No. 862,201. PATENTED AUG. 6, 1907.

W. D. RUNDLETT.

SPINNING MULE.

APPLICATION FILED AUG. 17, 1905.

2 SHEETS—SHEET 1.

Fig. 1.

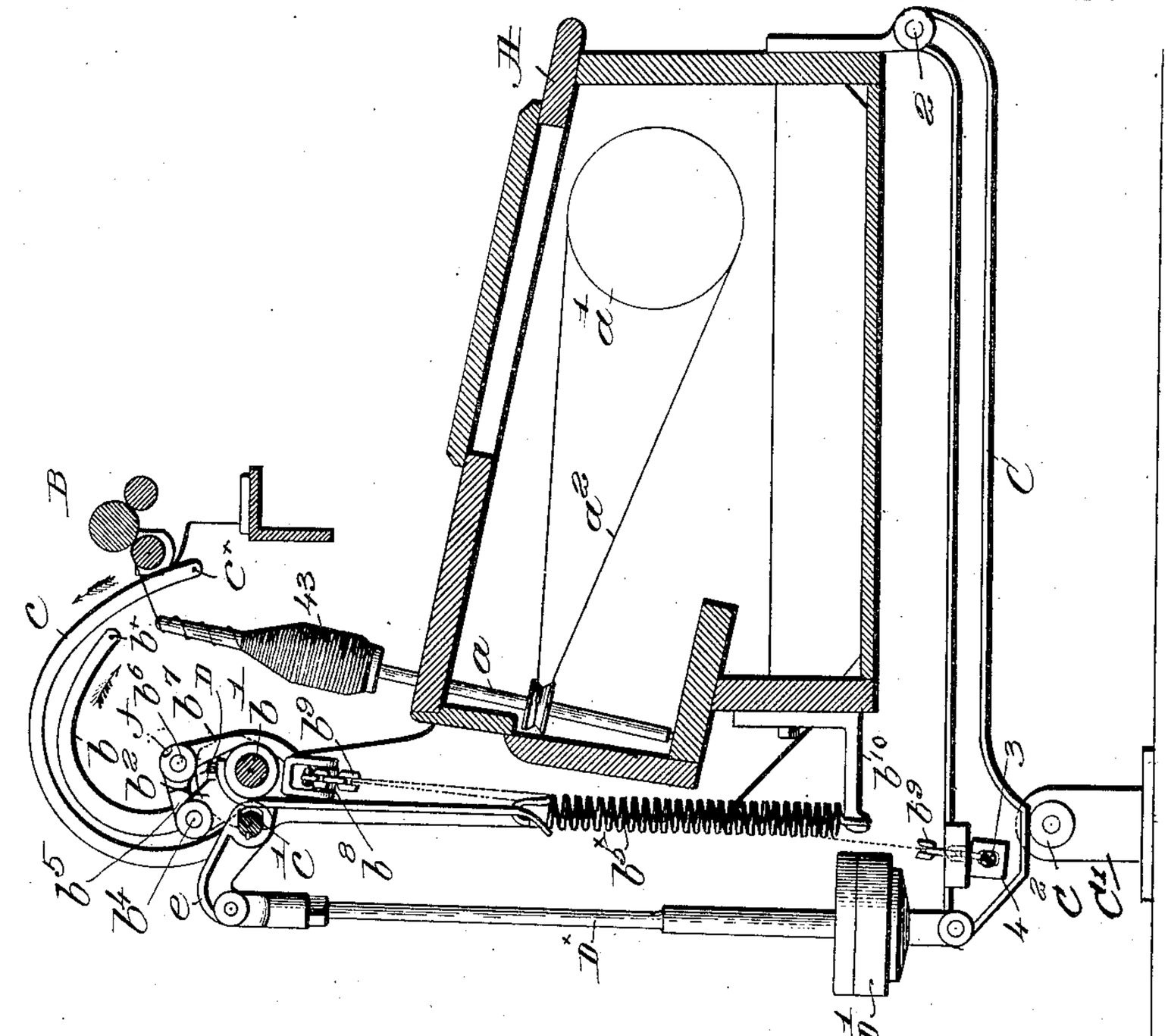
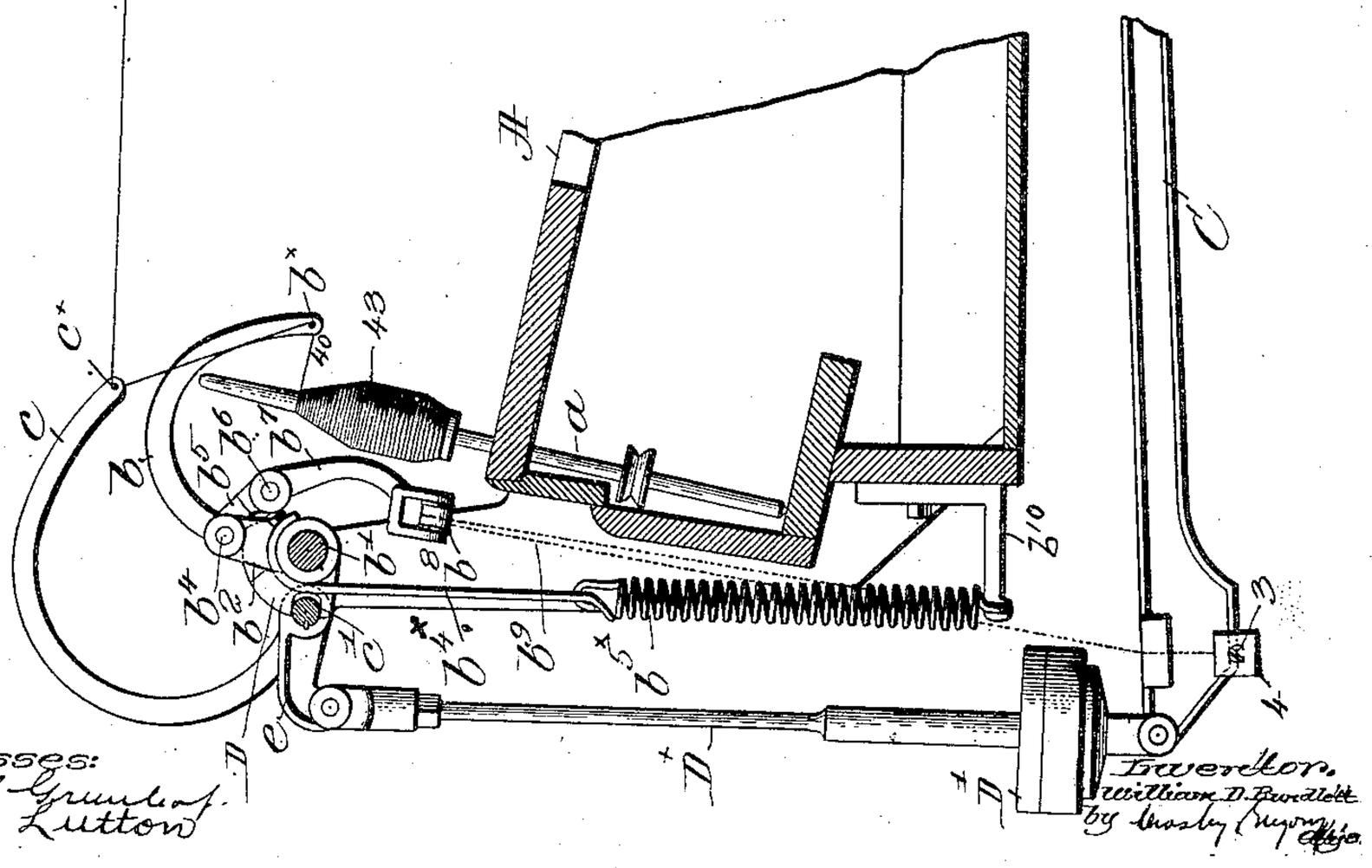


Fig. 2.



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2 SHEETS—SHEET 2.

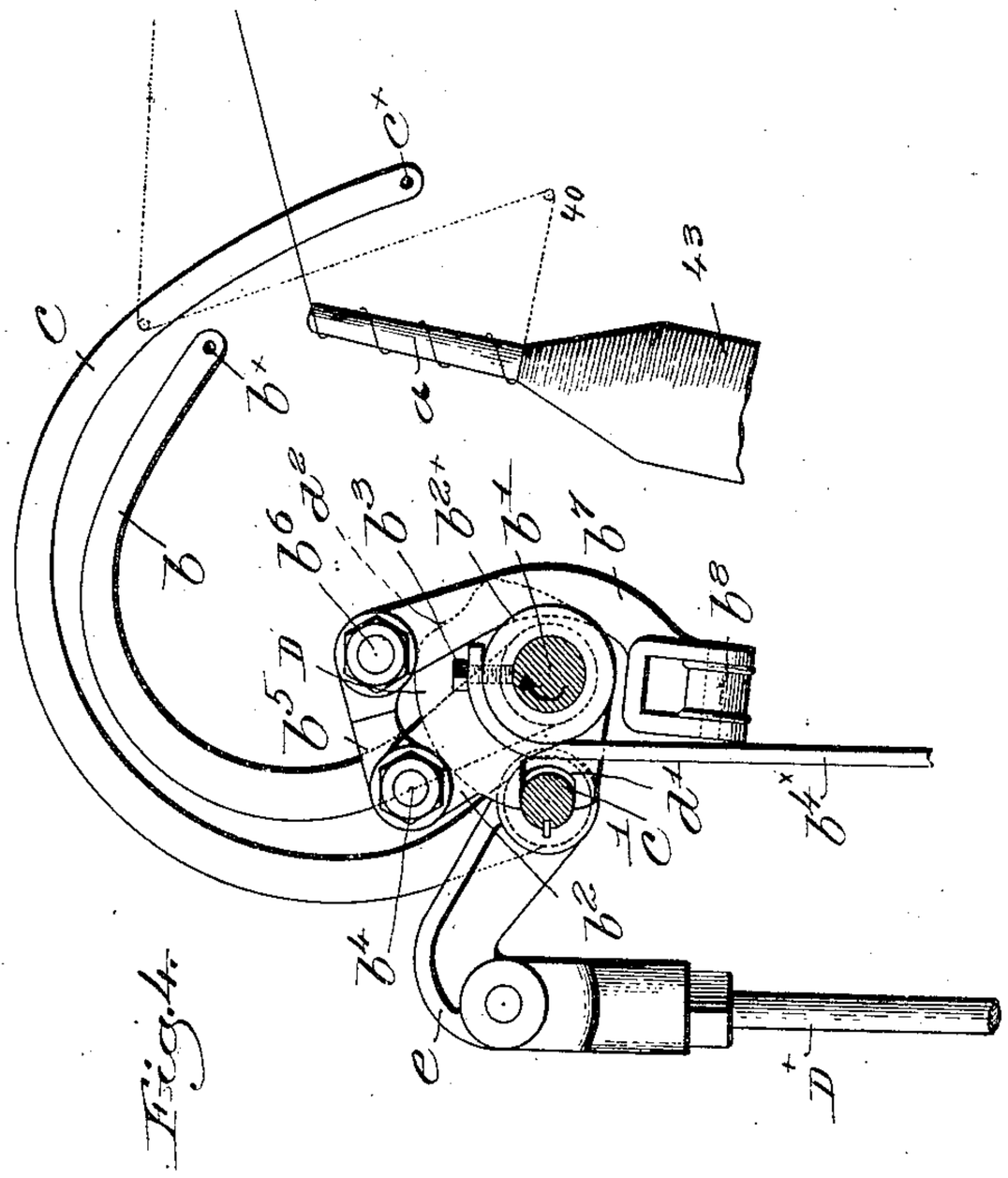

Fig. 4.

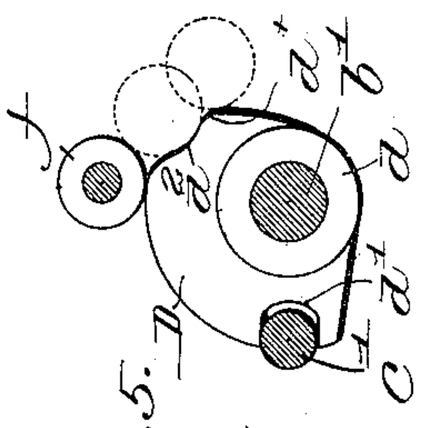

Fig. 5.

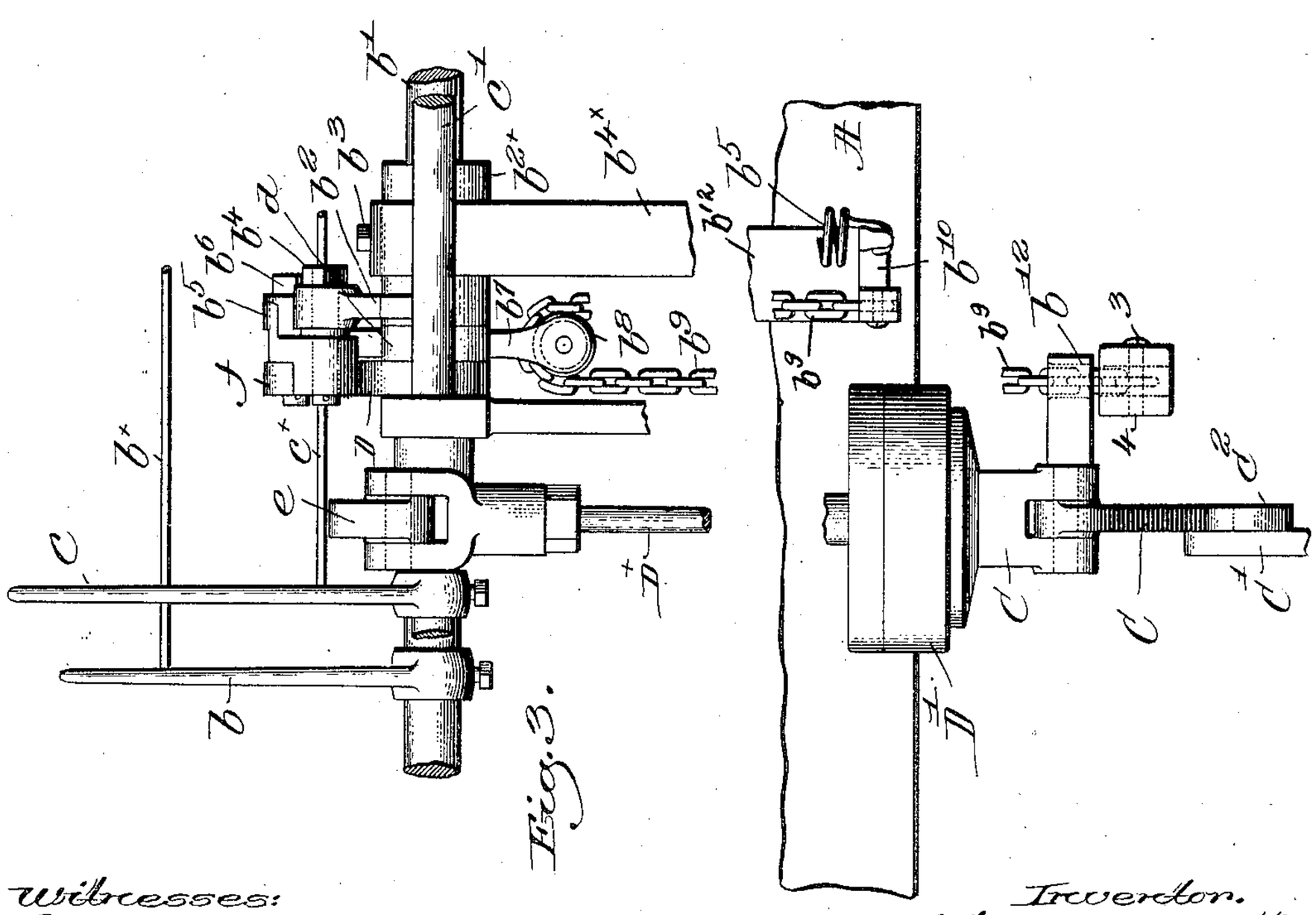

Fig. 3.

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UNITED STATES PATENT OFFICE.

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SPINNING-MULE.

No. 862,201. Specification of Letters Patent. Patented Aug. 6, 1907.

Application filed August 17, 1905. Serial No. 274,541.

To all whom it may concern:

Be it known that I, WILLIAM D. RUNDLETT, a citizen of the United States, residing at North Andover, in the county of Essex and State of Massachusetts, have invented an Improvement in Spinning-Mules, of which the following description, in connection with the accompanying drawing, is a specification, like letters on the drawings representing like parts.

This invention relates to novel means for so timing the motions of and actuating the winding and tension-fallers employed in mules as to prevent the snarling of the thread or yarns delivered from the spindles between their tips and the smaller ends of the partially-formed cones of the cops being built up on the spindle as the direction of rotation of the spindles is reversed during the operation of "backing-off" which is effected at the end of the outward run of the carriage; and also so that the wires of said fallers meet and hold the thread or yarn at tension when the spindles are again turned in the direction for winding the spun thread or yarn commencing at the small ends of the cones, the tension being maintained on the thread or yarn uniformly throughout the winding operation.

In the invention to be herein described, I have provided a cam that serves to hold the fallers locked during the outward run of the carriage, said fallers being unlocked as the backing-off commences at the end of the outward run of the carriage and enabling the tension-faller to rise quickly and meet and support the thread or yarn that is delivered from the spindles during backing-off so that said thread will not be snarled, the winding-faller descending more slowly, both fallers acting to subject the thread or yarn to the proper or desired tension preparatory to commencing the winding of the thread or yarn at the small ends of the cones. Applying tension to the threads or yarns just as they are to be wound on the cones insures a proper tight winding that is maintained throughout the winding operation. After each stretch, or outward run of the carriage, and after the backing-off is completed, the winding of the thread is commenced at the point of the cone, and the thread is laid by the winding-faller in an open spiral to the proper point for the base of the cone, and thereafter as the winding-faller is raised, the thread is laid in closer ascending spiral coils to the point of the cone.

An arm on the tension-faller shaft and the usual weight-carrying lever are united by a rigid connection that prevents any possibility of the tension-faller being raised by the operator during the outward run of the carriage without a corresponding lowering of the winding faller, the operator being thereby precluded from interfering with the position of the tension faller and raising the same during the outward run of the carriage, which would enable yarn to be pulled off from the bobbin, thus increasing the weight of the thread, and therefore the rigid connection insures that the thread or yarn made at each stretch of the carriage is of the same weight and strength, which is a matter of very considerable importance. It will be understood during the outward movement of the carriage that the weight lever to be hereinafter described is sustained in such manner that it cannot be lowered.

In my invention, the starting of the winding-faller, due to the action of the usual backing-off mechanism common to all mules, controls the initial or first movement of the tension-faller so that the latter is instantly released that its wire may care for all slack thread or yarn delivered during backing-off, and the wires of both fallers having come into position to establish the desired tension on the thread or yarn preparatory to the winding operation, the tension is maintained on said threads throughout the winding by the usual weights commonly employed in mules, the action of the weights being controlled through the cam referred to over which travels a roll operatively connected with and moved by the winding-faller, as will be more fully described. As the quickly-rising tension-faller takes up or cares for the slack thread delivered during backing-off, the more slowly descending winding-faller follows down the spindle and substantially touches the thread or yarn and serves to prevent the latter from following up the spindle due to the action of the rapidly rising tension-faller.

Figure 1 in side elevation represents a part of a mule-carriage together with the winding and tension-fallers, the draft-rolls and parts co-acting with said fallers, said parts being in the positions that they will occupy when the carriage is at the end of its outward run; Fig. 2 is a similar view showing the carriage at the outer end of its run and with the fallers in the position they will occupy preparatory to winding thread or yarn on the cones, cops or bobbins, the figure showing the fallers in the position they will occupy at the end of the backing-off; Fig. 3 is a view looking at Fig. 1 from the left, or a view of part of what is designated as the front of the mule part of said figure being broken out to save space on the drawing; Fig. 4 is an enlarged detail of the winding and tension-fallers represented in the position shown in Fig. 1, the dotted lines, however, showing the other extreme position of said fallers, and Fig. 5 is a detail to be referred to showing the cam and the roll thereon that is located on the pin at the junction of the main and auxiliary links to be referred to.

The mule-carriage A, its spindles a, spindle-drum a', banding a^2; the winding-faller b, its shaft b', and wire $b^{\times}$; the tension-faller c, its shaft c', and wire $c^{\times}$; the arm b^2 of a hub $b^{2\times}$ connected with the winding-faller shaft by a set-screw b^3 with which is connected a strap $b^{4\times}$ having an attached spring $b^{5\times}$ that engages a stand b^{10}; the arm c rigidly connected with the tension-faller

shaft c', the weight-lever C, the stand C′, its roller C^2, the chain b^9 attached to the stand b^{10} and extended over pulley b^8, said chain being passed loosely through a hole in the lever C and having connected with its lower end, by a screw 3, a lump or weight 4, and the delivery-rolls B are and may be all as common to mules.

In practice, it will be understood that the winding-faller shaft b' is moved in the direction of the arrow thereon, Fig. 4, during the operation of backing-off by the usual backing-off mechanism common to all mules, and said shaft will be turned in the opposite direction when the fallers are to be changed and locked at the end of the inward run of the carriage, the fallers being then at the rolls, by or through the strap $b^4\times$ and spring $b^5\times$. The winding-faller shaft b' is surrounded loosely by the hub d of a faller locking device shown as a cam D notched at d' to embrace the tension-faller shaft c' so that said cam remains stationary throughout the operation of the mule.

The cam D, shaped as best shown in Fig. 5, has a depression d^2. The arm b^2 rigidly connected to the winding-faller has a stud b^4 to which is jointed a two-part link comprising an auxiliary link b^5 and a main link b^7, the main link being jointed to the auxiliary link by a stud b^6 on which is mounted a roll f, and the lower end of the main link is provided with a pulley b^8 over which is passed the usual chain b^9, one end of which is fixed to the stand b^{10} attached to the carriage, and the other end sustains the weight 4. The roll f on the stud b^6 stands on the high part of the cam D close to the depression d^2 during the outward run or stretch of the carriage, and in this position, the fallers will be locked so that they cannot be disturbed or changed until the commencement of the backing-off.

Fig. 1 shows the fallers locked in position with relation to the spindles or bobbins preparatory to backing-off, said fallers remaining locked during the outward run of the carriage. When the direction of rotation of the spindles is to be reversed, the usual backing-off means referred to comes into operation and turns the winding-faller shaft in the direction of the arrow thereon, Fig. 4, causing the roll f on the stud b^6 uniting the two-part link to leave the high point of the cam, see full lines, Fig. 5, and immediately enter the depression d^2, as represented by dotted lines in said figure. This movement of the winding-faller shaft serves to immediately unlock the tension-faller and permit the weights D′ controlling the same to move the tension-faller in the direction of the arrow thereon in Figs. 1 and 4.

It will be noticed, see Fig. 1, that the center of the stud b^6, the shaft b' and the longitudinal axis of the chain b^9 stand in the same line, while the fallers are locked and the carriage is being moved outwardly, and a very slight movement of the winding-faller serves to move the roll from its high point into the depression, so that the tension-faller is quickly released, leaving it free to rise at its fastest speed toward the top of the spindle, said tension-faller meeting and supporting the under side of the thread as it is delivered from the spindle in backing-off, and at the same time, the winding-faller is descending at a slower speed so that its wire follows in substantial contact with the upper side of the thread or yarn being unwound from the spindle during backing-off, the wire of said winding-faller contacting with the unwinding thread and by the time that the winding is to be commenced at the upper end of the cone, at which time the movement of the spindles is again changed and they are revolved in the direction for winding, the wires of both fallers in engagement with the thread or yarn holding the same at tension. After the roll f during backing-off enters the depression d^2 and the tension-faller is moved upwardly to take up the slack thread through the action of the usual tension weights, the winding-faller descends, due to the usual backing-off mechanism until said faller arrives in the position Fig. 2. As the roll f enters the depression d^2 of the cam D, the tension-faller is permitted to rise rapidly, as stated, and just before the fallers arrive in the position Fig. 2, the roll has ridden up the part $d\times$, thus gradually checking the fast upward movement of the tension-faller to thus avoid shock or sudden strain on the thread as the wires of both fallers exert the necessary tension thereon preparatory to winding the same on the cone.

When both fallers occupy their position to exert tension on the thread or yarn, the spindles are again turned forwardly or in the direction for winding, and the winding is commenced and the winding-faller continues to descend from the full line position until its wire occupies a position about at the point 40 Fig. 4, and at this time the weights D′ which may be varied according to the count of the thread or the number of spindles on which threads are being wound, controls the tension.

During the inward run of the carriage when the winding-faller descends, the roll f enters the depression d^2 of cam D, and the weight-lever is placed under the control of the weights D′, the weights acting until the inclined projection at the lower side of the lever C passes the roll C^2. While the winding-faller is being moved downwardly from its full line position to the point indicated at 43, Fig. 4, the tension-faller remains substantially in its full line position Fig. 2, the weights D′ controlling the tension on the thread or yarn, but as the winding-faller rises from the point 40 during the continued inward run of the carriage, the tension-faller, due to the strain on its wire of the threads passing thereover, is depressed, thus raising the weights D′ and in this way the tension is maintained uniform during the winding of the thread on the cone. By the time that all the thread is wound on the cone, the tension-faller by the strain of the thread thereon will have been depressed to about the level of the top of the spindle leaving the thread supported by the top of the spindle. This point of descent is designated as the safety point, and at this time the winding-faller will be in the position shown by full lines Fig. 2. As the carriage completes its inward run, the roll C^2 acting on the lever C raises said lever and the rod D×, or rigid connection carrying the weights D′, and turns the tension-faller into the position Fig. 1, and the winding-faller is then raised, as stated, causing the roll f to travel over the cam D into the position shown in Fig. 1, thus locking the fallers when the operation just described may be again repeated.

The rod D×, or rigid connection between the lever C and arm e, provides against the possibility of rising or unlocking of the tension-faller preventing any upward movement of its wires from the position shown in Fig. 1 until the completion of the outward run of the

carriage, and consequently it becomes possible to insure the same draft and weight or size of thread or yarn at each stretch.

Heretofore a chain has been used instead of the rigid rod, but with a chain it is possible for the operator to raise the tension-faller in case the threads are too taut, thus preventing breaking of the thread which is not desirable. I deem it more advantageous to a manufacturer to have the thread break if necessary than that the operator have the opportunity, as he may see fit, to move the tension-faller upwardly which always increases the weight of thread or yarn, which is not desirable when a mule has been set to spin a yarn of a certain weight or count.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a mule, winding and tension fallers, their shafts, an arm connected with said winding shaft, a stationary cam, and a device movable with said winding faller over said cam, combined with connections between said device and the tension faller to lock said tension faller in position and restrain its movement when unlocked.

2. In a mule, the following instrumentalities, viz: a winding faller, its carrying shaft, a tension faller, a tension faller shaft, a stationary cam, an arm attached to the shaft of said winding faller, an auxiliary link, one end of which is attached to said arm, the opposite end of said link being supported by said cam, and connections between said auxiliary link and said tension faller.

3. In a mule, a winding-faller, its carrying shaft, a cam through the hub of which said shaft is extended loosely, an arm fixed to said shaft, a main and auxiliary link, and a roll at the junction of said main and auxiliary link, said roll running over said cam, and means for connecting one end of said main link with said tension faller.

4. In a mule, a tension faller shaft, a connected tension faller, a coacting rigid arm, a lever mounted on the mule carriage, means for sustaining said lever against downward movement during the outward run of the carriage, a rigid connection with said lever and arm and a coacting link, said rigid connection preventing the upward movement of the tension faller during the outward run of the carriage.

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

WILLIAM D. RUNDLETT.

Witnesses:
GEO. W. GREGORY,
MARGARET A. DUNN.