No. 865,947. PATENTED SEPT. 10, 1907.

W. D. RUNDLETT.

SPINNING MULE.

APPLICATION FILED MAY 11, 1906.

2 SHEETS—SHEET 1.

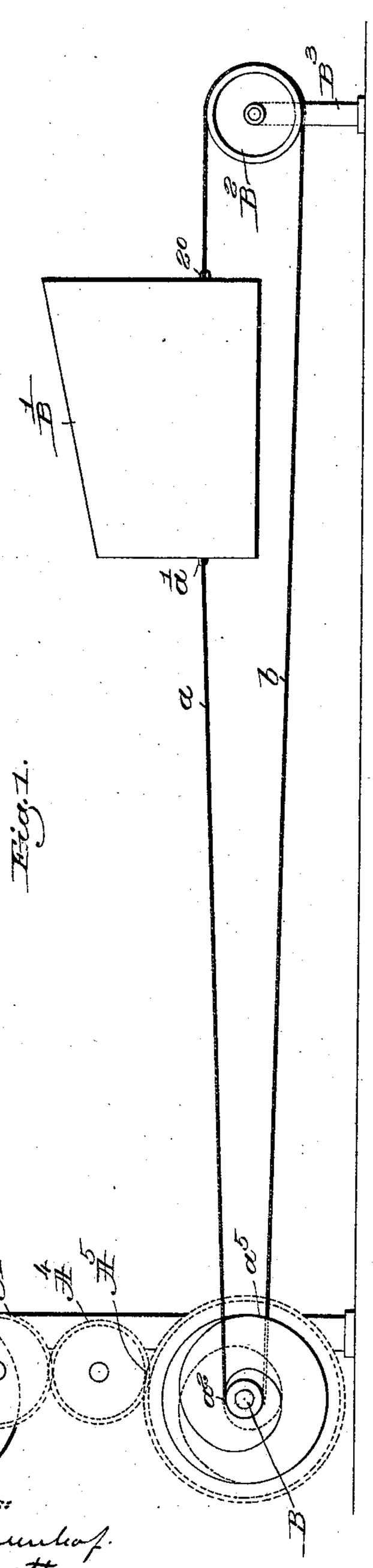

Fig. 1.

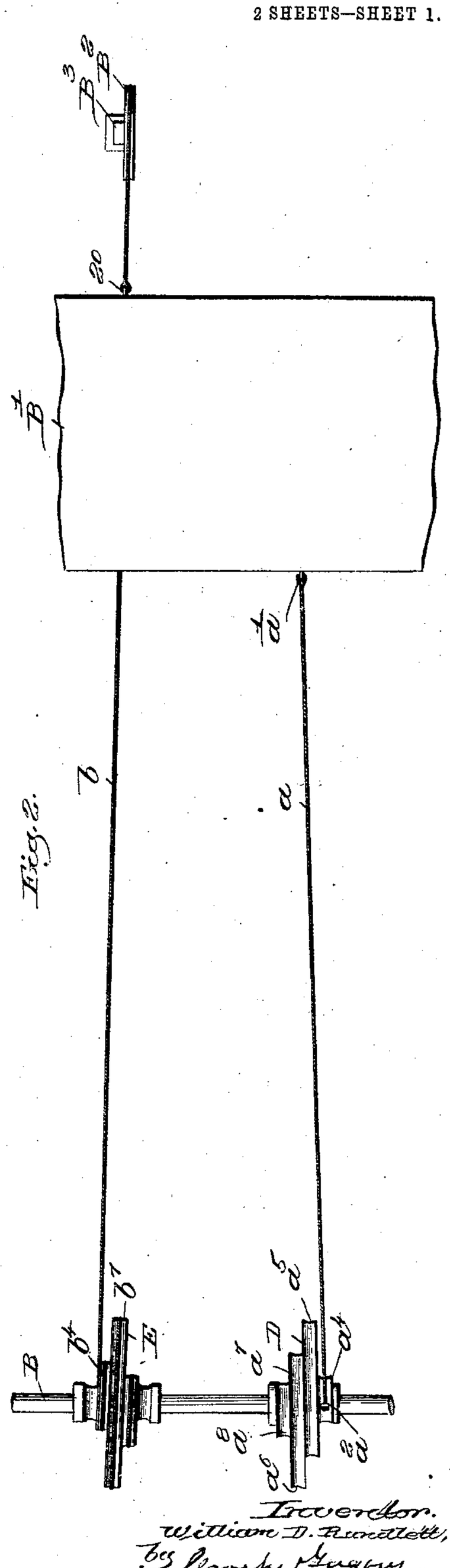

Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 3.

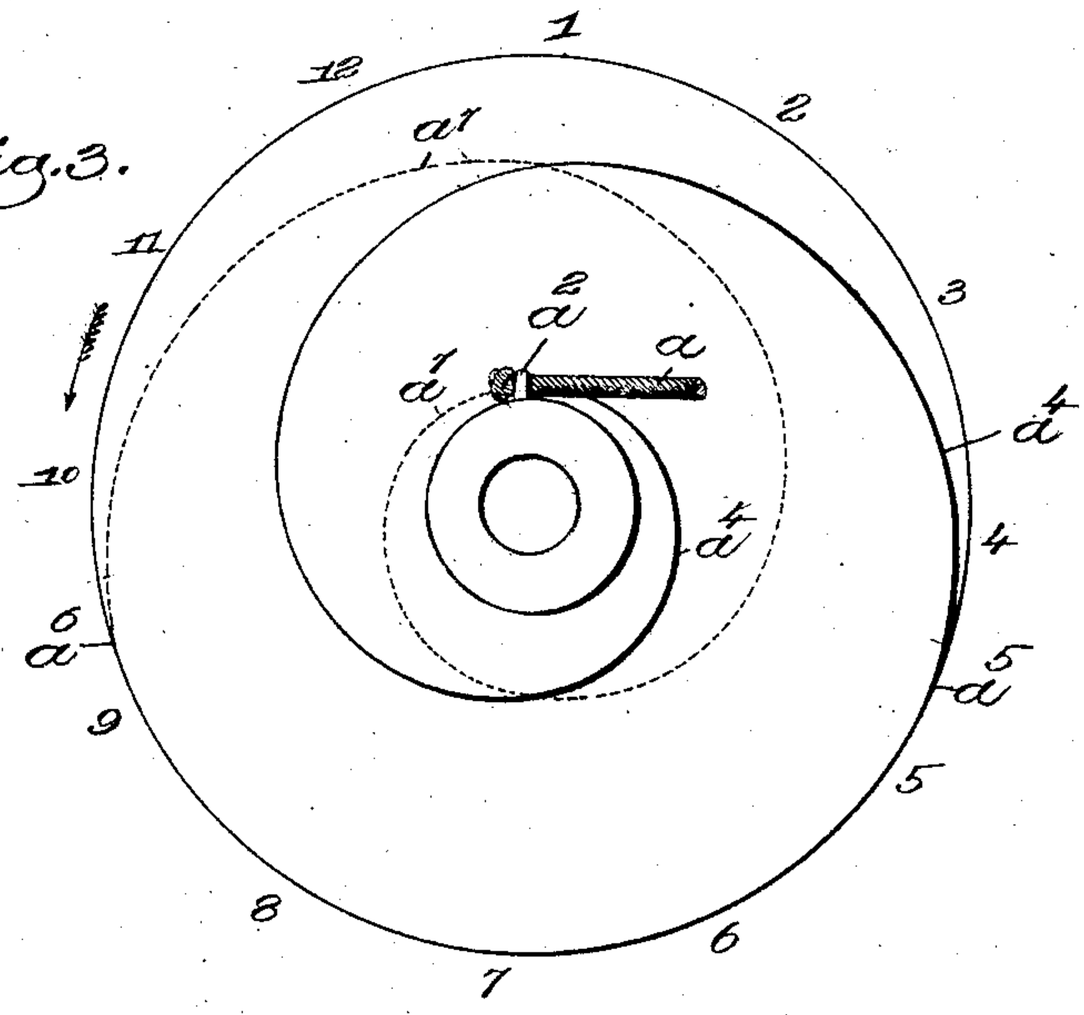
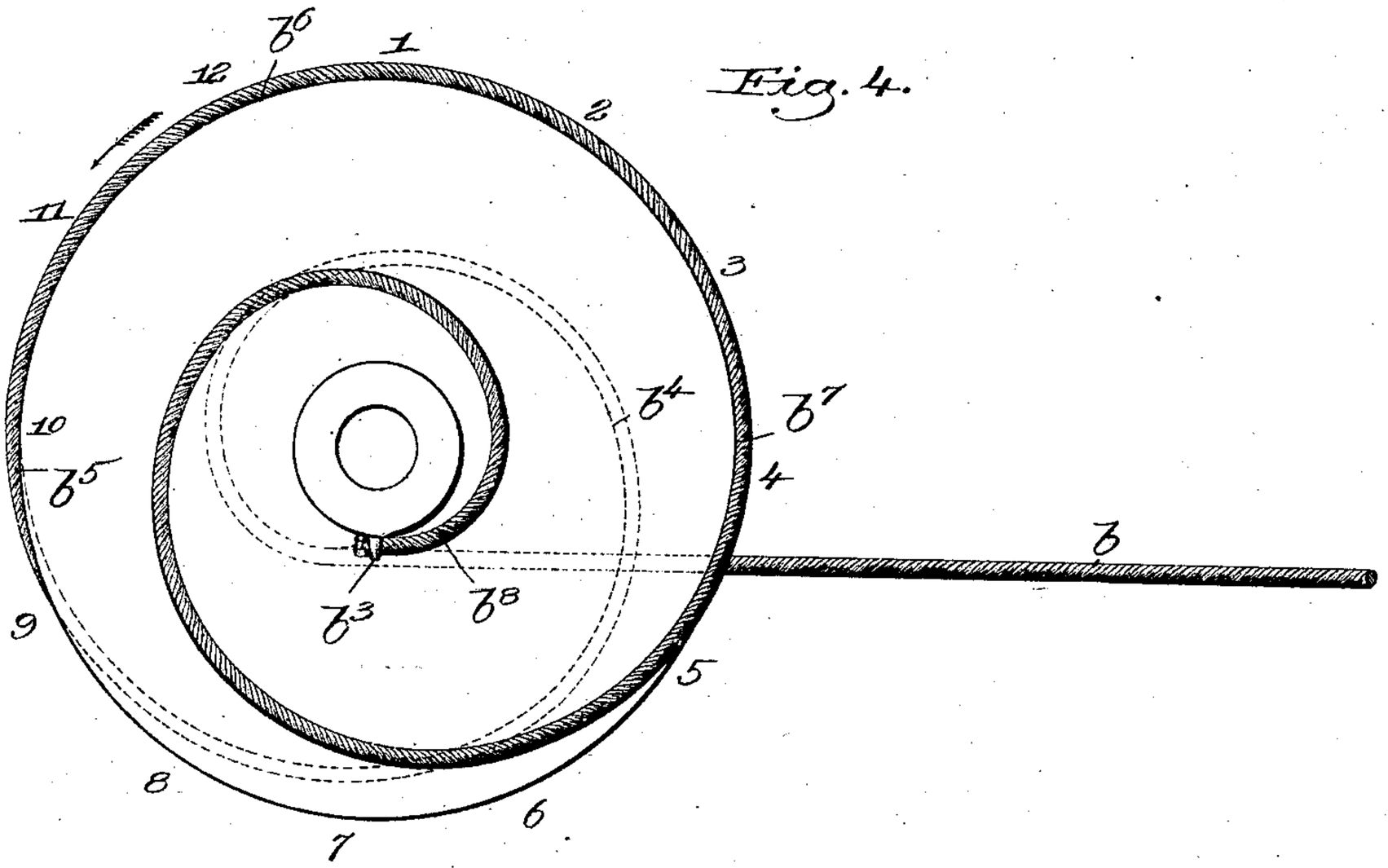


Fig. 4.



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SPINNING-MULE.

No. 865,947. Specification of Letters Patent. Patented Sept. 10, 1907.

Application filed May 11, 1906. Serial No. 316,287.

To all whom it may concern:

Be it known that I, WILLIAM D. RUNDLETT, a citizen of the United States, and a resident of North Andover, county of Essex, 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.

In mules as now commonly made it is customary to stretch very taut the check-rope which is connected at one end with the check-scroll, and at its other end with the front side of the carriage, and also the drawing-in ropes leading in from the drawing-in scrolls to the back of the carriage.

It will be remembered that the longer a rope the more liable it is to stretch due to strain, and as these scrolls are now shaped it is found that the slack in the check-rope in the inward movement of the carriage results in letting the carriage override by momentum the drawing-in ropes so that the carriage has a jumping motion at the inner end of its run, thus breaking the yarns.

In my invention to be herein described I have so shaped the scrolls for controlling the tension on the check and drawing-in ropes that said ropes control positively the movement of the carriage throughout its inward run and makes it impossible for the carriage to be moved solely by its momentum.

When the carriage is to be started on its inward run both ropes are subjected to the maximum tension, and the drawing-in scroll acting on the taut drawing-in rope promptly starts the carriage inwardly, and the speed of the carriage is gradually increased until its maximum speed is reached, and thereafter, for a short distance, the maximum speed of the carriage is continued, and at this time the check-rope is actually doing no work, and consequently need not be unduly stretched. As soon however as the speed of the inward run of the carriage begins to be decreased, as it is for about the last third of its movement, the tendency of the drawing-in rope is to slacken and the carriage would continue its movement due to its momentum.

To overcome the tendency of the carriage, due to its momentum, to overrun the drawing-in ropes it becomes essential to hold the carriage back, which is done by subjecting the check-rope to increased tension, and this increased tension, which is started on the check-rope as the speed of the carriage commences to decrease, is continued throughout the remainder of the inward run of the carriage, the maximum strain on the check-rope taking place or being exerted thereon as the carriage completes its inward run. In this way any irregular movement of the carriage in its inward run due to momentum is completely obviated, which is a matter of very decided advantage in mules.

In accordance with my invention it will be obvious that the tension on the ropes varies, yet the effective tension of said ropes connected with the carriage is so controlled by the scrolls, to be described, as to move the carriage positively during its inward run at the speed predetermined by the drawing-in scrolls; or in other words the speed of the carriage is maintained at the predetermined speed without any possibility of the carriage being moved due to momentum.

In the invention to be herein described it will be understood that the tension on the drawing-in ropes and on the check-ropes varies at different points in the movement of the carriage, and that said ropes may act to move the carriage positively at the predetermined speed desired for the carriage, it is only essential that the tension on said ropes be applied at such times in the movement of the carriage as to overcome any tendency of either rope to become ineffective in controlling the movement of the carriage due to slack rope resulting from any cause whatever, and in my invention I designate the increased tension on the ropes to insure a positive rope-controlled movement of the carriage, as the "effective tension".

Figure 1, in side elevation, represents a diagrammatical figure showing part of the carriage, part of the head-stock, and a scroll-shaft having a drawing-in scroll together with usual driving mechanism for said scroll-shaft; Fig. 2 is a plan view thereof; Fig. 3 is a detail showing the drawing-in scroll; Fig. 4 is a detail showing the check-scroll with the check-rope wound thereon.

The head stock A (but partially shown), the power driven pulley A′ on a shaft having a pinion A^2 engaging an intermediate gear A^3 that in turn engages a second intermediate A^4, that in turn engages a toothed wheel A^5 (but partially shown in Fig. 1) that is mounted loosely on the scroll-shaft but connected therewith at the proper time by a clutch in the usual manner when it is desired to start the scroll-shaft; the scroll-shaft B, the carriage B′, the sheave B^2 having its journals in a stand B^3 erected on the floor at a point beyond the outward run of the carriage at the front of the mule, and the drawing-in rope *a*, and check-rope *b*, are and may be all as usual in self-acting spinning mules, it being understood that there are two drawing-in scrolls, but one being herein shown, two being necessary on account of the length of the carriage in order that the same may be moved evenly over its usual tracks, not herein shown.

My invention relates chiefly to the construction of the check-scroll D and the drawing-in scroll E, which I will now proceed to describe, the advantage due to their new shape being already partially pointed out in the preamble to the specification. The drawing-in rope *a* is connected, as usual, at one end with an eye *a*′,

or otherwise, to the carriage B′ having the usual spindle driving drum, and tension and winding fallers, not necessary to be described. The opposite end of the drawing-in rope is attached to an eye a^2 on that part of the drawing-in scroll of least diameter, and viewing Fig. 3, assuming that the carriage is in its furthest position from the head-stock in its outward run and is about to be started in, the rope a will be wound on the contour a^4 of gradually increasing diameter, said contour reaching its largest diameter at a^5.

It will be supposed that when the drawing-in rope commences to be wound on the surface a^4 that the check-rope is held taut, so that as the strain of the drawing-in rope becomes effective to move the carriage inwardly no appreciable slack is produced in the check-rope, thus preventing any movement of the carriage not positively desired, or not effected solely by the drawing-in rope.

The speed of the inward movement of the carriage, it being started by the drawing-in ropes, is increased gradually until the drawing-in rope arrives at the point a^5 where the drawing-in scroll is of the greatest diameter, during which movement the tension of the check-rope is gradually lessened, and between the points a^5 and a^6 where the said scroll is of the same diameter the maximum speed of the inward run of the carriage is kept up, and during this period of maximum speed the check-rope is maintained at its slack tension.

From the point a^6 along the surface a^7, shown by dotted lines on the opposite side of the drawing-in scroll to its smallest diameter, designated in Fig. 2 by a^8, the diameter of the scroll is decreasing and some means has to be provided to prevent the carriage, when running at its maximum speed, from continuing its movement by momentum and overrunning the drawing-in ropes, for if the carriage by its momentum overruns the drawing-in ropes, usually the yarn will be broken at the completion of the inward run of the carriage when said carriage is suddenly checked by the back-stops or bunters, this result being caused by the check-rope being overstrained by the momentum of the carriage, and when the carriage is stopped by the back-stops the force of momentum is suddenly removed, and in the readjustment of strain between the taut check-rope and the slackened drawing-in ropes the carriage will be moved away from its position at the rolls, said movement being assisted by the recoil of the carriage in striking the back-stops.

My invention is directed especially to controlling the inward movement of the carriage by applying an increase of strain on the check-rope just as the drawing-in rope leaves the surface a^5 and comes onto the surface a^6 of the drawing-in scroll which is of gradually decreasing diameter, as thereby I prevent any tendency whatever of the carriage to start forward due to its momentum.

Referring now to Fig. 4 where the check-scroll is shown detached, said figure shows the check-rope as fully wound onto the check-scroll, as it will be when the carriage is at its extreme outer position, the same position referred to in Fig. 3. It will be understood that both scrolls are on the same shaft B and that said scrolls move in unison and in the same direction.

Turning now to Fig. 4 showing the check-scroll, it will be observed that what I shall designate the "mating" curve or surface b^4 of the check-scroll, shown by dotted lines at the rear side of the check-scroll, it mating with the surface a^4 of the drawing-in scroll, is of increased length on its rope surface, as the radial ordinates determining this curve are greater than the corresponding ordinates in the mating curve a^4 in the drawing-in scroll, and the surface b^4 runs out onto the larger diameter of the check-scroll at the point b^5 corresponding with the point a^5 of the drawing-in scroll, while beyond the point b^5 along the portion b^6, the check-scroll is of the same diameter to the point b^7, and the surface b^6 from b^5 to b^7 is of the same diameter as the surface of the drawing-in scroll from the point a^5 to a^6, so that while the ropes are on these surfaces of the check-scroll and drawing-in scroll of same diameter, they run at uniform tension, and each rope is slacker between these points than at other parts of the inward run of the carriage. From the point b^7 the rope-sustaining surface of the check-scroll gradually decreases in diameter to the eye b^3 where one end of the check-rope is connected with the check-scroll, the other end of the check-rope being carried under the carriage and led around a sheave B^2 and connected to an eye 20 at the rear of the carriage.

With a check-scroll and a drawing-in scroll of the particular shape shown, both started in the same direction, and with the drawing-in ropes taut and the check-rope connected with the front of the carriage under its maximum tension so that the drawing-in ropes as they commence to wind feel the tension of the check-rope until the drawing-in rope assumes full control of the carriage. After the drawing-in ropes start the carriage from its state of rest at the end of its outward run the tension is gradually decreased due to the greater delivery of the stretched check-rope, said rope being delivered from the surface of the check-scroll at a faster rate than the rope a is wound upon the surface a^4 of the drawing-in scroll, and while the drawing-in ropes are wound on the surface a^4 the speed of the inward movement of the carriage being continually increased, the surface b^4 continues to give up more and more slack in the rope b, but on the arrival of the rope a upon the receiving end of the surface a^5, from that point throughout the inward movement of the carriage at the maximum speed, the tension on the check-scroll is maintained in its slackened condition. From this point on, as has been stated, the speed of the carriage must be gradually decreased, this decreased speed taking place for about the last third of the inward run of the carriage, and provision must be made for subjecting the check rope to a gradually increasing tension during this period, said tension reaching its maximum at the end of the inward movement of the carriage, to stretch the ropes and prepare them for the strain to which they are subjected in decreasing the speed of the carriage. To provide for this increase in the tension of the ropes, I have made the surface of the check-scroll b^7, b^8 of such shape that each point in this rope surface is of less radius than corresponding mating points in the surface a^6, a^7 of the drawing-in scroll, and as a result the sustaining surface b^7, b^8 of the check-scroll delivers less rope as it is unwound than the surface a^6, a^7 of the drawing-in scroll winds up.

Viewing Fig. 3 it will be understood that both sides of the drawing-in scroll are alike, and if said scroll should be split on the vertical line 1—7 intersecting the

shaft B, said scroll would present two like halves, and consequently I designate a scroll, such as shown in said figure which is a scroll of usual shape, as a "symmetrical" scroll.

Viewing Fig. 4 it will be noticed that the opposite sides of the check-scroll are unlike or differ in contour, and if said scroll were cut in the line 1—7 intersecting the shaft B, the halves so made would be unlike, and hence I designate such a scroll as "unsymmetrical".

I have chosen to illustrate my invention herein by making the check-scroll unsymmetrical, the drawing-in scroll being illustrated as symmetrical and of usual shape, and the unsymmetrical check-scroll is so shaped as to effect the tension of the ropes when the carriage is being drawn-in, but my invention is not to be limited to the exact shape of scrolls herein shown, as I believe I am the first to provide a rope surface having the mating points of unlike radius, to thereby enable the scroll surfaces to control the tension on the ropes moving the carriage to maintain a steady movement of the carriage throughout its inward run, or to employ in a mule for moving the carriage a scroll and a check-scroll whose mating curves are unlike, and I desire to claim this feature broadly.

My invention is applicable not only for effecting the drawing-in of the carriage, but also the outward movement of the carriage, in which event the scroll used would be designated as the "draft scroll" and with it will be used a check-scroll.

Herein I have used the term mating surfaces and mating curves to indicate corresponding portions or points in two compared scrolls with relation to circumferential position.

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

1. In a mule, a carriage, a scroll-shaft having two scrolls, one being a check-scroll, the mating curves of said scrolls being unlike, and ropes connecting said scrolls with said carriage.

2. In a mule, a carriage, a drawing in scroll, and a check-scroll, ropes connecting said scrolls with said carriage, the mating curves on the peripheries of the scrolls being unlike.

3. In a mule, a scroll shaft, two scrolls thereon one being a check-scroll the mating grooves of which differ in radius at corresponding points, and ropes connecting said scrolls and carriage, the rope surfaces of the scrolls being such that the maximum tension on the ropes is maintained when the carriage starts on its inward run, said tension being decreased as the speed of the carriage is increased, and thereafter increased as the speed of the carriage is decreased during the completion of its inward run.

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,
EVANGELINE C. BROWN.