6 Sheets--Sheet 1.

P. McGOVERN.

Self-Acting Spinning Mules.

No. 138,511. Patented May 6, 1873.

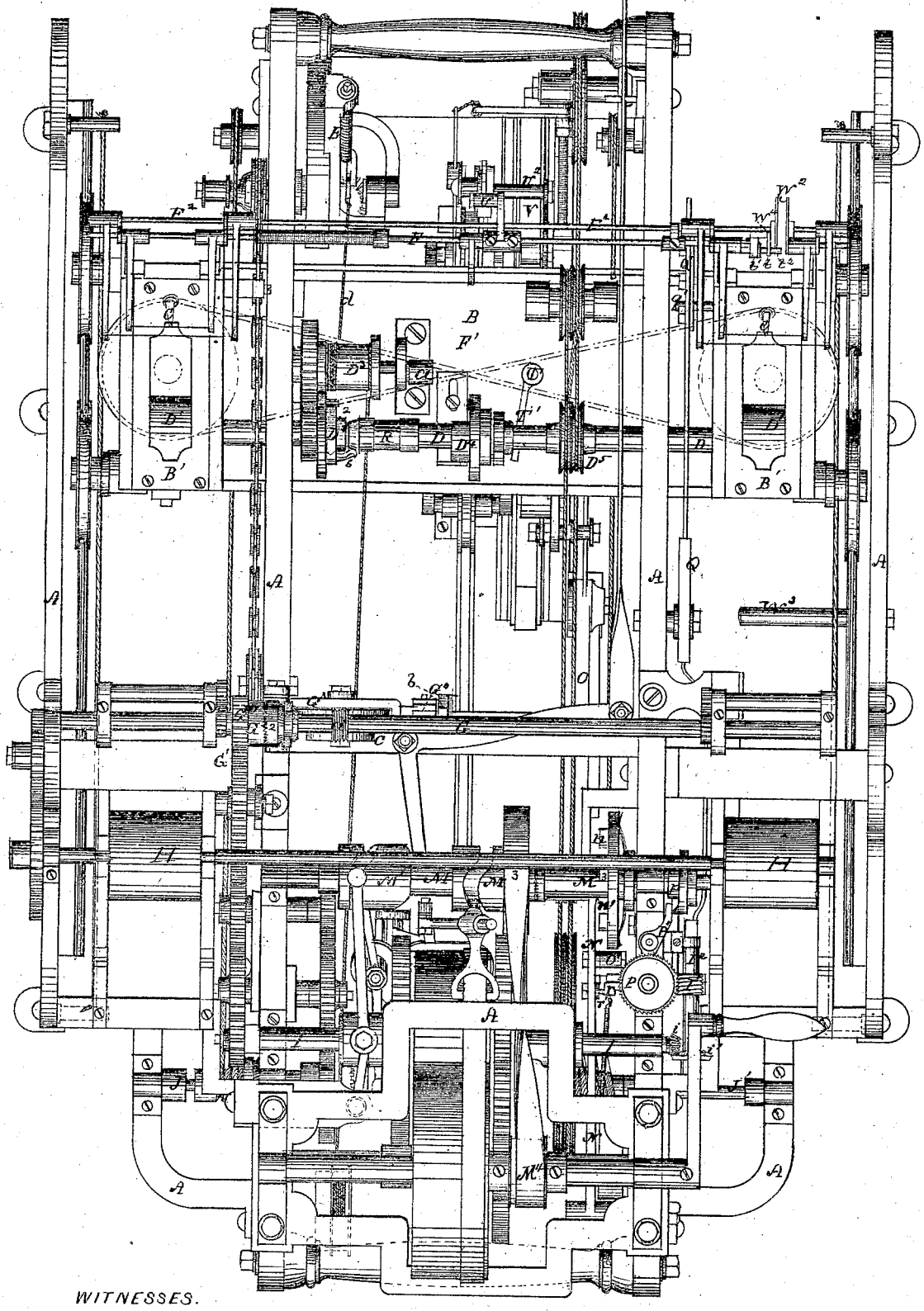

FIG. 1.

WITNESSES.

N. C. Lombard

G. E. Whitney

INVENTOR.

Peter McGovern

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P. McGOVERN.

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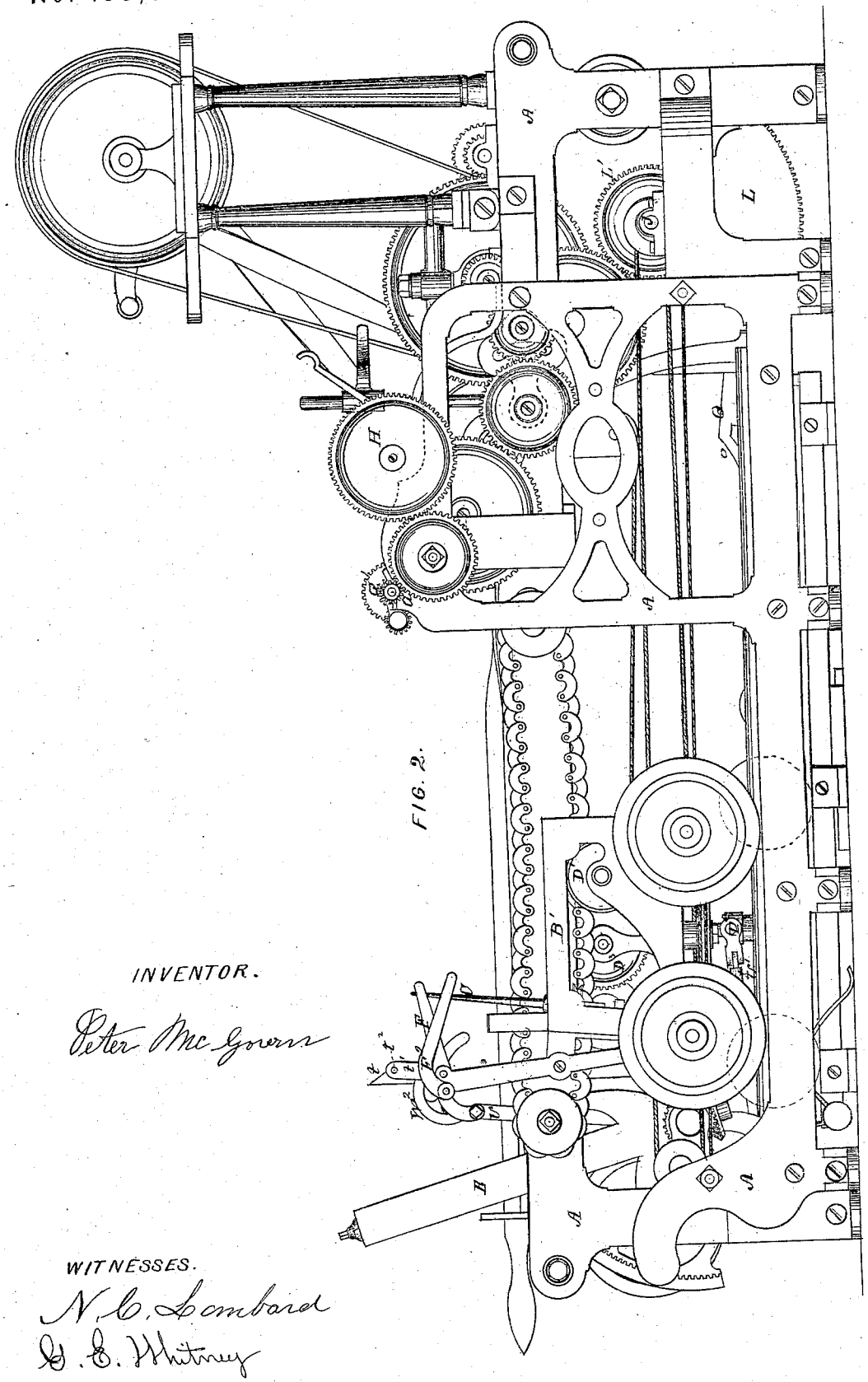

FIG. 2.

INVENTOR.

Peter McGovern

WITNESSES.

N. C. Lombard

G. E. Whitney

6 Sheets--Sheet 3.

P. McGOVERN.

Self-Acting Spinning Mules.

No. 138,511. Patented May 6, 1873.

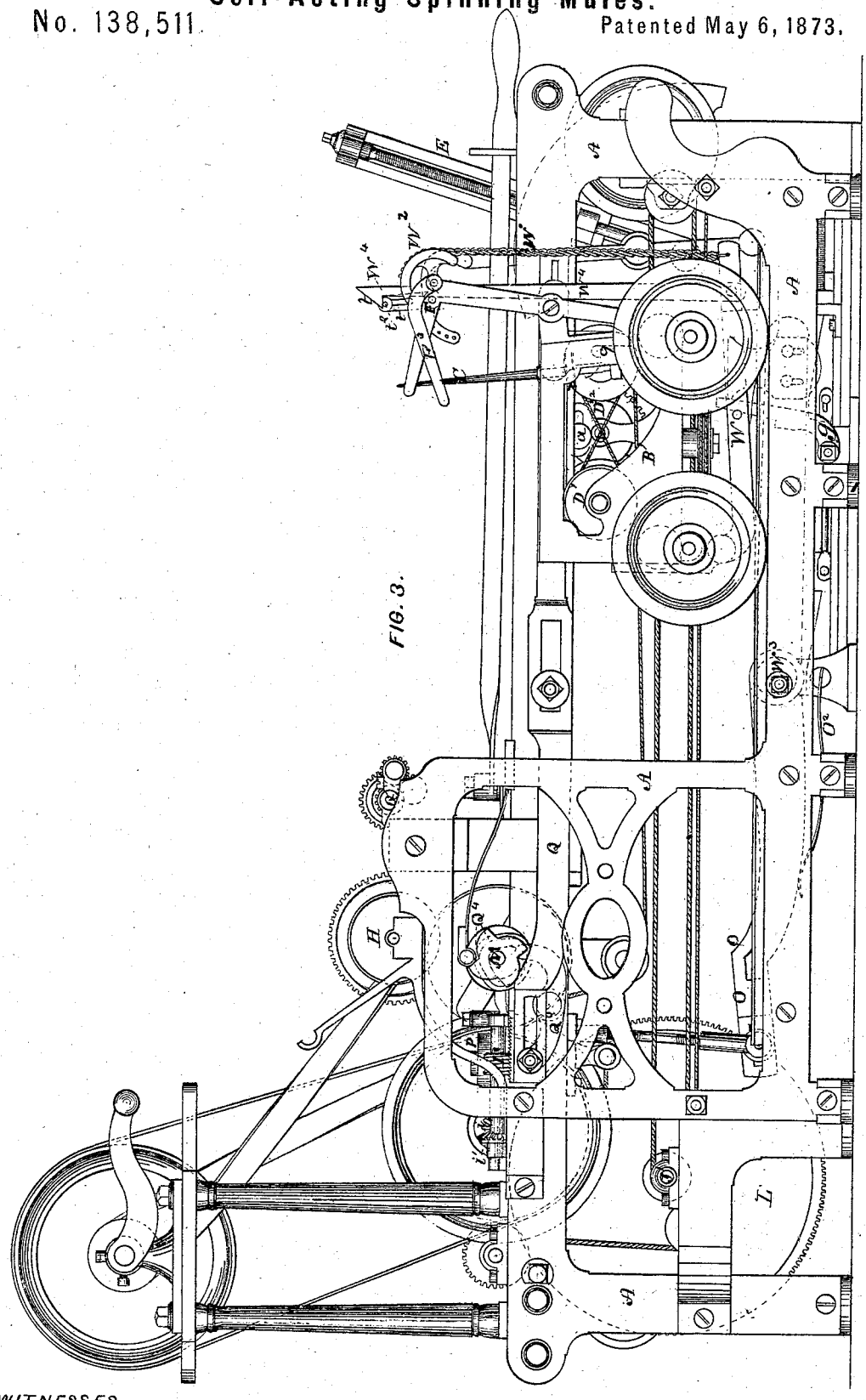

FIG. 3.

WITNESSES.

N. C. Lombard

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Peter McGovern

6 Sheets--Sheet 4.

P. McGOVERN.

Self-Acting Spinning Mules.

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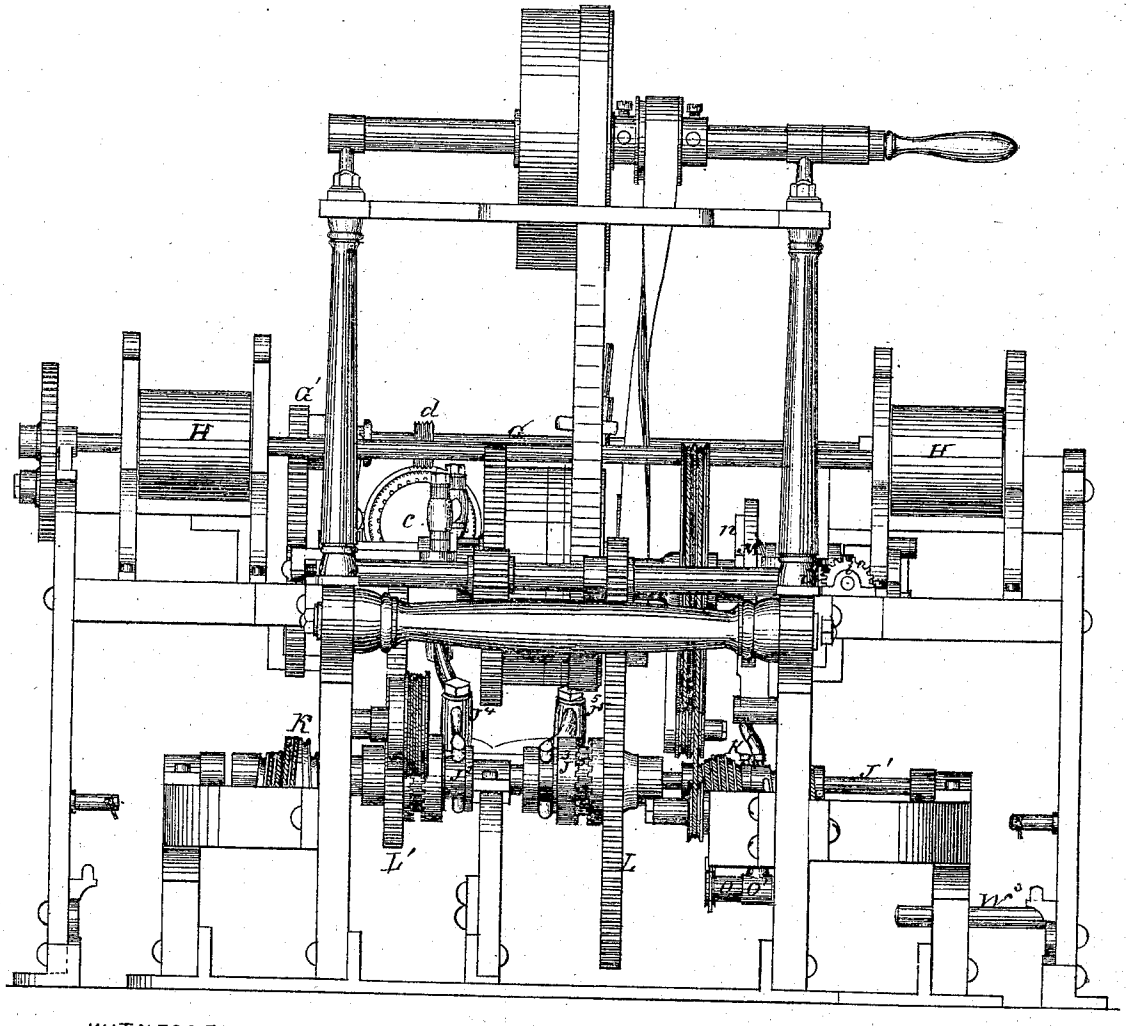

FIG. 4.

WITNESSES.

N. C. Lombard

G. C. Whitney

INVENTOR.

Peter McGovern

6 Sheets--Sheet 5.

P. McGOVERN.

Self-Acting Spinning Mules.

No. 138,511. Patented May 6, 1873.

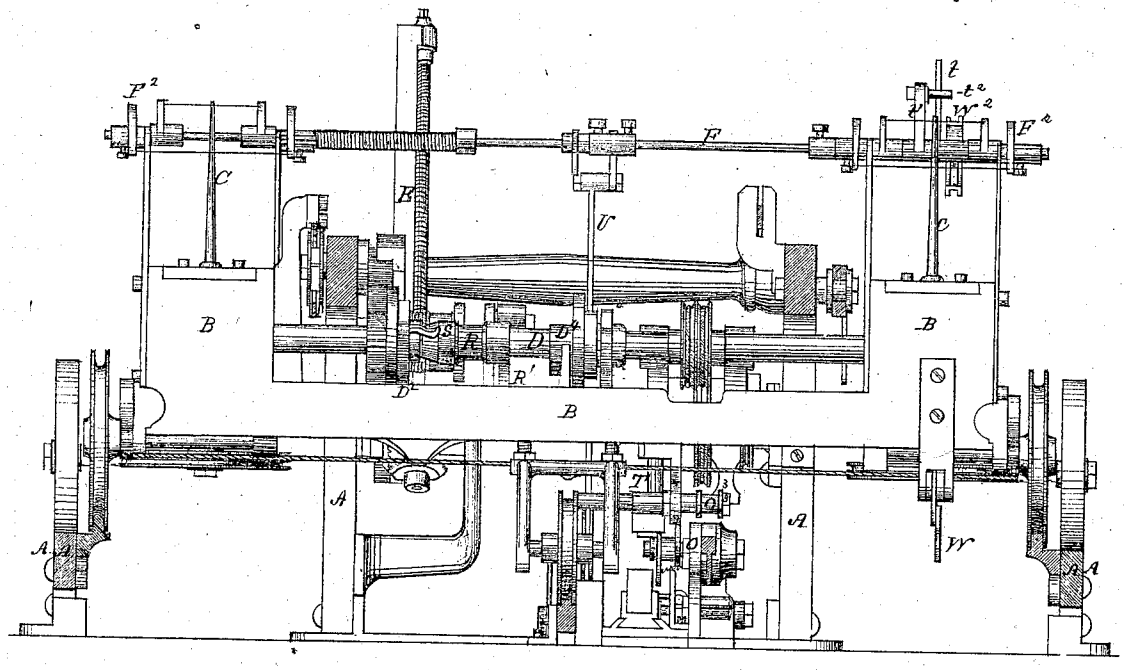

FIG. 6.

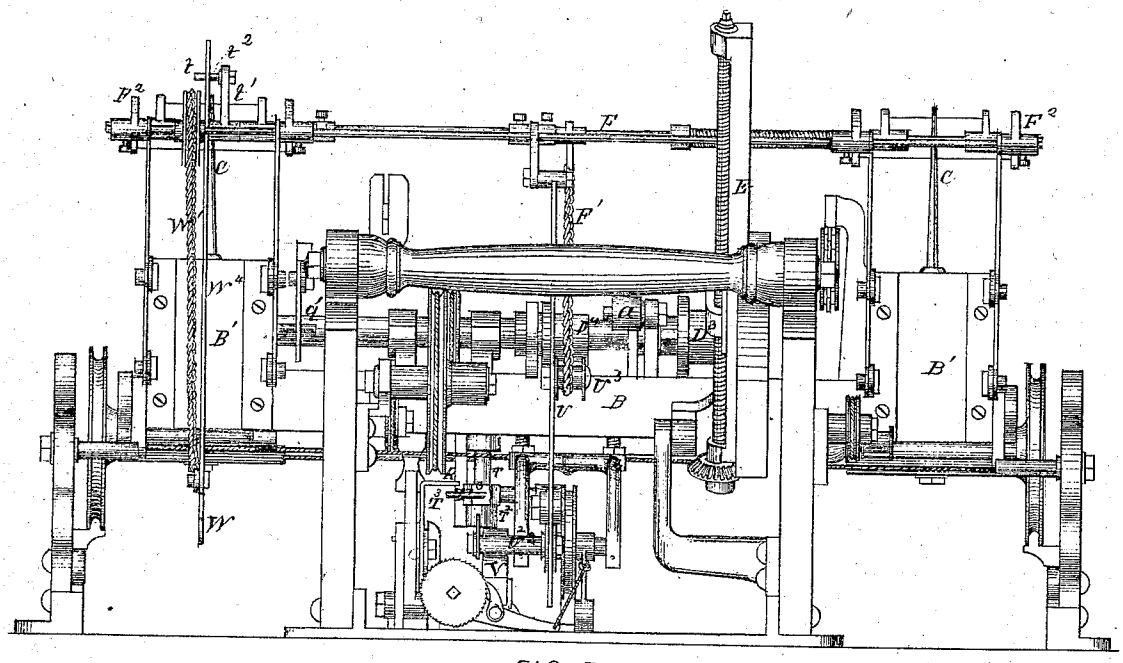

FIG. 5.

WITNESSES.

N. C. Lombard

G. E. Whitney

INVENTOR.

Peter McGovern

P. McGOVERN.

Self-Acting Spinning Mules.

No. 138,511. Patented May 6, 1873.

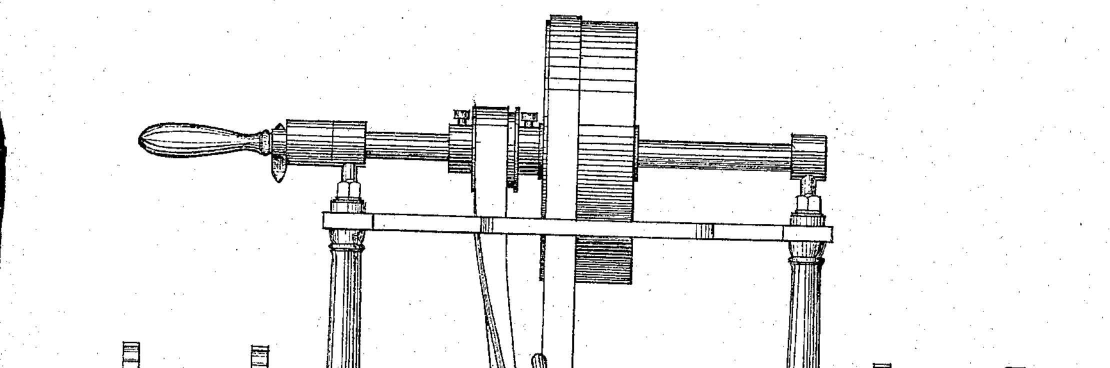

FIG. 7.

WITNESSES.

N. C. Lombard

G. E. Whitney

INVENTOR.

Peter McGovern

UNITED STATES PATENT OFFICE.

PETER McGOVERN, OF NORTH ANDOVER, MASSACHUSETTS, ASSIGNOR TO GEORGE L. DAVIS, JOHN A. WILEY, JOSEPH M. STONE, GEORGE G. DAVIS, JOSEPH H. STONE, AND JAMES H. DAVIS, OF SAME PLACE.

IMPROVEMENT IN SELF-ACTING SPINNING-MULES.

Specification forming part of Letters Patent No. **138,511**, dated May 6, 1873; application filed August 24, 1871.

To all whom it may concern:

Be it known that I, PETER McGOVERN, of North Andover, in the county of Essex and State of Massachusets, have invented certain Improvements in Automatic Mules for Spinning, of which the following is a specification:

My invention relates to the construction of several of the subordinate parts of a mule, some of which may be applied to other automatic mules differently arranged from that herein shown, so far as regards the other parts of the machine which are not embraced by my invention, by which construction the mechanism is much simplified and improved in operation.

The mule represented and described is adapted to spinning wool, in which a measured length of roping is given out and is drawn down to the proper size to form yarn by the recession of the spindles from the delivering-rollers.

My first improvement relates to the construction and arrangement of the counter or clock that determines the length of roping that is to be given out at each draft, and the mechanism for operating the same, and also the manner of connecting the same with the devices by which the delivering-rollers are engaged with and disengaged from the power that drives them; and consists in arranging the endless screw or worm that drives the clock directly upon the roller-shaft, and in combination therewith arranging upon the said shaft a driving-gear, turning loosely thereon, and a clutch for connecting the said gear, when required, with the shaft, the operation of which, to stop the delivering-rollers, are controlled by the clock, as will be described; and it also consists in combining and arranging the clock directly with and upon the lever that works the said clutch, which greatly simplifies this part of the mechanism.

My second improvement relates to the manner of combining and arranging the spindle-carriage and the mechanism for throwing the said clock and clutch, or their equivalents, into gear, so that they will cause the delivering-rollers to commence their operation and to deliver the roping before the spindle-carriage is run in, so that, by the delivery of the roping while the spindles are winding up the yarn, all the yarn produced at each draft can be wound up instead of leaving several inches between the points of the spindles and the delivering-rollers, as is usually done, which increases the production of yarn to that extent without any increase of the speed or labor of the machine.

My third improvement relates to the manner of combining and arranging the mechanism for drawing in the spindle-carriage while putting in the head-twist and the counter that determines the amount of twist, and the detent or escapement that controls the movements of the cam-shaft, so called, which effects the engagement and disengagement of the several parts of the mechanism and the main driving-shaft of the machine, all in relation to each other.

My fourth improvement relates to the arrangement of devices by which the pawl of the ratchet, by which the winding-drum drives the main drum, is controlled in its movements by the movement of the locking-rod, which operates the faller, so that its engagement and disengagement shall be more positive than when the said pawl is worked by frictional devices upon the drum-shaft, as is usually done, and its action also takes place at the proper time in relation to the backing-off operation.

My fifth improvement relates to the arrangement of mechanism by which that movement of the floor-lever, so called, is controlled, which stops the backing-off and puts the running-in mechanism in operation through the agency of the latch-rod, which operates the faller, by which arrangement the backing-off is stopped and the running-in and winding commences as soon as the faller is depressed, so that the shoulder on the latch-rod will slip over the piece that rests upon the copping-rail and cannot commence before that takes place.

My sixth improvement relates to a combination of devices, by which the counterpoise-lever of the counter-faller is held up while the stretch is being made, and is released by the depression of the faller to build the cop.

Description.

In the drawing, Figure 1 is a plan of the machine. Fig. 2 is an elevation of one end of

the machine. Fig. 3 is an elevation of the opposite end. Fig. 4 is an elevation of the back side of the machine. Fig. 5 is an elevation of the front side of the machine. Fig. 6 is a sectional elevation looking toward the front side of the machine, and Fig. 7 is a sectional elevation looking toward the back side of the machine.

A is the frame of the machine. B is the spindle-carriage, with the parts B′, which contain the spindles represented only as long enough to contain one spindle, C, at each side of the head-stock, so as to bring the drawing within convenient compass; but the carriage will be made long enough at each side of the head-stock to contain as many spindles as desired. D is the drum-shaft, which drives the spindles. D^1 D^1 are the drums. D^2 is the ratchet of the winding-gear. D^3 is the winding-drum driven by the cord *d*, which is attached to the quadrant arm E. D^4 is the ratchet and pulley for drawing down the faller F by the chain F′. D^5 is the driving-pulley of the drum-shaft. G is the delivering-roller shaft. H is the drive-shaft which carries the roping-bobbins. I is the driving-shaft of the machine carrying several pulleys, and driven by a belt from above, as shown. All these parts and many other of the details of the machine are constructed as they have heretofore been done, and will not be particularly described, as they are not modified by my improvements, except as will be more particularly described, and their construction and arrangement will be obvious from an inspection of the drawing. The delivering-rollers are driven by the gear G^1, which revolves loosely upon the shaft G by means of the clutch G^2, which engages with it to revolve the shaft. This clutch is worked by the bent lever G^3, to the outer end of which is attached a vertical slide, G^4, which is raised by the roller *a* upon the spindle-carriage acting upon the incline *b* upon the lower end of the slide. Upon the bent lever G^3 the clock or counter *c* is mounted, and the worm *d* for driving the same is fixed upon the delivering roller-shaft. When the lever G^3 is raised to throw the clutch G^2 into engagement with the gear G^1, the clock *c* is also raised so as to engage with the worm *d*, and they are held in that position by a catch concealed in the cross-bar A′, which is withdrawn at the proper time to stop the delivering-rollers by the clock which acts upon the catch at the point *e*, and releases it. The roller *a* is so placed as to raise the slide G^4 and put the clock and clutch into gear when the spindle-carriage is about ten inches, more or less, from its inward limit of motion, so that the delivering-rollers commence to deliver the roping while the yarn is being wound upon the spindles. The purpose of this arrangement is that there shall be roping enough delivered when the carriage is fully run in to reach the point of the spindles, so that all the yarn that is made at each stretch shall be wound up instead of leaving several inches between the rollers and the spindles, as is usually done, which increases the product of yarn to that extent without increasing the labor of the machine. J J^1 are the scroll-shafts. The shaft J carries the scrolls K for running out the spindle-carriage and the shaft J^1 carries the scrolls K^1 K^2 for running the carriage in, as is shown. By this arrangement of the scrolls the cords from both are made to draw directly in a line with the carriage and use the shortest possible length of cord, and avoid the use of pulleys to lead the cords into the proper direction, and thus enables the cords to wear longer, and makes the parts very convenient and accessible. The scrolls are driven by clutches J^2 and J^3 from the gears L L′, which revolve loosely upon the shafts, and are driven by two trains of gearing connected with the driving-shaft I, and the loose pulley that revolves upon it, in a manner similar to that usually practiced, except so far as it is modified to suit this mode of arrangement. The train of gearing which drives the running-out scrolls K, also drives the delivering-roller shaft G, as is clearly shown in the drawing. The clutches J^2 and J^3 are worked by the shippers J^4 and J^5, which are worked by the cams M^1 and M^2 on the cam-shaft M, in a manner similar to what has been before practiced. N is the escape-lever, which controls the movements of the cam shaft M by engaging in succession with the stops *n* upon the index-plate of the clutch M^3, which drives the cam-shaft from the pulley M^4. Upon that part of the escape-lever N which co-operates with the stops *n* there is formed an incline, *n′*, by which, when the stops *n* come in contact with it, the clutch M^3 is pushed back to disengage it from the pulley M^4, so as to revolve the cam-shaft one-fourth of a revolution at a time, as has already been done. This escape-lever N is worked by the floor-lever O being connected with it by the rod O′. This end of the floor-lever and the escape-lever are pressed upward by the spring O^2, and are pressed downward when the spindle-carriage runs in by the roller O^3 upon the carriage acting upon the upper inclined surface of the lever at *o*. P is the clock or counter that determines the amount of twist to be given. It is arranged as shown in Fig. 1, and is driven by the worm I^1 upon a short horizontal shaft I^2 at a right angle to the main driving-shaft I, and driven by it by the small bevel-gears *i* i^1. The clock P is mounted upon the lever P^1, and is moved into engagement with the worm I^1, at the proper time, by the cam *p* upon the cam-shaft M. It controls and stops the twisting by a pin upon the under side which comes in contact with the catch *r*, and pushes it off from the stud r^1 which is fixed in the escape-lever N, and allows it to fly up and release the index-plate so that it will make one-fourth of a revolution, and, by the cams on the cam-shaft, move the several shippers so as to stop the twist and run the driving-belt onto the loose pulley upon the driving-shaft to back off. Q is the rod for

drawing in the spindle-carriage while putting in the head-twist, which I call the balance-rod. It is made with a long slot near its middle, so as to slide upon its fulcrum lengthwise, and, also, to oscillate upon it. At its front end it is provided with a piece, Q^1, projecting downward, and having a gab or recess, *q*, formed in its lower side, which engages with a pin or stud, q^1, which is fixed in the carriage, as is seen in Fig. 3, in dotted lines, and in Figs. 1 and 5. The opposite end of the balance-rod is provided with a rack upon its upper surface, which, when it is raised, engages with the worm I^1 and is drawn lengthwise by it. This end of the rod Q is carried upon the lever Q^2 by a pin in the end of the same working in a slot in the end of the balance-rod, as is shown in Fig. 3. The lever Q^2 is worked at the proper time by the path-cam Q^3 upon the cam-shaft M. This oscillation of the rod Q causes it to engage with and disengage from the worm and carriage simultaneously, and the last is done by the movement of the cam-shaft, which throws the running-in clutch into engagement, so that the carriage is held fast until the running-in scrolls can control its movement; and, also, the gab *q* controls the movent of the carriage while putting in the head-twist, and prevents the draft of the yarn from drawing the carriage in too fast to keep the proper stretch upon the yarn. R is a sleeve which slides lengthwise upon the drum-shaft D, the end of which, toward the ratchet D^2, is made conical, and, when it is slid toward the ratchet, passes under the stem *s* of its pawl, and raises it from the ratchet and holds it until the sleeve is drawn back. The sleeve is moved back and forth by the arm R^1, which projects downward, and is connected by a yielding rod, which is directly beneath the shaft D, with the arm T^1 upon the vertical rocking shaft T, Fig. 1. The rocking shaft T is mounted upon the carriage, as is seen more clearly in Fig. 5, and is operated by the locking-rod U which works the faller F by means of the rod U^1 which connects it with the arm T^2 of the rocking shaft T. T^3 is an arm also attached to the rocking shaft T, the outer end of which, when in the position shown in Fig. 5, is beneath the plate *k* which projects from the side of the floor-lever O, and acts as a detent to prevent the lever from descending lower until the arm T^3 is withdrawn, which is done when the shoulder of the locking or latch rod U slips forward over the piece U^2 which rides upon the coppin-rail V; and, by the same movement, the sleeve R is withdrawn from beneath the pawl *s*, and allows it to engage with the ratchet D^2, ready for winding up the yarn. By this means the operation of the winding-ratchet is made certain, and to act at the right time. W is the counterpoise-lever which carries a weight sufficient to hold the counter-faller F^2 up to the yarn by means of the chain W^1, which works on a grooved sector, W^2, on the counter-faller shaft, as is shown. This lever W has an incline upon its under side, which, when the carriage is run in, passes over the stud W^3 which projects from the frame, and raises the lever and lets the counter-faller down. W^4 is a rod which is attached to the lever W, and extends upward above the faller-shaft F, and its upper end is provided with a hook, *t*. Upon the faller-shaft is an arm, t^1, projecting upward, which carries the stud t^2 projecting from its side, over which the hook *t* passes when the faller is not at work, and holds up the lever W until the faller is depressed, which withdraws the stud t^2 from the hook *t*, and allows the lever to fall. The movements of the cam-shaft are controlled primarily by the floor-lever O, in connection with the other divices described which co-operate with it, and it is made to assume four positions, corresponding to the four quarter-revolutions that the cam-shaft M makes in the cycle of operations in this manner. When the carriage runs in, that end of the floor-lever is depressed to its lowest position, and is held there by the catch *g*, shown in dotted lines in Fig. 3, which holds that end of the lever up. This puts the machine in a condition to make a stretch. When the carriage has reached the outer limit, it pushes off the catch *g* from a stud in the lever O, and the lever oscillates by the force of the spring O^2, until it is stopped by the catch *r*, which takes hold of the stud r^1 in the escape-lever N. The cam-shaft M then turns and puts the parts in a position to disengage the running-out scrolls, and put in gear the balance-rod Q, which draws in the carriage to put in the head twist. When the clock P detaches the catch *r*, the lever O oscillates further till the projection *k* strikes the arm T^3, which prepares the machine to back off. When the follower is drawn down by the chain F^1, and the locking-rod U is drawn upon the piece U^2 by the chain which passes around the pulley U^3 upon the rod, the arm T^3 is, by that movement, withdrawn from beneath the projection *k*, and allows the lever to oscillate to its limit, which prepares the machine to wind up the yarn and complete the cycle of operations.

The operations of the other parts of the machine not described are similar to those now in use.

What I claim as my invention is—

1. The combination of the worm and the driving-gear of the roller-shaft revolving loosely thereon, and the clutch by which motion is imparted from the gear to the shaft, with the clock, and the shipper-lever or other equivalent means by which the clock disengages the clutch B to stop the rollers, substantially as described.

2. The combination and arrangement of the clock with and upon the shipper-lever so that the clock is carried upon the lever, substantially as described.

3. The combination and arrangement of the incline *b*, that puts the clock *c* and clutch G^2 into gear, and the roller *a* upon the spindle-carriage, so that the delivering-rollers will be

started a sufficient time before the carriage is entirely run in to deliver nearly all the yarn made at each stretch to be wound up by the spindles, substantially as described.

4. The balance-rod Q, in combination with the spindle-carriage and the worm I^1 or its equivalent, for drawing in the carriage while the twist is being put in, and also in combination therewith the cam Q^3 and its lever Q^2 or their equivalents for producing the engagement and disengagement of the rod Q and the carriage and worm gear, substantially as described.

5. The combination of the endless screw or worm I^1 with the clock that determines the twist and the rack upon the balance-rod, so that one worm drives both of them, substantially as described.

6. The combination of the clock P, the catch *r*, and the escape-lever N, substantially as described.

7. The combination of the clock P, the cam *p*, and the worm I^1, and their subordinate devices, to throw the clock into gear, substantially as described.

8. The combination and arrangement of the main driving-shaft and the worm-shaft at a right angle thereto, and the clock and the balance-rod, substantially as described.

9. The combination of the conical sleeve R with the latch or locking rod U of the faller and the rocking shaft T and its accessories or their equivalents, so that the pawl *s* will be held out of the ratchet during the backing off, and its engagement restored at the commencement of winding on, substantially as described.

10. The combination of the detent arm T^3 on the rocking shaft or its equivalent with the floor-lever and the latch or locking rod U of the faller, so arranged that when the rod engages with the piece that rides upon the coppin-rail, the floor-lever will be released from the detent, and the backing off stopped and the winding mechanism started, substantially as described.

11. The combination of the radial-arm t^1 and its catch t^2 upon the faller-shaft with the hook-rod and counterpoise lever W, which raises the counter-faller, by which the counter-faller wire is allowed to fall below the top of the spindles while the stretch is made, substantially as described.

Executed August 14, A. D. 1871.

PETER McGOVERN.

Witnesses:

N. C. LOMBARD,

G. E. WHITNEY.