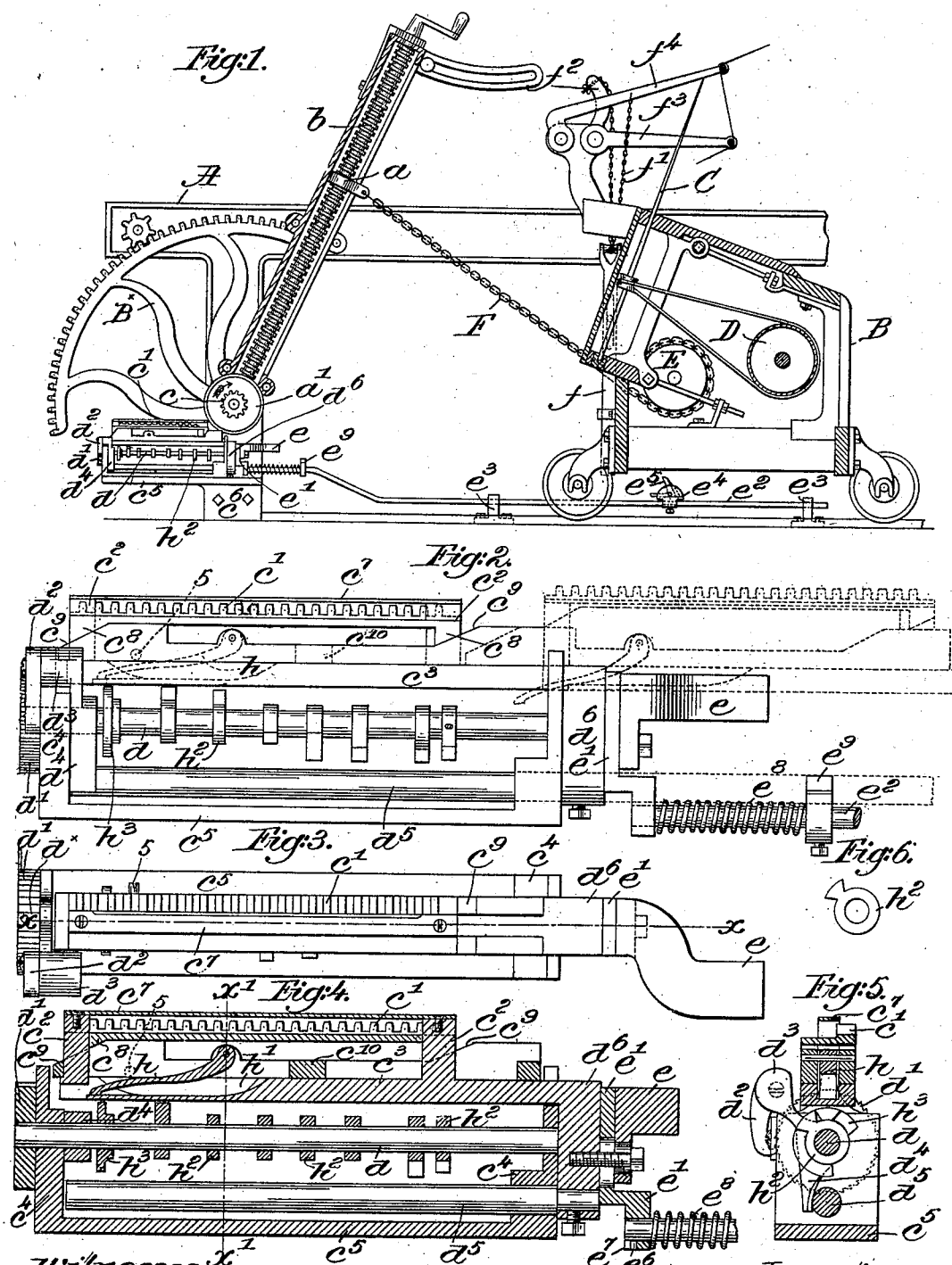


(No Model.)

S. JACKSON.
SPINNING MULE.

No. 578,061.

Patented Mar. 2, 1897.



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UNITED STATES PATENT OFFICE.

SAMUEL JACKSON, OF PAWTUCKET, RHODE ISLAND.

SPINNING-MULE.

SPECIFICATION forming part of Letters Patent No. 578,061, dated March 2, 1897.

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To all whom it may concern:

Be it known that I, SAMUEL JACKSON, of Pawtucket, county of Providence, State of Rhode Island, have invented an Improvement in Spinning-Mules, of which the following description, in connection with the accompanying drawings, is a specification, like letters and numerals on the drawings representing like parts.

10 This invention has for its object to improve spinning-mules in respect of the devices for automatically moving the usual quadrant-nut or its equivalent outwardly on the quadrant to vary the number of rotations of the winding or chain drum during the time in which the cop-bottoms on the spindles are being formed or built out to the full diameters of the cops, my invention being an improvement upon that shown and described in my
20 previous patent, No. 273,997, dated March 13, 1883.

In my patent of 1883, referred to, the mule-carriage, on which the spindles are mounted, is provided with what is there called a "regulator," having a plurality of racks or series of teeth of different lengths, that is, series having different numbers of teeth, which at each forward movement of the carriage engage a pinion connected with the quadrant-screw and rotate the pinion and screw a greater or less distance, according to the number of teeth in the particular rack or series which engage the pinion, thereby moving the chain-nut on the screw a greater or less distance radially from the axis of the quadrant to vary the rotative movement of the winding-drum in the subsequent backward movements of the carriage.

In my former patent the pinion which rotated the quadrant-screw was splined upon the hub of a bevel-wheel geared directly to the quadrant-screw, said pinion being threaded to engage a threaded stud, which caused it to move laterally, to thereby engage successively the different series of teeth or racks on the regulator. To simplify and improve such mechanism in my present invention, I provide a regulator having a single rack or series of teeth or their equivalent instead of
50 several series, as before, and to impart to the cooperating pinion or wheel a variable movement for adjustment of the quadrant or chain

nut I vary the effective throw or movement of the regulator. This in the preferred construction is accomplished by raising the regulator at the beginning of its movement into such a plane as will cause it to engage and rotate the wheel on the quadrant, and by suitable mechanism automatically dropping it out of engagement with the wheel after it has moved the same far enough to impart the desired change to the quadrant or chain nut. I mount this regulator in a fixed support or stand connected with the frame of the machine or upon the floor instead of upon the carriage, as in my former patent, thereby obviating the liability of accidental breakage or displacement which I have found to be present in my former device. The regulator is moved to rotate the wheel on the quadrant by means of a suitable device, which I shall call an "actuator," on the carriage and moved by the varying tension in the threads.

The above, together with other features constituting my invention, will be hereinafter fully described, and set forth in the claims.

In the drawings, Figure 1 in vertical cross-section shows a sufficient portion of a spinning-mule of common construction to enable my invention to be understood; Fig. 2, a detail showing in side elevation and on an enlarged scale the regulator, Fig. 1; Fig. 3, a top or plan view of Fig. 2; Fig. 4, a longitudinal section taken on the dotted line xx , Fig. 3; Fig. 5, a cross-section taken on the dotted line $x'x'$, Fig. 4; and Fig. 6, a detail showing one of the collars h^2 detached.

In the particular embodiment of my invention selected for illustration and shown in the drawings, A represents part of the framework of a spinning-mule; B, the usual carriage; C, one of the spindles; D, the usual tin cylinder; E, the usual drum to receive the chain or connection F, connected with the nut, or, as I shall hereinafter call it, "chain-holder" a , shown as mounted upon the usual quadrant-screw b of the quadrant B^x , all of which are and may be of usual or desired construction so far as concerns my present invention.

The quadrant-screw b , as herein shown, is rotated by a bevel-wheel a' at the base of the quadrant, and fast upon the shaft of the bevel-gear is a pinion c , adapted to be en-

gaged by the teeth of the rack c' , which constitutes in the present instance one form of regulator. This regulator c' is notched at its ends to receive the two posts c^3 , rising from the sliding bar c^3 , mounted to slide in suitable supports c^4 on the base c^5 , which is secured to a suitable fixed support, as the bracket c^6 , on the part of the frame adjacent the pinion c , Fig. 1.

A narrow plate c^7 , Figs. 2 and 3, connecting the tops of the post c^2 , prevents withdrawal of the regulator, the latter at its under side and near its ends being provided with downwardly inclined or beveled lugs c^8 , which rest upon correspondingly-inclined faces c^9 on a lifter c^{10} , mounted to slide on the top of the bar c^3 and also slotted or notched to straddle the posts c^2 , which latter constitute guides both for the horizontally-sliding lifter and for the vertically-moving regulator.

Sliding movement of the lifter to the left on and with relation to the bar c^3 will cause the regulator to ride up the inclined surfaces c^9 , and be thereby raised into such a plane as will, on reciprocation of the bar c^3 , cause the regulator to engage and rotate the pinion c , sliding of the said lifter in an opposite direction dropping the regulator out of engagement with the said pinion.

Journaled in the supports c^4 is the shaft d , which, at one of its ends outside of one of the supports, is provided with a ratchet-toothed wheel d' , coöperating with which is a pawl d^2 , pivoted to a pawl-carrier d^3 , pivoted loosely upon the shaft d , and having a depending tail portion d^4 , which is beveled to be acted upon by the beveled end of a rod d^5 , fast on a depending lug d^6 of the bar c^3 .

To the depending lug d^6 I have bolted two brackets e and e' , and to the bracket e' I have secured one end of a rod e^2 , which is carried toward and under the mule-carriage and is supported in suitable stands e^3 . (See Fig. 1.) Upon this rod e^2 , and preferably between the stands, I have bolted a suitable casting e^4 , in which is pivoted the V-shaped dog e^5 .

Upon the carriage B is mounted to slide in suitable bearings a vertically-movable bar f , which I have denominated the "actuator," it being suspended from a chain f' , connected at one of its ends with an arm f^2 , fast on an arm of and rotatable with the main faller f^3 , and at its opposite end with the auxiliary or counter faller f^4 .

The thread from the rollers is carried, as indicated, over the guide-wire of the counter-faller f^4 , down beneath the guide-wires of the main faller f^3 , thence to the spindle, as indicated in Fig. 1.

The operation of the device thus far described is as follows: At the beginning of the spinning operation, when the spindles are all empty, the holder a is in a position near the pinion c of the quadrant, and when in such position the vibrations of the quadrant will impart through the chain F to the chain-cylinder E greater rotative movement than

when the holder is in its illustrated position, rotation of the cylinder being in each instance caused by movement of the carriage toward and from the quadrant, causing the chain F to be wound upon and unwound from the cylinder. In the drawings, Fig. 1, the carriage is shown in the act of moving backward toward the rollers and winding upon its spindles the thread previously twisted or spun, the end of the actuator f passing over the dog e^5 without engaging it, said actuator being held in its elevated position by the chain f' , connected with the fallers. Having wound upon the spindles the thread previously twisted, the carriage moves forward again for another stretch of the yarn, which when spun is again wound upon the spindles during the return or backward movement of the spindles, as before. During these movements of the carriage the quadrant is rocked or vibrated in usual manner to cause the chain-holder a to follow to a greater or less extent the movements of the carriage. If the chain-nut a does not follow the carriage to a sufficient extent, the drum E will be rotated through a greater distance than it ought to be and will thereby rotate the spindles to such an extent as to render the threads excessively taut, which will cause the counter-faller f^4 to be pulled down somewhat and thereby drop the chain f' and its attached actuator, so that just before the carriage reaches the limit of its backward movement toward the rollers the said actuator will engage the dog e^5 and push it and the rod e^2 before it, thereby drawing the bar c^3 , with the regulator, to the right, Figs. 1 and 2, into their dotted positions, the dog e^5 being so placed upon the rod e^2 that when engaged by the actuator and moved to the limit of movement of the carriage it will just move the regulator from its extreme left position to its extreme right-hand position, Fig. 2, the distance through which the regulator is moved being represented by the length of the bar c^3 .

When the regulator is drawn out, as described, just before it reaches the end of its movement, a pin 5, Fig. 3, on the lifter strikes the support c^4 and is stopped before the bar c^3 and lifter have completed their movements, thereby causing a relative movement of the regulator to the right on the lifter, causing it to ride up the inclined faces c^9 and lift the regulator into its elevated position. (Shown in dotted lines, Fig. 2.) With the regulator in this new position the carriage moves forward for a new stretch, and just before reaching the end of its forward movement strikes the bracket e and pushes the bar c^3 , the lifter, and regulator, with the latter still held in its elevated position, forward beneath the pinion c , causing the lifter to engage the pinion and rotate it in the direction of the arrow, Fig. 1, to thereby rotate the quadrant-screw and move the chain-holder or nut a farther out on the screw away from the axis of the quadrant, so that the next time the quadrant swings

over it will cause the nut to follow the carriage farther than before and thereby rotate the chain-cylinder less to cause the spindle to be rotated less for the winding of the yarn thereupon to compensate for the increased diameter of the cop upon the spindle. As the cop enlarges the nut a must be moved farther out on the quadrant to thereby rotate the chain-drum and spindles less at each backward movement of the carriage for winding the yarn thereupon; but the nut e is not moved at regular intervals and through definite distances each time, it being moved only at such times as the actuator by dropping shows that the tension on the thread is tight enough or too tight, and each time the nut is moved less than at the previous time until the base of the cop on the spindle is formed, when thereafter the vibrations of the quadrant are such as to control the movements of the chain-cylinder without change in the position of the nut a . To impart to the nut a these occasional and varying movements referred to, I have provided the lifter c^{10} with a depending dog h , which normally rests in a depression h' in the bar c^3 , and on the shaft d I have mounted a series of stop-collars h^2 , one of which is shown separately in Fig. 6 and provided, respectively, with radially-extended ears h^3 , which are so adjusted on the said shaft that the ears referred to shall lie in a spiral around the shaft. (See Fig. 5.) When the bar c^3 is drawn out and the lifter moved forward to raise the regulator, as in dotted lines, Fig. 2, in the manner described, the movement of the lifter to the left relatively to the bar c^3 causes the pawl h to move forward beyond the end of the bar c^3 and to drop into its position shown in dotted lines at the right, Fig. 2, so that when the bar c^3 with its regulator in an elevated position is subsequently moved to the left to engage the pinion c and rotate the quadrant-screw as the regulator nears the end of its movement the dog h will strike the ear on the endmost collar h^2 of the series and will thereby stop further movement of the lifter, so that the final movement of the bar with its regulator will cause the regulator to drop down the inclines c^9 into its lowermost position. At the same time the beveled end of the rod d^5 , by striking the tail d^4 of the pawl-carrier d^3 , moves the said carrier to the left, Fig. 5, causing its pawl to rotate its ratchet-wheel and the shaft d a sufficient distance to turn the shaft to bring the next collar h^2 of the series into position, with its ear in the line of travel of the dog h , so that at the next movement of the regulator the dog h will strike the ear of that collar which is next to the endmost one of the series and will thereby cause the lifter to be moved to drop the regulator earlier than before, to thereby impart less movement to the pinion, each movement of the regulator acting as described to bring a new collar into position, with its ear in the path of movement of the dog h , to drop the regulator earlier at the next

movement, and so on throughout the series, the difference in the lengths of effective movements of the regulator being determined by the spacing of these collars on the shaft d , and the device may be and preferably is so adjusted that a series of movements of the regulator will necessarily take place before the ratchet-wheel d' has been rotated sufficiently to bring a new collar into position. In the movements of the bar c^3 to the right the dog is held in its elevated position by the bar c^3 , as shown in Fig. 4, it being dropped only at the end of its movement to the right in readiness to engage the first collar which lies in its path on the return movement. In this way the length of the effective movement of the regulator, which is the movement while in its elevated position, is made longer or shorter, according to the position and number of collars h^2 on the shaft d , said collars being arranged to cause the regulator to have such movements as shall rotate the quadrant-screw and move the chain-nut a the proper distances for regulating the movements of the chain-drum, as is necessary to compensate for the increase of the size of the cop when building up the base of the cop.

The ratchet-wheel d' has two or three teeth omitted at some one point in its periphery, as at d^x , Fig. 3, which portion is so arranged as to be reached by the pawl when the shaft d has made one complete rotation, so that after all of the collars have in turn acted through the pawl h to drop the regulator the ratchet-wheel will thereafter fail of rotation by its pawl and the regulator will thereafter be dropped uniformly at the same point in its movements.

The ears h^3 are segmental, being relatively arranged to leave a longitudinal gap or return-path along the shaft d for the dog h , so that the latter may be shifted directly back to the starting-point after it has reached the end of its forward travel. As arranged, the rotation of ratchet d' to bring its toothless space into operation takes the last ear out of the return-path of the dog h , so that a free path is opened for the shifting back of the dog to the original position.

Referring now to Figs. 1 and 4, the rod e^2 is loosely mounted in the bracket e' and is provided with a laterally-extended pin e^6 , adapted to enter a notch e^7 in the bracket, a spring e^8 interposed between the bracket and a collar e^9 on the rod holding the latter always in its position at the right with the said pin in the notch e^7 , the pin thereby holding the rod in position with the dog e^5 in a vertical position. When the base of the cop has been built up to the desired diameter and the mechanism described is no longer needed, the operator can move the rod e^2 to the left to disengage the pin e from the notch e^7 and then rotate the rod through a quarter-revolution to thereby turn the dog e^5 into a horizontal plane, where it cannot be engaged by the actuator.

My present invention differs from my previous patent referred to in that in my previous patent the toothed regulator or rack had always the same effective movement, the variations in the rotation of the pinion being determined by the particular rack or series of teeth which is brought into engagement with it, while in this my present invention the regulator has a variable effective movement, that is, its effective movement or movement while elevated is of a longer or shorter duration according to the particular collar $\frac{1}{2}$ which is to stop it, my present invention enabling the device to be made much more simple than the invention of my patent referred to.

The regulator in my present invention is preferably mounted upon the frame, and is therefore not moved by and with the carriage, as in my former patent, thereby reducing to a minimum liability of derangement or breakage.

I do not limit myself to the particular construction herein shown and described, for it is evident the same may be varied without departing from the spirit and scope of my invention.

I claim—

1. In a spinning-mule, the quadrant, the chain-holder movable thereon, the carriage and its spindles, the chain-holder regulator, and means controlled by the varying tension of the thread to impart a predetermined varying effective movement to said regulator and means to vary said predetermined movement, substantially as described.

2. The quadrant, its screw and pinion to rotate the same, and the chain-holder, the carriage, its spindles, and the actuator moved by varying tension of the threads, combined with the toothed regulator, the lifter for raising and lowering the same on relative movement of it and the said regulator, connections between said actuator and regulator for moving the latter by the former, and a series of stop-surfaces, and means to automatically move the same into position to cause relative movement of the lifter and regulator for varying the effective travel of the latter, substantially as described.

3. The quadrant, its screw and pinion to rotate the same, the chain-holder, the carriage, its spindles, and the actuator moved by varying tension of the thread, the stationary support, the regulator, the shaft connected and movable longitudinally with the said regulator, the lifter movable with and independently of said regulator and adapted on independent movement to raise and lower the said regulator, a series of stop-surfaces on the said shaft, and devices on the said lifter to co-operate with said surfaces to cause independent movement of the lifter and regulator, and means to rotate said shaft at each complete movement of the regulator, substantially as described.

4. In a spinning-mule, the quadrant, the

chain-holder movable thereon, the carriage and its spindles, the chain-holder regulator, means controlled by the varying tension of the thread to impart a predetermined varying effective movement to said regulator, said means including a rotatable shaft and a plurality of independent ears projecting therefrom, said ears having a substantially spiral arrangement on said shaft, substantially as described.

5. In a spinning-mule, the quadrant, the chain-holder movable thereon, the carriage and its spindles, the chain-holder regulator, means controlled by the varying tension of the thread to impart a predetermined varying effective movement to said regulator, said means including a rotatable shaft, and a plurality of independent ears projecting therefrom, said ears having a substantially spiral arrangement on said shaft, and certain of said ears being wider than the others, substantially as described.

6. In a spinning-mule, the quadrant, the chain-holder movable thereon, the carriage and its spindles, the chain-holder regulator, means controlled by the varying tension of the thread to impart a predetermined varying effective movement to said regulator, said means including a rotatable shaft, and a plurality of independent stop-collars on said shaft, each collar having an ear projecting therefrom, the collars being adjustable longitudinally on said shaft, substantially as described.

7. In a spinning-mule, the quadrant, the chain-holder movable thereon, the carriage and its spindles, the chain-holder regulator, means controlled by the varying tension of the thread to impart a predetermined varying effective movement to said regulator, said means including a rotatable shaft, having a pawl and ratchet connected therewith to rotate the same, a spirally-arranged series of stop-surfaces on the shaft, a rod adapted to operate said pawl, and an actuator for said rod, substantially as described.

8. In a spinning-mule, the quadrant, the chain-holder movable thereon, the carriage and its spindles, the chain-holder regulator, means controlled by the varying tension of the thread to impart a predetermined varying effective movement to said regulator, said means including a rotatable shaft having a pawl and ratchet connected therewith to rotate the same, a spirally-arranged series of stop-surfaces on the shaft, means to operate said pawl and ratchet, and means to render said pawl and ratchet inactive when the cop is built to its thickness, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL JACKSON.

Witnesses:

JOHN C. EDWARDS,
AUGUSTA E. DEAN.