No. 652,203.

Patented June 19, 1900.

J. D. WHYTE.

SPINNING MULE.

(Application filed July 10, 1899.)

(No Model.)

6 Sheets—Sheet 1.

FIG. 10.

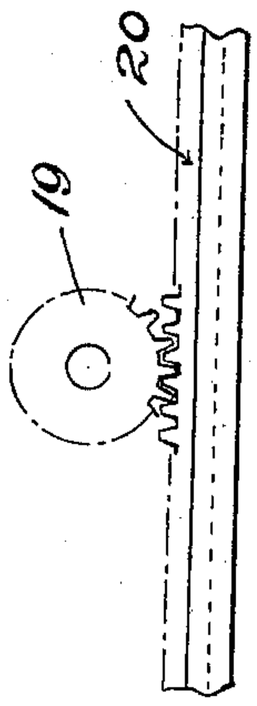

FIG. 1.

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FIG. 2.

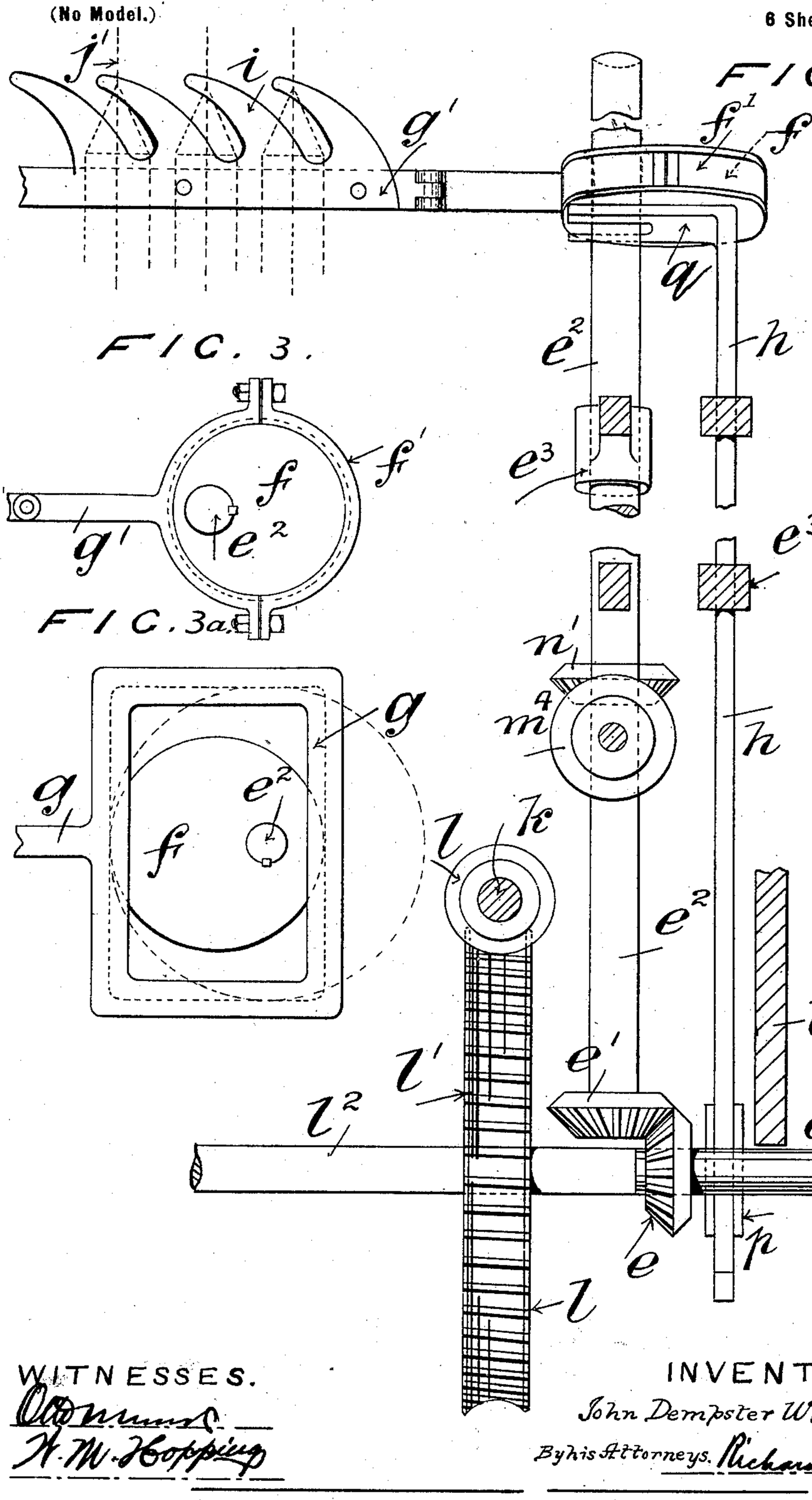

FIG. 3.

FIG. 3a.

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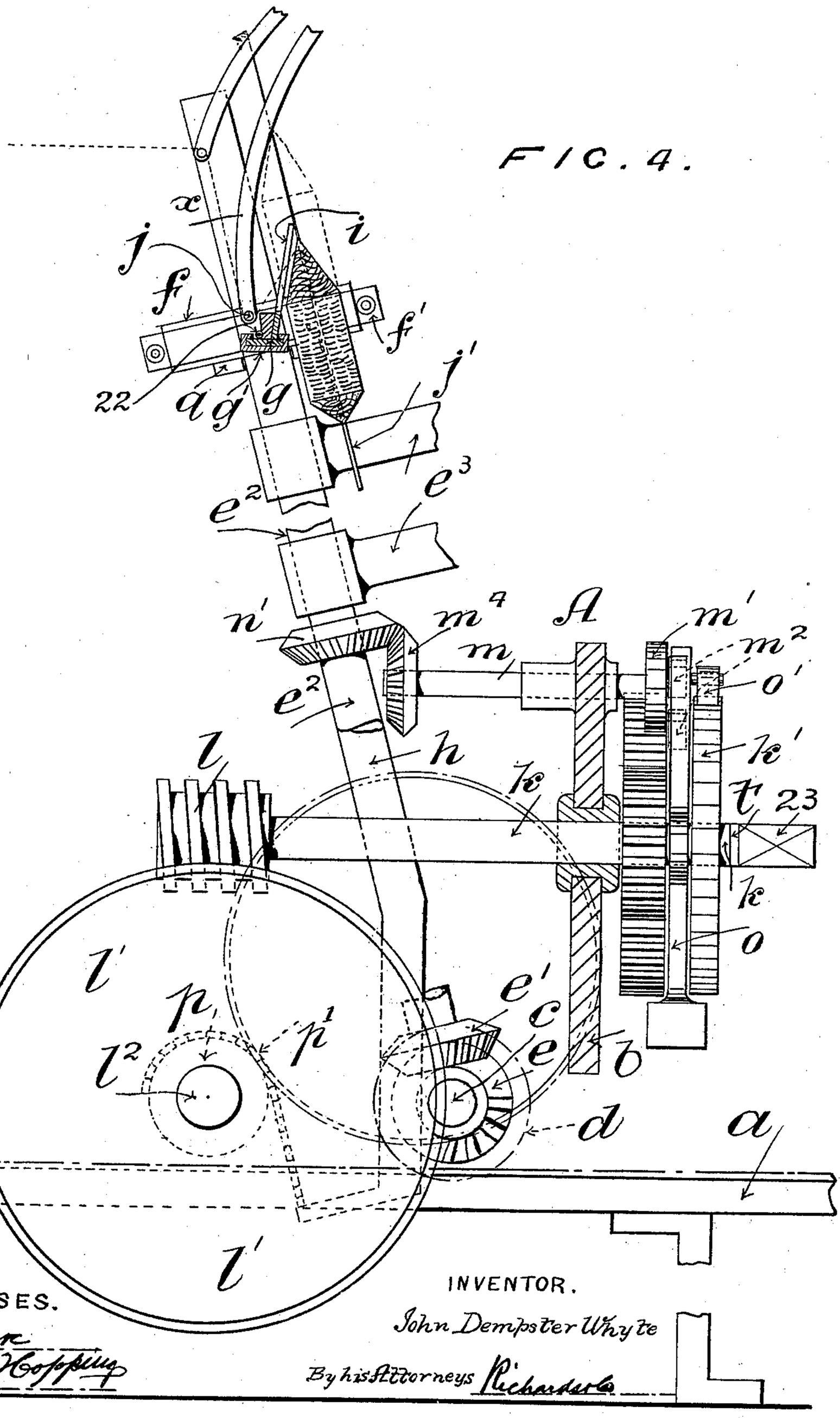
FIG. 4.



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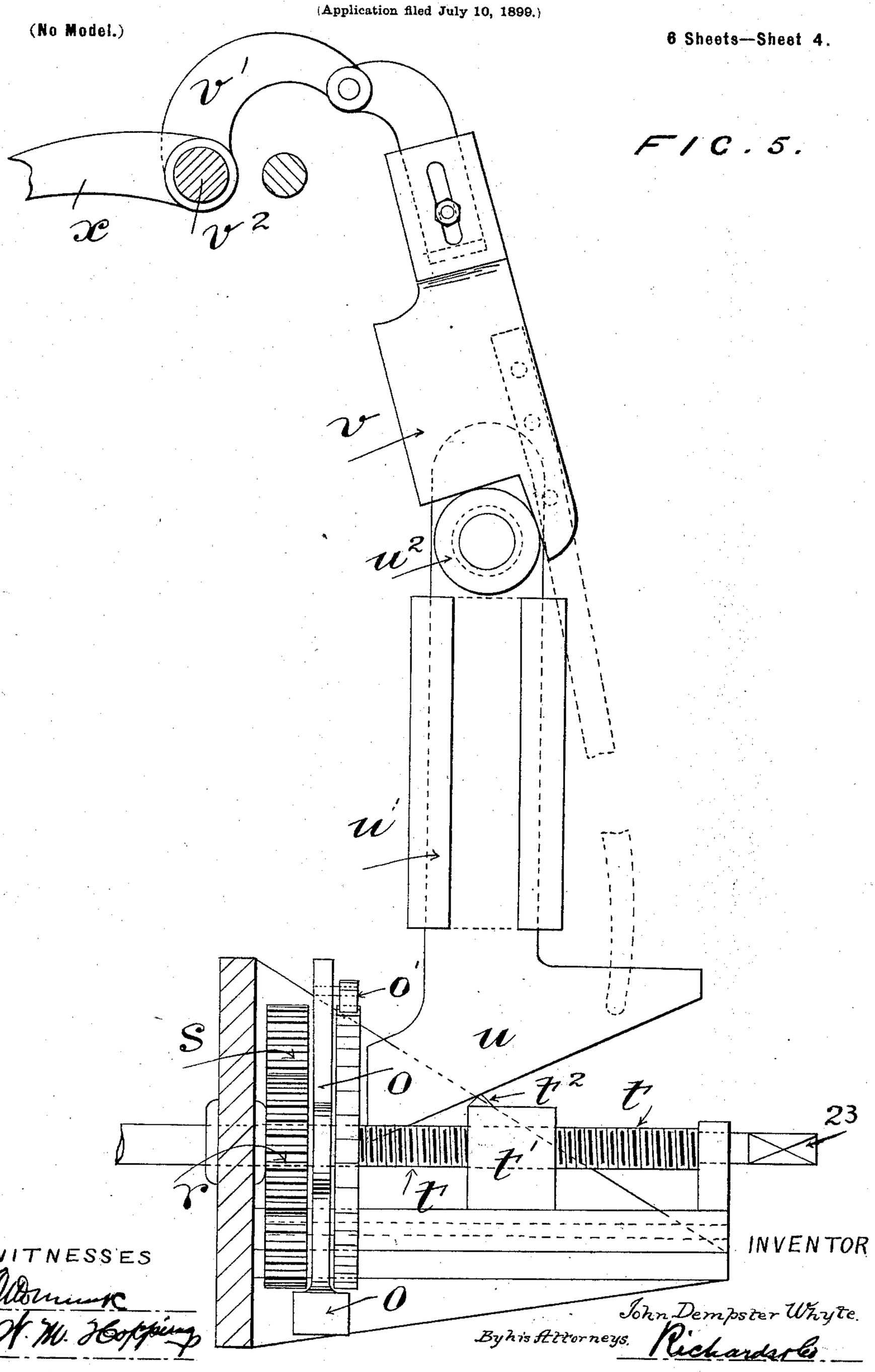
(No Model.)

6 Sheets—Sheet 4.

FIG. 5.



WITNESSES

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No. 652,203. Patented June 19, 1900.

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(No Model.) 6 Sheets—Sheet 5.

FIG. 6.

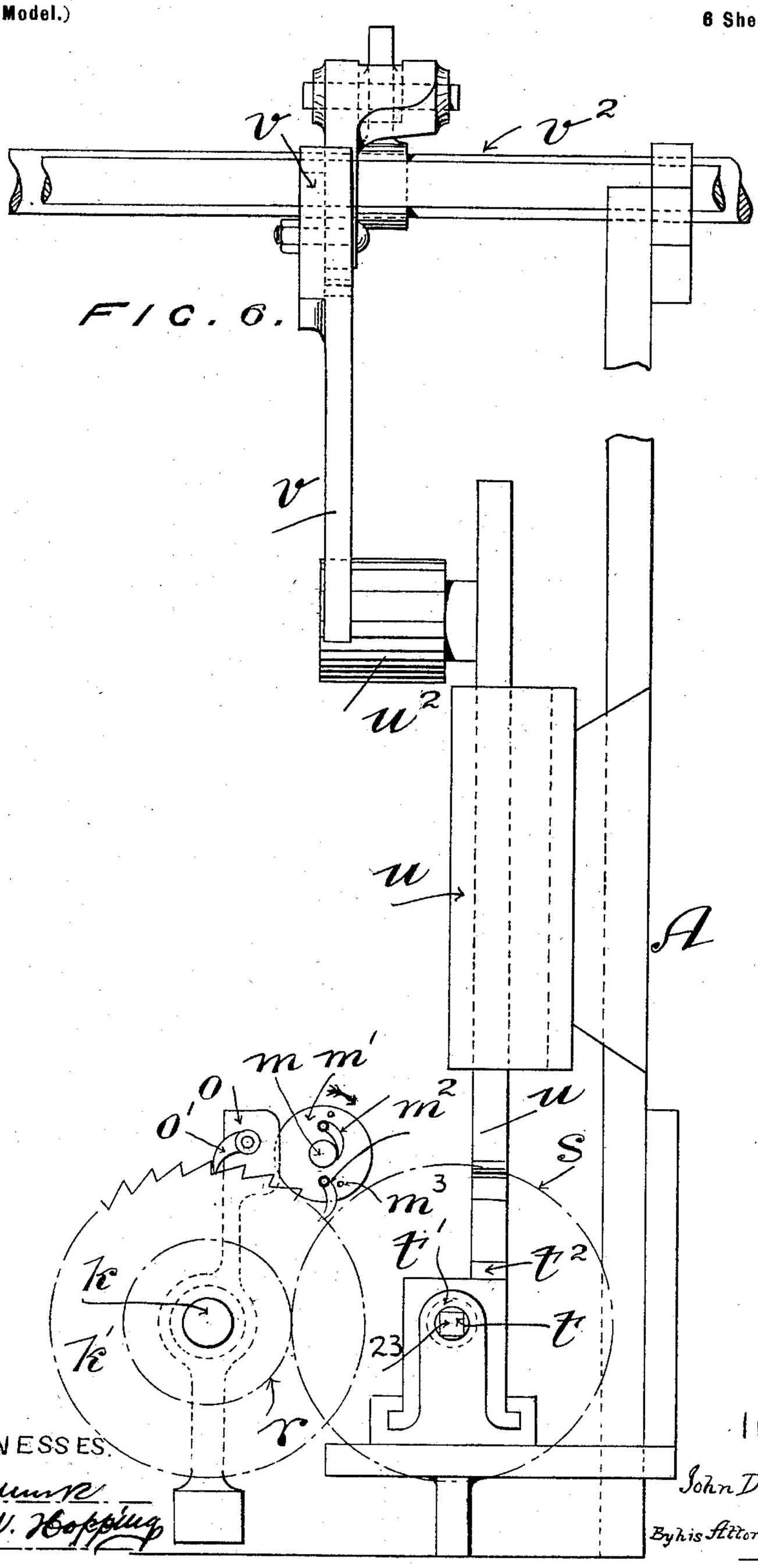
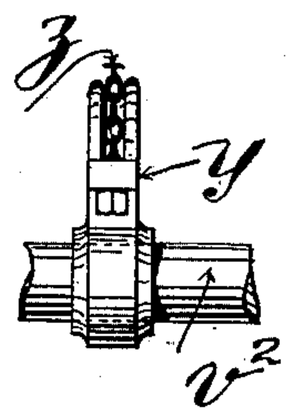


FIG. 6a.



WITNESSES.

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(No Model.) 6 Sheets—Sheet 6.

FIG. 8.

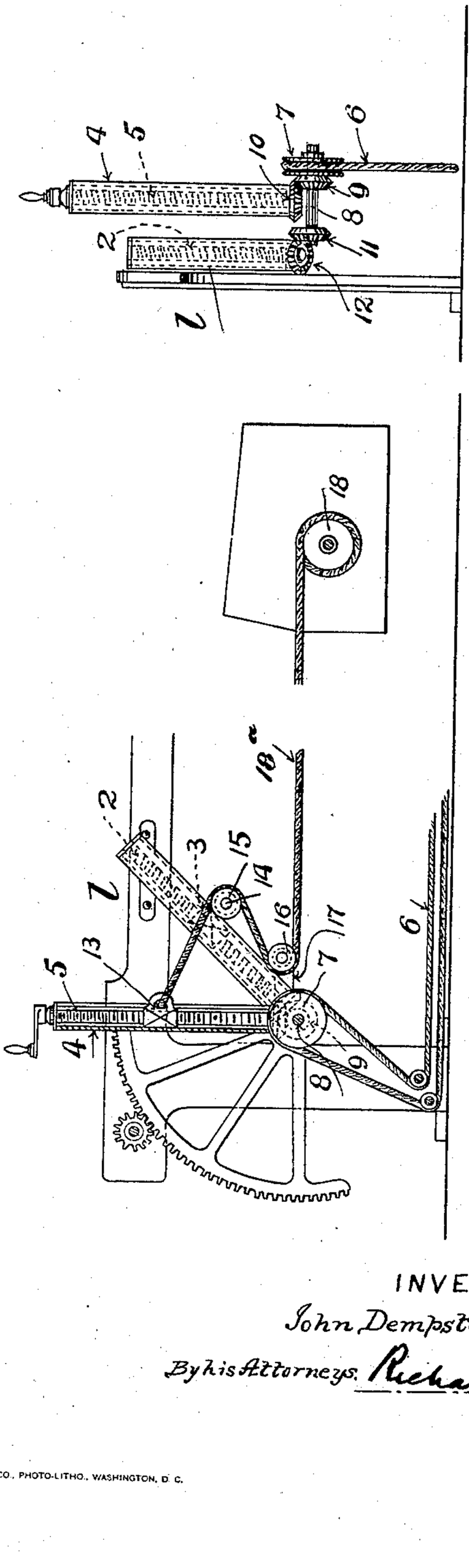

FIG. 9.

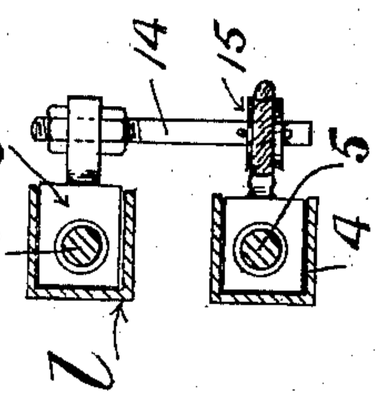

FIG. 7.

WITNESSES.

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UNITED STATES PATENT OFFICE.

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

SPINNING-MULE.

SPECIFICATION forming part of Letters Patent No. 652,203, dated June 19, 1900.

Application filed July 10, 1899. Serial No. 723,384. (No model.)

To all whom it may concern:

Be it known that I, JOHN DEMPSTER WHYTE, engineer, a subject of the Queen of Great Britain and Ireland, residing at 31 Lime avenue, Urmston, near Manchester, in the county of Lancaster, England, have invented a certain new and useful Improvement in Spinning Mules and Twiners, (for which I have made application for patent in Great Britain, No. 26,188, and dated December 12, 1898,) of which the following is a specification.

My invention relates to spinning-mules, and has reference particularly to improvements upon a former invention for which I have obtained Letters Patent of the United States of America, No. 604,593. In the specification of my said former Letters Patent I have described a method of cross-winding cops in a spinning-mule. To effect this, I vibrated the yarn in the space between the spindle and winding-faller wire by means of an interposed series of traveling double inclines.

My present invention relates chiefly to improved means for vibrating the yarn and raising such vibrating means to effect the building of the cops.

In order that my invention may be fully understood, I have attached hereto six sheets of illustrative drawings, to which I will refer.

Figure 1 shows a portion of the carriage-square of a spinning mule or twiner with part of my invention applied. Fig. 2 shows a portion of a series of curved inclines for vibrating the yarn, together with means for reciprocating and raising same to effect the building of the cops. Fig. 3 is a plan of the eccentric for reciprocating the inclines. Fig. 3^a is a modification of same. Fig. 4 is a view at right angles to Fig. 2. Fig. 5 shows the arrangement for raising the winding-faller wire as the cops are built up. Fig. 6 is a view of same at right angles. Fig. 6^a is a detail view. Figs. 7 to 9 show modifications in the construction of the quadrant. Fig. 10, Sheet 1, is a plan view representing the rack-teeth on the incline carrier and the pinion engaging therewith, as shown in my said former invention.

In carrying my invention into effect I provide a rack *a*, fixed to the floor of the room in position similar to that occupied by the present copping-rail under the end of the carriage-square *b* at one side of the head-stock. This copping-rail, it will be understood, is dispensed with under my invention. Upon the carriage-square *b* I mount a shaft *c*, capable of revolving in bearings *c' c'*, secured to the carriage-square *b*, the shaft *c* being provided with a pinion *d*, gearing with the rack *a*. The rack *a* is of sufficient length to permit the pinion *d* to gear therewith throughout the run in and out of the carriage. The necessary movements for vibrating the yarn and for gradually lifting the yarn-guides to effect the building of the cops are obtained through this rack *a* and pinion *d*, these movements being thus controlled by the running of the carriage. These movements consist of a reciprocatory action of the yarn-guides and the raising of the same and are effected as follows: At each end of the shaft *c* I provide a bevel-pinion *e*, gearing with another bevel-pinion *e'*, mounted on a vertical shaft e^2, carried in suitable bearings e^3, secured to the framing of the carriage. It must be understood that each side of the carriage-square *b* is provided with the vertical shaft e^2, driven by the bevel-gearing, so as to actuate yarn-guides for the spindles on each side of the carriage-square. Upon the vertical shaft e^2 is slidably mounted an eccentric *f*, to the strap *f'* of which is connected the yarn-guide carrier *g*, which reciprocates in a slide or slides *g'*, secured at intervals to pokers *h*. (See Fig. 4.)

In Fig. 3^a I show a modification in the method of reciprocating the yarn-guide carrier *g*. The carrier *g* is formed or provided with a rectangular frame g^2, formed with a groove within which works the eccentric *f*, slidably mounted upon and driven by the vertical shaft e^2. As the mule-carriage runs in and out the vertical shaft e^2 is revolved by the bevel-gearing *e e'*, thus imparting a reciprocatory motion to the incline carrier *g*. On the run out of the carriage when the yarn is being spun the winding-faller wire has been raised and the yarn is then at the spindle-tips, and it is thus unaffected by the re-

ciprocatory movement of the inclines. On the run in of the mule-carriage the winding-faller is dropped, as shown in Fig. 4, and holds down the yarn upon the inclines i, secured to the carrier g. I form the inclines with curved faces, as shown in Fig. 2, this shape having been found preferable in practice to straight inclines. Each thread has its separate curved incline i, which, being reciprocated, as stated gives by its reciprocatory movement a slight side push upon the thread on its passage from the winding-faller wire j to the spindle j', causing it to run up and down the curved incline and similarly upon the revolving spindle and be "cross-wound" thereon, as it is technically called, or wound in widely-pitched spirals. While this winding is going on it is necessary in order to build up the cops that the yarn-guide carrier should receive a slow upward movement, so that each layer of thread coiled on the spindle shall be a little higher than the previous layer. This I effect by a copping-motion constructed as follows: In the carriage A, I mount a short shaft k (see Fig. 1) to revolve in suitable bearings, on one end of which, outside the carriage-frame, is fixed a ratchet-wheel, k', and on the other end, within the frame, is mounted a worm l, gearing with a worm-wheel l'. The worm-wheel l' is mounted on a longitudinal shaft l^2, extending the length of the mule and below the carriage. During the run out of the mule-carriage when spinning is being effected I arrange that the ratchet-wheel k' shall remain idle, but shall be revolved during the run in of the carriage when the yarn is being wound on the spindles. To effect this, I provide the carriage-frame A with a shaft m, (see Figs. 1, 4, and 6,) carrying a disk m', with one, two, or more hinged fingers or pawls m^2. The other end of the shaft m carries a bevel-pinion m^4, gearing with a bevel-pinion n', keyed upon the vertical shaft e^2, whereby the shaft m and disk m' are revolved. Upon the shaft k I mount loosely a weighted lever o, provided with a detent o', engaging with the teeth of the ratchet-wheel k. During the run in of the mule-carriage the disk m' is revolved in the direction of the arrow and the pivoted fingers m^2 come into contact with the lever o and stops m^3 and rapidly vibrate the weighted lever o, the detent of which operates to intermittently revolve the ratchet-wheel k', which thus revolves the worm l and worm-wheel l'. During the run out of the mule-carriage the disk m' is revolved in a reverse direction and the fingers m^2 may come into contact with the lever o without affecting it, the contact with the lever o simply turning the fingers on their pivots. Upon the shaft l^2 I mount at intervals bosses or collars p, to which chains p' are secured, the other end of the chain being secured to the foot of the pokers h. As the shaft l^2 is revolved by the described mechanism the pokers h raise the attached slide g' of the yarn-guide carrier g, and thus provide for the building of the cops. It will be evident from the foregoing description that this raising of the yarn-guides takes place only at the essential time—*i. e.*, when the carriage is being run in and the yarn is being wound upon the spindles. To effect the raising of the eccentric f, I provide one of the pokers h with a fork q, embracing the vertical shaft e^2 and upon which the eccentric f rests. The poker h thus raises the eccentric f, which is slidably mounted on the shaft e^2 and driven thereby. It will be understood that the winding-faller wire must also be gradually raised to synchronize with the raising of the inclines or yarn-guides, as described. As mentioned, however, in the specification of my said former patent, the gradual raising of the winding-faller wire during the run in of the carriage to guide the yarn in closely-pitched spirals from the base to the tip of the cop-nose is dispensed with. To effect the simultaneous raising of the winding-faller wire j, Fig. 4, I mount upon the shaft k a pinion r, gearing with a pinion s. (Shown more clearly in Figs. 5 and 6.) The pinion s is secured to a screwed shaft t, upon which is mounted a nut t', carrying a projection or die t^2, upon which rests a shaper u, capable of vertical movement in a slide or guide u', secured to the framing A of the mule-carriage. The shaper u carries a bowl u^2, upon which at times rests the usual locking-lever v, which is actuated by the mechanism at present in use. The locking-lever v is, as usual, connected to the faller-sector v', secured to the winding-faller shaft v^2. The faller-sector v' has been slightly modified, as will be hereinafter explained. As the screwed shaft t is slowly revolved the nut t' is traversed and allows the shaper u to slowly descend. Thus when the locking-lever v is on the bowl u^2, as shown in Figs. 5 and 6, the mule-carriage is running in, and simultaneously with the lift of the pokers h the shaper u is slightly lowered by the rotation of the screw-threaded shaft t. This causes also the corresponding lowering of the locking-lever v and the slight rotation of the winding-faller shaft v^2 and the raising of the winding-faller sickles x. As will be understood, before the run out of the carriage the locking-lever v is knocked off the bowl u^2 to permit the winding-faller sickles x to rise before commencing spinning. This knocking off and replacing of the locking-lever v upon the bowl u^2 is effected by the mechanism at present in use in spinning-mules and need not be here described. As stated above, the faller-sector v' has been modified to adapt it to the altered position of the locking-lever. In the present mule the locking-lever is arranged between the inner end of the carriage and the head-stock frame. In order, however, to operate the shaper u from the shaft k (see Fig. 1) through the de-

scribed mechanism, the locking-lever and shaper have been brought within the frame of the carriage A. This has necessitated a change in the faller-sector. I now make the portion of the sector v' which is pivoted to the locking-lever v separate from the portion to which is secured the "backing-off chain," so as to accommodate it to the altered position of the locking-lever. The remaining half y of the faller-sector, to which is secured the backing-off chain z, is shown in Fig. 6ª and is mounted on the winding-faller shaft in its usual position.

In present practice the quadrant, to which is attached the winding-drum chain for imparting motion to the winding-drum, is used to drive the spindles at a variable speed. At the commencement, when winding on the bare spindle, the maximum velocity must be imparted to the spindle. This velocity is decreased as the cop-bottom is being formed, and the minimum velocity is imparted to the spindles when the cop-bottom is formed. This driving of the spindles at the maximum velocity on commencing to wind and gradually reducing it to a minimum when the cop-bottom is formed is retained under my invention. In addition, however, to this in present practice the speed of the spindles during the run in of the carriage is varied, the spindles being driven at their slowest speed when winding on the thicker portion of the "chase" and gradually increasing to their maximum speed as the end of the chase or bare spindle is reached. This is effected by the varying angular pull of the driving-chain secured to the quadrant and the additional effect of the "nosing" motion. Under my invention this variable driving of the spindles during the run in of the carriage is dispensed with and the spindles are driven at a speed relative to the speed of the carriage. The means whereby this is effected are shown in Figs. 7 to 9. The present quadrant arrangement is maintained in its entirety, with the exception of the nosing motion; but in addition thereto I provide an arrangement whereby the pull on the winding-drum chain is taken from a fixed point, so that the chain is maintained horizontal and at an unvarying angle from this point to the drum instead of from a varying angle thereto, as at present. To effect this, I provide an additional screw-box 1, carrying the usual screw 2 and nut 3. The screw-box 1 is fixed to the frame of the mule at an angle which corresponds to the angle assumed by the usual quadrant-screw box 4 at the end of its inward vibration. The screw 5 of the quadrant-screw box 4 is rotated in the usual manner by the band 6 operating a pulley 7, mounted on a shaft 8, carrying a bevel-pinion 9, gearing with a bevel-pinion 10, mounted on the end of the screw 5. The screw 2 of the screw-box 1 must be rotated to correspond with the screw 5, and to effect this I lengthen the shaft 8 and provide it with a duplicate bevel-pinion 11, gearing with a bevel-pinion 12 on the screw 2, which is a duplicate of the bevel-pinion 10. As the nut 13 on the quadrant-screw 5 is raised by the rotation of the screw 5 in the usual manner during the formation of the cop-bottom, the corresponding nut 3 on the screw 2 is equally raised. The nut 3 carries a spindle 14, upon which is mounted a grooved chain pulley or bowl 15, and a similar grooved bowl 16 is mounted to revolve in bearings in a fixed bracket 17. The winding-drum chain 18ª passes over these bowls 15 and 16 to the winding-drum 18 and converts the usual varying angular pull to a horizontal one. At the commencement of winding on the bare spindle the nuts 3 and 13 are in their lowest position on the screws 2 and 5 and a minimum of chain is paid out on the run in of the carriage, the spindles being thereby driven at their highest velocity. As the nuts 3 and 13 are being raised in their respective screw-boxes, as described, an increased length of chain is withdrawn from the winding-drum 18 on the run in of the carriage. This length of chain being paid out by the quadrant, as usual, provides for the decreasing speed of the spindles; but as the pull of the chain is horizontal and from a fixed point, instead of being from a variable angle and from a point moving through the arc of a circle, as at present, supposing the speed of the carriage to be constant throughout its run in, the spindles will be driven at a constant speed. Therefore by this arrangement the spindles are driven at a speed relatively to the speed of the carriage on its run in. It will be understood that the spindles on the run out of the carriage during spinning are driven in the usual manner.

My improvements are equally applicable for use with the series of double traveling inclined yarn-guides described in my said former specification. In this case, as shown in Figs. 1 and 10, the pinion 19, which gears with the rack-teeth cut on the double-incline carrier 20, is slidably mounted upon and driven by the vertical shaft e^2, which is driven in reverse directions by the running in and out of the carriage, as already described, the pokers h, as before, raising the carrier 20, one of the pokers h being formed with a fork 21, which serves to support and raise the pinion 19. The pinion 19 is thus rotated in reverse directions to traverse the double-incline carrier 20 to and fro through the bevel-gearing $e\,e'$ and rack and pinion $a\,b$. To doff the cops when completed, the single or double inclines are hinged at 22, at intervals throughout its length, to the sliding carrier, as shown in Fig. 4. When the cops are completed, the inclined yarn-guides are turned back or tilted on the hinge 22, thus permitting the doffing of the cops. When the cops have been doffed, a handle is placed on the square 23, the pawl or detent o' being turned up from contact with the teeth of the ratchet-wheel k' and the screw-shaft t revolved in a reverse direction, so as to lower the pokers h, carrying the inclined yarn-

guides, and raise the shaper *u* and locking-lever *v* into their initial position for starting to wind a fresh set of cops.

I declare that what I claim is—

1. In a spinning-mule, the combination with the spindles of a plurality of single-incline yarn-guides with means for reciprocating them, whereby the yarn will be raised and lowered to produce cross-winding, substantially as described.

2. In a spinning-mule, the combination with the spindles, of incline yarn-guides, a shaft, an eccentric slidably mounted thereon and connected with the carrier and a rack and gearing for operating said shaft, whereby the yarn may be raised and lowered to produce cross-winding, substantially as described.

3. In a spinning-mule, the combination with the spindles, of the vertically-movable pokers, yarn-guides carried thereby, a shaft carrying winding pulleys or drums, chains secured to said drums and to the pokers, and rack and gearing for operating said shaft, substantially as described.

4. In a spinning-mule, the combination with the winding-drum, and quadrant, of a screw-box, a screw therein, a nut traveling on said screw, a chain or belt pulley carried thereby a second pulley journaled on a fixed support, a stationary box having a block or nut, a pulley carried by said box, and means for causing the travel of said block or nut, the belt or chain passing over said pulleys and being maintained thereby in an unvarying horizontal line, substantially as described.

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

JOHN DEMPSTER WHYTE.

Witnesses:
JOSHUA ENTWISLE,
ALFRED YATES.