(No Model.) 3 Sheets—Sheet 1.

J. D. WHYTE.

YARN WINDING MACHINE.

No. 605,984. Patented June 21, 1898.

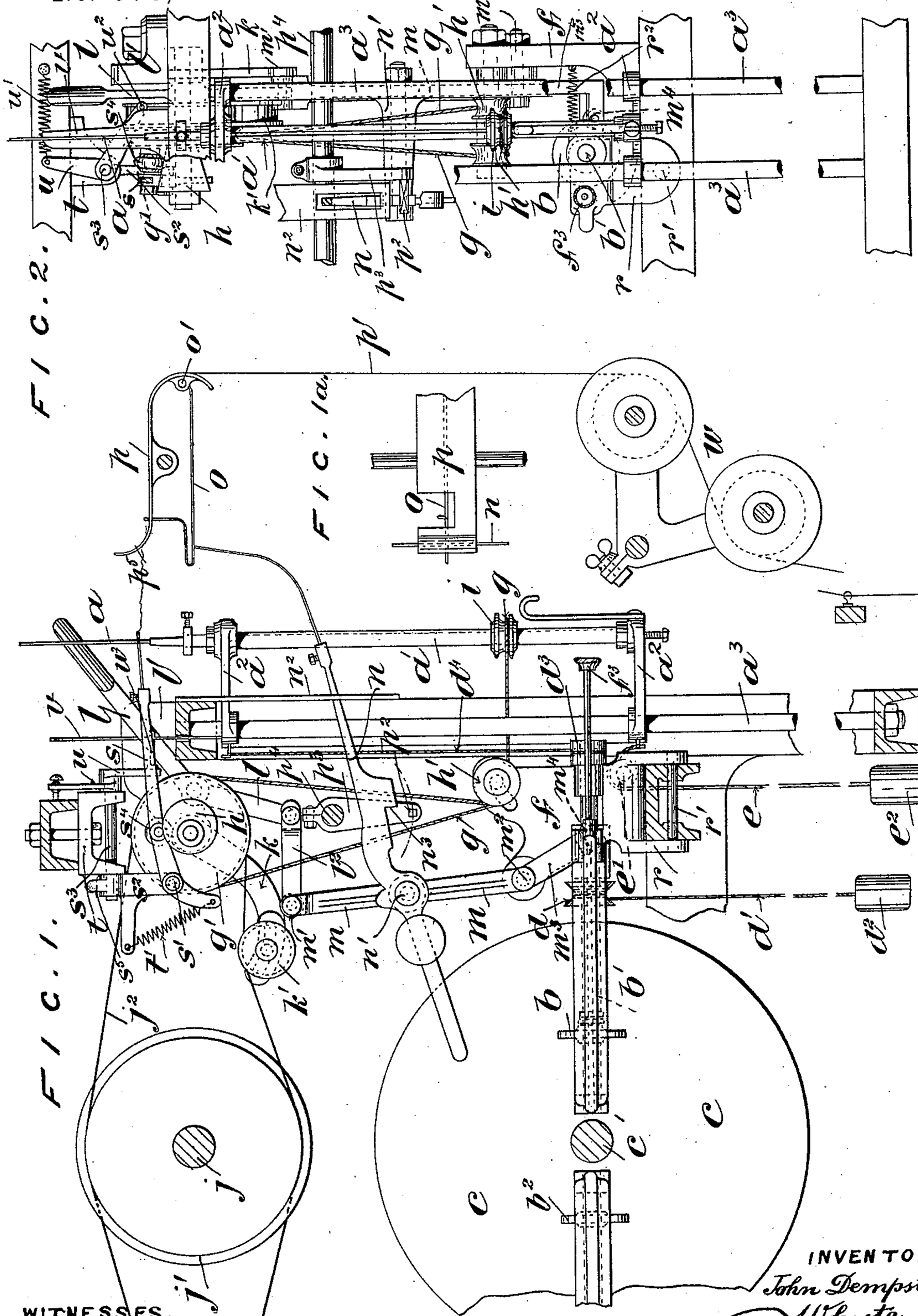

FIG. 2.

FIG. 1a.

FIG. 1.

WITNESSES.

Otto Munk

John F. Townsend

INVENTOR.

John Dempster Whyte

By his Attorneys Richardson & Co

(No Model.)

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YARN WINDING MACHINE.

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FIG. 5.

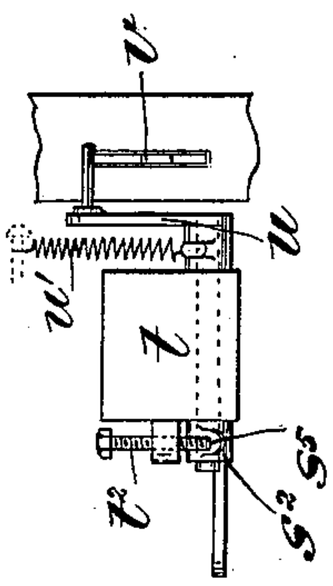


FIG. 7.

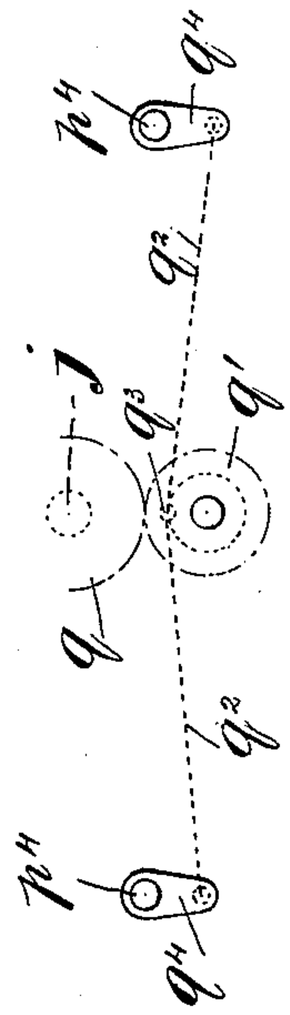


FIG. 9.

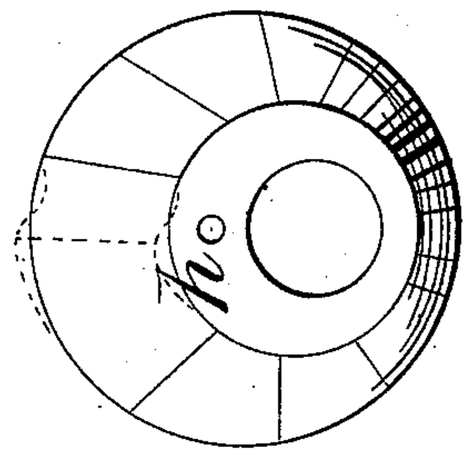


FIG. 8.

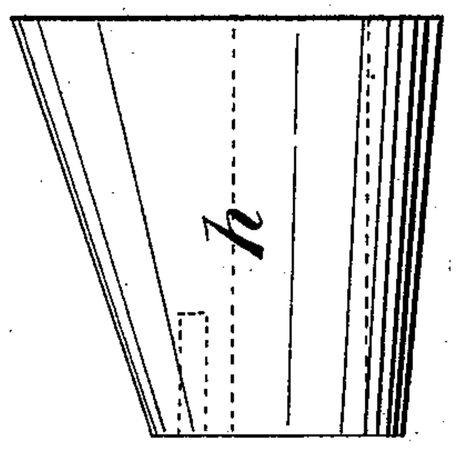


FIG. 3.

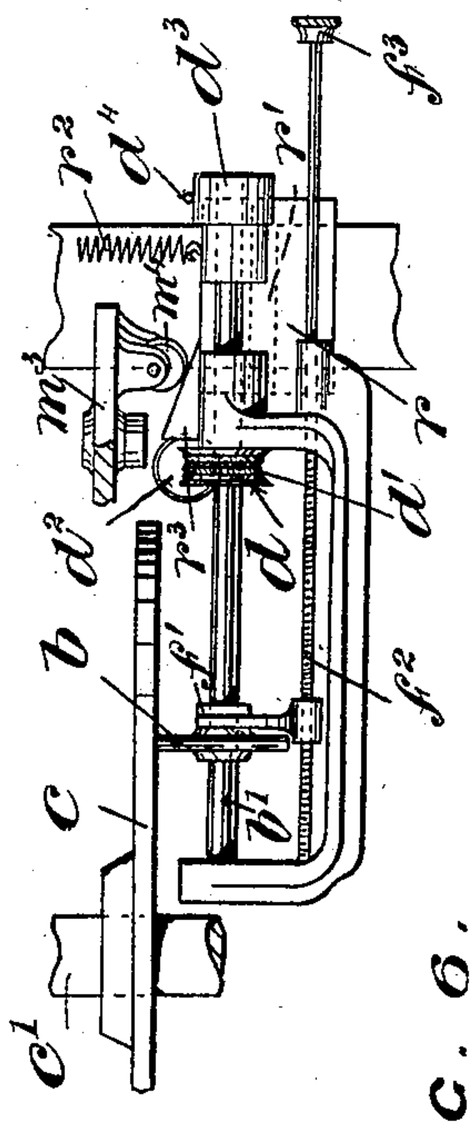


FIG. 4.

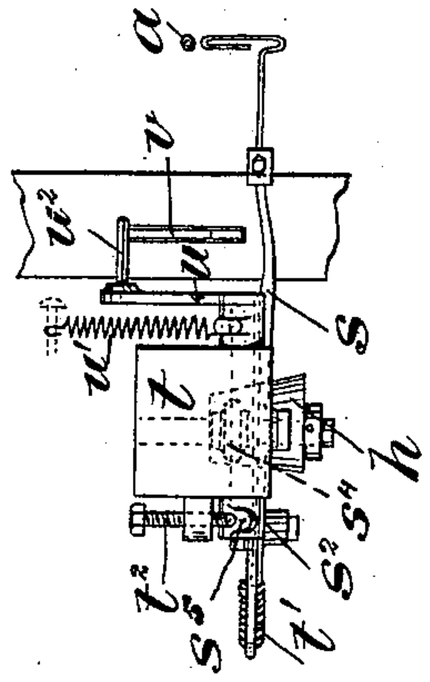
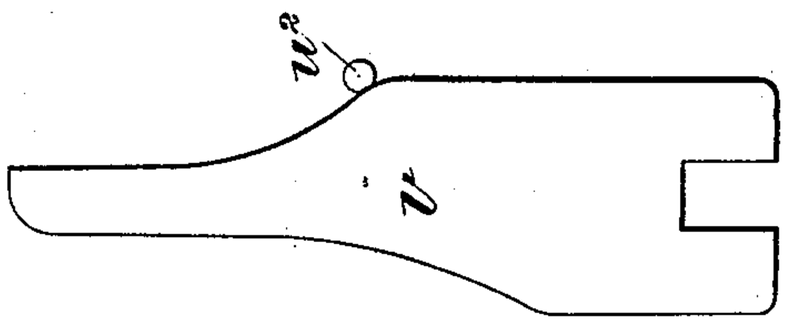


FIG. 6.



WITNESSES.

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John F. Townsend

INVENTOR.

John Dempster Whyte,

By his Attorneys Richards & Co

(No Model.) 3 Sheets—Sheet 3.

J. D. WHYTE.

YARN WINDING MACHINE.

No. 605,984. Patented June 21, 1898.

FIG. 14.

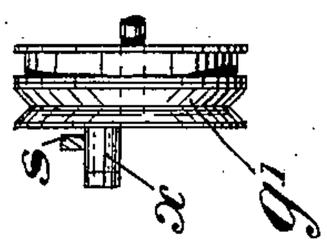


FIG. 16.

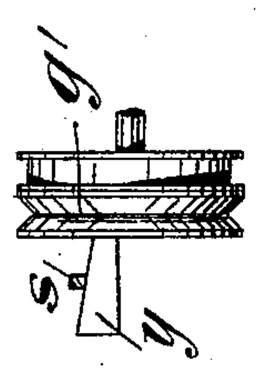


FIG. 13.

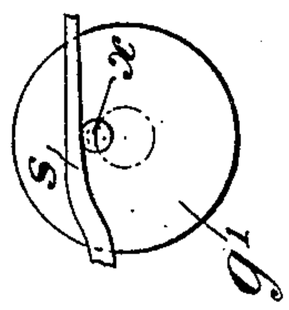


FIG. 15.

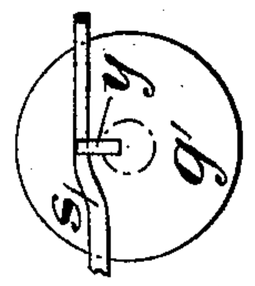


FIG. 11.

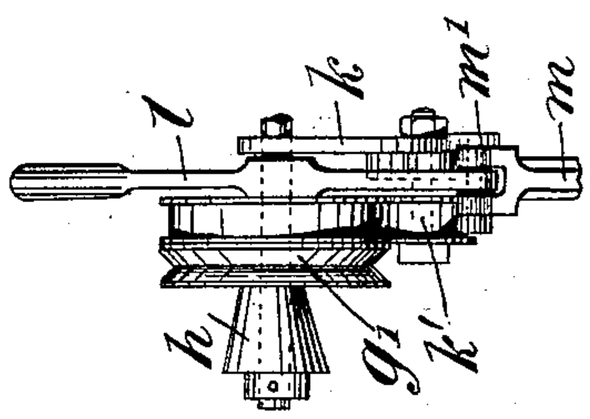


FIG. 12.

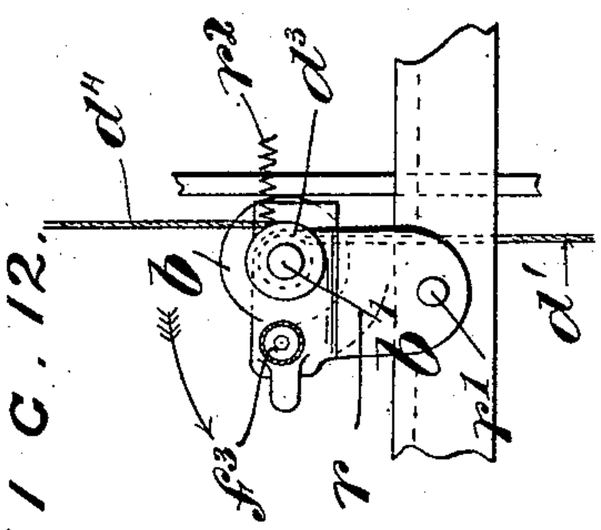
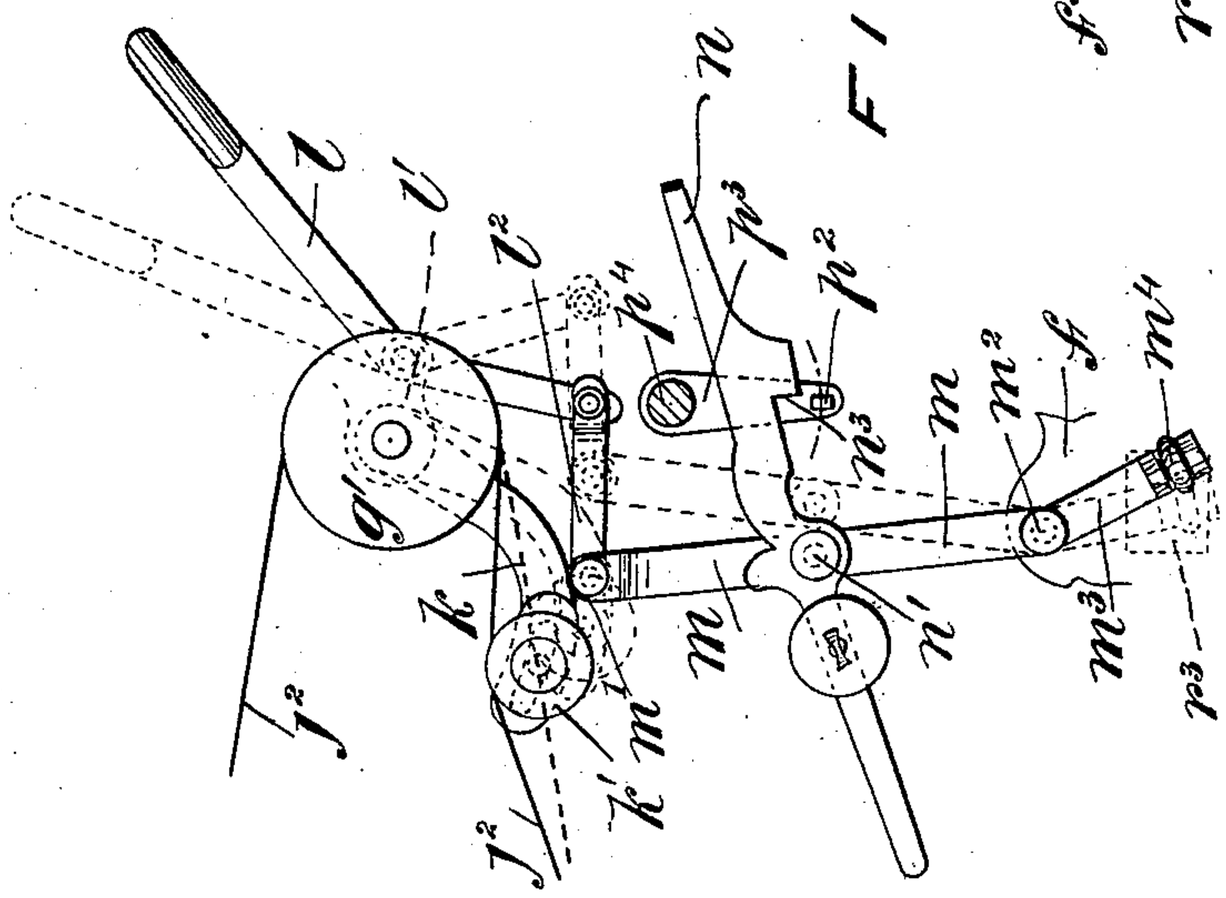


FIG. 10.



WITNESSES.

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John F. Townsend

INVENTOR.

John Dempster Whyte.

By his Attorneys Richards & R

UNITED STATES PATENT OFFICE.

JOHN DEMPSTER WHYTE, OF URMSTON, ENGLAND.

YARN-WINDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 605,984, dated June 21, 1898.

Application filed September 22, 1897. Serial No. 652,580. (No model.) Patented in England October 5, 1896, No. 21,992.

To all whom it may concern:

Be it known that I, JOHN DEMPSTER WHYTE, a subject of the Queen of Great Britain, residing at Urmston, near Manchester, Lancaster county, England, have invented certain new and useful Improvements in Yarn-Winding Machinery, of which the following is a specification, the invention having been patented in England, No. 21,992, October 5, 1896.

My invention relates to improvements in yarn-winding machinery used for cross-winding yarn into cops, as is now well known, and it relates particularly to improvements in an apparatus for which I have obtained Letters Patent in the United States, No. 586,279, of July 13, 1897.

As already stated in my former patent, No. 586,279, of July 13, 1897, under my invention I am enabled to wind successfully upon the bare spindle without the use of the usual guide-cups or substitutes therefor, and also to produce cops for warping or other purposes the contents of which would be ordinarily wound upon bobbins.

According to my present invention the essential features of my former invention are retained; but I have devised various improvements in detail which are adapted to produce a more perfect and effective apparatus. As before, the spindle is carried vertically in a suitable carriage, and the same is lowered as the winding on proceeds. A cone-shaped cam is again employed to operate the yarn-guide, the formation of the cam and the method of operating the yarn-guide therewith enabling me to vary the length of traverse of the yarn-guide. This varying of the traverse of the yarn-guide from a minimum to a maximum traverse at the commencement of the build of the cop enables me to produce cops with a flattened or slightly-rounded bottom. This is particularly useful in the production of large cops for warping or other purposes.

The improvements will be best understood by a detailed description of the annexed three sheets of drawings.

On Sheet 1, Figure 1 is a sectional view of my improved apparatus. Fig. 1^a is a plan view of the curved guiding-plate over which the yarn passes to the yarn-guide. Fig. 2 is a front elevation. On Sheet 2, Fig. 3 is a plan view of the driving-disk and frictional driving-pulley. Fig. 4 is a plan view of the cone-cam and yarn-guide. Fig. 5 is a plan view of the yarn-guide and the bracket carrying the same. Fig. 6 shows the contour of the copping-plate. Fig. 7 is a diagrammatic view showing the method of oscillating the rock-shaft used to effect the stoppage of the apparatus on the breakage of the yarn. Fig. 8 represents a side elevation of the cone-cam. Fig. 9 is an end elevation of the cone-cam. On Sheet 3, Fig. 10 is a detail view showing more clearly the stop-motion for effecting the stoppage of the apparatus on the breakage of the yarn. Fig. 11 is an edge view of a portion of the parts shown in Fig. 10. Fig. 12 is an end view of the pivoted bracket carrying the friction driving-pulley. Fig. 13 indicates a modified method of actuating the yarn-guide. Fig. 14 is an end view of Fig. 13. Fig. 15 is a further-modified method of actuating the yarn-guide. Fig. 16 is an end view of Fig. 15.

In the following description and drawings one spindle and its accompanying parts only are referred to; but it will be understood that a frame may be provided with any convenient number of spindles.

The spindle a is secured to the revolving sheath a', which sheath is adapted to revolve in bearings formed in the sliding supports a^2. The supports a^2 are adapted to slide on rods a^3. A frictional pulley b, driven from the disk c, mounted on the shaft c', which receives a slow motion by suitable reducing-gear, as indicated in my former United States patent, No. 586,279, of July 13, 1897, operates the descent of the spindle as the winding proceeds in the following manner: Upon the shaft b', on which the pulley b is mounted, is a grooved pulley d, to which is secured a cord d', carrying a weight d^2. Upon the end of the shaft b' is mounted a plain pulley d^3, to which is secured one end of a cord d^4, the other end of the cord being attached to the upper support a^2 of the spindle-carriage. To the lower support a^2 of the spindle-carriage is secured another cord e, passing over a pulley e', mounted in bearings in the bracket f. The cord e carries a counterbalance-weight e^2. When the spindle-carriage is in its highest position, as indicated in the drawings, the cord d' is wound to some

extent upon the pulley d. By the revolution of the shaft b' the cord d' is unwound from the pulley d, the cord d^4 being wound upon the plain pulley d^3, thus pulling down the spindle-carriage as the winding of the cop proceeds. The pull of the weight d^2 is counterbalanced by the counterbalance-weight e^2, which exerts a pull upon the spindle-carriage in a direction contrary to that exerted by the weight d^2. The spindle-carriage is thus counterbalanced or held in equilibrium and its downward traverse arrested immediately the friction-pulley b is moved out of contact with the driving-disk c.

The method of adjusting the friction-pulley b upon the shaft b' to vary the speed of downward traverse of the spindle-carriage is clearly shown in the plan view Fig. 3. The pulley b is slidably mounted upon the revolving shaft b' by means of a slip-feather and groove or the like, so that while revolving with the shaft it is capable of being slid along the same. A fork f' engages with the boss of the pulley b, the other end of the fork being formed as a nut engaging with a screw f^2. By operating the screw f^2 by means of the projecting nut f^3 the pulley b may be traversed along the shaft b'.

The spindle a is driven by means of an endless cord g, passing partly around a grooved pulley g', mounted on the spindle of the conical building-cam h, and from thence under two pulleys h', mounted to revolve in bearings in the bracket f, to a sliding wharve i upon the spindle-sheath a'. The wharve is slidably mounted on the spindle-sheath a' by means of a slip-feather and groove, so that while the sheath is driven it is enabled to slide within the boss of the wharve i.

Instead of moving the driving-disk c away from the friction-pulley b on the breakage of the yarn, as in my former invention, I move the pulley b from contact with the driving-disk. This is effected in the following manner: Upon the driving-shaft j I mount a band-pulley j', whereby motion is communicated by means of a band or belt j^2 to the pulley g', mounted on the spindle of the conical cam h. The pulley g' is formed double to accommodate the driving-belt j^2 and the cord g, as plainly shown in edge view in Fig. 11. A pendent lever k, pivoted on the axis of the conical cam h, carries, adjustably secured to it, a pulley k'. When in the position shown in Fig. 1 and in full lines in the detail view Fig. 10, the pulley k' maintains the belt j^2 taut, so as to drive the pulley g' and with it the conical cam h. A double lever l, loosely pivoted to the bracket l', is connected by a link l^2 to a lever m.

The upper end of the lever m carries an antifriction-bowl m', upon which rests the pendent lever k. The lower end of the lever m is loosely pivoted upon a stud m^2, secured to the bracket f, and is formed with an extension m^3, carrying at its lower end a bowl m^4. A drop lever or finger n is mounted to turn upon a pivot n', secured to the lever m. The end of the drop-lever n projects through a slot in the plate n^2, secured to the frame of the apparatus and bears against the under side of the drop-wire o. The end of the drop-lever n is preferably bent at a right angle at the point where it is brought to bear beneath the drop-wire o, as shown in Fig. 1ª. The drop-wire o is pivoted at o' to the bent plate or guide p and is maintained in its raised position (shown in Fig. 1) by means of the yarn p'. On the breakage of the yarn the drop-wire o falls, depressing the drop-lever n and thus bringing an abutment n^3 on the lever n in the path of a stud p^2, carried by a finger p^3, secured to a rock-shaft p^4. The drop-finger n is thus pulled forward, drawing with it the lever m into the position shown in dotted lines in the detail view Fig. 10, thus allowing the pendent lever k to drop and slackening the driving-band j^2, which thus ceases to drive the pulley g' and with it the cone-cam h. The band-pulley j' is made double and is utilized to drive a corresponding pulley g' on the rear side of the frame.

The method of reciprocating the shafts p^4 is indicated in the diagrammatic view Fig. 7. Upon the driving-shaft j is mounted a spur-wheel q, gearing with a spur-pinion q', revolving in suitable bearings. Connecting-rods q^2, mounted loosely on a stud q^3, fixed on the pinion q', are loosely secured to cranks q^4. Consequently the continued revolution of the pinion q' oscillates the cranks q^4, which are secured to the ends of the shafts p^4. The vibrating movement thus imparted to these shafts is communicated to the attached fingers p^3, mounted on the shafts p^4.

The diagram represents the arrangement in duplicate where spindles are mounted at each side of the winding-frame. To stop the revolution of the friction-pulley b simultaneously with the cone-cam h on the breakage of the yarn, I mount the bracket r, carrying the friction-pulley to rock upon a pivot r', as shown most clearly in the detail view Fig. 12. A spring r^2 maintains the pulley b into frictional driving contact with the driving-disk c during the working of the apparatus. I form an incline r^3 upon the bracket r, against which bears the bowl m^4, carried by the extension m^3 of the lever m. This incline and bowl will be most clearly seen in the plan view Fig. 3. When in the position shown in dotted lines in Fig. 10, the bowl m^4 traverses the incline r^3, thus turning the bracket r upon its pivot r' in the direction of the arrow, Fig. 12. The friction-pulley b is thus withdrawn from contact with the driving-disk c, and the downward traverse of the spindle is arrested. The driving-disk may therefore be utilized to actuate two spindle-carriages, one at each side of the apparatus, as indicated in Fig. 1, the pinion b^2 operating the spindle-carriage in the rear. When "piecing up" has been effected, the attendant by pulling down the lever m by means of the handle returns the parts to their nor-

mal positions. The pulley k' on the pendent lever k again tightens the belt j^2, while the spring r^2 returns the pivoted bracket into its working position, thus again bringing the friction-pulley b into driving-contact with the disk c.

The yarn-guide s is pivoted at s' to a finger s^2, secured to a spindle s^3, which can turn freely in a bracket t, bolted to the top rail of the apparatus.

A bowl s^4 upon the yarn-guide s rests upon the cone-cam h and is maintained in contact with the cam by means of a spring t', secured at one end to the yarn-guide and at the other to an extension of the finger s^2, as clearly shown in Fig. 1. As in my former invention, the yarn-guide is arranged to be traversed from the smaller end of the cone-cam h to its larger end, so as to vary the traverse of the yarn-guide from a minimum to a maximum traverse at the commencement of the build of the cop. This is effected in the following manner:

Upon the spindle s^3, to which the finger s^2, carrying the yarn-guide, is secured, I key a bell-crank lever u. The upper end of the bell-crank lever u is connected to a spring u', the tendency of which is to turn the spindle s^3 upon its axis in the bracket t, and thus traverse the bowl s^4 along the conical cam h. This will be more plainly seen from an inspection of Fig. 2. The lower end of the bell-crank lever u is provided with a finger u^2. The upper support a^2 of the spindle-carriage carries a copping-plate v. This copping-plate is shown separately in Fig. 6. At the commencement of the build of the cop, when the parts are in the position shown in Figs. 1 and 2, the finger u^2 rests against the edge of the copping-plate and is maintained in contact therewith by the pull of the spring u'. On the descent of the copping-plate v the finger u^2 follows the contour of the edge of the plate, and the spindle s^3 is thereby gradually turned on its axis, thus traversing the bowl s^4 on the yarn-guide s from the smaller to the larger diameter of the cone-cam h, canting the finger s^2, carrying the yarn-guide s, and increasing the traverse of the yarn-guide. When the maximum traverse has been attained and the cop-bottom formed, a snug s^5 upon the finger s^2 comes in contact with a screwed stop t^2, carried by the bracket t, and is maintained in this position throughout the downward traverse of the spindle-carriage by the pull of the spring u'. Figs. 4 and 5 show the snug s^5 and screwed stop t^2 more clearly, Fig. 4 being a plan view of the parts with the top rail removed, while Fig. 5 is a plan view of the bracket t and the finger s^2, to which the yarn-guide is pivoted. It will be evident that by operating the screwed stop t^2 the traverse of the bowl s^4 upon the yarn-guide s may be regulated so as to vary the maximum traverse of the yarn-guide s. By pivoting the yarn-guide s to the finger s^2, as illustrated in Fig. 1, the requisite length of traverse of the yarn-guide eye may be obtained with a smaller cone-cam h than is the case with the fixed yarn-guide illustrated in my former United States Patent, No. 586,279. Figs. 8 and 9 illustrate, respectively, in side and end views the cone-cam h. The cam is formed with a quick-drop ridge, (shown in in dotted lines,) so as to provide for a rapid descent of the yarn-guide from the nose of the cop at the moment of reversal, so as to prevent an overwound or soft peak to the nose. If considered desirable, however, this drop-ridge may be dispensed with. The yarn passes from the cops (not shown in the drawings) through the tension device w. (See Fig. 1.) The tension device w consists of two barrels covered with felt or the like and fixed to a bracket carried on a rod extending throughout the length of the frame. The bracket is loosely mounted on the rod and secured thereto by a wing-nut. By altering the angle of the bracket the tension on the yarn may be varied. When winding from the hank, the tension device w may be dispensed with. From the tension device w the yarn is led over the curved plate p to the eye of the drop-wire o and from thence through a slot in the plate p to the eye of the yarn-guide s. This is clearly shown in the plan view Fig. 1^a of the plate p. When winding on the base of the cop, the yarn is conducted straight from the eye of the drop-wire o direct to the cop, but when raised to the top of the cop-nose by the yarn-guide s it is directed against the under side of the curved portion p^5 of the plate p, which thus serves to put an increased tension on the yarn as it is being wound upon the thinner portion of the cop-nose.

Modified methods of obtaining the requisite traverse of the yarn-guide are indicated in Figs. 13 to 16, Sheet 3, of the drawings. In Figs. 13 and 14 the pulley g' is provided with an eccentrically-mounted pin x, upon which the yarn-guide s rests and is oscillated by the revolution of the pulley g'. Instead of the pin x an eccentrically-mounted angle-plate y may be employed, as indicated in Figs. 15 and 16. In the example illustrated by Figs. 13 and 14 the length of traverse of the yarn-guide s is not varied; but in Figs. 15 and 16 the yarn-guide may be traversed from the smaller to the larger end of the angle-plate y when forming the cop-bottom, so as to gradually lengthen the traverse of the yarn-guide as the cop-bottom is being formed. Thus the example indicated in Figs. 15 and 16 may be used for the winding of the larger cops, while the modification shown in Figs. 13 and 14 is suitable for the smaller weft-cops for which a flattened bottom is not essential.

In winding yarn upon the bare spindle the cone-shaped cam or its equivalent is driven so as to impart a rapid vibratory movement to the yarn-guide, thus producing cross-wound cops. By reducing the speed of the cam a slow vibratory movement may be given to the yarn-guide, if desired, so that instead of cross-

winding the yarn may be wound in closely-pitched superimposed spiral layers. In the latter case it would be necessary, however, to wind the yarn upon paper tubes or bobbins.

What I claim as my invention is—

1. In combination in a yarn-winding apparatus, a movable frame, a spindle carried thereby, a cord and winding-drum, said cord being connected to the movable frame, a friction-pulley connected to said cord-winding drum, a weight acting to raise the frame and a weight acting in opposition thereto to hold the frame in equilibrium, and the driving-disk for engaging the friction-pulley, substantially as described.

2. In combination with the spindle, the frame carrying the same and movable vertically, a yarn-guide, a swinging support therefor to which said yarn-guide is pivoted, said support comprising the finger s^2, a copping-plate v arranged to reciprocate with the spindle-carrying frame and having connection with the finger s^2 for canting the same, and the device having an inclined surface for giving the yarn-guide different lengths of throw when brought into engagement with different parts thereof by the canting of the finger s^2, substantially as described.

3. In combination, the vertically-movable spindle, the carrier therefor, means for moving the carrier comprising the friction-disk c and the adjustable pulley with connections to the movable frame, the bracket r carrying the friction-pulley adjustably, the pivotal support for said bracket by which the friction-pulley may be swung to and from contact with the friction-disk, means for rotating the spindle comprising the pulleys and belts, the tension device acting on the said belt and means for controlling said tension device and the pivoted bracket of the friction-pulley comprising a drop-lever controlled by the thread, a device for operating the same when in its lowest position and the connections between the said drop-lever and the said tension device and bracket, substantially as described.

4. In combination, the vertically-movable spindle, the carrier therefor, means for moving the carrier comprising the friction-disk c and the adjustable pulley with connections to the movable frame, the bracket r carrying the friction-pulley adjustably, the pivotal support for said bracket by which the friction-pulley may be swung to and from contact with the friction-disk, means for rotating the spindle comprising the pulleys and belt, the tension device acting on the said belt and means for controlling said tension device, and the pivoted bracket of the friction-pulley comprising a drop-lever controlled by the thread, a device for operating the same when in its lowest position and the connections between the said drop-lever and the said tension device and bracket comprising the lever m carrying the drop-lever pivotally, the incline and roller between the lever m and the bracket, the upper end of said lever m engaging the said tension device, substantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

JOHN DEMPSTER WHYTE.

Witnesses:

J. ENTWISLE,

R. IBBERSON.