Sheet 1, 5 Sheets.

B. Lapham.

Spinning Mach.

No. 1,797. Patented Sept. 25, 1840.

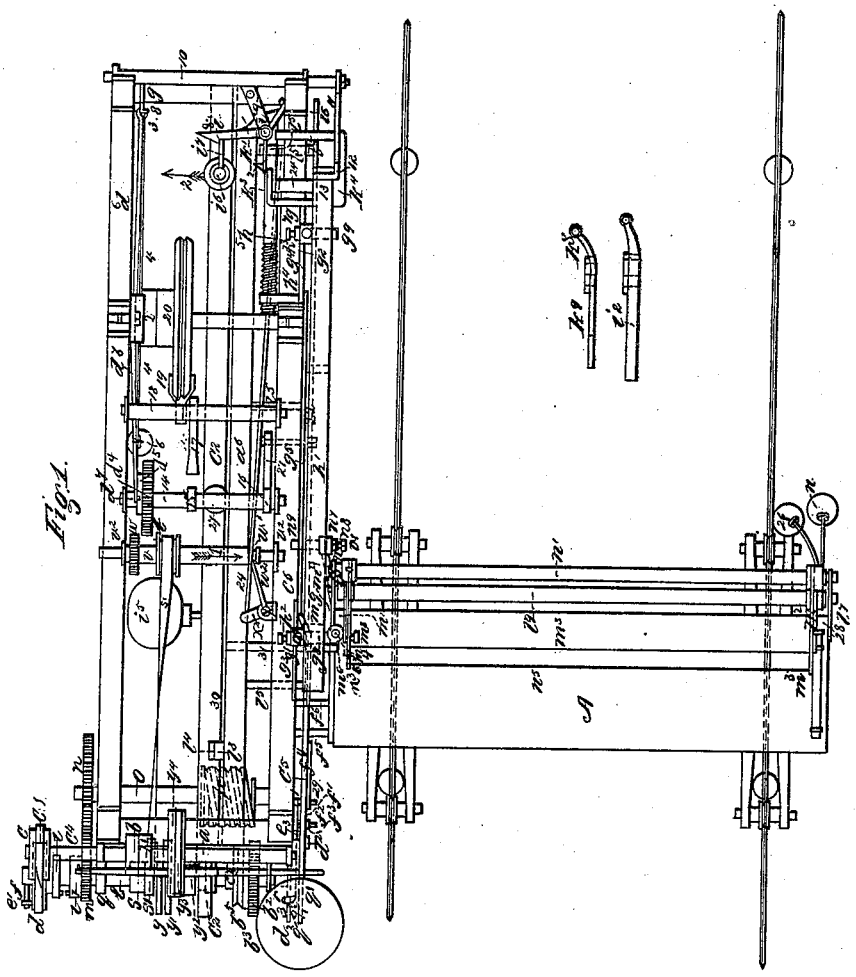

Fig. 1.

Witnesses

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Spinning Mach.

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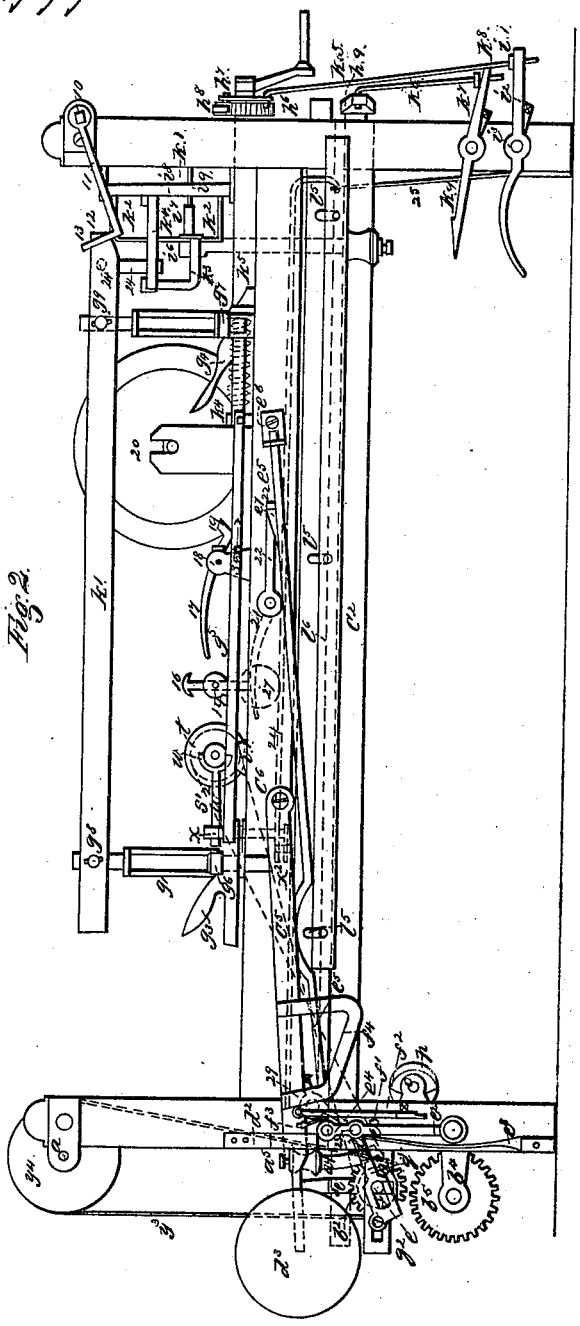

Fig. 2.

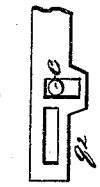

Fig. 13

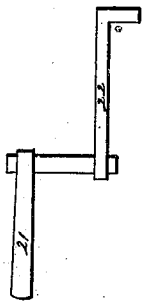

Fig. 12.

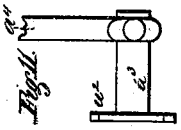

Fig. 11.

Fig. 10.

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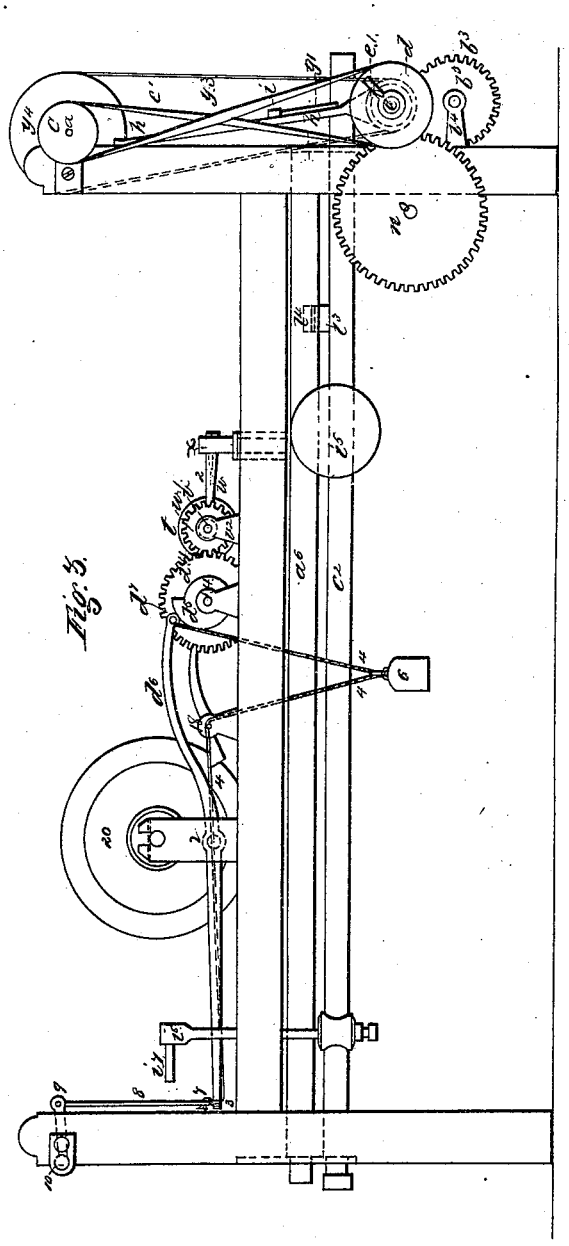

Fig. 5.

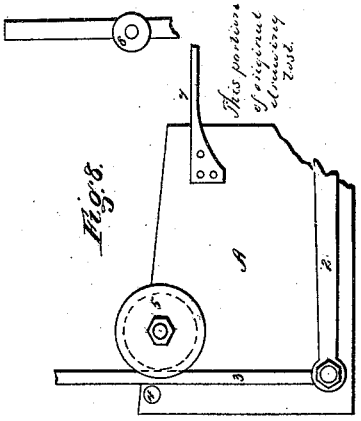

Fig. 3.

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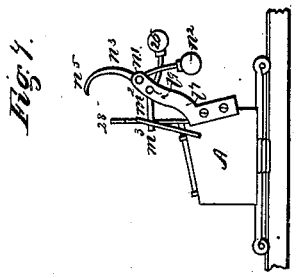

Fig. 4.

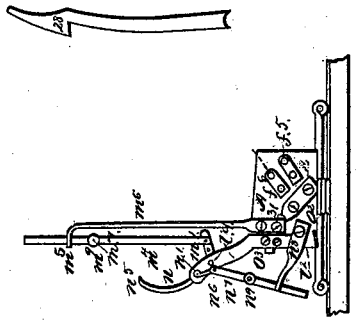

Fig. 6.

Fig. 2. missing

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B. Lapham.

Spinning Mach.

No. 1,797. Patented, Sept. 25, 1840.

Fig. 3.

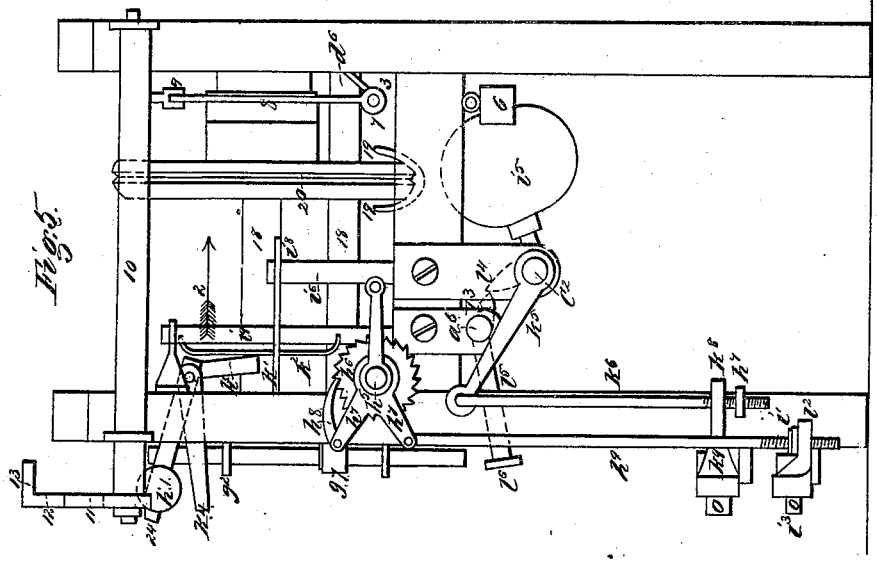
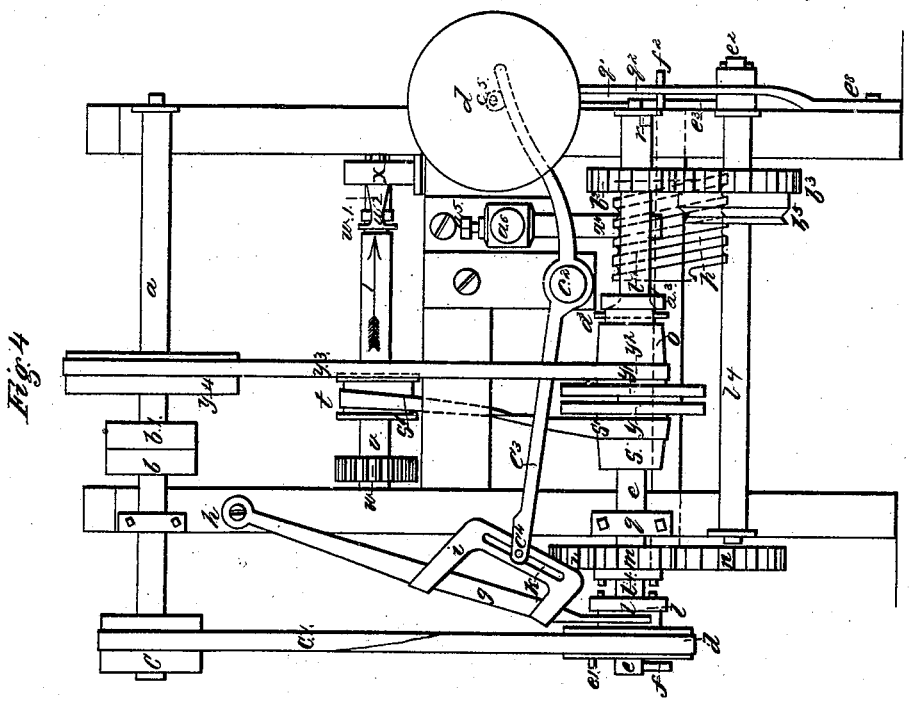


Fig. 4.



Witnesses:

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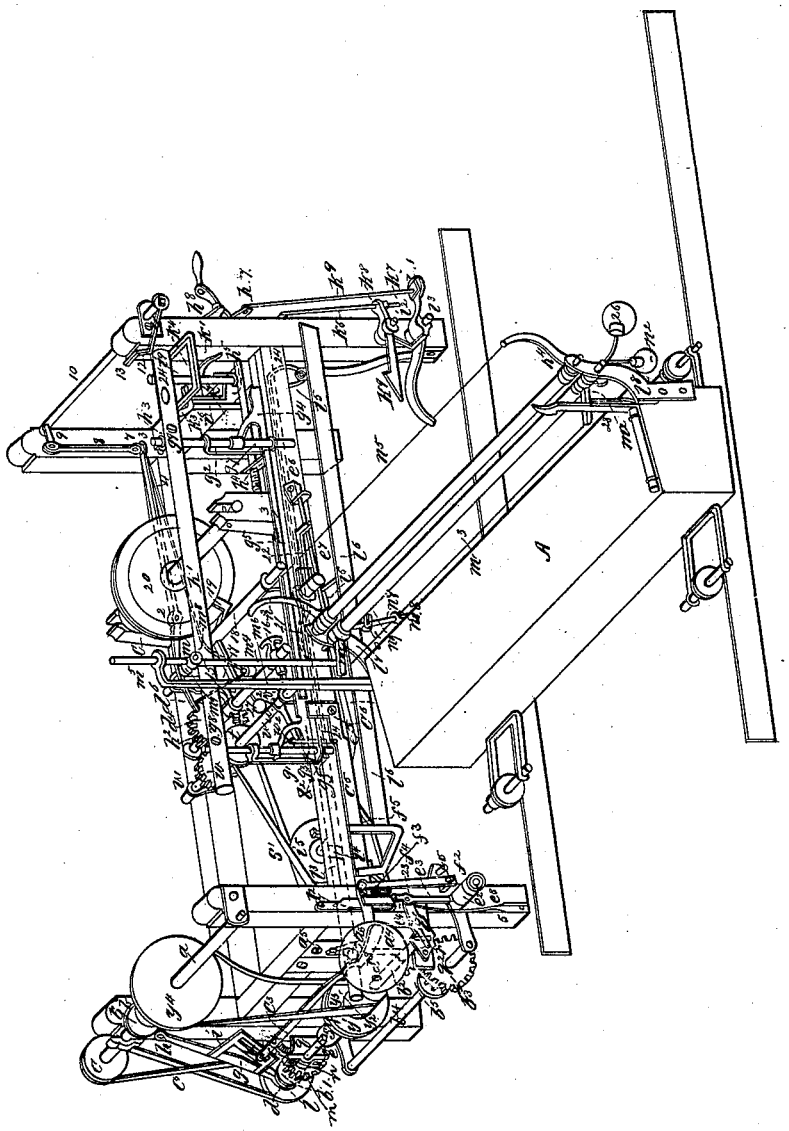

Witnesses
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UNITED STATES PATENT OFFICE.

BEN. LAPHAM, DECEASED, BY DANIEL P. LAPHAM, ADMINISTRATOR, OF ADAMS, MASSACHUSETTS.

SELF-ACTING MULE FOR SPINNING.

Specification of Letters Patent No. 1,797, dated September 25, 1840.

To all whom it may concern:

Be it known that I, BENJAMIN LAPHAM, deceased, late of Adams, in the county of Berkshire and State of Massachusetts, machinist, did, during his lifetime invent and make and apply to use certain new and useful improvements as mechanical additions to common spinning-machines, the object of such additions being to effect what is technically termed "building the cop" by mechanical means instead of hand labor, as heretofore practised, such means of building the cop being applicable to mules, stretchers, jennies, jacks, and all descriptions of machinery by which threads or yarn, of cotton, flax, silk, wool, or hemp are to be spun and wound into cops by increasing the dimensions of the parts of the machines; and for which improved means the said BENJAMIN LAPHAM sought Letters Patent of the United States by a memorial, affirmation, specification, and drawings, bearing date the 15th day of September, 1838, and addressed to the Commissioner of Patents of the United States; and whereas the said BENJAMIN LAPHAM departed this life, shortly after executing the said memorial, affirmation, specification, and drawings; and whereas DANIEL P. LAPHAM, of Adams aforesaid, manufacturer, was duly appointed administrator to the estate and effects of the said BENJAMIN LAPHAM by letters of administration of the probate court of the said county of Berkshire, dated the 2d day of October, 1838, under the hand and seal of the Honorable Wm. P. Walker, judge of the said court, and whereas the said specification and drawings have been since returned from the Patent Office of the United States to the said DANIEL P. LAPHAM as not being in the full and due form required by law, and the same require to be renewed with amendments. Now, therefore, I, the said DANIEL P. LAPHAM, do hereby declare that the said improvements and the methods of constructing and using the same and the advantages to be derived therefrom are fully and substantially set forth and shown in the following description and in the drawings attached to and making part of this amended specification, wherein—

Figure 1, Sheet 1, is a geometrical projection of the horizontal plan, or position of the common mule spinning machine, with the said improvements attached, the spindle carriage being shown near the back end of the machine; Fig. 2 is a lengthwise geometrical sectional elevation of the machine, on the side next the spindle carriage; Fig. 3, is a similar elevation of the machine, seen on the opposite side; Fig. 4 is a similar cross section of the back end of the machine; Fig. 5 is a similar cross section of the fore end of the machine; Fig. 6 is a similar cross section of the spindle carriage and frame, at the end which gears into, or is connected with, the standing part of the machine; Fig. 7 is a similar cross section of the spindle carriage, at the opposite end; and the figure in Sheet 2, is a general perspective representation of the whole machine; such detached figures as are necessary for clear explanation, are successively referred to hereafter, and the same letters and numbers, as marks of reference, apply to the corresponding parts on all the several figures.

a is a shaft, carrying a fast and loose pulley *b* and *b'*, see Figs. 1 and 4, by which power is to be communicated from any prime mover to this portion of the machine; *c*, is a pulley on one end of the shaft *a*, connected by the band *c'*, to the drum, *d*, which slides on the shaft *e*, having a crank pin *e'* on the outside, to give motion to the shaft *e*, when needed, by sliding the drum *d* out, so that the crank pin *e'* takes the crank arm *f*; on the inside of the drum, *d*, is a groove, to receive the fork at the lower end of the clutch bar, *g*, whose fulcrum or joint is at *h*, and the bar is fitted with a frame, *i*, having a slot, *k*, which stands at an acute angle with the center line of the bar, *g*; within the fork *g*, the side of the drum, *d*, forms one half of the clutch box, *l*, the other half being formed by the box, *l'*, fitted on that side of the loose pinion wheel, *m*, which gears into the cog wheel, *n*, on the shaft, *o*, this is fitted with the spiral grooved rigger, *p*, whose use is to draw the spindle carriage A up, by a band 30 attached to the bar 31, see Figs. 1, and 6, the opposite motion being given in the usual way.

The shaft, *e*, is fitted in a bearing, *g*, at this end, formed so that the journal of the shaft is allowed to play freely, when the other end of the shaft *e*, has a vertical motion given to it, by the action of the sliding diagonal frame, *g'*, which bears the weight of the shaft at the opposite end, the vertical line of the shaft *e* being maintained by mov-

ing in a vertical slot in the fixed frame, g^2, which has a second slot to receive the pin r, is shown in the attached Fig. 13, which serves as a connection between the frames g' and g^2, for the purpose of engaging or disengaging the gearing wheels b^2, and b^3, for the purposes, and in the manner hereafter detailed. Within the bearings g, g', the drum s, is fitted on the shaft e, to receive the band s', by which it is connected with the drum, t, on the shaft v, mounted on bearings v', v^2, and fitted with long journals, that admit of the shaft sliding endways, between the bearings v', v^2. At one end of the shaft v, is the pinion w, and at the other end a groove, to receive the fork w', on the outer end of the bar w^2, which forms a long crank arm, from the top of the vertical shaft H mounted in common bearings, and having a short crank H^2, on the lower end, to which is connected the rod 24, whose length finishes at the fore end of the machine, by an attachment to the upper point of the vertical spring 25. Next the drum, s, is a fixed friction plate, y, to match the loose friction plate y', having a drum y^2, by which the friction plate y', is connected through a band y^3, to the pulley y^4, on the shaft a; next the drum y^2, is a groove, to receive the fork a^2, at the end of the counter arm a^3, shown detached in the small Figs. 10 and 11, and which is adjustable in the length, by the screw at the other end of the arm a^3, which is fitted into the lower end of the vertical arm a^4, whose longitudinal position in the machine is to be regulated and maintained by a set screw a^5, in the upper end where the arm a^4, has a mortise, to receive that end of the longitudinal shaft a^6, which is made the whole length of the machine, for the purposes shown hereafter.

The shaft e has a pinion b^2 to gear into the tooth wheel b^3, on the shaft b^4, having next the wheel b^3, a grooved rigger b^5, from which a band is to be led off to drive the spindles on the carriage A, in the usual manner. The shaft c^2 is elongated at this end of the machine, to serve as a fulcrum for the lever c^3, one end of which is fitted with a pin c^4, taking into the slot R, of the frame i, the other end being curved upward, to meet the drop lever c^5 which has a fulcrum c^6 on the side of the machine, and is kept in place by a guide d^2, on the side of the machine, and kept by the weight d^3 from rising out of the guide by the motion of the machine, as hereafter stated. The pinion w, on the shaft v, gears into the tooth wheel d^4, on the shaft 14, when the shaft v is driven in the direction of the arrow 1. On the outside of the wheel d^4, is the spiral cam d^5, Figs. 1 and 3, by which that end of the lever d^6 is raised through a pin d^7, the fulcrum of this lever is at 2, and its forward end is formed with an eye 3, through which is reeved the line 4, which returns toward the center of the machine, descending over the shaft 18, passes through the eye of the weight 6, and returns upward to the end of the lever d^6, near the pin d^7, which secures this end of the line, the other end being passed through the eye 3, and made fast to the eye 7, in the lower end of the vertical link 8, whose upper end is jointed to the arm 9, on the cross shaft 10, whose inner end has attached to it, a crank arm 11, with an elbow 12, carrying a finger 13, whose direction is toward the main frame, in a parallel line with the shaft 10. The shaft 14, which carries the tooth wheel d^4, carries also two T cams, 15 and 16, which when not in action are kept upright by the balance weight 27; the cam 15, in its rotation depresses the end of the crooked lever 17, mounted on the shaft 18, and opposite to this, on the shaft 18, is the crutch fork 19, whose use is to stop the head wheel 20, which is driven and operates in the usual way, this is the same as the head wheel in the common mule spinning machine, and a band from it works the spindles in the carriage, in the usual way.

The T cam 16, operates in its rotations to depress the lever 21, which is mounted on a small shaft, going through the inside rail of the frame, and carrying on its other end the finger crank 22, shown detached in Fig. 12, which will be raised when the lever 21 is depressed. On the inside of the back end of the frame, the pin e^2, carries the upright arm e^3, to which one end of the diagonal frame q^1, is jointed at 23; the arm e^3, at its upper end, is jointed, at e^4, to the horizontal latch bar e^5, which is made crooked upward to carry it clear of other parts, the outer end slides in an eye e^6, and has a latch piece e^7, fitted to receive the finger 22, and the arm e^3 is kept in place by the crooked spring e^8.

The drop lever c^5, having its fulcrum at c^6, has a drop leg f^1, with a shoulder near the point, by which the lever is supported in place on the stud f^2, this is kept to the stud, by a bent spring f^3, and in front of this leg, is a frame cam f^4. On the spindle carriage A, at this end, are two long pins f^5, f^6, and when the carriage comes up, the lower pin f^5, strikes away the leg f^1, and lets the drop lever c^5 fall, and on the return of the carriage, the upper pin f^6, coming under the frame cam f^4 lifts the lever, and the bent spring f^3, springing the lower shoulder of the leg f^1, onto the stud f^2, retains the lever in the upper position, this part of the motion is nearly the same as in the common mule spinning machine, but as stated hereafter, is applied to a different purpose.

Two standards, g^1, g^2, each having an upper and lower horizontal eye, are fixed on the main frame, next the spindle carriage, so as to receive at their lower parts, a pair of

triangular formed cams g^3, g^4, the upper part of the back cam g^3 being convex, the similar part of the fore cam g^4 being concave, these two are connected by the bar g^5, at the required distance. In front of these two, and going through the eyes on the standards g^1, g^2, are two slides g^6, g^7, having in their middle each a boss, to receive a pin, which bears on the cams g^3, g^4, and by which the cams, in their horizontal motion, raise and lower the slides, the tops of which receive each a knob of metal by a mortise through it, and steadied on the slides by set screws h^2, h^3, which knobs are the heads of pins g^8, g^9, going through the guide bar h^1, which is thus raised or maintained to any required height, by the operation of the cams g^3, g^4, through the pins in the shoes g^6, g^7, the height on the slide being adjusted, by the set screws h^2, h^3. At the fore part of the frame, near the fore cam g^4, within the frame a metal arm is fixed, to form a nut h^4, for the leading screw h^5, the shaft of which has, at the other end outside the bearing, a ratchet wheel, h^6 fixed on it, and outside that, a two armed crank, h^7, the eye of which is movable on the shaft h^5, the upper arm on the crank h^7 is fitted with a pawl h^8, working into the ratchet wheel h^6, the lower arm has the rod h^9, attached by a joint, and the rod below has a screw thread cut on it, fitted with a nut i^1, by which the distance from the crank to the lever i^2 is regulated. This lever is mounted on the pin i^3, the fore arm being crooked, to receive the stud o^2 on the spindle carriage, which, as it comes up, depressing that arm of the lever i^2, raises the other arm, and with it the rod h^9, and crank h^7, sending the ratchet wheel on by the pawl h^8, this motion progresses the cams g^3, g^4, in the direction of the arrow 3, on the bar g^5, and raises the guide bar h^1.

The longitudinal shaft c^2, has a balance weight i^5, which, in operation, depresses the lever c^3, so as to bring the pin c^4 in action, in the slot k, and thus connects the clutches b and b^1. The standard i^6, on the bar c^2, has an arm i^7, which catches in the latch i^8, mounted on the standard i^9, which is supported in two bracket bearings, and a back spring, k^1, keeps the latch i^8 up to the arm i^7, the latch frame k^2 is fitted on the standard i^9, and stands in contact with the elbows k^3, on the curb piece, k^4, this is mounted on an arm 24, on the guide bar h^1. The fore end of the bar, c^2, outside the bearing, has a crank arm k^5; at the outer part of this the rod k^6 is jointed on, having the lower end screwed to receive a nut k^7, which regulates the length between the crank arm k^5, and the lower side of the eye k^8, on the fore end of the spindle carriage latch k^9, which takes into a pin l^2, on the end of the spindle carriage.

The longitudinal shaft a^6 already referred to has a stud l^3, which meets a corresponding stud l^4, on the shaft c^2, so that the two gear together, for purposes of the work, as will appear hereafter. The shaft a^6, has, toward the spindle carriage, three arms l^5, which collectively carry a lower guide bar, l^6.

The spindle carriage is mounted, and the spindles fixed and driven in the usual way; upon the carriage A, the stands or brackets l^7, l^8, to carry the fallers, are secured on the ends, and the top faller is formed by the shaft l^9, the fingers m^1, m^2, and the guide wire m^3, and the balance weight 26, in the usual manner, but, on the inner finger m^1, the vertical rod m^4 is jointed, and slides up and down, in an eye m^5, made in the right angled end of the vertical standard m^6, and the rod m^4 goes through the mortise in a boss piece m^7, which has a set screw m^8, to adjust it one one side, and on the other side, a pin carrying a guide roller m^9; the back faller, instead of being fixed on the back of the spindle carriage, as in the old mode, is herein mounted on the tops of the stands or brackets l^7, l^8, above, and rather before the top faller, and is formed by the shaft n^1, balance weight n^2, and fingers n^3, n^4, formed of an increased length, and curved downward, so as to carry the guide wire n^5 behind and below the guide wire on the top faller. At the inner end the shaft n^1, has a small crank arm n^6, to which is jointed the vertical slide rod n^7, whose lower end slides in a guide eye, in the outer end of the bracket arm n^8. Upon the rod n^7, is an arm n^9, with a mortise to slide it, and a set screw o^1, to adjust and secure it in place.

The operation of this machine thus fitted, and the effects produced, are as follows: On the spindle carriage A arriving at the outward point, the arm o^2, at the lower and outer corner of the carriage, strikes the curved part of the lever i^2, depressing that, and raising the other end, and rod h^9, and crank arm h^7, sends the pawl h^8, forward, carrying the ratchet wheel h^6 part of a turn, and with it the screw shaft h^5, thus drawing the cams g^3, g^4, a little outward, and raising the guide bar h^1. The pin l^2, at the same time catches over the shoulder of the latch k^9, and the spindle carriage is now held fast. The arm o^3, on the carriage, has also thick back the spring 25, which carries with it the bar 24, this draws the crank h^2, forward, and causes the arm w^2, to slide the shaft v in the direction of the arrow 1, and thus bring the pinion w into gear with the tooth wheel d^4, which has been standing still with the cam d^5, and kept in that position by the balance weight 27, but on motion being thus given, the T cam 15 depresses the lever 17, and stops the head wheel 20, the cam d^5, simultaneously raising the lever d^6, by the pin d^7, depresses the other end, and by the connection through the line 4, draws down

the link 8; this gives the shaft 10 a partial turn, that carries the arm 11 and the elbow 12 downward; at the same time the T cam 16 strikes the lever 21, and forcing that down, disengages the fingers 22, from the latch catch e^7, on the bar e^5, and allows the spring e^8, to force the bar e^3 forward, and thus put the pinion b^2 into gear with the wheel b^3, by depressing that end of the shaft e, through the action of the diagonal sliding frame q^1, q^2, this motion turns the spindles backward, by reversing the motion of the rigger b^5, this causes a portion of the length of each thread to unwind from the spindles, and the top faller, at the same time, being depressed by the action of the cam d^5 through the action of the lever d^6 and crank arm 11, on to the roller m^9, the guide wire m^3, takes up the slack of the threads, until the roller m^9 strikes the curb frame k^4, and continuing to be forced down, by the arm 11, the elbow k^3 of the curb frame, forces the latch frame k^2, off and disengages the latch i^8, so that the arm i^7 and standard i^6, with the shaft c^2, have all a small motion in the direction of the arrow 2, at the same time lifting the outer point of the crank arm k^5, which, through the rod k^6 lifts the eye k^8, of the latch k^9, and disengages the latch from the pin l^2, leaving the spindle carriage free to be drawn up, at same time, the arm c^3 quits the spring 25, which forces back the bar 24, and reversing the previous motion of the crank w^2, slides the shaft v, in the opposite direction of the arrow 1, and puts the pinion w out of gear with the tooth wheel d^4, the weight i^5 now forces the pin c^4 on the lever c^3, downward in the slot k, and disengages the crank arm f, from the crank pin e^1, which stops the reverse motion of the spindles, and bringing the clutches l, and l^1 together, sets the pinion m, in work on the tooth wheel n, and brings up the spindle carriage by the band 30 from the grooved rigger p, attached to the bar 31.

The motion described, as given to the shaft c^2 in the direction of the arrow 2, moves the stud l^4 with it, and allows of a motion in the stud b^3 on the shaft a^6, which gives the power of a limited motion, in the opposite direction, to the shaft a^6, which will be immediately caused by the weight of the guide bar l^6, and the effect is to bring the friction plates y and y^1, into contact, by the operation of the vertical arm a^4, horizontal arm a^3, and fork a^2, this contact occurring at the same instant that the spindle carriage is disengaged from the holding latch k^9, causes the driving power to operate through the belt y^3, and drum y^2, to work the shaft e, and the parts attached, with a power which is changeable by the increase or decrease of the contact in the friction plates, which is given as follows: The latch 28, attached to the carriage A, and not before described, is to hold the back faller down, when the carriage is running out, and when the top faller is depressed, as before described, the operation of the finger m^2 against the spring latch 28, forces it outward and leaves the back faller free for the guide wire p^5, to rise up under the threads, and take up the additional slack which may arise in the operations of the machine. When the threads are being wound on the cops, at a proper tension, the guide wire n^5 may remain nearly steady at about half an inch above the tops of the spindles and the arm n^9, on the slide bar n^7, will then run evenly below, but in contact with the guide bar l^6, but if the threads become too slack the guide wire n^5, will rise by the balance weight n^2 and the arm n^9 be depressed, the effect of this will be that the guide bar l^6 will go down by its weight so as to force the friction plates y and y^1 into closer contact and thus by accelerating the motion wind on the threads quicker; on the contrary if the threads become too tight the guide wire n^5, will be depressed and the arm n^9 be raised, lifting with it the guide bar l^6, which will draw the friction plates y, y^1 apart, the motions will be decreased and the threads will be wound on more slowly, the general result of winding the threads by this arrangement will be that the threads will be wound on the cops with an equal degree of tension. When the roller m^9 is depressed on to the curb k^4, by the crank arm 11, as previously described, it remains so depressed until it has passed under the whole length of the guide bar h^1, and the guide bar being elevated at the back end the threads are wound on the cop in turns each turn commencing above the one wound on next before it and on the roller m^9, passing clear of the back end of the bar h^1, the balance weight 26 raises the roller above the bar and the guide wire m^3, on the top faller rises above the tops of the spindles. The back faller may be returned to bring the guide wire n^5, below the guide wire m^3, by a cam on the machine or the floor or by any usual mechanical means that will raise the lower end of the sliding bar n^7, and throw the fingers n^3, n^4, and guide wire n^5, downward. When the carriage comes up at the back motion the pin f^5 strikes the leg f^1 and knocking it off the stud f^2, lets down the drop lever c^5, which in its descent strikes the curved arm of the cross lever c^3, and elevating the other end with the pin c^4 in the slot k forces the lever and fork g outward so as to separate the clutches l and l^1 and bring the crank pin e^1 and crank arm f, into gear and at the same time sets the arm i^7, into the catch of the latch i^8, and the stud l^3, on the shaft c^2, striking the stud l^4, on the shaft a^6, lifts the guide bar

l^6 and draws the friction plates y and y^1 apart; the drop lever c^5 also strikes the elbow of a small crooked lever 29 not before described which lies under the drop lever and depressing that elbow forces the other part in the opposite direction against the top of the bar e^3, which moving with the force applied draws the bar e^5 with it and brings the catch e^7 into gear with the fingers 22 and forcing the frame q^1 in the same direction raises and separates the pinion b^2 from its gearing into the wheel b^3, the drop lever c^5 will be lifted into place by the pin f^6, and cam frame f^4 as already described.

The operation of the screw shaft p^5, being such as to draw the cams g^3 and g^4 outward a small distance, and thereby raise the guide-bar h^1, in a like proportion, at each alternate motion of the spindle carriage, at the same time raising the guide wire m^3, in the same ratio, causes the threads to wind on the cops, in successive commencements, each a small distance above, and outside the precedent commencement, while the curves in the edges of the cams, by their shape, regulate the shape of the cops, forming the lower part, as a rather abrupt inverted cone, the upper part being a more tapered cone; this, combined with the uniform tension of the threads maintained during the winding, produces cops, which will unwind without tangling, loss, or waste.

The detached Figs. 8 and 9, show a mode of varying the parts, and positions, by which, if more convenient for particular purposes, the back faller may be made to operate from the back of the spindle carriage A, as follows: 1 is a shaft, the length of the spindle carriage, on which the cross lever 2 is fastened, at the fore end of this, the vertical arm 3, is jointed on, working vertically, or nearly so, between the guide pin 4, and grooved friction roller 5, the top of the arm serving as a finger for the guide wire, and being made straight, or curved, as the work may require. At the back end of the lever 2, the vertical slide rod 6 is jointed on, and steadied by the bracket eye 7, having on one side the arm 8, adjustable by the screw 9, and intended to work under the guide bar l^6, in the same manner, and with the same effects, as the arm n^9 already described; and corresponding parts to the lever 2, and vertical arm 3, at the other end of the shaft 1, will produce like effects at the outer end of the spindle carriage, on that end of the guide wire, and a balance weight 10, may be placed in any convenient part of the shaft 1.

What I claim as my improvements are—

1. The arrangement of means, as herein substantially set forth, by which the back faller and guide wire h^5, is made to operate on the lower guide bar l^6, and through that and the shaft a^6, on the friction plates y and y^1, to regulate the tension of the threads when winding.

2. I further claim the arrangement of means described, by which the shaft v, the pinion w, the cam d^5, lever d^6, crank 11, and finger 12, depressing the roller in 9, and sliding bar m^4, in combination with the motion of the cams g^3, g^4, and upper guide bar h^1, operates on the top faller and guide wire m^3, to produce a cop, built in successive commencements, in such a way that the cop will unwind, without loss by tangling, or waste.

3. Finally, I claim the general combination of new parts claimed above as invented and applied by me, to and with the parts of common spinning machines which are retained, as above described and set forth, for the purposes of maintaining an equal tension of the threads when winding, and building cops which will unwind without loss by tangling, or waste, as the same are herein substantially described and set forth, including any mechanical variations in the position of the parts, which shall be substantially the same in the means employed, and the effects produced.

In witness whereof, I, the said DANIEL P. LAPHAM, have hereunto set my hand, as the administrator of the said BENJAMIN LAPHAM, deceased, at Adams aforesaid, in the presence of the witnesses signing in the margin hereof, on the fourth day of May, in the year one thousand eight hundred and forty.

DANL. P. LAPHAM. [L. S.]

Witnesses:
N. W. HARMON,
H. J. BLISS.