Sheet 1- 5 Sheets.

F. Norrell.

Spinning Jack.

No. 6,732. Patented Sep. 25, 1849.

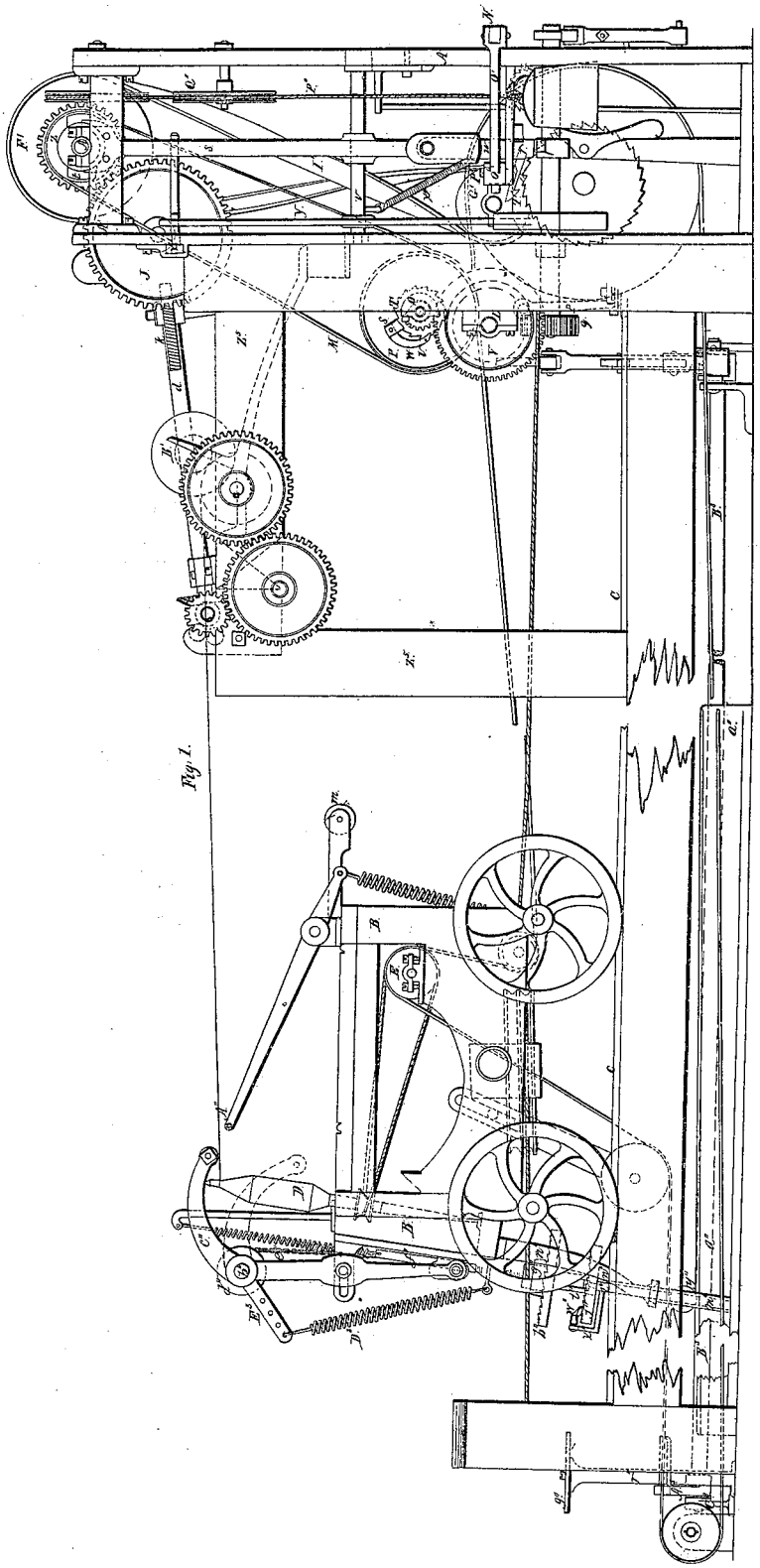

Fig. 1.

Sheets-Sheets.

F. Nowell.

Spinning Jack.

No. 6,732. Patented Sep. 25, 1849.

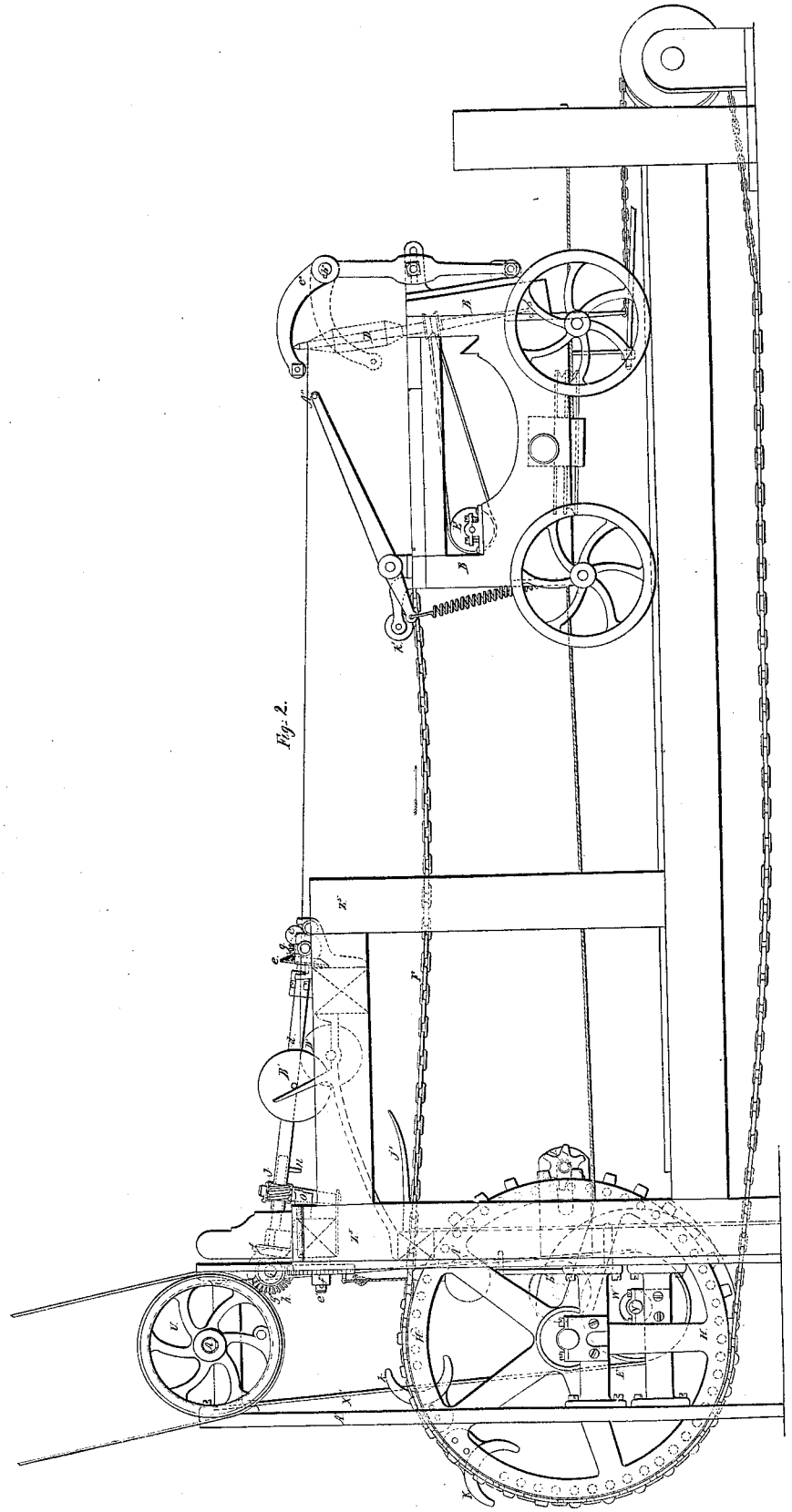

Fig. 2.

F. Nowell.
Spinning Jack.

Sheet 3 - 5 Sheets.

No. 6,732.

Patented Sept. 25, 1849.

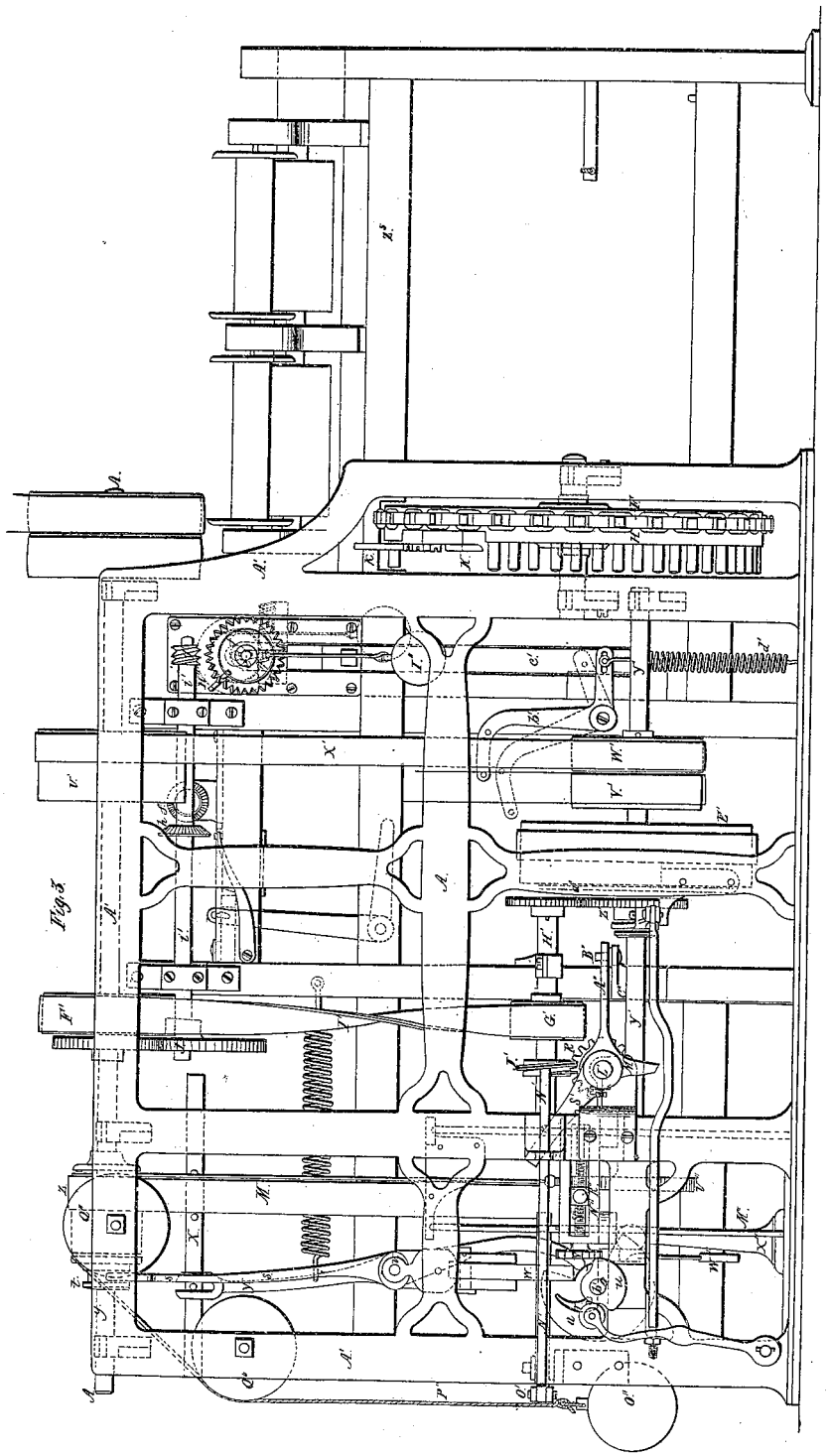

Fig. 3.

Sheet 4 - 5 Sheets.

F. Nowell.

Spinning Jack.

No. 6732.

Patented Sept. 25, 1849.

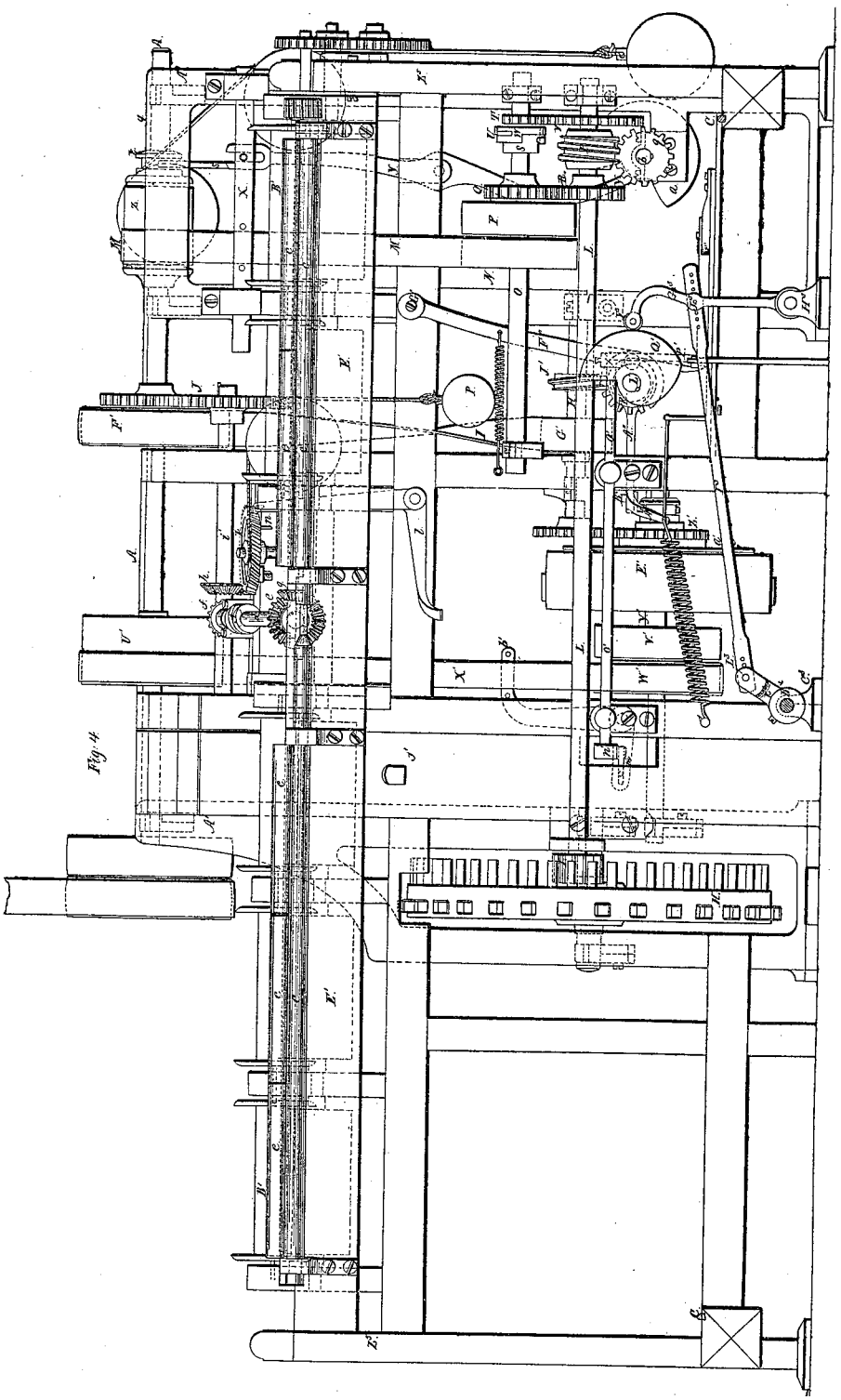

Fig 4.

Sheet 5-3 Sheets.

F. Nowell.

Spinning Jack.

No. 6,732. Patented Sep. 25, 1849.

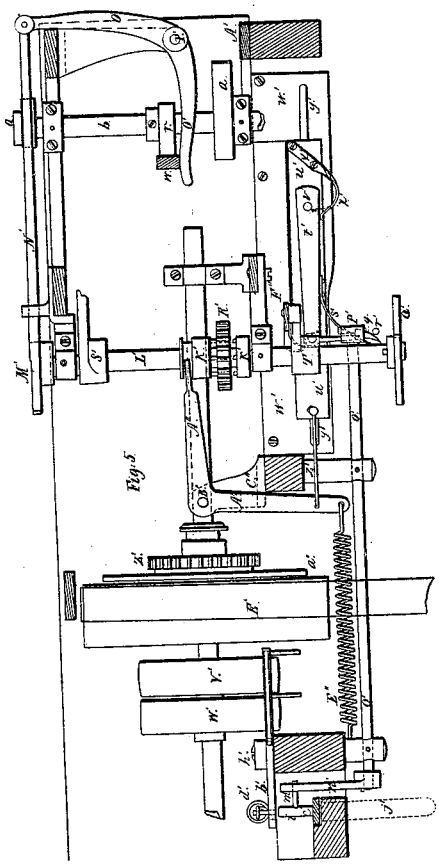
Fig. 5

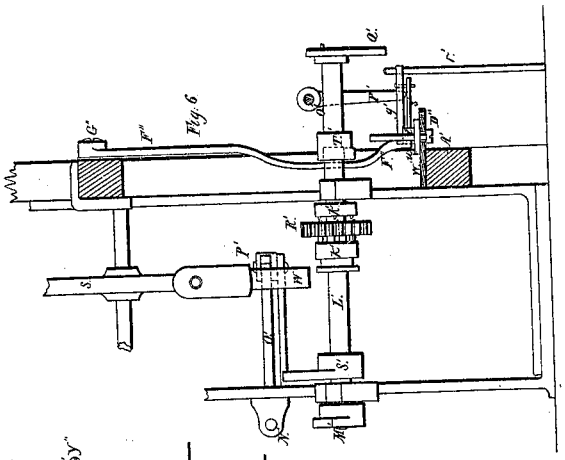
Fig. 6

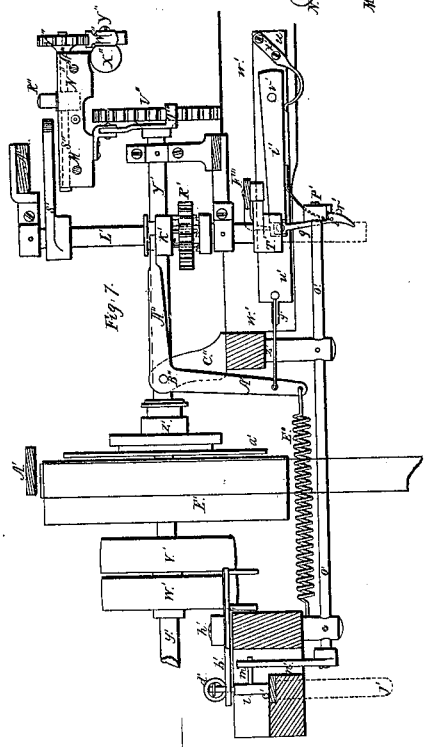
Fig. 7.

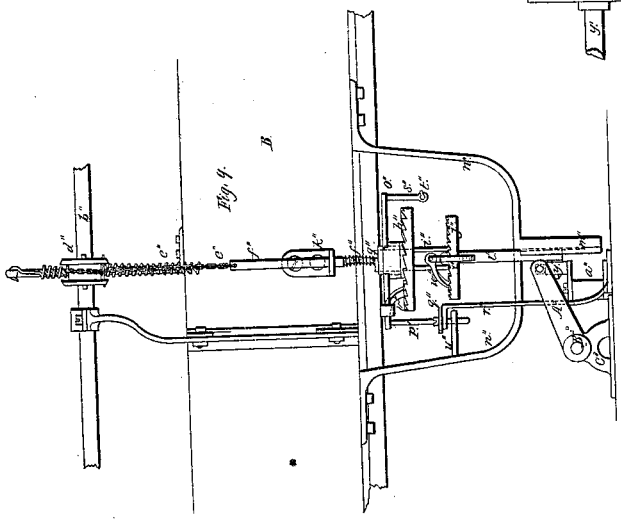
Fig. 4.

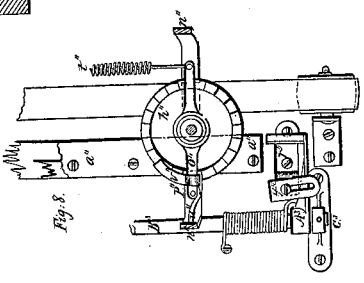
Fig. 8.

UNITED STATES PATENT OFFICE.

FOSTER NOWELL, OF LOWELL, MASSACHUSETTS.

SPINNING-JACK.

Specification of Letters Patent No. 6,732, dated September 25, 1849.

To all whom it may concern:

Be it known that I, FOSTER NOWELL, of Lowell, in the county of Middlesex and State of Massachusetts, have invented new, and useful Improvements in Jack Spinning Machinery, and that the following description, taken in connection with the accompanying drawings hereinafter referred to, forms a full and exact specification of the same wherein I have set forth the nature and principles of my said improvements by which my invention may be distinguished from others of a similar class, together with such parts as I claim and desire to have secured to me by Letters Patent.

The figures of the accompanying plates of drawings, represent my improved spinning machinery.

Figure 1, Plate 1, is an elevation of one side of the apparatus, and Fig. 2, Plate 1, is an elevation of the opposite side. Fig. 3, Plate 2, is an elevation of the back part of that portion of the machine, from which the roving is delivered to be twisted into a thread. Fig. 4, Plate 3, is an elevation of the front side of said portion of the machinery, and Figs. 5, 6, 7, 8 and 9, Plate 4, are detail views of some of the important parts of the apparatus, which will be explained in the sequel.

In most if not all of the "spinning jacks" which have ever been introduced into use, it is known that almost all of those nice operations in the spinning process, which are essential for the formation of an even and perfect thread or yarn, have to be performed or regulated by the hand of a practiced and discriminating operative. In the first place, the necessary variation in the speed, with which the spindle carriage moves, is either accomplished by hand or, in mule spinning, by another mode which causes a great deal of friction; that is, by arranging the teeth of the mangle wheel, which drives said carriage, on an eccentric curve, and causing the pinion, which operates said mangle wheel, to travel to and from the center of the same over said teeth, and thereby get the varying speed for the movement of the carriage. In the second place, the unwinding or "backing off," so called from the cops or bobbins on the spindles; and the traverse motion of the "copping wire" or "faller," have been accomplished solely by manual means. All these several operations are produced in my improvements, with unerring certainty and at proper times by mechanical means; every part of the apparatus deriving its motion from one main driving shaft, A A, thereby of course, making great saving of labor, and doing the work more perfectly and economically.

A′ A′ A′ A′ &c. in the several figures, is the headstock, which supports the various operative parts of the machine, which are not attached to the spindle carriage, and in front of which is a frame work, z^5 z^5 z^5 z^5, in which are arranged in the usual way, the roving spools, B′ B′ B′ B′, &c., the rollers, D′ D′ D′ D′, &c., the roller beam, E′ E′, and the ordinary delivering rollers, *c*, *c*, *c*, *c*, through which the roving is fed out, to be twisted.

The rollers, *c c c c*, for delivering the roving, are driven by the cross shaft, *d d*, Figs. 1 and 2, Plate 1 and Fig. 4, Pl. 3, in the usual manner, by the bevel gears, *e* and *f*, on the cross shaft, *d d*, the bevel wheel, *g*, on one of the rollers, *c*, and the bevel wheel, *h*, on the shaft, *i i*, which shaft is driven by the gear, J, from the main shaft, A A, in the usual manner. On the shaft, *d*, there is an endless screw, *j*, engaging with the regulating wheel, *k*. This wheel, *k*, is put in connection with the endless screw, *j*, by the lever or arm, *l*, which is worked by the stud, *m*, on the carriage, B B B, when it moves up, and at the same time the bevel wheel, *f*, on the cross shaft, engages with the bevel wheel, *h*, on the shaft, *i*, causing the delivering rolls to revolve and deliver the yarn to the spindles in the usual manner.

When the carriage has receded a certain distance, the delivery is stopped by means of the pin, *n*, in the regulating wheel, *k*, which comes against the catch, *o*, releasing the spring slide to which one of the bearings of the cross shaft, *d d*, is attached, and allowing the bevel wheels, *f* and *h*, to be disengaged from each other; at the same time the weight, *p*, causes the regulating wheel, *k*, to revolve in part, and bring the pin, *n*, to the proper position for repeating the movement. This arrangement is entirely similar to that used in the ordinary "spinning jack."

B B B, Figs. 1 and 2, is the spindle carriage, which moves to and from that portion of the machine from which the roving is delivered, on the guiding rails, C C, C C, Figs. 1 and 2. The spindles, D D D, &c.,

are arranged on the carriage, B B B, in the ordinary way, being driven by cross bands, passing from the long driving drum, E E, around suitable whirls on the bottom of said spindles, as shown in Figs. 1 and 2, partially by dotted lines. The reciprocating movement of the carriage above referred to, is effected by the chain belt, F F F F, Figs. 1 and 2, passing from the bottom of the back of said carriage around a fixed pulley, G, to and over the larger angle wheel, H H, to the top of the front of the carriage, to which it is connected; and it will be seen that, from the above described connection of parts, a reciprocating motion of said mangle wheel will give the required motion to said carriage. This reciprocating motion of the mangle wheel, is produced by the pinion, I, (Fig. 2 Pl. 1 and Fig. 4 Pl. 3,) which gears on the outside of the mangle wheel, H H, in running the carriage out, and travels to the inside of the mangle wheel, by means of the curved guides, K K, Figs. 2 and 4, to effect the inward movement of the carriage. This pinion, I, is fixed to the mangle shaft, L, Figs. 1 and 2 Pl. 1 and Fig. 4 Pl. 3, which shaft is driven by pulleys and gear from the pulley, Z, (Fig. 1, Pl. 1, Fig. 3, Pl. 2 and Fig. 4, Pl. 3) on the main shaft, A A, as follows: The pulley, Z, by means of the belt, M, drives the pulley, N, which is fixed tight to the shaft O, and the pulley, P, which is loose on said shaft. The pulley, P, has attached to it the gear, Q, which engages with the gear, R, of about the same size, fixed to the shaft, L, Figs. 1 and 2, Pl. 1 and Fig. 4, Pl. 3, for moving the carriage, B B, at the quick speed. On the shaft, O, is the arm, S, with its pawl, W, which arm is tight on said shaft, and the pinion gear, T, and ratchet, U, which are loose upon the shaft, O, but fixed tightly to one another; this gear, T, engages with the gear, V, (three or four times its diameter), on the shaft L. When the belt, M, is on the pulley, P, (loose on the shaft, O,) it drives the gear wheels, Q and R, and consequently the pinion and mangle shaft, L, and the mangle wheel and carriage are driven at the greatest speed required; but when the belt, M, is shifted to the pulley, N, which is tight on the said shaft, O, it drives the ratchet, U, and pinion, T, by means of the arm, S, and pawl, W, and thereby causes the gear, V, and shaft, L, the pinion, I, and mangle wheel and of course the carriage, B B, to move at the slow speed. The belt, M, is shifted from the pulley, N, to the pulley, P, by means of the shipper X, worked by the lever, Y, and cam, *a*, on the cross shaft, V, as will be shown in the sequel. The object or result effected by this difference in the speed of the carriage is, that when the roving is first delivered from the delivery rolls, *c*, *c*, *c*, *c*, (Figs. 1 and 2, Pl. 1 and Fig. 4 Pl. 3,) and the carriage first begins to move backwards, the greater part of the tension or drawing out of the roving may be secured; but when it has been drawn out as much as the fibers of the wool will permit, the speed of the carriage may be so much slackened, as to permit the spindles, (still revolving), to complete the torsion, and perfect the yarn.

For different lengths of fiber in the staple, the speed of the carriage, and the drawing of the roving, may be regulated by changing the relative proportions of the gear wheels, T and V, above referred to. As hereinabove suggested this result has hitherto been effected by hand in jack spinning, and therefore this mechanical arrangement for doing the same, will form the basis of one of my claims.

The shafts, *b*, (Fig. 1, Pl. 1, Fig. 3, Pl. 2 and Fig. 4, Pl. 3), is driven from the shaft, L, by the endless screw, *p*, on said shaft, L, which engages with the gear wheel, *q*, on said shaft, *b;* this shaft has fixed to it the cam, *a*, (shaped as shown in the several figures,) which works the shipper, X, as before described; the cam, *r*, which disengages the pulley, Z, from the main shaft, A, by means of the lever, S W, and clutch, *t*, and the cam, *u*, which causes the friction on the race pulley, E′. The lever, S W, is attached to, and supported on the shaft, V, at about the center of said lever; and its upper end is connected with the clutch, *t*. There is a fork below the center of this lever, S W, and the arm, W, is inserted in said fork, so as to move laterally independently of the portion, *s*, of said lever, being kept in a vertical position or nearly so most of the time, by the spiral spring, w^4, (Fig. 1, Pl. 1 and Fig. 4, Pl. 3). The cam, *x*, (shaped as shown in Fig. 3, Pl. 2) is pressed against the side of the lower arm, *w*, of the lever *s w*, by the revolution of the shaft, *b*, so as to move the whole of said lever, and thus throws the clutch outward, and disengages the pulley, Z, from the shaft, A A, and permits said shaft to turn while said pulley is stationary. This pulley, Z, remains in this position, (thereby stopping the carriage,) until the yarn has received the requisite quantity of twist; it is then connected with the shaft, A A, in the following manner. On the main shaft, A A, is the pulley, F′, which drives the pulley, G′, and shaft, H′, by the crossed belt, I′. This shaft, H′, has on it an endless screw, J′, working in the pinion on the cross shaft, L′, which is connected with the said shaft, L′, at the proper time, by the clutch, K′, causing the said shaft, L′, to revolve, and press the arm, M′, against the rod, N′, which moves the right angled lever, O′ O′, working on the fulcrum, P′. One end of the lever, O′ O′, bears against the arm, (which is jointed to,

and forms a part of the vertical lever, *s w*,) and moves this arm, *w*, laterally, as before suggested, so as to clear the cam, *r*, and release the lever, *s w*, and the clutch, *t*, which is thrown back to its first position by means of a spiral spring, *y*, arranged on its side on the main shaft, A A.

The shaft, L′, has fixed to it the cam, Q′, (of the form shown in Fig. 4, Pl. 3,) which, with the machinery, moves the faller or copping wire,—the pinion, R′,—the clutch, K′,—the arm, S′, which works the backing off motion,—the arm, M′, which relieves the lever, *s w*, and puts the pulley, Z, in connection with the main shaft, A A, as before described,—and lastly, the cam, T, which operates the stop motion, by which the clutch, K′, is put in gear with the pinion, R′, thereby moving the shaft, L′, and arm, M′, effecting the connection between the main shaft, A A and the pulley, Z, as before specified.

I shall now proceed to describe, or refer to that portion of the apparatus which alternately drives and stops the spindles, while the carriage is drawn in and out, and which is substantially the same as that in the ordinary machine now in use. On the main shaft, A A (Fig. 2, Pl. 1, Fig. 3, Pl. 2, Fig. 4, Pl. 3, and Figs. 5 and 7, Pl. 4) is fixed the pulley, U′, which drives the fixed pulley, V′, and the loose pulley, W′, on the race belt shaft, Y′, by means of the belt, X′. This shaft, Y′, carries the race pulley, E′, which by a band passing from it to the drum, E E, before mentioned, drives the spindles, D D D, in the usual manner; it has likewise on it the clutch pinion, Z′, which is loose on it; this clutch pinion is firmly connected to the friction plate, *a′*, so as to revolve with it, the pressure and operation of which plate against the race belt pulley, so as to give the quick motion to the spindles, is precisely the same as in the jack and mule spinning machinery.

To the frame of the headstock is attached the shipper, *b′*, moving on the screw, *h′*, which embraces the belt, X′, in the usual manner, and shifts it from the loose pulley, W′, to the fast pulley, V′, on the race belt shaft, Y′; when it is on the former the spindles do not revolve; but when on the latter, they turn and give the twist &c. This shifting of the belt is effected as follows. One end of this shipper, *b′*, is connected with the vertical slide, *c′*, by the pin, *l′*, which is drawn down constantly by the spiral spring, *d′*. On the upper end of this slide, *c′*, is a pin or stud, *e′*, which has loosely on it the wheel, *f′*, which wheel can be put in gear with the endless screw, *g′*, on the shaft, *i i*, which shaft, *i i*, is driven from the main shaft, A A, as before described. When the carriage B B B, moves up the stud or roll, *k′*, on its front, (Fig. 2, Pl. 1) comes in contact with the arm, *j′*, (in the several figures), which is firmly connected with the slide, *c′*, raising the said slide, and putting the wheel, *f′*, into gear with the endless screw, *g′*, on the shaft, *i i*, which is constantly revolving, and likewise moving the slipper, *b′*, and shifting the belt onto the tight pulley, V′, on the race belt shaft, Y′, as shown in Fig. 5, Pl. 4; and thereby driving the spindles. When sufficient twist is put in the yarn, a stud or stop, H″, (inserted in proper position in the wheel, *f′*, so as to regulate the twist in the ordinary mode,) comes in contact with the catch, K″, which supports the slide *c′*, when in its upper position, (shown by red lines in Fig. 3, Pl. 2,) moves said catch, K″, laterally, and permits said slide to drop, and thereby, as will readily be seen, shifts the belt, X′, to the loose pulley, W′, on the race belt shaft; and stops the revolutions of the spindles.

We have now described the machinery which drives the spindles as the carriage moves out, and also the apparatus which stops the carriage, by throwing the clutch, *t*, out of connection with the pulley, Z, on the main shaft, A A, while the twisting is completed. We now proceed to describe the combination of mechanical devices, which keeps the carriage stationary the requisite length of time, (by preventing the revolution of the shaft, L′, the turning of which, as before described, works the lever, S W, and clutch, *t*,) and then starts it again toward the delivering rolls. To the pin *l′* (before referred to as connected to the bottom of the vertical slide, *c′*, is attached a stud, *m′*, moving in a slot in the horizontal arm, *n′*, which is firmly fastened to the shaft, *o′ o′*, which shaft turns in suitable bearings on the headstock, A′ A′ A′ A′. On the other end of this shaft, *o′ o′*, is firmly attached the vertical arm, *p′*, shown in Fig. 1, Pl. 1, by dotted lines, in Fig. 4, Pl. 3, partly by dotted lines, and in Figs. 5, 6, 7, Pl. 4. When the slide, *c′*, is raised by the carriage, B B B, coming in contact with the arm, *j′*, as before described, the horizontal arm, *n′*, is raised by the stud, *m′*, on the pin, *l′*, which moves in a slot in said arm, as before mentioned; causing the lower part of the vertical arm, *p′*, to be turned toward the headstock, A′ A′ A′ A′, through the medium of the shaft, *o′ o′*, as shown in Fig. 5, Pl. 4; which shaft is turned a little in its bearings by the raising of the arm, *n′*; when this lever, *p′*, is moved to this position, as above mentioned, it allows the horizontal lever or catch, *q′*, (shown most clearly in Figs. 5, 6, 7, Pl. 4,) to be pressed against the stop, *r′*, by the spring, *s′*, and at the same time to catch against the lower outside part of the lever, *p′*, which is furthest from the headstock. This catch, *q′*, and the spring, *s′*, are attached to the piece, *t′*, which lays on a sliding bed, *u′*, and has a slight lateral

motion on said bed, on the pin or screw, v': a spring, x', attached to the bed, keeps the piece, t', above mentioned, constantly pressed toward the headstock; the sliding bed, u', moves on a plate, w', fixed permanently to the headstock, and is guided on said plate by screws, D′, moving in the slot, y'. The sliding bed, u', is connected by a small rod, Z′, to the right angled lever, A″, moving on the pin, B″, attached by the piece, C″, to the headstock, (as shown in Fig. 3, Pl. 2, Fig. 4, Pl. 3 and Figs. 5 and 7, Pl. 4.) This right angled lever, A″, moves the clutch, K′, connecting the wheel, R′, with the shaft, L′. This right angled lever, A″, has attached to it at the same end to which the rod, Z′, is fastened, a spiral spring E″, the tendency of which is, to keep the clutch, K′, always in gear, and thereby keep the wheel, R′, connected with the shaft, L′. This tendency of the spring aforesaid, is resisted at certain times, by the crooked lever, F″, (shown in Fig. 4, Pl. 3, Figs. 5, 6, 7, Pl. 4.) This lever, F″, vibrates on a screw, G″, fastened to the headstock, A′ A′ A′ A′; the lower end of this lever, F″, is bent out from the headstock, and receives the end of the piece, t', which is pressed toward the headstock by the spring, X′, when the catch, q', attached to said piece, t', is allowed to move by being released from the vertical lever, p', on the shaft, o' o', as before described. The operation of this part of the machinery is as follows. When the spindle carriage, B B B B, Figs. 1 and 2, Pl. 1, has been drawn out to its full extent, by the mangle wheel, H H, and the chain belt, F F, its motion is stopped by the cam, r, (Fig. 1, Pl. 1, Fig. 3, Pl. 2, and Fig. 5, Pl. 4,) on the shaft, b, driven from the long shaft, L, (Figs. 1 and 2, Pl. 1 and Fig. 4, Pl. 3), by the endless screw, p, working into the wheel, g, on said shaft, b, as before described. The cam, r, presses on the lower end of the double lever, S W, and causes the clutch, t, to which the upper end of this lever, S W, is connected, to release the pulleys, Z, (the driver of the mangle wheel, H H, and the carriage, B B B B, through the long shaft, L) from the main shaft, A A. The pulley, Z, being stopped, the shaft, L, (driven from it by the belt, M, the pulleys, N and P, and the gearing &c., as above described,) stops also; the shaft, b, driven from the shaft, L, stops likewise, and the lever, F″, pressed by the cam, T′, on the shaft, L′, as before mentioned, moves the piece, t', and the sliding bed, u', drawing by the wire or rod, Z′, the right angled lever, A″, and releasing by the clutch, K′, the wheel, R′, from the shaft, L′, and consequently stopping said shaft, as has been before fully described. The parts above described remain in this position, until the wheel, f', driven by the endless screw, g', the constantly revolving shaft, i', is turned sufficiently to bring the stop, H″, against the catch, R″, and thereby release said catch; this allows the wheel, f', with the slide, c' (to which it is attached by the stud or pin, e), to be drawn down by the spring, d', as before mentioned. When this slide is drawn down, it moves the shipper, b', ships or changes the belt, X′, from the tight pulley, V′, to the loose one, W′, and stops the revolution of the spindles as before explained. The dropping of the slide, c', also moves, through the stud or pin, l', the pin m', the lever, n', which is attached to the shaft, o' o', turns the vertical arm, p', away from the headstock, A′ A′ A′ A′, (shown by dotted lines in Figs. 1 and 2, Pl. 1 and in Fig. 4, Pl. 3.) This vertical arm, p', it will clearly be seen, draws with it the catch, q', and consequently the piece, t', which has a slight lateral motion, as before mentioned, till it is freed from the crooked lever, F″, against which the piece, t', was held, by the spring, E″, through the rod, Z′, and sliding bed, u'. The sliding bed, u', and piece, t', being clear, are drawn by said spring, E″, toward the slide, c', putting the clutch, K′, into action through the right angled lever, A″, thereby connecting the shaft, L′, and the gear wheel, R′, which is driven from the constantly revolving endless screw, j'', on the shaft, H′, (shown in Fig. 3, Pl. 2, Fig. 4, Pl. 3.) The revolution of this shaft, L′, moves the arm, M′, pushing the rod, N′, thereby moving the right angled lever, O′, as is clearly shown in Fig. 5, Pl. 4. This lever, O′, forces the lower part, W, of the vertical lever, S W, laterally away from the cam, r, thereby connecting by the clutch, t, the pulley, Z, with the main shaft, A A, and consequently starting the spindle carriage, B B, after the twist is completed.

The machinery for producing the "backing off" motion, as it is called, or for unwinding so much of the yarn as is irregularly wound on the cop, and rewinding it in proper position on the same, may be thus described. At the opposite end of the headstock from the mangle wheel, are fastened two vertical rods M″ M″, (shown in elevation, in Fig. 1, Pl. 1, Fig. 3, Pl. 2, Fig. 7, Pl. 4.) On these rods the box or frame, N″, slides freely. Its weight is counterbalanced by the weight, O″, (Fig. 1, Pl. 1, Fig. 3, Pl. 2,) acting through the cord, P″ P″, which passes over the grooved wheels, Q″ Q″. Projecting from the side of this box or frame, N″, is a pin or stud R″, which slides longitudinally in said box, and is moved therein by the screw, S″, (shown in elevation in Fig. 3, Pl. 2 and plan in Fig. 4, Pl. 7 by dotted lines.) This pin, R″, is acted on by the lever or arm S′, firmly attached to the shaft, L′. When this shaft is caused to revolve, as before described, this arm, S′, presses on the top of the pin, R″,

forcing it and the box, N″, downward, until the arm S′, by the revolution of the shaft, L′, is cleared from the said pin, R″, when the box, N″, and its appendages are raised again to their former position by the counterweight, O″. On the side of the box N″ opposite that from which the pin, R″, projects, is jointed a hook, T″, which catches in the teeth of the ratchet wheel, U″, on the race belt shaft, Y′, which drives the spindles; and when the box N″, is forced down by the arm, S′, as described, the ratchet wheel, U″, being firmly attached to the shaft, Y′, causes that shaft to rotate backward or in the contrary direction from that in which it revolves, when driving the spindles, D D D &c., so as to twist the yarn. This reversing the motion of the shaft, Y′, it will clearly be seen, causes the spindles to revolve backward, and unwinds the yarn therefrom as before suggested. It is necessary to regulate the amount of "backing off," or diminish it as the cop is filled, which is done by means of the screw, S″, working in the pin, R″, and causing the said pin, R," to be moved longitudinally, in the box, N″, as before mentioned, so as to be under the influence of the revolving arm, S′, for a shorter period, and consequently be moved through a less distance; all of which is effected as follows. On the end of the screw, S″, is fastened the small ratchet wheel, V″, (shown clearly in Fig. 1, Pl. 1, Fig. 3, Pl. 2, and Fig. 7, Pl. 4,) when the box, N," is lowered, as shown previously, the teeth of the ratchet wheel, V″, are caught by the vertical catch finger, W″, which vibrates on the pin, Y″, passing through it near the upper end; this pin is attached to the stand, X″. As the box, N″, and ratchet, V″, descend, and one edge of the said ratchet wheel is held by the finger, W″, as mentioned above, the ratchet and screw, S″, to which it is attached, make part of a revolution, sliding the pin, R″, through which the screw passes, from the revolving arm, S′, and thereby diminishing the descent of said box, N′, and consequently the amount of back rotation of the spindles. When a new or clean set of spindles or spools are placed in the carriage, the pin, R″, must be screwed along, so as to be operated on the longest time by the revolving arm, S′; and thus produce the required amount of "backing off."

The traverse movement of the copping wire, is effected as follows. Between the rails, C C C C, on the floor of the room, is placed a box or groove, a'', of the form shown in elevation, (Fig. 1, pl. 1, in end view, Fig. 9, pl. 4, and in plan Fig. 8, pl. 4). The end of this box or groove nearest the headstock, A′ A′ A′ A′, is somewhat higher than the outer end for reasons which will be given hereinafter. When the carriage, B B B, &c., is moving out, or from the headstock, the copping wire, is elevated so as not to press upon the yarn, and when the spindles have received the requisite number of revolutions, and the carriage is about to be drawn in, the copping wire is lowered so as to cause the yarn to wind on the lower part of the spindle. The mechanical arrangement for effecting this result is as follows: On the top of the carriage, B B B, is fixed in the usual manner a shaft, b, (Figs. 1 and 2, pl. 1, Fig. 9, pl. 4). To this shaft are attached arms, c'' c'', to which the copping or faller wire is connected. Near the center of this shaft is firmly fastened a grooved pulley, d'', around which a chain, e'', passes, one end of which chain is fastened to the pulley, d'', and the other is connected with a square rod, f'' f'', on the lower end of which is formed a screw. This screw is embraced by a nut or female screw, g'', which is attached to a ratchet wheel, h''; this ratchet wheel is made fast to a tube or box, i'', on the lower part of which box is another ratchet wheel, j''. The ratchet wheels, h'' and j'', and the tube or box, i'', are attached so as to revolve together, while the rod and screw, f'', which is embraced by the female screw, g'', cannot revolve, being prevented from so doing by a slot in the plate, K″, shown only in Fig. 9, pl. 4, through which however it slides freely as will be described. Passing through the lower ratchet to which it is loosely connected, is the square rod, l'', which slides freely in a guide, m'', attached to the curved frame, n'' n'', secured to the lower side of the front end of the spindle carriage, B B B. On the upper part or hub of the ratchet wheel, h'', is loosely fitted the horizontal cross bar, o'' o'', suspended at its center; from one end of this cross bar, a vertical pin, p'', projects downward, which when the carriage, B B B, has moved its greatest distance from the headstock, comes in contact with the stop, q'', connected with a stationary upright piece, r'', fastened to the floor. On the other end of the cross bar, o'' o'', is a pin, s'', to which is connected one end of a spiral spring, t'', part of which is shown in the Fig. 8, pl. 4; this spring is fastened at the other end to the underside of the carriage, and the tendency of this spring is to keep the pin, p'', in contact with the stop, u'', in the side of the frame, n'' n''. Near the pin, p'', on the cros bar, o'' o'', is a pawl, v'', engaging with the teeth in the ratchet wheel, h''. There is a similar pawl, w'', fastened to an arm, x'', which is firmly connected with the square rod, l'', before described. When the cariage, B B B, has been moved out or from the headstock, A′ A′ A′ A′, to the full extent, the traversing roll, y'', (Fig. 1, pl. 1, Fig. 9, pl. 4,) attached to the lower end of the square rod, l'', before described,

is moved beyond the end of the box or groove, a'' a'', on the top of which it has been moving, while the carriage, B B, &c., was run out; and comes under the bent arm, A^3, attached to the shaft, B^3, which shaft works in suitable bearings, C^3 C^3, (Fig. 1, pl. 1, Figs. 8 and 9, pl. 4), and is depressed, causing the roll, y'', to go into the groove or box, a'' a'', in which it is caused to travel, while the carriage, B B B, is being moved in or toward the headstock, A' A' A' A'. At the same time that the carriage, B B B, has been moved into its full distance toward the headstock, A' A' A' A', the roll, y'', above mentioned, has arived at the inner end of the box or groove, a'' a'', which, it will be remembered, is higher than the outer end, as before described. From the above described connection of parts, and their operation together, as specified, it will be seen that the yarn will, as in the ordinary jack-spinner, be gradually elevated on the cop, drawing the latter part of the time of the inward movement of the carriage, B B B, &c., so as to be wound spirally from the bottom to the top of the cop, ready for the next outward movement of the carriage. When the roll, y'', which depresses the faller wire, by means of the rods, l'', f'', the chain, e'', and arms, c'' c'', as before described, has arrived at the inner end of the groove, a'', as just mentioned, the spiral spring, D^3, (the lower end of which is attached to the carriage, B B B, while the upper end is connected with the arm E^3, which arm is fastened to the shaft, b'', on the opposite side from the arms, c'' c'', of the faller wire,) raise the rods, f'' and l'', and the ratchets, etc. (which compose the regulating apparatus, and work as before described,) and with them, the roll, y'', onto the top of the groove, ready to repeat the process. The object of this let off motion (so to call it), is, to increase the distance from the shaft, b'', (Fig. 1, pl. 1, Figs. 8 and 9, pl. 4) to the roll, y''; as the cop is filled in will be clearly seen that this will be effected by the apparatus above described. For, as the carriage, with the ratchet apparatus and frame, n'' n'', attached, is moved backward, the pin, p'', on the arm, o'' o'', comes in contact with the stop piece, q'', before mentioned, turning the arm, o'' o'', and causing the pawl or catch, v'', attached to said arm, o'' o'', (as shown most clearly in Fig. 8, pl. 4,) to engage in the teeth of the ratchet wheel, h'', and move it a part of a revolution; and as the screw which passes through said ratchet and female screw attached to this ratchet, cannot revolve, the female screw and its appendages are lowered the distance due to that part of a revolution, which depends upon the coarseness of the thread of the screw or angle of inclination. The use of the lower ratchet wheel, j'', with its click or pawl, w'', is merely to prevent the upper ratchet from revolving on the screw, when the arm, o'' o'', is drawn back to its first position by the spiral spring, t'', as before described; and retain the gain thus made in the distance between the copping wire and the traversing roll, y''. It now only remains to show how the arm, A^3, on the shaft, B^3 B^3, is caused to descend at the proper time. This is done by the cam, Q', (shown best in Fig. 4, pl. 3,) which is fast to the shaft, L', the movement of which shaft has been fully described. When this shaft revolves, the cam, Q', is pressed against the roller, F^3, on the lever, G^3, mounted on suitable bearing, H^3. This lever, G^3, has a rod, I^3, attached to it by a pin, J^3; the other end of the rod, I^3, is fastened to a short arm, K^3, by the pin, L^3; the arm, K^3, being firmly attached to the long shaft, B^3, before described. The lever, G^3, moved by the cam, Q', draws, through the medium of the rod, j^3, and arm, K^3, laterally, causing the shaft, B^3 B^3, to turn, and depress the end of the lever, A^3, before mentioned as acting upon the roll, y'', which roll operates the ratchet apparatus connected to the copping wire. The regulating wire, A'' A'', works under the yarn, keeping it level and tight in the usual manner.

It will be seen from the foregoing specification of the details of my apparatus, that my improved machine, is in distinction from all others now in use, a "self operating jack," and that all the different movements of the different parts of the apparatus, and the variations in said movements, are accomplished from one driving shaft. I shall, therefore, found my claims on the mechanical arrangements by which I am enabled to accomplish these results.

What I claim as my invention, and desire to have secured to me by Letters Patent is,—

1. Driving the spindle carriage forward and back, by means of a mangle wheel, on which the teeth are arranged in a circular position; and securing the quick and slow motion of said carriage, by alternately driving the mangle shaft, L, with gears, Q and R, of equal size, and gears, T and V, greater or less disproportioned to each other.

2. I also claim, stopping the movement of the carriage when it is out, so that the requisite twist may be put into the yarn, by throwing, from time to time, the pulley, Z, (on the main shaft, A A, and from which the mangle shaft derives its motion,) out of connection with said shaft by the clutch, t, operated substantially as hereinabove described.

3. I also claim, effecting the "backing off" of the yarn from the spindles, or reversing the action of the race-belt shaft, from time to time, by means of a suspended

box or frame, N″, containing the self adjusting stud, R″, operated, or pressed down by the revolving arm, *s′*, on the shaft, L′, and having a hook, T″, which, as said box descends, engages with, and turns the ratchet, U″, on said race-belt shaft; the whole being substantially as hereinabove described.

4. I also claim, changing or varying the traverse movement of the copping or fuller wire, by the double ratchet *h″ j″*, operated as described, the screw rod, *f″ f″*, and chain, *e″*, connected to the shaft, *b″*, which holds the copping wire; the whole being combined, and operating substantially as hereinabove set forth.

In testimony that the foregoing is a true description of my said improvements I have hereto set my signature this eleventh day of July, in the year 1848.

FOSTER NOWELL.

Witnesses:

EZRA LINCOLN, Jr.,

LUTHER BRIGGS, Jr.