Edward Wright.
Imp'ts in Self-acting Mules.

PATENTED JUL 18 1871

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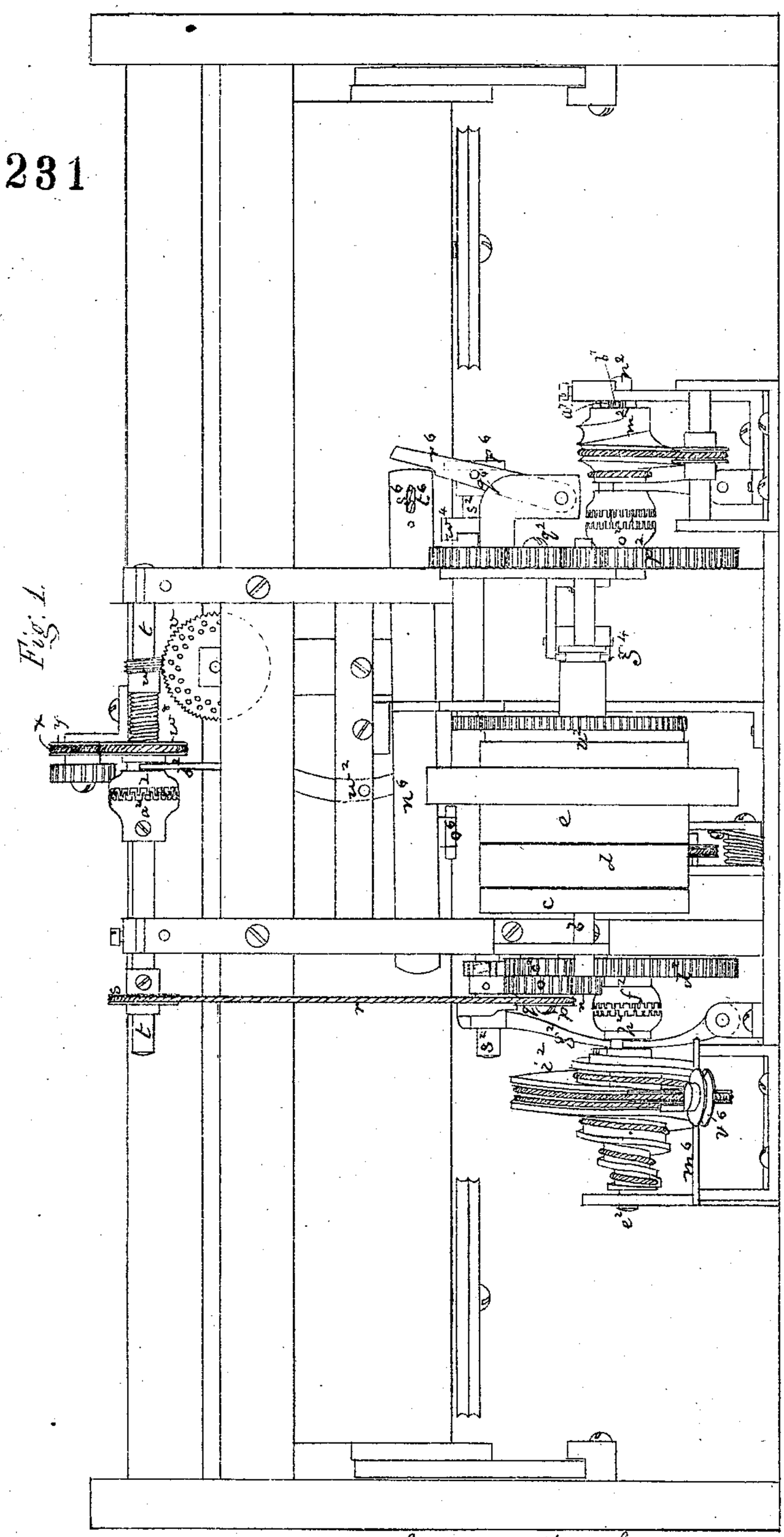

Fig. 1.

Witnesses.
M. M. Trotpingham.
E. H. Eatinn.

Edward Wright,
By his Attys.
Crosby & Gould.

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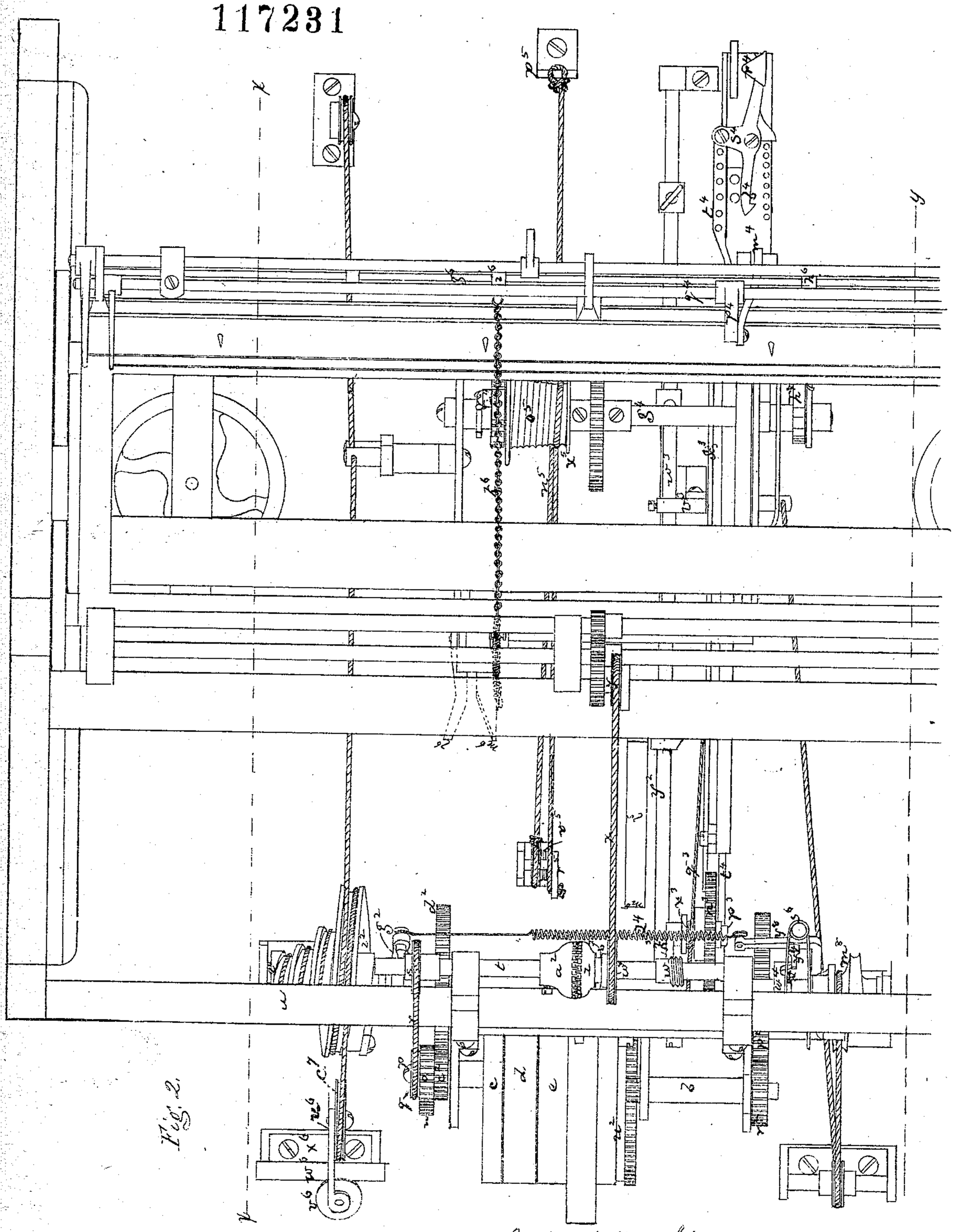

Fig. 2.

Witnesses.
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L. H. Eaton

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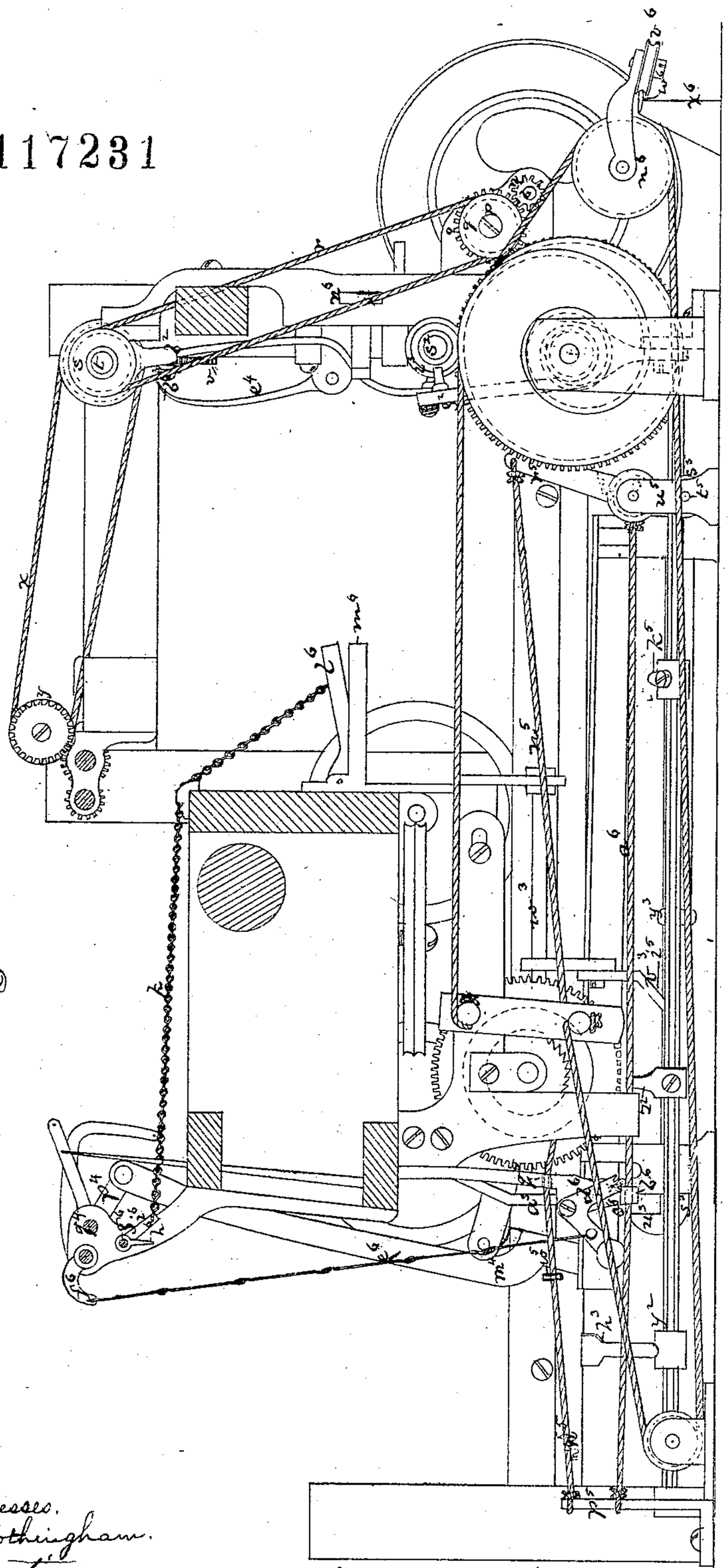

Fig. 3.

Witnesses.
M. W. Frothingham.
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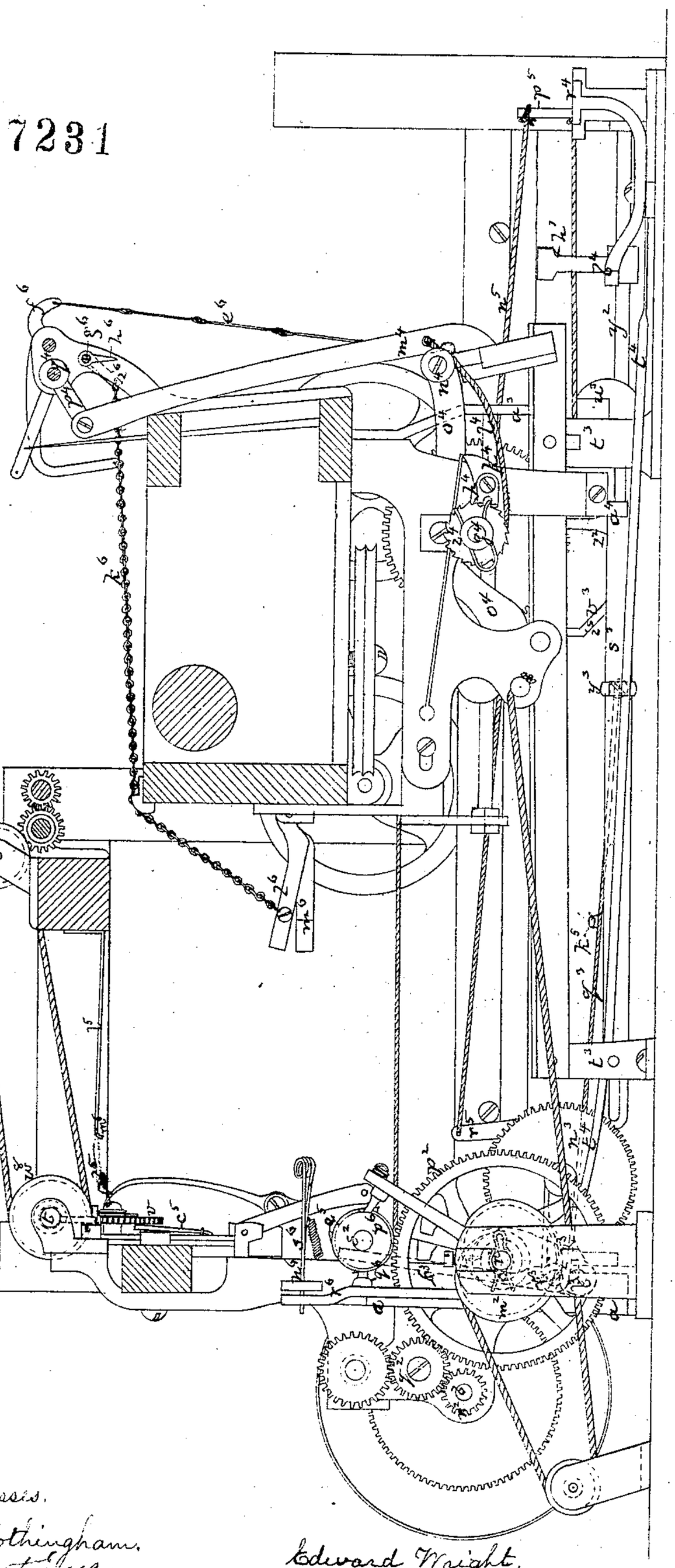

Fig. 4.

Witnesses.
M. M. Fothingham.
L. H. Latimer.

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Fig. 5.

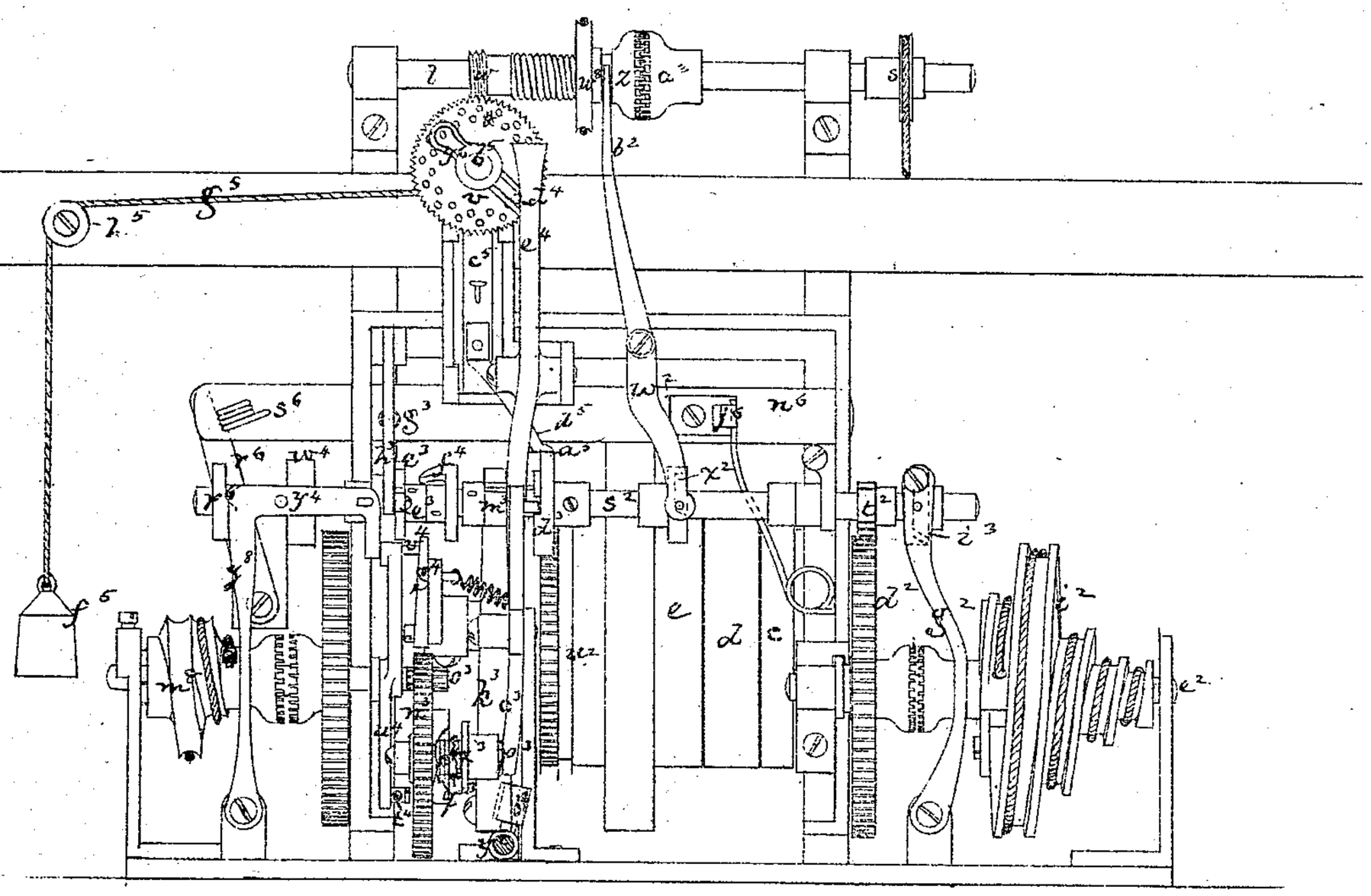


Fig. 6.

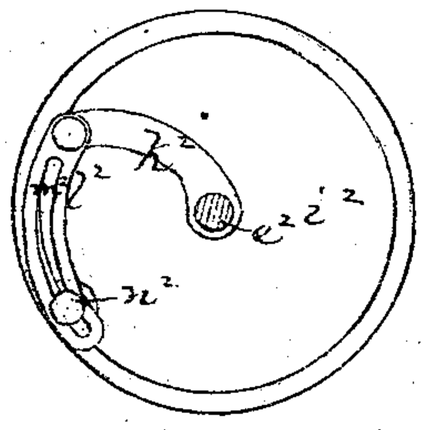
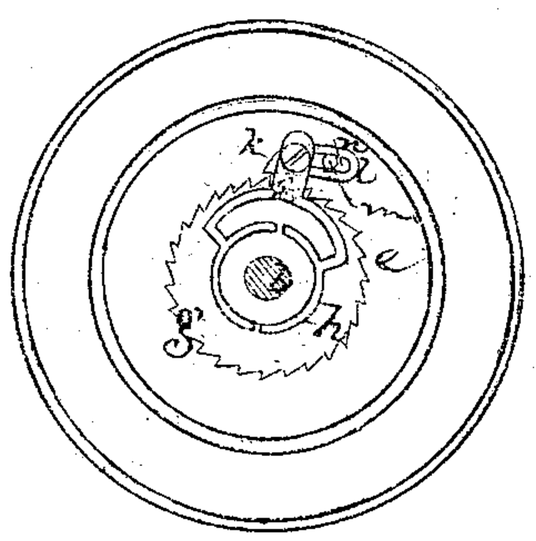


Fig. 7.



Witnesses.
Mc. W. Hotchingham.
L. M. Gatchell.

Edward Wright.
By his Attys.
Crosby & Gould

UNITED STATES PATENT OFFICE.

EDWARD WRIGHT, OF WORCESTER, MASSACHUSETTS.

IMPROVEMENT IN SELF-ACTING MULES FOR SPINNING.

Specification forming part of Letters Patent No. 117,231, dated July 18, 1871.

To all whom it may concern:

Be it known that I, EDWARD WRIGHT, of Worcester, in the county of Worcester and State of Massachusetts, have invented an Improvement in Self-Operating Mule-Spinners; and I do hereby declare that the following, taken in connection with the drawing which accompanies and forms part of this specification, is a description of my invention, sufficient to enable those skilled in the art to practice it.

My invention relates to some of the details of construction and organization of the mechanism of self-acting mule-spinners.

The drawing represents a mule or the parts of a mule embodying my improvements.

Figure 1 is a front elevation of the mule. Fig. 2 is a plan of it. Fig. 3 is a sectional elevation on the line *x x*. Fig. 4 is a sectional elevation on the line *y y*. Fig. 5 is an elevation of the cam-shaft and its cams and the adjacent mechanism. Fig. 6 is a side view of the draft-scroll wheel. Fig. 7 is a side view of pulley *e* and its ratchet-and-pawl mechanism.

a denotes the head-stock or frame. *b* is the main shaft, having upon it the series of pulleys by which the respective operations of the mechanism are all effected. The first pulley *c* is fast upon the shaft, and drives the mule-carriage up. The second pulley *d* is a loose pulley, and the third pulley *e* is a loose pulley, but is connected with the first pulley by a peculiar mechanism, so that, while the first pulley operates without imparting motion to the pulley *e*, movement imparted to the latter is communicated to the pulley *c*, the pulley *e* operating on the slow-return mechanism and working the carriage up. Fixed on the shaft (see Fig. 7) is a ratchet-wheel, *g*, and loose on said shaft is a collar or ring, *h*, to an arm, *i*, of which is pivoted a pawl or pawl-lever, *k*, the point of which, when thrown down, meshes with and rotates the ratchet. Back of the pawl-pivot or fulcrum the pawl-lever has an arm, *l*, in which is a slot, *n*, through which extends a pin, *m*, projecting from the side of the pulley *e*. When the pulley *c* (fast on the shaft) is rotated the ratchet is rotating with it, but the pulley *e* being loose upon the shaft the friction causes the pin on it to be thrown back in the slot, and throws the pawl up from the ratchet, there being then not only no motion imparted by the rotating shaft to the pulley *e*, but the pawl being out of engagement with the ratchet, and therefore noiseless. But when the pulley *e* is driven in the same direction the friction causes the pin to advance in the slot *m*, thereby throwing up the slot-arm and carrying the pawl into engagement with the ratchet, causing both pulleys *e e* to operate together, or as one pulley. On one end of the shaft *b* is a gear-pinion, *n*, that meshes into and drives a gear, *o*, on a stud-pin, *p*, this gear having on one side, and forming part of it, a pulley, *q*, connected, by a belt, *r*, to a pulley, *s*, on a shaft, *t*, that operates, through a worm, *w*, the twist-wheel *v*, the shaft *t* also carrying a loose slide-pulley, w^8, connected, by a band or chain, *x*, with a pulley, *y*, which is geared to and operates the drawing-rolls, this pulley w^8 having on one end a clutch, *z*, which at proper times is thrown into connection with a clutch-wheel, a^2, (fast on the shaft *t*,) by a clutch-lever, b^2, which will be hereinafter described. On the opposite side of the gear *o*, and also fixed to or forming part of it, is another pinion, c^2, that meshes into and drives a gear-wheel, d^2, on the draft-scroll shaft e^2, the wheel d^2 being loose on the shaft e^2 and having on one side a clutch, f^2, into which is thrown at proper times, as will be hereinafter described, and by the action of a clutch-lever, g^2, a clutch-wheel, h^2, fast on the shaft, to drive the draft-scroll i^2, which is also fast on the shaft. This scroll-wheel is made adjustable as to the length of its cord-winding groove, the provision for adjustment being as follows: On one side of the wheel, and pivoted on the shaft, (see Fig. 6,) is a curved arm, k^2, having a peripheral groove, and to the outer end of this arm is jointed an adjusting-link, l^2, having a long slot, m^2, through which a screw, n^2, extends, and fastens the link to the side of the wheel adjacent to the peripheral groove thereof. By loosening the screw the arm k^2 may be moved nearer to or further from the screw, such movement effecting a shortening or prolongation of the extent of winding-periphery upon the scroll, according as the draft-cords may need to be operated more or less rapidly, the movement of the carriage being very easily and quickly regulated by this adjusting-scroll mechanism. It will be observed that the connections to operate the scroll-shaft (to draw the carriage up) and the connections to operate the twist-wheel and drawing-scroll shaft are directly geared from the main shaft, the main-shaft pin-

ion driving both the gear that operates the scroll-shaft gear and the wheel that operates the twist and draw-roll shaft. The return-scroll is seen at m^2. It slides and turns loosely upon a shaft, n, and is driven by a clutch, o^2, on the side of a gear-wheel, p^2, fast on the shaft, said gear being rotated by a pinion, q^2, driven from the driving-shaft by a pinion, r^2, on the driving-shaft. The rotating movements of both scrolls of the time or twist-wheel and of the drawing-rolls being thus directly effected by the main shaft and connections therewith, the timing or respective movements of the carriage, the draw-rolls, the twist-wheel, and other mechanism are controlled by and from a cam-shaft, s^2, turning in suitable bearings on the inner side of the journal-frame, and driven intermittently by the gear-wheel on the scroll-shaft, the cam-shaft s^2 having near one end an intermittently-toothed wheel, t^2, the respective teeth of which at proper times are thrown into engagement with the gear d^2 on the scroll-shaft e^2. On the driving-shaft is a friction-clutch, w^2, by which the backing off of the spindles is effected in the ordinary manner. When the carriage is in position to start out the draft-scroll-shaft clutch is engaged with its clutch-wheel and the clutch on the twist-wheel shaft is in connection with its clutch-wheel, and the rotation of the main shaft will then draw out the carriage and operate the draw-rolls in the ordinary manner. When the draw-rolls (as the carriage is moving out) have let out sufficient roving to form the yarn, the sliding clutch on the twist-wheel shaft is thrown out of connection with the clutch-wheel and the rotation of the draw-rolls ceases.

The unclutching of the draw-roll-pulley clutch is effected as follows: The fork of a clutch-lever, b^2, pivoted at w^2, straddles the sliding clutch-sleeve or hub, and a pin on the lower arm of said lever lies in the path of a side cam, x^2, on the cam-shaft s^2. Under the carriage is a long rod or rocker-shaft, y^2, turning in bearings on the bed of the machine. On this shaft is an arm, z^2, which may be slid upon said shaft, but is held in any required part thereon by a suitable screw. Attached to the forward side of the carriage is an inclined dog, a^3, and, as the carriage moves out, this dog strikes the arm z^2 and turns the rocker-shaft slightly as it passes it. At the inner end of the shaft is an incline or lug, b^3, and the movement of the rocker-shaft causes this lug to act on the lower arm of an escape-lever, c^3, throwing a pin on the upper end of the lever out of engagement with a locking-notch in the side of an escape-wheel, d^3, on the cam-shaft, so that said shaft can turn. The cam-shaft has fixed on it a star-wheel, e^3, against the point of one of the teeth of which a roll, f^3, is held by a spring, g^3, acting on an arm, h^3. When the escape-lever is thrown from the notch in the wheel d^3 the cam-shaft is free to move, and the stress of the spring g^3 causes the roll f^3, acting on the face of the tooth of the star-wheel, to turn the shaft sufficiently to throw one of the teeth of the sectional gear-wheel into engagement with the gear on the scroll-wheel shaft. As soon as the tooth meshes with the gear the cam-shaft is rotated a quarter turn, and, by such rotative movements, the side cam moves the clutch-lever laterally and unclutches the draft-roll pulley, thereby stopping the movement of the draw-rolls. As the rotation of the gear carries the sectional toothed wheel t^2 on the cam-shaft out of engagement with the gear the center of the roll f^2 passes the point of the next tooth of the star or cam-wheel, and the pin of the lever springs into another notch in the escape-wheel, and the cam-shaft is again locked in position. The continued outward movement of the carriage next brings the dog against an arm, h^3, on the rocker-shaft, and rotates the rocker-shaft still further and throws out of engagement the draft-scroll-clutch mechanism, as follows: The movement of the rocker-shaft presses the lug b^3 laterally against the escape-lever and releases the escape-lever from the lever-pin, thereby releasing the cam-shaft as before; the roll again acts on the star-wheel to turn the shaft and carries the next tooth of the sectional gear into engagement with the gear d^2, the cam-shaft being then again rotated a quarter rotation by the gear-wheel. This movement of the cam-shaft causes a side cam, i^3, to act on the clutch-lever of the draft-scroll clutch and throw the slide-clutch out of engagement with the clutch-wheel fast on the draft-scroll shaft. This same movement of the cam-shaft throws into gear the compensating or slow-return mechanism, (for effecting the slow return of the carriage,) as follows: k^3 denotes a bent lever, (pivoted at l^3,) the upper arm of which stands in the path of rotative movement of a peripheral cam, m^3, on the cam-shaft. The lower arm of the lever carries a gear-wheel, n^3, and, as the cam-shaft turns, (as last described,) the upper arm of the lever is thrown outward and the lower arm upward, carrying the gear-wheel into connection with the teeth of a pinion, o^3, in the return-scroll shaft. The gear n^3 turns on a stud-pin, p^3, and has a pulley, x^3, at its side, to which pulley is fastened a cord or chain, q^3, which, passing round a guide-sheave or pulley, r^3, extends out to and is fastened to a slide-bar, s^3, sliding on pins extending from stationary uprights t^3. At the end of the bar is a hook, u^3, which acts against an arm, v^3, extending from a rod, w^3, on the carriage. When the carriage moves out it draws the hook and bar with it and unwinds the chain from the pulley x^3, the pulley being then loose. As the scroll-shaft turns, after the gear has been thrown into engagement with the pinion, the chain winds on the pulley and draws the carriage slowly in to compensate for the twist. The chain is fastened to the bar by means of a sliding shoe, y^3, and, by setting the shoe more or less distant on the bar from the winding-pulley, the carriage can be made to return slower or faster, as the twist in the yarn may require, setting the shoe nearer to the winding-pulley, of course, enlarging the diameter of the winding-surface, (by means of the chain already wound thereon as the carriage begins to move in,) and, of course, correspondingly in-

creasing the speed of the carriage. The slow movement of the carriage continues until an arm or projection, a^4, on the carriage, strikes a hook or locking-catch, b^4, which arrests further movements of the carriage. This hook is made adjustable in position so that it may be set to stop the carriage at any desired point. Although the carriage is thus stopped, the gear n^3 continues to rotate, and, for this reason, I hold the gear to the winding-pulley by friction-washers c^4, which permit the gear to rotate without drawing the carriage, or notwithstanding the stopping of the carriage, the friction being sufficient, however, to cause the wheel and pulley to rotate together and draw in the carriage when the latter is free to move. The twist-wheel shaft having in its rotation now brought the pin d^4 around to a lever, e^4, the pin strikes said lever, which operates upon the escape-lever, actuating it, and again freeing the escape-wheel, when the cam-shaft is again rotated another quarter-turn, as before. This movement of the cam-shaft frees the bent lever k^3 from the cam m^3, and the slow-return gear drops out of engagement with the return-scroll shaft. This same movement of the cam-shaft causes a side cam, f^4, to act against the inner arm of a friction-clutch lever, g^4, movement of which by the cam operates the friction backing-off clutch-wheel that effects the stoppage of the spindles and the backing off of the spindles in the ordinary manner.

During the backing-off movement (the machine being banded in the usual manner) the movement of the chain-drum shaft or winding-shaft g^4 is reversed, and by this reversal a pawl, h^4, is thrown into engagement with a ratchet, i^4, on the shaft g^4, and so that the rotation of the ratchet carries the pawl with it. The pawl-pin projects from a segment-scroll, k^4, in the groove of which the faller-lock chain l^4 lies. This chain is attached to the lower end of the faller-lock m^4, the hook of which locks under a roll, n^4, on the outer end of a weighted lever, o^4, the upper end of the faller-lock being jointed to an arm, p^4, on the faller-rod q^4. As the segment turns, as described, it draws in the chain, (running under the roll,) and thereby not only draws down the faller-wire, but locks the faller-lock in position under the roll. As the faller-lock descends, its lower end, in moving in, strikes an incline, r^4, or the outer end of the stop-hook, moving said end laterally, thereby releasing the carriage from the stop-hook and leaving the carriage free to move up. From the stop-hook an arm, s^4, projects, and to this arm is jointed a long rod or link, t^4. The unlocking movement of the hook actuates this rod, and, the other end of the rod being jointed to a lever, u^4, (the upper arm of which rests against a pin, v^4, projecting from the backing-off-clutch lever,) the movement of the rod causes this lever u^4 to start the clutch-lever, and throws it from the point of the clutch-operating cam, thereby effecting the release of the backing-off-clutch mechanism. The last-described rotative movement of the cam-shaft also brings the return-scroll cam w^4 into position, where its notch x^4 will allow the pin y^4 of the clutch-lever y^3 to be thrown in to connect the return-scroll-clutch mechanism by the action of a spring, z^4. This movement of the clutch-lever cannot take place, however, when the cam-shaft is first rotated, because it is held back by the upper arm of the lever u^4. But when the said lever is thrown in to release the backing-off mechanism the movement of the lever-arm carries it out of the path of movement of the arm of the clutch-lever y^8, and the spring then throws the clutch-lever in to connect the return-scroll clutch, so that the rotation of the return-scroll shaft will now effect the working up of the carriage, the release of the backing-off mechanism and the starting of the return-scroll wheel being simultaneously effected by the movement of the lever u^4. The last-described movement of the cam-shaft also effects the release of the twist-wheel from the worm of the twist-wheel shaft, the twist-wheel dropping from the shaft just after the pin has actuated the lever that moves the escape-lever and as the cam-shaft begins to move. This is effected by a peripheral cam, a^5, the twist-wheel turning on a pin, b^5, projecting from a vertical slide, c^5, from the lower end of which extends an arm, d^5, that rests on the cam a^5. The cam is circular, except at the cam-shoulder e^5, and, as the cam-shoulder passes from under the arm d^5, the slide drops (by gravity or the stress of a suitable spring) and the twist-wheel is released from its shaft. As soon as released the twist-wheel is returned to its original position by a weight, f^5, attached to the hub of the wheel by a cord, g^5, the cord passing over a guide-sheave, h^5. As the twist-wheel is turned by its shaft the cord winds on the hub, and as soon as released the cord unwinds and returns the twist-wheel to its original position. After the return-scroll mechanism is engaged the carriage is worked up by the return-scroll, and, as it reaches its original position, an incline, i^5, on the rear side of the arm v^3, strikes an arm, k^5, in the rocker-shaft, (turning said shaft in a direction opposite to that in which it has previously moved,) and carries it into its original position, its extent of back movement being equal to its three movements in the opposite direction. This movement causes the lug at its inner end to throw in the lower end of the lever c^3, and throws the pin at its other end out into the outermost notch in the escape-wheel. The cam-shaft is now again free to move, and is turned, as before, until the next tooth of the sectional gear is thrown into engagement with the gear, and the cam-shaft is again turned by the gear and completes its next and last quarter rotation, effecting the reconnection of the draft-scroll-clutch mechanism and the draw-roll-clutch mechanism, the rotation of the cam-shaft causing the side cam i^3 to move the clutch-lever g^2 and carry the clutch into connection with the draft-scroll clutch, and the movement of the cam-shaft also causing the side cam x^2 to actuate the clutch-lever w^2 and throw the sliding clutch on the twist-wheel shaft into connection with the clutch of the draw-roll-operat-

ing pulley. The escape-lever is held in proper position for the respective notches of the escape-wheel by the lever e^4 and a spring, l^5. This spring is fixed to the roller-beam, and its outer end bears against the upper part of the lever. The face of the lever is inclined, and the spring has a downward stress, so that, as the lever-arm is intermittently moved more and more in, the spring slips down at each of such movements and locks the lever in position, the lower arm of said lever being jointed to the escape-lever so that the stress of the spring keeps the pin of the escape-lever in proper position at all times in the respective notches. At the third quarter rotation of the cam-shaft the escape-lever pin is thrown to the innermost notch of the escape-wheel, (by the action of the twist-wheel pin on the upper arm of the lever,) and the said arm, when thrown back, is locked under or back of an incline or lip, m^5, at the outer end of the spring, so that, at each turn of the cam-shaft, the escape-lever retains the wheel in position, but in such a manner that it can freely move at the proper time.

It will thus be seen that the cam-shaft has four operative movements, and that the four results produced thereby are as follows: First, the carriage starts out, the draft-scroll clutch being engaged with the slide-clutch of the draft-operating shaft, and the draw-roll-pulley clutch with the slide-clutch of the twist-wheel shaft, and, as the carriage reaches the point where the delivery of the roving is to cease, the cam-shaft receives its first movement, and, by such movement, the draw-roll-pulley clutch is disengaged, and the rotation and delivery of the draw-rolls cease. The carriage continues to move out to the end of the stretch, and, reaching this point, the cam-shaft is again started, and by its second movement disengages the draft-scroll clutch and engages the slow-return or compensating mechanism. The carriage then moves in (by the action of the slow-return mechanism) to an extent to compensate for the amount of twist which may be required in the yarn, which being accomplished, the cam-shaft again moves, throwing out the slow-return mechanism and throwing in the backing-off mechanism, the movement of the faller-lock effecting the full engagement of the slow-return mechanism, after which the faller-lock is locked and the carriage is ready to move up. The carriage is then worked up to the draw-rolls, and the fourth and last movement of the cam-shaft then takes place, carrying the parts into their original position (the position first described) ready for the carriage to again start out. n^5 denotes the friction-cord for keeping the quadrant-chain tight. The quadrant-chain and its connections are not shown, as they are the same as in many other mules; but the winding-drum on which the chain winds is shown at o^5. The end of the cord is attached to the top of a post, p^5, extending up from the bed, and passes through a guiding-eye, q^5, thence around the drum o^5, and thence to the top of an arm, r^5, which extends up from a hub-sleeve, s^5, mounted on a pin, t^5, extending out from a stationary post, u^5. Around the sleeve a coiled spring, v^5, extends, one end of the spring being fastened to the arm and the other end to the post, the stress of the spring forcing the arm toward the head-stock and tightening or straining the cord. As the carriage works out the cord turns the drum until, when nearly out, the bar (through the eye of which the rope renders) strikes a stop, w^5, on the cord, which causes the cord to travel with the carriage, producing a slack in the cord between the carriage and the post p^5, the yielding motion of the arm allowing the cord to go forward with the carriage, but keeping it tight at all times, so that, except when the rope and carriage move together, the cord will turn the drum, the drum, of course, stopping when the cord is carried forward with and by the carriage, the drum being held from rotation in this manner during the completion of the outward movement of the carriage, during the slow-return movement of the carriage, and until the backing off and twisting are effected, the drum beginning again to move in the usual manner, by the action of the chain, when the holdback-hook is released and the carriage starts to work up, the slack in the cord being then drawn tight by the yielding arm. The winding-drum is made tapering from one head, x^5, to the cord-winding end of it; and this tapering or conical surface is peripherally and helically grooved. The drum may be largest at the head or end x^5, to which the chain is fastened; and, the chain being coiled on the drum, (when the carriage is out,) the drum will be driven fastest by the chain as the carriage begins to move in, moving slower and slower as the carriage works up and the chain runs from the larger part of the pulley, thus driving the spindles slower as the carriage moves up, according to the size and shape of the quadrant. The taper of the drum may be so formed, however, or the end of the chain be fixed to such part of it, as to drive the drum faster as the carriage moves up. a^6 denotes the relief-cord, which regulates the tension of the yarn in the usual manner. The cord runs through a guide-hook, b^6, at the bottom of an arm, c^6, projecting down from the carriage, and above the hook is jointed a weighted gripe, d^6, the teeth at the bottom of which catch into the cord (if the weighted arm of the gripe be drawn up when the carriage is working up) and draw the cord with the carriage, thereby working the quadrant-screw and relieving the stress upon the yarn. The weighted arm is attached, by a chain, e^6, to an arm, f^6, on the faller-rod shaft, and, if the yarn is being wound too tight, the faller-rod is drawn down, drawing the arm f^6 up, thereby drawing up the chain e^6 and forcing the griping-arm down, so that the arm pinches the cord between its teeth and the hook and causes the rope and carriage to travel together, so as to relieve the yarn in the usual manner. The griping-arm pinches the cord only when the carriage is going in and the yarn is too tight; and the greater the resistance the tighter is the hold of the arm on the cord, because of its

movement with the carriage and of the inclined position of the griping-arm relatively to the cord, causing it to gripe like one member of a toggle-joint; this part of my invention consisting in the method of effecting the gripe upon the cord by means of the griping-lever. This part of my invention, however, relating to the griping-arm and its action, I do not claim in this application, reserving the same for an independent application. g^6 denotes the stop-rod, by which the operator causes the machine to stop, when (in case of breakage of threads or for other reasons) it is desired to arrest the operations of the mule at the end of the working-up movement of the carriage. This rod turns rotatively in bearings on top of the carriage, and has fingers h^6 fixed upon it at regular intervals. To the rod an arm, i^6, is fixed, and to the end of this arm one end of a chain, k^6, is fastened, the chain extending laterally over the carriage, and its other end being fastened to a jointed arm, l^6, of a fork, having another and stationary arm, m^6, the position of the stop-rod holding the arm l^6 in an inclined upward position, as seen at Figs. 3 and 4. When the rod is turned by the operator the weight of the arm l^6 carries it down into horizontal position. The stationary arm m^6 of the fork, when the carriage reaches its normal position, (at the end of its working-up movement,) strikes a projection, j^6, from the shipper-slide n^6, and moves said slide so as to cause the shipper-fork o^6 to move the belt from the outer pulley onto the next and loose pulley, and, if the movable arm l^6 be up, the cam-shaft and the shipper-slide n^6 and fork o^6 effect the transfer of the belt from the loose pulley over onto the third pulley. But if the arm l^6 be thrown down by the operator, (by turning the stop-rod,) the projection j^6 is straddled by the two arms l^6 m^6, and the shipper-slide is thereby prevented from movement, and the belt is held upon the loose pulley, under which circumstances the carriage remains stationary and the work stops. The shipper-slide n^6 is operated, to move the shipper-fork o^6, by the arm r^6 and by a side cam, p^6, on the cam-shaft. This side cam operates on a pin, q^6, projecting from the arm r^6, and, when the carriage is in its normal position ready to start out, the shoulder of the cam is just beyond the pin and the fork of the shipper-slide holds the belt on the third pulley. The belt remains on this pulley while the carriage is out, and the rotation of the cam-shaft does not cause the cam to change the position of the slide until after the slow-return movement and the throwing out of the twist-wheel, the third rotative movement of the cam-shaft causing the cam to throw the arm forward, and with it the shipper-slide, transferring the belt from the third to the first pulley, from which pulley it is thrown to the loose pulley as the carriage comes up to the head-stock. The arm r^6 bears against a spring, s^6, fixed to the slide, and bent and extending through a slot, t^6, therein, and this slot and spring enable the slide to be thrown back by the arm r^6, when the carriage works up to the head-stock, the cam being then against the pin and holding the arm in position, but the spring enabling the slide to be moved by the arm r^6 so as to throw the belt onto the loose pulley. The cam is carried beyond the pin at the next and last movement of the cam-shaft, and the slide can then be moved to transfer the belt. The scroll-cords run around guide-sheaves at the front of the machine in the usual manner, each sheave being so mounted upon its frame as to be capable of lateral slide movement, in accordance with the laterally-varying position of the cord upon the scroll. To facilitate this lateral slide movement of the guide-sheave c^7, it is hung to a bearing or connecting-yoke, u^6, having another sheave, v^6, which runs upon a guide-rail, w^6, of the sheave-stand x^6, so that no strain upon the guide-sheave by the draft-cord can prevent its assuming the proper position relatively to that part of the draft-scroll groove where or from which the cord may be running. The twist-wheel pin is held in position by a spring-fork or clamp, y^6, which straddles the hub of the twist-wheel and turns freely thereon, the prongs of the fork embracing the pin (entering a peripheral groove therein) and thus keeping the pin from dropping out. When the return-scroll is unclutched from its clutch-wheel it turns so freely as to allow the cord to unduly slacken; and, to keep the cord tight, I place upon the shaft a fork or arm, a^7, embracing the shaft, or so connected therewith as not to turn freely. From the side of the scroll a pin, b^7, extends, and when the scroll is engaged with the clutch-wheel this pin runs clear of the friction-fork or rotates with it. But when the scroll is unclutched the pin runs against the fork, and the scroll will only turn as fast as the friction of the fork upon the shaft will permit, this friction being sufficient to keep the scroll-cord tight.

I claim—

1. In combination with the fast pulley c, loose pulley d, and ring h, the pulley e, loose upon the shaft, but connected to and driving the shaft by means of a pin working through a slotted pawl, which is thrown out of connection with its ratchet when the belt is on the pulley c, substantially as described.

2. In combination with the draft-scroll, the prolonging-arm k^2 pivoted upon the scroll-shaft and jointed to the slotted arm l^2 or its equivalent, and made adjustable in position with reference to the scroll-wheel groove, substantially as shown and described.

3. In combination with the escape-lever c^3, escape-wheel d^3, and the cam-shaft, the rocking-rod y^2, provided with one or more arms and arranged to be operated by the movements of the carriage to effect the movements of the cam-shaft, substantially as described.

4. In combination with the escape-lever c^3, escape-wheel d^3, and the lever e^4, the spring or its equivalent, for holding the lever in position, substantially as described.

5. The slow-return lever k^3, gear n^3, pinion o^3,

stud p^3, pulley x^3, chain q^3, pulley r^3, and slide-bar s^3, combined and arranged to operate substantially as shown and described.

6. The adjustable runner or shoe y^3, in combination with the slide s^3, pulley x^3, and hook w^3.

7. In combination with the slow-return gear n^3, slide s^3, and pulley x^3, the friction-washers c^4 for permitting said gear to turn on its shaft, substantially as and for the purpose described.

8. The combination of the rotary stop-rod g^6 and the movable fork-arm l^6, substantially as and for the purpose described.

9. The sliding sheave or pulley v^6, in combination with the connecting-yoke w^6 and the scroll-cord-guide sheave c^7.

EDWARD WRIGHT.

Witnesses:
JAMES BOOTH,
WILLIAM A. HOOD.