(No Model.) 3 Sheets—Sheet 1.

J. D. WHYTE.

YARN GUIDE FOR SPINNING MULES.

No. 604,593. Patented May 24, 1898.

FIG. 3.

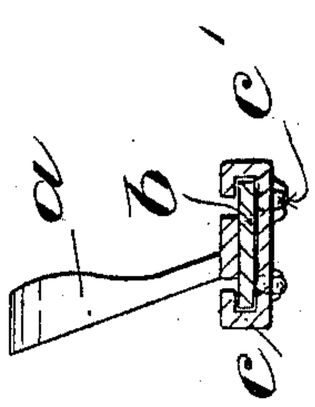


FIG. 4.

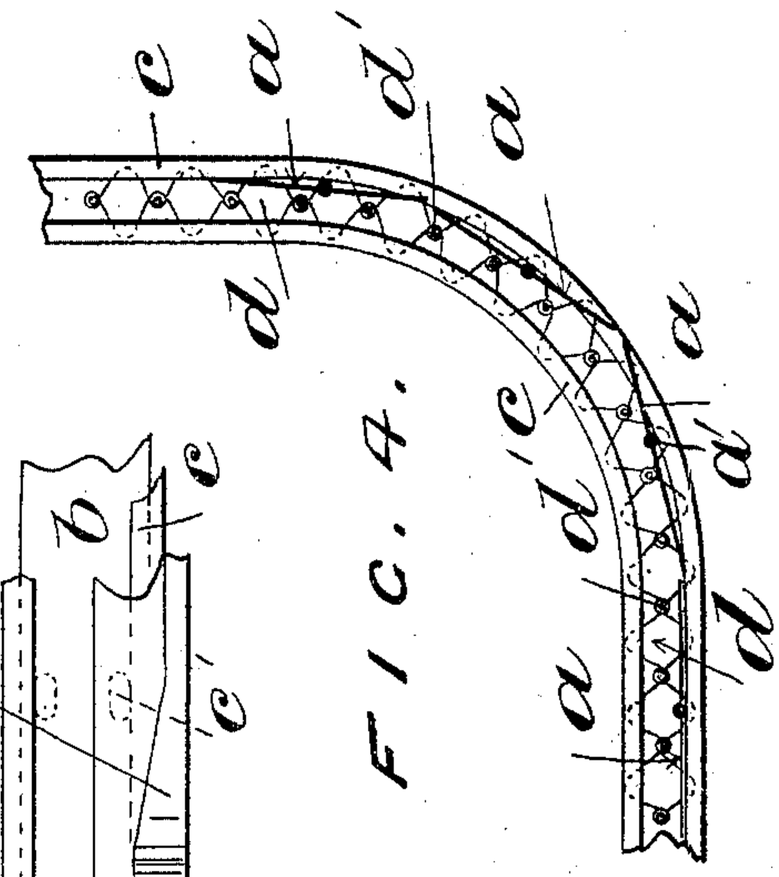


FIG. 1.

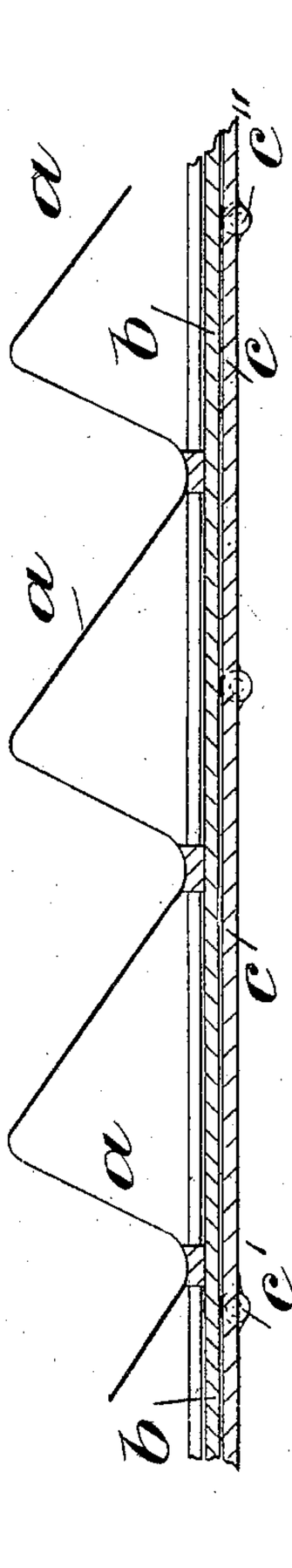
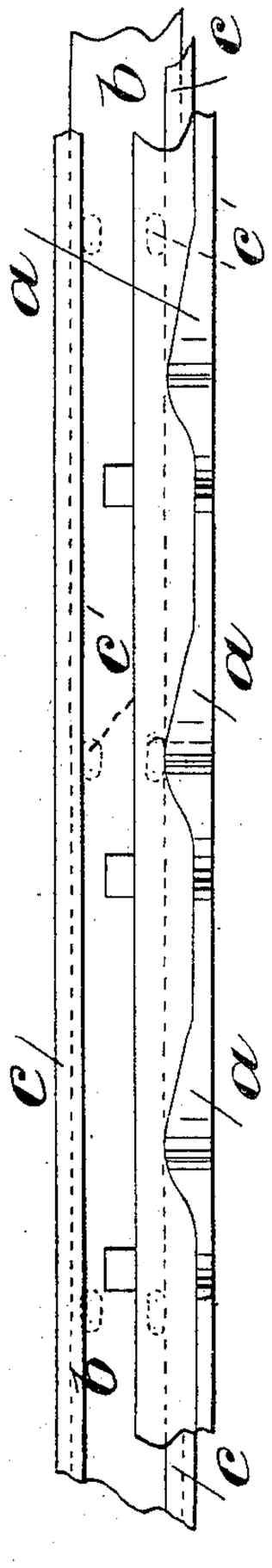


FIG. 2.



WITNESSES.

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(No Model.)

3 Sheets—Sheet 2.

J. D. WHYTE.

YARN GUIDE FOR SPINNING MULES.

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FIG. 4.

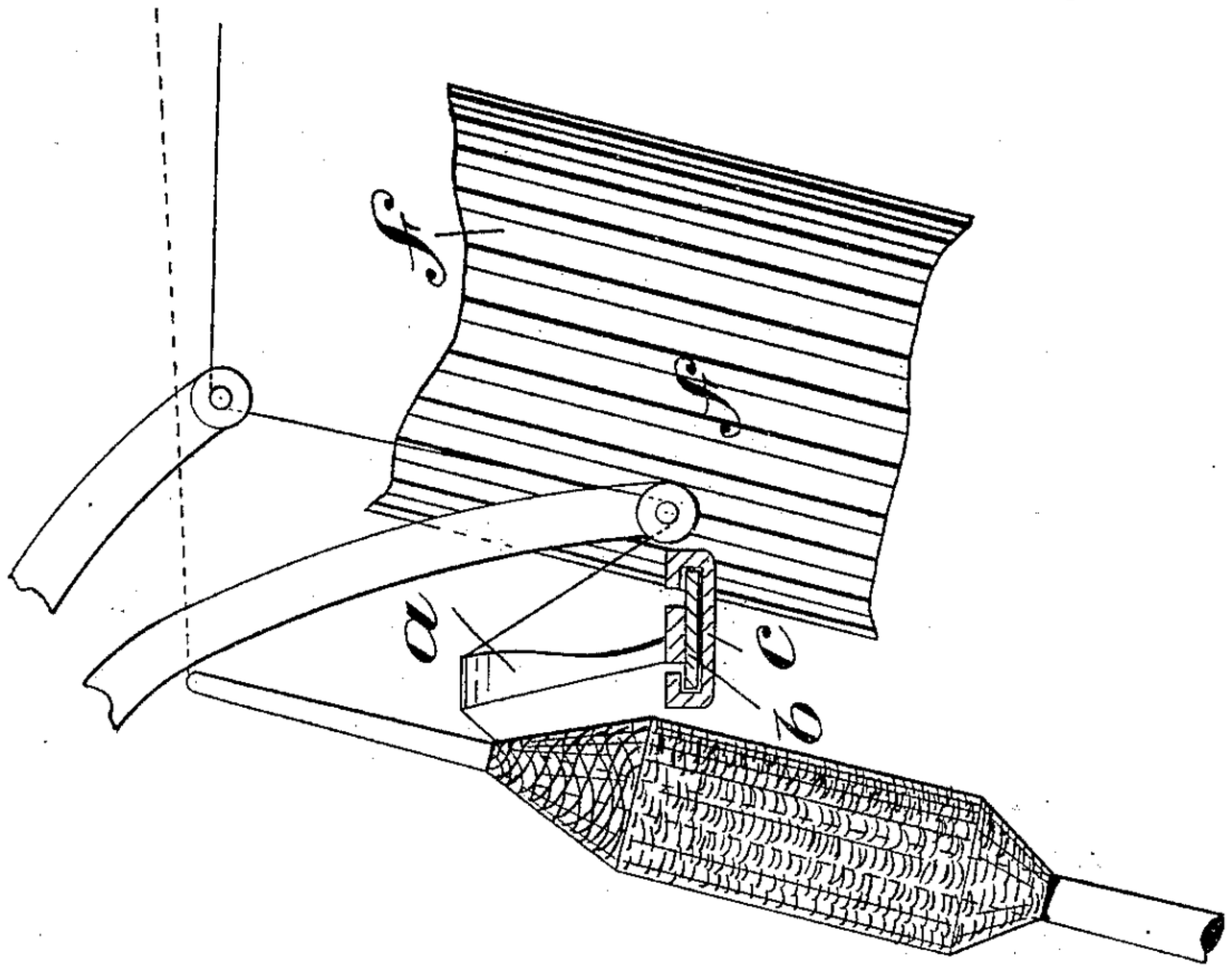


FIG. 5.

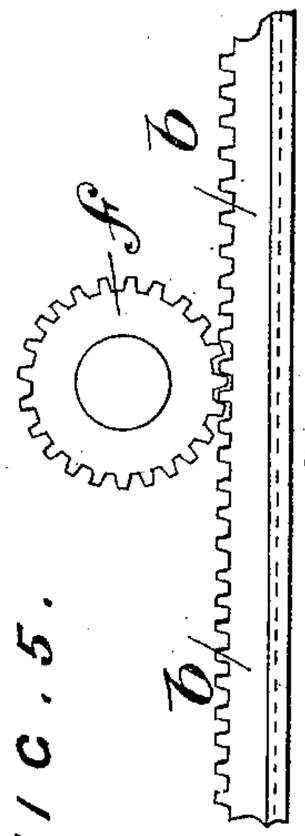
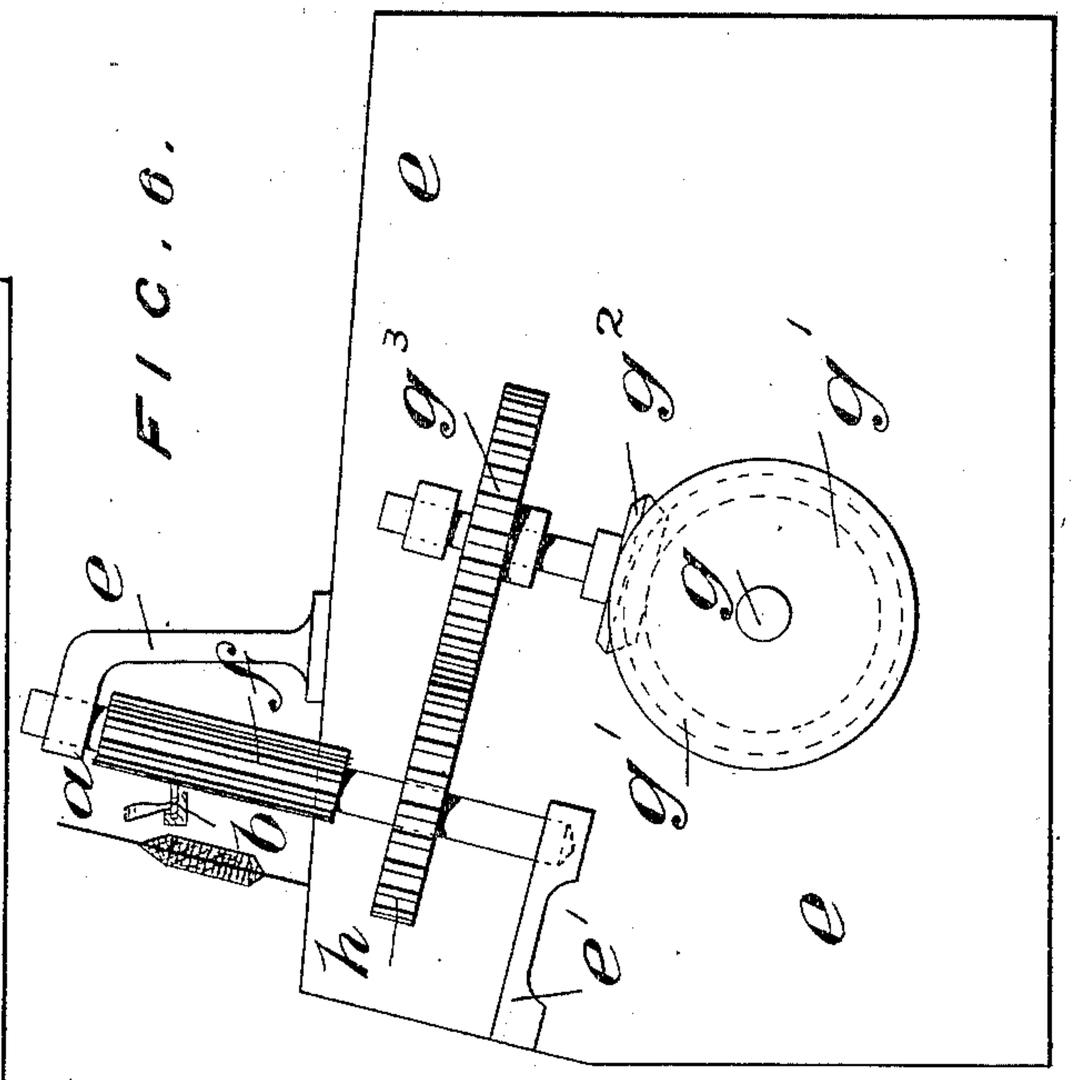


FIG. 6.



WITNESSES.

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3 Sheets—Sheet 3.

J. D. WHYTE.

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FIG. 9.

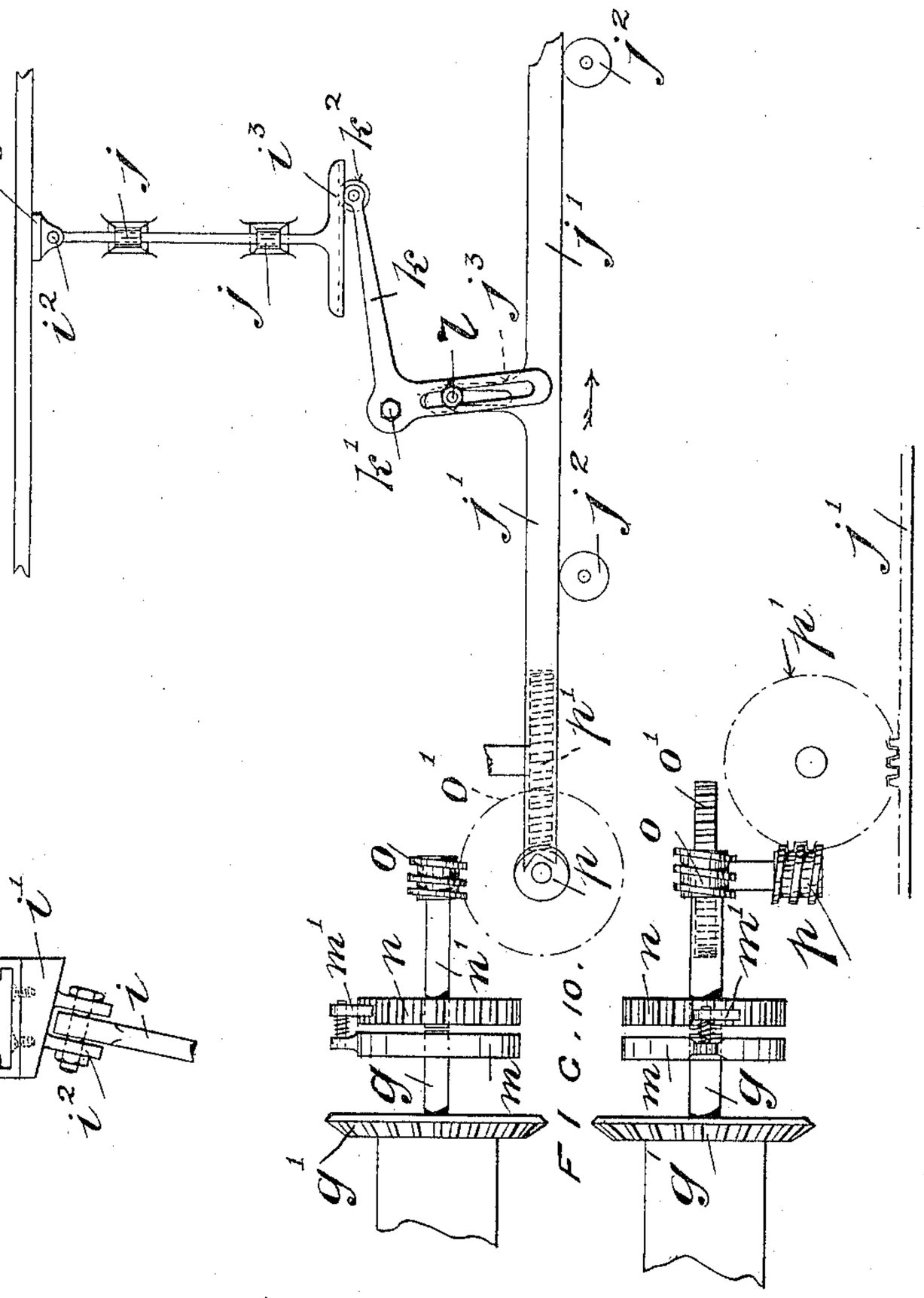
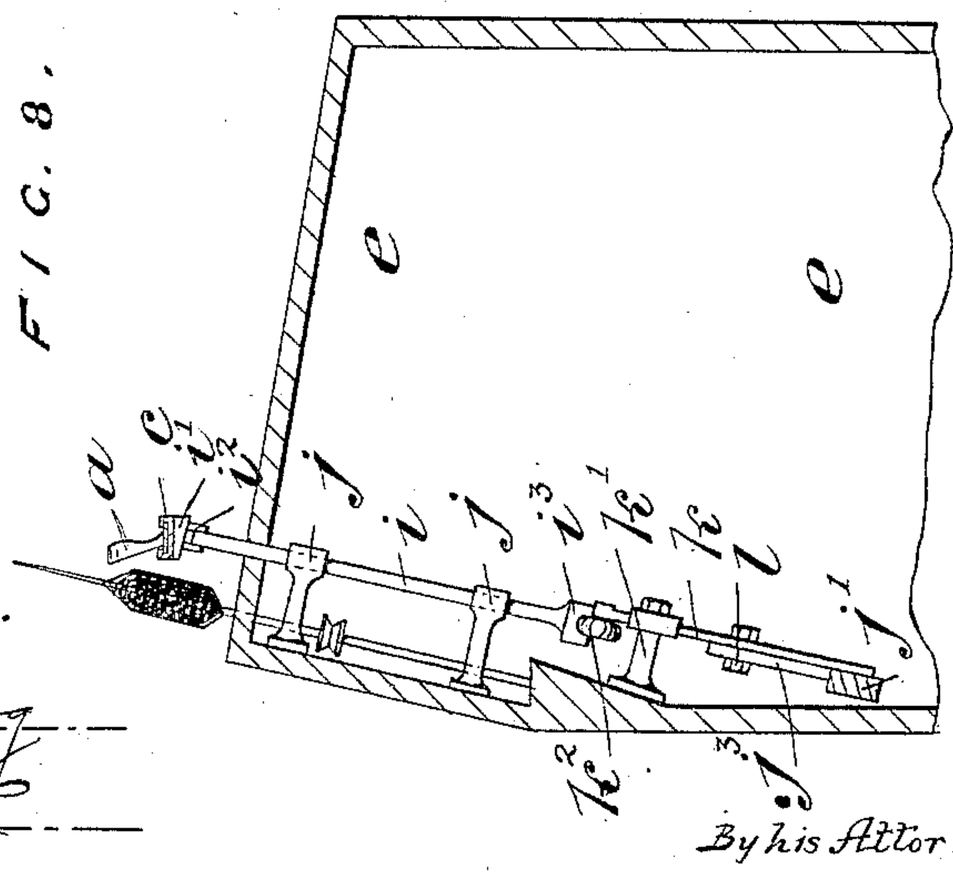


FIG. 11.

FIG. 10.

FIG. 8.



WITNESSES.

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UNITED STATES PATENT OFFICE.

JOHN DEMPSTER WHYTE, OF URMSTON, ENGLAND, ASSIGNOR OF ONE-FOURTH TO HENRY STAFFORD GOLLAND, OF WORSLEY, ENGLAND.

YARN-GUIDE FOR SPINNING-MULES.

SPECIFICATION forming part of Letters Patent No. 604,593, dated May 24, 1898.

Application filed August 27, 1897. Serial No. 649,708. (No model.) Patented in England October 17, 1896, No. 23,069.

To all whom it may concern:

Be it known that I, JOHN DEMPSTER WHYTE, a subject of the Queen of England, and a resident of Urmston, near Manchester, county of Lancaster, England, have invented certain new and useful Improvements in Spinning-Mules, of which the following is a specification, the invention having been patented in England, No. 23,069, October 17, 1896.

My said invention relates to spinning-mules, and refers particularly to an improved device for winding the spun yarn into cops upon the revolving spindles, as is well understood.

Under the present practice when the carriage of the mule has reached the limit of its outward traverse during the "backing off" the winding-faller drops and directs the yarn to the base of the conical top or nose of the cop. The carriage is run in and the spindles are revolved at a variable speed, the maximum speed being attained toward the end of the traverse of the carriage. At the same time the faller-wire is gradually raised, and the yarn is thus wound upon the spindle in closely-pitched spirals. Cops wound in this manner are subject to many disadvantages. The layers of close spirally-wound yarn being directly superimposed upon each other, the slightest accident to the cop or any rough handling results in the cop being "slubbed" or broken, so that it is impossible to unwind the cop. Moreover, in skewering the cop when placing the same in the shuttle it is sometimes "stabbed," thus causing a large proportion of waste.

The object of my invention is to wind the cops in such a manner as to obviate these disadvantages. To effect this, instead of winding the cop in a series of successively-superimposed spirals, as usual, I cross-wind the yarn, and so succeed in obtaining a cop much more coherent and less liable to be broken than heretofore.

In carrying my invention into effect I vibrate or rapidly raise and lower the yarn in the space between the winding-faller wire and the spindle during the run in of the carriage. The yarn is thus caused to mount rapidly from the base of the cop-nose to the apex and to descend from thence to the base. The yarn being thus rapidly raised and lowered upon the revolving spindle instead of being wound upon the spindle in closely-pitched spirals, as heretofore, is cross-wound in widely-pitched spirals of yarn. To effect this rapid vibration of the yarn, I employ a number of double inclines disposed below the yarn and traversed between the spindles and the winding-faller wires at right angles to the yarn. By the traversing of this series of double inclines the yarn is rapidly raised and lowered during the run in of the carriage.

In order that my invention may be more fully understood, I will now describe the same with reference to the accompanying three sheets of drawings.

On Sheet 1 Figure 1 represents a sectional elevation of a portion of the series of double inclines. Fig. 2 is a plan of Fig. 1. Fig. 3 is a cross-section. Fig. 4 represents a method of running the inclines around the ends of the mule. On Sheet 2 Fig. 5 indicates the method of traversing the double inclines. Fig. 6 shows the means of driving or traversing the double inclines. Figs. 4 and 6 are drawn to a scale of about one-half that of Figs. 1 to 3. Fig. 7 shows the relative position of the inclines to the spindle and the winder and counter-faller wires. On Sheet 3 Figs. 8 to 10 indicate the means whereby the series of double inclines are raised as the winding of the cop proceeds, being respectively end elevation, front elevation, and plan. Fig. 11 is a detail view.

Referring in the first place to Figs. 1 to 3, these figures indicate the contour of the double inclines and the method of carrying the same. The double inclines *a* may be pressed, stamped, or cast from sheet metal or any other convenient material formed with a smooth surface, so as to offer as little frictional resistance to the passage of the yarn as possible. They extend along the full length of the mule and to some extent around the ends thereof. The double inclines *a* may be made singly or in sections and are mounted upon a rigid bar or carrier *b* by brazing or other convenient means, so as to present no obstruction to the free passage of the yarn over their surfaces.

The carrier *b* is adapted to be freely traversed upon a slide *c*, formed with turned-over

edges to embrace the edges of the carrier *b*. In order to provide for the free running of the incline-carrier *b*, the slide *c* may be formed with antifriction-bowls *c'*, as shown, upon which the incline-carrier *b* bears. If considered advisable, however, the carrier *b* may be provided with the antifriction-bowls instead of the slide.

The double inclines are set at an angle upon the carrier, as indicated in Figs. 3 and 7, so as to conform to the angle of the cop-nose.

It will be evident that as the double inclines are traversed along the full length of the mule the series of double inclines must be made of greater length than the length of the mule, so as to act equally upon all the yarns. In cases where space is no object the inclines upon the carrier may project beyond the ends of the mule, and in this case the carrier *b* may be rigid throughout its length. Where, however, space is a consideration, the carrier *b* is formed flexible at each end for a certain portion of its length. The slide *c* is then curved at each end around the ends of the mule, and the flexible portion of the carrier *b* is traversed in the curved portion of the slide. It will be noted from an inspection of Fig. 4 of the drawings that this flexible portion is formed from a number of links *d*, loosely pivoted together at *d'*. The double inclines (represented by the thick lines in plan view in Fig. 4) are detached from each other and are each firmly secured at *a'* to one of these links and are thus carried around the ends of the mule.

When drawn out into the straight portion of the slide *c*, the inclines *a* adjust themselves into line with those secured to the rigid portion of the carrier.

The method of traversing the incline-carrier *b* across the length of the mule is indicated in Figs. 5 and 6.

Upon the inner end of one of the carriages *e* and near the head-stock of the mule I mount a pinion *f*, capable of revolving in suitable bearings formed in brackets *e'*, secured in any convenient situation to the carriage *e*.

Upon the axis *g* of the winding-drum from which the tin roller is driven during the inward run of the carriage I mount a bevel-wheel *g'*. The bevel-wheel *g'* gears with a bevel-wheel g^2, upon the axis of which is mounted a spur-wheel g^3. The spur-wheel g^3 gears with another spur-wheel *h*, mounted upon the spindle carrying the pinion *f*.

As the carriage is run out and in during the operations of spinning and winding, the drum upon the axis *g* is revolved first in one direction and then the other, as is well known. This therefore causes the pinion *f*, through the interposed gearing, to be also revolved in alternate directions.

The incline-carrier *b* is formed with rack-teeth for a portion of its length. These rack-teeth gear with the pinion *f*, as indicated in Fig. 5. To permit of this, one side of the slide *c* is cut away for some distance. It will be noted that as the pinion *f* is mounted at the inner end of one of the carriages of the mule near the head-stock it will in no way interfere with the faller and wires. As the carriage of the mule is run out and in the revolution of the pinion *f* in alternate directions effects the traverse first in one direction and then the other of the incline-carrier *b*. In addition, however, to this alternate traverse of the incline-carrier *b* it is essential that as the building of the cop proceeds the inclines *a* must be gradually raised until the cop is completed. Figs. 8 to 10 illustrate the method of effecting this.

The slide *c*, within which the incline-carrier *b* is traversed, is supported at suitable intervals in its length by rods *i*. Brackets *i'* are secured to the under side of the slide *c*. The brackets *i'* are formed with jaws i^2, within which are bolted the upper ends of the rods *i*, as clearly indicated in the detail view, Fig. 9. The rods *i* are adapted to slide freely in brackets *j*, secured to the carriage *e*, and are formed at their lower ends with feet i^3. The rods *i*, supporting the slide *c*, are canted to the same angle as the spindles. A rail *j'*, sliding in suitable bearings secured to the carriage *e* and running upon the antifriction-bowls j^2, is formed with extensions j^3. A bell-crank lever *k*, rocking freely upon a fixed stud *k'*, secured to the carriage *e*, carries at one end a bowl k^2, working within a groove formed in the under side of the foot i^3 of the rod *i*. A stud *l*, adjustably secured in a slot of the extension j^3 of the rail *j'*, engages with a slot in the other arm of the bell-crank lever *k*. It will be evident that if the rail *j* be traversed in the direction of the arrow the bell-crank lever *k* will be turned upon its fulcrum and the rod *i* raised, carrying with it the slide *c*. It will be understood that each of the supporting-rods *i* are correspondingly supported and actuated by similar bell-crank levers. The rail *j'* is actuated as follows: The shaft *g*, from which the traversing of the slide-carrier *b* is obtained, is again utilized. Upon the end of this shaft is mounted a plain disk *m*, carrying a spring-pawl *m'*. The pawl *m'* gears with a ratchet-wheel *n*, mounted upon a short shaft *n'*, carried in bearings secured to the carriage *e*. Upon the shaft *n'* I mount a worm *o*, gearing with a worm-wheel *o'*. The axis of this worm-wheel *o'* also carries a worm *p*, which gears with a worm-wheel *p'*. The worm-wheel *p'* gears with suitably-formed teeth upon the rail *j'*. During the run in of the carriage the revolution of the shaft *g* revolves the worm *o* by means of the ratchet and pawl, and the slight necessary raising of the slide *c* by the traversing of the rail *j'* is effected. On the outward run of the carriage and consequent reverse revolution of the shaft *g* during the spinning of the yarn the pawl *m'* simply slips over the teeth of the ratchet-wheel, and the worm-gearing is unaffected. The amount of traverse of the rail *j'* during the building of

the cops must be slight, and the worm-gearing to effect this is proportioned accordingly with respect to the speed of revolution of the shaft *g*. Suppose, for instance, the distance from the stud *l* to the stud *k'* and from the stud *k'* to the bowl k^2 on the bell-crank lever *k* is as one to four and the lift of the slide *c* is to be four inches. The path through which the rail *j'* must traverse the stud *l* would be one inch only. The stud *l* is made adjustable within the slot of the extension j^3 to provide for the different counts of yarn being spun. For instance, when spinning 40 yarn the stud *l* would have to be lowered sufficiently to cause the rail *j'* to be traversed about twice the distance in order to raise the supporting-rods *i* the requisite height than would be necessary with 20 yarn to produce cops of equal diameter. The rail *j'* may then be moved back to the starting-point, thus lowering the slide *c* to its normal position for the commencement of the build of the cops.

I will now describe the working of my invention during the building of the cops. At the commencement of the winding of the yarn upon the spindle the slide *c* is in its lowest position, so that the yarn is directed by the winding-faller wire to the point upon the spindle at which the winding commences. The yarn then lies on the inclines. On the run in of the carriage the series of inclines *a* is traversed by the pinion *f* along the length of the mule in the direction of the arrow, Fig. 1. The passage of the series of inclines *a* causes the yarn to follow the contour of the double inclines, and thus a rapid vibratory motion is imparted to the yarn, causing the same to be cross-wound upon the spindle in widely-pitched spirals.

From an inspection of Fig. 1 it will be noted that the yarn on its way to the spindle slides up the less-inclined side of the inclines and descends the more abrupt side. This provides for a gradual spiral ascent of the yarn to the nose of the cop and an abrupt descent to the base, which will produce a more firmly-wound cop.

It is to be understood that I do not confine myself to the exact size or angle of the double inclines, although I have shown what I consider to be most suitable. Upon the run out of the carriage the incline-carrier *b* is returned by the reverse rotation of the pinion *f* to its normal position.

The present practice of imparting the maximum velocity to the spindles when the winding of the yarn begins on the bare spindle and the gradual decreasing of that velocity until the cop-bottom is formed is retained under my invention. It must be understood, however, that the gradual raising of the winding-faller wire from the base of the cop-nose to the apex during the run in of the carriage is dispensed with; but the copping-rail may be used with such an incline only as will raise the faller-wire a distance corresponding to the raising of the inclines which is effected during the run in of the carriage, as already described, and indicated in Sheet 2 of the drawings. Except in this respect the movements of the fallers remain as at present.

An inspection of Fig. 7, Sheet 1 of the drawings, will show the relative position of the double inclines and the spindle and faller-wires. In this view the yarn is shown upon the top of the double incline.

It may be found necessary in practice to slightly increase the space between the winding-faller wire and the spindle to provide for the interposition of the inclines *a*.

Under the present practice, as the yarn is gradually wound from the base to the apex of the cop-nose the speed of revolution of the spindles is correspondingly increased. This variable motion of the spindles is dispensed with under my invention and the spindles are revolved at a uniform speed relatively to the speed of the run in of the carriage. It will be noted from an inspection of Fig. 3 of the drawings that the apex of the double incline *a* is formed of greater width than the base. This has the effect of taking up slack yarn as it is wound upon the thinnest portion of the cop-nose. In order to preserve the same relative distance of the inclines from the cop-nose, I cant the inclines *a* upon the carrier *b*, as indicated in Figs. 3 and 7.

As my invention consists, essentially, in the production of cross-wound cops in a mule by vibrating the yarn as it is being wound upon the spindle by means of double inclines or their equivalents traversed along the length of the mule, it must be understood that I do not confine myself to the exact method described for effecting the traversing and raising of the incline-carrier *b*, as these means might easily be varied by any experienced machinist.

Cops wound according to my invention may, if desired, be placed directly in the shuttle without the use of a skewer, and may be unwound either from the exterior or interior. They are not liable to be "slubbed" and can be utilized with little or no waste.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In combination in a spinning-mule, the spindle for the bobbin, the winding-faller wire and means between the winding-faller wire and the spindle engaging the yarn with means for giving the same a vibrating motion to produce cross-winding, substantially as described.

2. In combination in a spinning-mule, the spindle for the bobbin, the winding-faller, and a double incline between the winding-faller and the spindle with means for traversing the said incline across the path of the yarn whereby said yarn will be raised and lowered to produce cross-winding, substantially as described.

3. In combination, the spindle, the wind-

ing-faller and a series of double inclines between the spindle and winding-faller with means for traversing the double inclines across the path of the yarn and in contact therewith to produce cross-winding, substantially as described.

4. In combination, the spindle, the winding-faller, the device between the faller and the spindle with means for moving the same across the path of the yarn and in contact therewith, said device comprising inclines and means for moving the device up and down, substantially as described.

5. In combination, the spindle, the winding-faller, the double inclines between the winding-faller and the spindle, means for traversing said inclines, the reciprocating carrier for the inclines, the slideway in which the carrier moves and means for reciprocating said carrier, substantially as described.

6. In combination, the spindle, the winding-faller, the double inclines between the same and the spindle, the carrier *b* for said inclines having gear-teeth thereon, and the pinion *f* for moving the carrier, means for actuating said pinion *f*, substantially as described.

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

JOHN DEMPSTER WHYTE.

Witnesses:
JOSHUA ENTWISLE,
RICHARD IBBERSON.