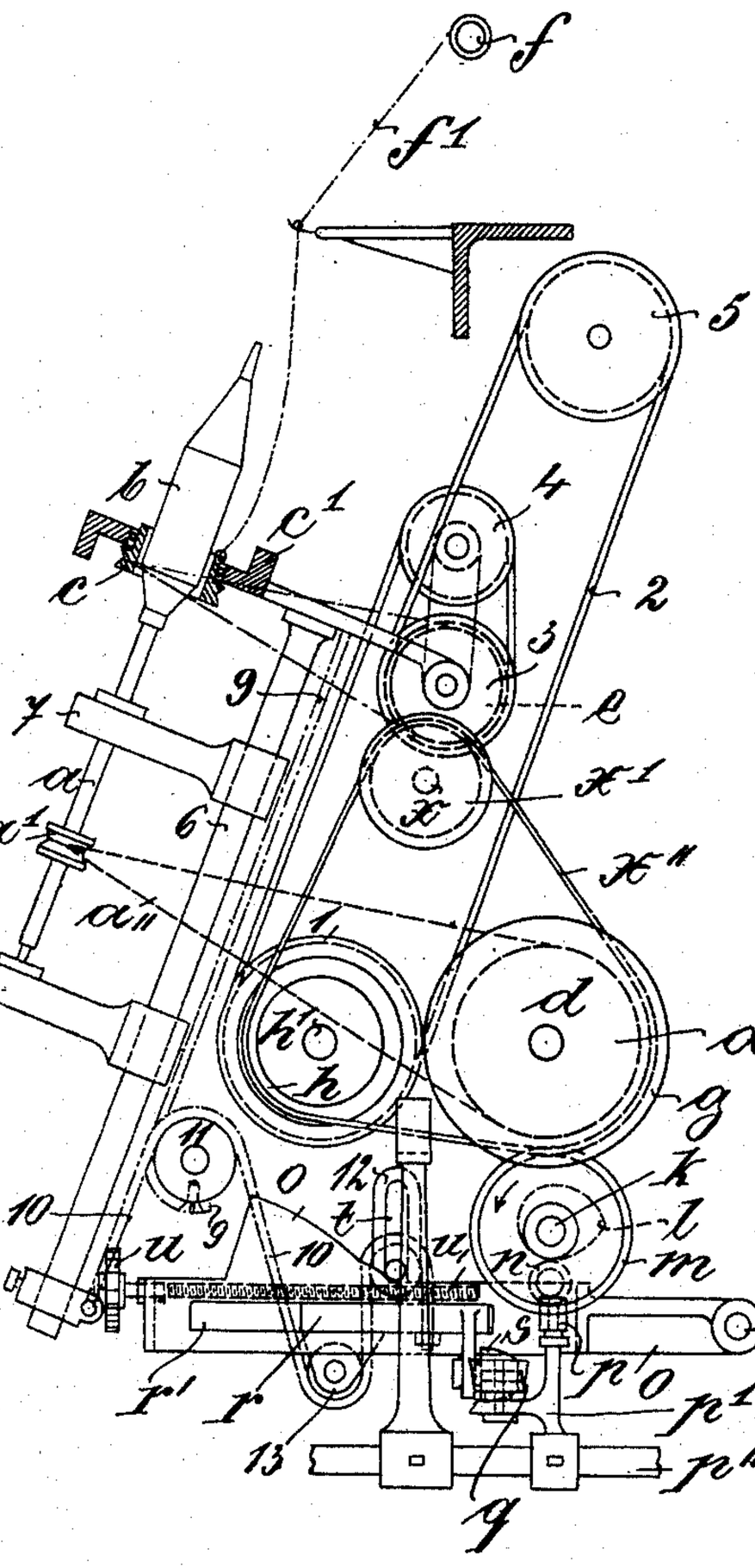
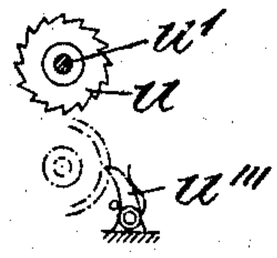


Fig. 6.



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UNITED STATES PATENT OFFICE.

ACHILLE KLEIN, OF ROUBAIX, FRANCE.

RING-SPINNING MACHINE.

No. 865,048. Specification of Letters Patent. Patented Sept. 3, 1907.

Application filed May 31, 1904. Serial No. 210,522.

To all whom it may concern:

Be it known that I, ACHILLE KLEIN, a citizen of the Republic of France, and a resident of 27 Rue Perrot, Roubaix, in the Republic of France, have invented certain new and useful Improvements in Ring-Spinning Machines, of which the following is an exact specification.

My invention relates to improvements in ring spinning and winding and ring twisting or doubling machines in which are employed devices for the automatic regulation of the thread tension.

The object of the invention is to enable the winding of the thread coming from the cylinder and passing through the guiding eye of the rotating ring on to a naked spindle, to be effected with exactly the same tension when winding the various diameters during the formation of the cop.

In the arrangements hitherto used the winding of the thread could only be commenced on a tube of sufficiently large diameter placed on the spindle, or on a tube with a sufficiently thin point the lower portion of which formed a cone and served as bottom for the cop. Moreover, in the devices hitherto used, the speed of the rotating ring was either always constant or this ring rotated with increasing or decreasing speed according to the actual diameter of the cop, the speed of the cop however remained the same from the commencement of the winding to the finish.

According to the present invention the thread, at the commencement of the winding is wound on to the cylindrical portion of a naked, and in the case of the self-acting mule, of a thin spindle.

The rotating thread-guide-ring hereinafter called traveler ring is gradually lifted into a higher zone and firstly in consequence of its alternate rising and descending through the various zones, winds the thread around the spindle in such a manner that a double cone is formed as will be hereinafter specified and serving as bottom for the cop and when this double cone is completed a cylindrical cop-portion is formed upon said bottom part of the cop in a manner in itself well-known, by the lifting of the traveler ring into the higher zones and the simultaneous rising and falling motion of the ring, until the cop is completely finished, the cop being in every way similar to the one produced on the self-actor. In order to attain this the traveler-ring is always rotated in the same direction as the cop-spindle and with a speed which is always less than the cop-spindle, the speed of the ring relative to the cop-spindle being variable according to the different positions of the ring and diameters of the cop during the formation of the latter. During the winding of the first layer of thread on the cylindrical portion of the spindle the speed of the traveler-ring is nearly the same as that of the cop-spindle, the speed of the ring being somewhat accelerated during the descent in order to equalize the pull exercised on the thread by such descent. As the winding goes on the diameter of the successive layers gradually becomes greater a cone rising from the lower end being formed, and when the desired diameter is attained this cone constitutes the bottom of the cop. In the formation of this bottom portion the speed of the ring has diminished more and more as the diameter of the bottom has increased, while towards the point of the cone during the continued upward movement of the ring the speed of the said ring is altered according to the different diameters to be wound. When the bottom of the cop is completed the same speed increasing upon the ascent and decreasing upon the descent of the ring is maintained in the well-known manner until the completion of the whole cop. By this mode of working exactly the same tension is always imparted to the thread although it is wound on to parts of different diameter. The same result can be obtained if, contrary to what has just been said, the traveler-ring is operated with a speed which remains the same, the speed of the spindle however, when small diameters are being wound being almost equal to the speed of the ring, while the speed of the spindle is increased when larger diameters are wound. In this case too the speed of the spindle must of course always be greater than the speed of the ring. Finally it is also possible to vary simultaneously the speed of the spindle and that of the ring, that is to say to diminish the speed of the spindle upon the increase in the speed of the ring or vice versa, so that exactly the same tension of the thread is obtained when winding different diameters in the formation of a cop.

The improved construction is shown in the accompanying drawing, in which the new driving mechanism for the spindle and the traveler-ring is illustrated, and in which:

Figure 1 is a view partly in section and partly in side elevation, Fig. 2 is a front view of the device, Fig. 3 is a diagrammatic view of a cop showing the formation of the same, Fig. 4 is a developed view to an enlarged scale of the cam for effecting the displacement of the belt on the conical driving pulley. Fig. 5 is a view similar to that of Fig. 1 but illustrating another method of actuation, Fig. 6 is a detail part.

The cop-spindle *a* together with the grooved wheel or pulley *a'* is driven by a cord *a''* from a drum *d'* constantly driven by power transmitted from an external source. The cop *b* is situated on the spindle *a*, a portion of the bottom being wound around a very thin paper tube *b'* which is removed from the spindle together with the cop upon the completion of the latter. The traveler ring *c* suitably mounted thereon rotates in a ring-support *c'* and is driven by a cord *c''* from a drum *e*. The thread *f'* is fed to the ring *c* by the drawing-roller *f*. A conical pulley *g* is secured on the shaft *d* of the drum *d'* and is geared by a belt *i* with a conical

pulley h inclined in the opposite direction. The conical pulley h is secured on a shaft h', a cord- or grooved pulley 1 being provided on its end. The movement of the shaft h' is transmitted from this cord pulley 1 to the drum e by a cord 2 traveling over the cord-pulleys 3, 4 and 5. This drum e and the cord-pulleys 3 and 4 are fixedly connected with the ring-support c' supporting the traveler-ring c and may be moved up and down with it, being guided by the rod 6 moving in bearings 7 and 8. The upward and downward motion of the bearing ring c' is effected by chains 9 and 10 conducted around a roller 11.

A shaft k is driven from the shaft d by suitable means in the direction of the arrow (Fig. 1). This shaft k by means of a cam disk l and a roller n moves a lever o about its pivot o' and also operates an arm p', by means of a cam disk m engaging on its raised lateral edge a roller p upon such arm p' which is situated on the shaft p'' and carries on an offset a conical roller q. An arm i' which embraces the belt i by means of a fork carried at its upper end is also secured to the shaft p''. A spring i'' presses the roller p against the curved lateral edge of the cam m and, moreover, at the commencement of the formation of the cop presses the roller q against a roller s. The lever o is provided with an inclined part o'' and a slot r' in which a slide r carrying the conical roller s is movable. The slide r to which the end of the chain 10 is secured is also provided with an upright in which a slot t is arranged which serves as a guide for the spindle of a roller 12 resting on the inclined part o'' of the lever o. A second roller 13 is mounted on a downward extension of the slide r and together with the roller 12 serves for the working of the chain 10 in such a manner, that the ascent and descent of the traveler ring c for the formation of the cop is caused in consequence of the constant upward and downward motion of the lever o by means of the cam disk l. The adjustment of the slide r is effected by means of a ratchet wheel u through the medium of a screw spindle u' engaging with a nut u'' of the slide r. The ratchet wheel u is at the up and down movement of the lever o advanced by means of a stationary ratchet u^3. If the whole cop is finished, the screw spindle u' is turned in the reverse direction, thereby bringing back the slide together with its rollers to the starting position shown in Fig. 5.

A shaft x is mounted above the conical pulleys g and h a disk x' being arranged axially but not rotatably movable with regard to the shaft in order to drive the conical pulleys g and h by means of a belt x'' during the above mentioned simultaneous variation of the speed of the cop-spindle and of the traveler-ring.

The operation is as follows: In order to obtain a constantly uniform thread tension by means of driving the cop-spindle at a constant speed and changing the driving speed of the traveler ring the shaft d carrying the driving drum d' for the cop-spindle a is driven together with the conical pulley g from the engine. The conical roller g transmits the movement by means of the belt i to the conical pulley h and from the latter the movement is transmitted to the traveler-ring by means of the pulley 1. The ring rotates in the same direction as the cop-spindle but with a lesser speed. The speed of the traveler ring is almost equal to the speed of the cop spindle at the commencement of the cop formation, *i. e.* when the traveler is in its lowermost position and the cylindrical portion of the cop spindle is being wound at v, Fig. 3. The slide r is then situated in its extreme right hand position, as shown in Fig. 5, so that the roller 12 is supported by the shallowest portion of the incline o'' which is formed according to the shape of the cop. In this position of the slide r the roller s rests against the roller q in such a manner that the roller p can only touch the cam disk m at the highest or deepest part of the curve (Fig. 4) and the roller n touches the cam disk l in its shallowest part. The cam disk l upon the rotation of the shaft k effects the supporting of the traveler-ring until the roller n is upon its deepest portion. The roller s remains in contact with the conical roller q until the bottom of the cop is completed. The lever i' in consequence of the position of the roller s which presses the roller p away from the cam disk m, moves the belt i on to the big diameter of the conical roller g, so that the traveler-rings upon ascending are driven with a speed which is almost uniform but which in consequence of the conical shape of the roller q is somewhat slackened towards b''. This slackening towards the upper portion of each thread layer must always take place and is provided for in the cam m by the receding portion y''' (Fig. 4), the speed of the traveler-rings decreasing in proportion to the decrease of the diameter. Upon the descent of the traveler ring the belt i is moved somewhat further towards the larger end of the conical pulley g by means of the highest part y of the curve of the cam disk m which here comes into action in order to increase the speed of the traveler ring until towards the end of the descent this additional speed equalizes the pull exercised on the thread by the descending ring. The slide r, in proportion as the diameter of the cop increases, *i. e.* according to the production of the various thread layers v', v'', v''' etc, (Fig. 3) is adjusted in such a manner that the roller 12 rises on the inclined plane o'' of the lever o by which means the traveler ring is gradually conducted into the higher zones through the medium of the chains 10 and 9. The roller s is thereby moved away more and more from the roller q and the roller p in consequence of the conical shape of the roller s approaches nearer and nearer to the cam disk m while the belt i is at the same time pushed on towards the small end of the conical roller g, so that the speed of rotation of the ring is more and more slackened when working in the higher zones. The decrease in the speed of the ring continues until upon the completion of the cop bottom, *i. e.* upon attaining the diameter at z (Fig. 3) when the roller s completely releases the roller q the roller p now comes in contact with the whole of the cam edge of the disk m and the belt i is in its extreme position on the conical pulleys g and h which position is maintained during the further working until the cop is completed *i. e.* until the winding reaches the point z' so that the same speed accelerated upon the ascent and slackened upon the descent is imparted during the whole time to the ring. Fig. 4 shows the development of the curve of the cam disk m, the part $y' y$ corresponding to the rising and $y y''$ to the descent of the traveler ring. The shape of the curve is such that the thread in spite of the varying diameters of the cop is always subjected to the same tension during both the ascent and descent of the traveler ring.

In order to obtain a uniform tension of the thread by varying the speed of the spindle when the speed of the

ring remains the same, the shaft h' of the conical pulley h is driven directly from the engine. It may be intimated that the speed of the traveler ring absolutely is not constant, owing to the up-and down-motion of the pulleys 3 and 4, whereby the rotary speed of the traveler ring is diminished in case the pulleys 3 and 4 rise and is increased, in case these pulleys move downwards. However it must be considered that the actual speed of the traveler ring is so small that the difference of speed has no further importance in winding the cop and practically it deals with a constant rotary speed of the traveler ring. The engine transmits the motion to the conical pulley g by means of the belt i and to the cop spindle a by means of the drum d'. The formation of the cop is effected in the same manner as described above the belt i being moved by the adjustment of the arm i', by which means the cop spindles are driven with a speed varying in such a manner that the thread tension remains the same in all the diameters of the cop. It is clear that in this mode of driving, the belt i upon the increase in diameter of the cop is moved towards the large end of the conical driving pulley h and the speed of the cop spindle is thus increased, while when the diameter of the cop is small the belt i moves towards the small end of the conical pulley h and the speed of rotation of the cop spindle is therefore less, both speeds being almost equal when winding the smaller diameters *i. e.* during the commencement of the formation of the cop bottom.

In order to obtain a uniform thread tension by the simultaneous variation of the speed of rotation of the cop spindle and of the traveler ring, the shaft x is driven from the engine so that the conical pulleys g and h are driven from the belt pulley x' provided with guiding flanges by means of the belt x'' motion being thus imparted to the cop-spindle and the traveler-ring. In this case too the formation of the cop is effected in the same manner as described above, the lever i' moving the belt x'' either to the left or to the right on the conical pulleys g and h so that upon the decrease of speed of the traveler ring the speed of the cop-spindles is increased, this being done in such a manner that when the small diameters are being wound, *i. e.* at the commencement of the formation of the cop bottom the speeds of the ring and of the spindle are almost equal, while these speeds differ from one another to a greater extent when the larger diameters are being wound.

Having thus fully described the nature of my invention, what I desire to secure by Letters Patent of the United States is:—

1. In a ring spinning, winding or doubling machine the combination with a traveler ring, of means comprising a pivoted lever *o*, a conical roller (*s*) carried by said lever and intermittingly moved thereupon, a conical roller (*q*), a lever (*p'*), a roller (*p*) carried by lever (*p'*) and a cam disk (*m y*) acting on the roller (*p*) for the purpose of automatically actuating the traveler ring to form a cop-bottom, a gearing for driving the spindle and connected with means for driving the ring, and automatic means for varying said gearing, so that the speed of the spindle is varied according to the diameter of the cop to be just wound, substantially as set forth.

2. In a ring spinning, winding or doubling machine, a spindle, means for driving the spindle, a traveler ring, a gearing for driving said ring and connected with said means for driving the spindle, of means comprising a pivoted lever *o*, a conical roller (*s*) carried by said lever and intermittingly moved thereupon, a conical roller (*q*), a lever (*p'*), a roller (*p*) carried by lever (*p'*) and a cam disk (*m y*) acting on the roller (*p*) for the purpose of automatically actuating the traveler ring to form a cop bottom, and automatic means for varying said gearing, so that the speed of the ring is varied according to the axial diameter of the cop to be just wound, substantially as set forth.

3. In a ring spinning winding or doubling machine, the combination of a traveler ring, with a spindle, means for driving both the ring and the spindle, means comprising a pivoted lever *o*, a conical roller (*s*) carried by said lever and intermittingly moved thereupon, a conical roller (*q*), a lever (*p'*) a roller (*p*) carried by lever (*p'*) and a cam disk (*m y*) acting on the roller (*p*) for the purpose of automatically actuating the traveler ring to form a cop bottom, automatic means for simultaneously increasing the speed of the ring, and decreasing the speed of the spindle according to the diameter of the cop to be just wound, substantially as described.

4. In a ring spinning, winding or doubling machine, the combination with a traveler ring, of a spindle, means for driving the ring and means for driving the spindle, a gearing connected with each of said means, means comprising a pivoted lever *o*, a conical roller (*s*) carried by said lever and intermittingly moved thereupon, a conical roller (*q*), a lever (*p'*), a roller (*p*) carried by lever (*p'*) and a cam disk (*m y*) acting on the roller (*p*) for the purpose of automatically actuating the traveler ring to form a cop bottom, automatic means for reciprocating the ring axially of the cop, and automatic means for simultaneously varying the speed of said gearing, substantially as described.

5. In a ring spinning, winding or doubling machine, the combination of means for driving the spindle, means for driving the ring, gearing connected with each of said means, automatic means for reciprocating the ring axially of the cop, automatic means for simultaneously varying said gearing and means for limiting for a portion of the operation the action of the last named automatic means, substantially as set forth.

6. In a ring spinning, winding or doubling machine, the combination of means for driving the spindle, means for driving the ring, gearing connected with each of said means, automatic means for reciprocating the ring axially of the cop, automatic means for progressively moving the ring axially of the cop, automatic means for simultaneously varying said gearing and means for limiting, for a portion of the operation, the action of the last named automatic means, substantially as set forth.

7. In a ring spinning, winding or doubling machine, the combination of a ring driving pulley shaft, a conical pulley thereon, a spindle driving pulley shaft, a conical pulley thereon, a belt passing over each of said conical pulleys, a cam shaft, gearing for driving said cam shaft simultaneously with said ring and said spindle driving shafts, an oscillatory belt shifter engaging said belt, a sliding frame carrying said ring, a lever, a chain connecting said slider and said lever, a cam on said cam shaft for oscillating said shifter, and a cam on said cam shaft for depressing said lever against the action of the weight of said sliding frame, substantially as set forth.

8. In a ring spinning, winding or doubling machine, the combination of a ring driving pulley shaft, a conical pulley thereon, a spindle driving pulley shaft, a conical pulley thereon, a belt passing over each of said conical pulleys, a cam shaft, gearing for driving said cam shaft simultaneously with said ring and said spindle driving shafts, an oscillatory belt shifter engaging said belt, a sliding frame carrying said ring, a lever, a chain connecting said sliding frame and said lever, a cam on said cam shaft for oscillating said shifter, a cam on said cam shaft for depressing said lever against the action of the weight of said sliding frame, a sliding block in said lever, a screw for traversing said block, a ratchet for automatically turning said screw, and a conical pulley on said block for temporarily limiting the amplitude of the oscillations of said shifter, substantially as set forth.

9. In a ring spinning, winding or doubling machine, the combination of a ring driving pulley shaft, a conical pulley thereon, a spindle driving pulley shaft, a conical pulley

thereon, a belt passing over each of said conical pulleys, a cam shaft, gearing for driving said cam shaft simultaneously with said ring and said spindle driving shafts, an oscillatory belt shifter engaging said belt, a sliding frame carrying said ring, a lever, a chain connecting said sliding frame and said lever, a cam on said cam shaft for oscillating said shifter, a cam on said cam shaft for depressing said lever against the action of the weight of said sliding frame, a sliding block in said lever, a screw for traversing said block, a ratchet for automatically turning said screw, a conical pulley on said block for temporarily limiting the amplitude of the oscillations of the said shifter, guides carried upon said block, an adjustment pulley for said chain mounted in said guides, and an inclined plane upon said lever engaging the spindle of said adjustment roller, substantially as set forth.

10. In a ring spinning, winding or doubling machine, the combination of a ring driving pulley shaft, a conical pulley thereon, a spindle driving pulley shaft, a conical pulley thereon, an axially movable flanged belt pulley, a belt passing over each of said conical pulleys and over said flanged pulley, a cam shaft, gearing for driving said cam shaft simultaneously with said ring and said spindle driving shafts, an oscillatory belt shifter engaging said belt, a sliding frame carrying said ring, a lever, a chain connecting said sliding frame and said lever, a cam on said cam shaft for oscillating said shifter, a cam on said cam shaft for depressing said lever against the action of the weight of said sliding frame, a sliding block in said lever, a screw for traversing said block, a ratchet for automatically turning said screw, a conical pulley on said block for temporarily limiting the amplitude of the oscillations of the said shifter, guides carried upon said block an adjustment pulley for said chain mounted in said guides, and an inclined plane upon said lever engaging the spindle of said adjustment roller, substantially as set forth.

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

ACHILLE KLEIN.

Witnesses:

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D. SNEER.