

A. METCALF & W. GIBBONS.

Self-Acting Spinning Mules

No. 134,915.

Patented Jan. 14, 1873.

Fig. 1

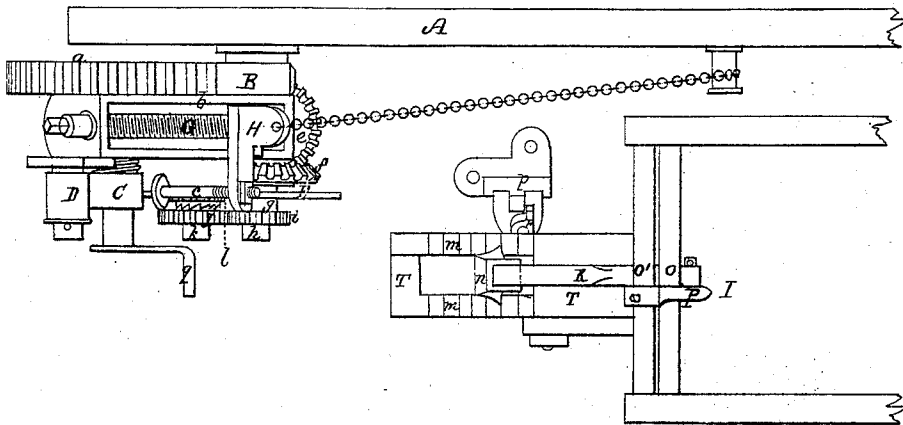
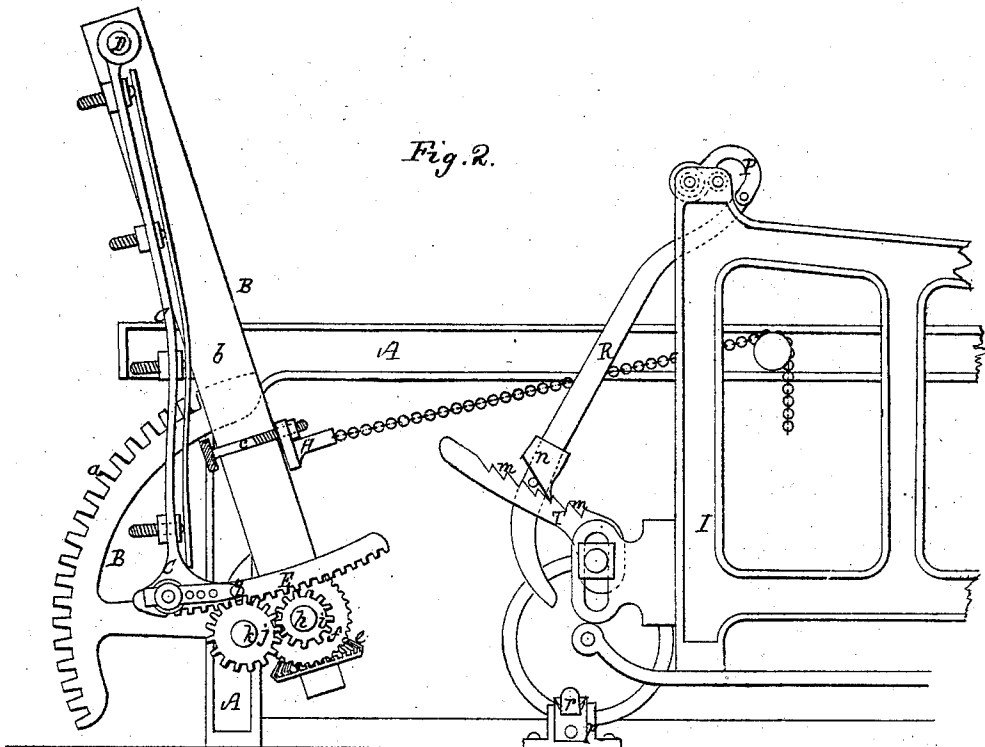


Fig. 2.



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UNITED STATES PATENT OFFICE.

AARON METCALF AND WILLIAM GIBBONS, OF PRESTON, GREAT BRITAIN.

IMPROVEMENT IN SELF-ACTING SPINNING-MULES.

Specification forming part of Letters Patent No. **134,915**, dated January 14, 1873.

To all whom it may concern:

Be it known that we, AARON METCALF and WILLIAM GIBBONS, of Preston, in the county of Lancaster and Kingdom of Great Britain, have invented certain Improvements in Self-Acting Spinning-Mules, of which the following is a specification:

Our present invention relates to what is generally known as the strapping or governing motion in spinning-mules; and its object is to obtain more certainty and regularity in the winding of the yarn or thread on the cop, and producing a more uniformly-even thread by preventing cut places, snarls, and "back-lashed" cop-bottoms, which frequently result from the governing motions heretofore in use, in which the minder's close attention is necessary until the cop reaches its desired thickness. With this invention no attention is required from the beginning to the completion of the cop, and the building up of such cop will go on automatically without care on the part of the attendant. The system may be adopted with any size or shape of cop-bottom, or any counts of yarn, from the highest to the lowest.

The drawing accompanying this specification represents in Figure 1 a plan, and in Fig. 2 a side elevation, of the parts of a spinning-mule requisite to show the application and operation of our invention.

In the drawing, A represents the frame of the head-stock of a spinning-mule, the "quadrant-arm," as it is termed, being shown at B as composed of a sectoral rack, *a*, and an upright vibratory hollow arm, *b*, the quadrant-arm thus composed being mounted and vibrating upon a horizontal stud projecting from the lower part of the frame A. Within the hollow arm *b* is disposed a long screw, G, which rotates in suitable bearings formed in or applied to such arm. The traveling mule-carriage is shown at I, and the faller-rods at O O', the latter being the counter faller-rod, the said carriage I and faller rods O O', with the frame A and quadrant-arm B, being the construction of spinning-mules in use prior to our invention. C in the drawing represents a pendulous rod, suspended from the upper part of the arm B by a horizontal pivot, D, the said rod C being of a length about equal to that of the arm B, and terminating at the bottom in a horizon-

tal quadrant-rack, E, the teeth of which are formed upon its under side. Working upon the screw G is a nut or carrier, H, which travels to and fro of the arm B, and is provided at the front side of the latter with a set-screw or adjustable stop, *c*, which serves to estop the forward movement of the pendulum-rod C. The connection of the pendulous rod C with the screw G is as follows: To the lower end of such screw, and immediately below the vibratory arm B, we attach a beveled or miter gear, *e*, which meshes into a second beveled gear, *f*, making part of a sleeve, *g*, which revolves freely upon a horizontal stud, *h*; a pinion, *i*, also being formed upon the outer end of said sleeve, which meshes into a spur-gear, *j*, mounted and freely revolving upon the outer end of a second horizontal stud, *k*, projecting from the lower part of the arm B, and parallel to and about on a level with the stud *h* before named, the said studs *h* and *k* and the pinion *i* and gears *f* and *j* rocking with the said arm B. Between the gear *j* and the arm B I mount, upon the stud *k*, a toothed or indented wheel, *l*, into which the teeth of the rack E take, and drive it in whichever direction such rack travels, the gear *j* and wheel *l* being connected by a suitable clutch in such manner that, as the quadrant-arm C is driven outward by the "going out" of the mule-carriage, the wheel *l* adheres to and drives the gear *j*, and, by means of such gear and the pinion *i* and gears *f* and *j*, rotates the screw in the direction to elevate the nut H, while, with a reverse or dropping motion of the arm C in the forward dip of the arm B, the wheel *l* slips over without actuating the gear *j*. Consequently, at such time, the screw G and nut H remain motionless. The chain which is wound about the drum of the spindle-driving mechanism is attached to the nut or carrier H, and the nearer the said nut approaches the top of the arm the slower the spindles revolve. As the paying out or this chain with the forward "dip" or vibration of the arm B in the "going in" of the mule-carriage governs the speed of the revolving spindles and cops, and as the speed of such spindles and cops during the laying on of yarn to the latter, must be diminished gradually with the increasing bulk of the cops, it follows that the screw G must be rotated gradually in one direction during the winding of such cops,

in order to elevate the nut H and retard the speed of the spindles.

In carrying our invention into practical operation we proceed as follows: Heretofore the mechanism which has operated the screw G has been usually an endless band and a weighted lever connected with the faller-rod in such manner that the undue tension of the yarn upon the latter lowers the weight or ball of the lever into contact with one side of the band, and adheres to the latter with friction sufficient to drag the belt along with it, and thus operate the screw to which the band is connected. In this case the weight often slips upon the belt without carrying the latter along with it, in which event the whole arrangement is very unreliable and uncertain.

In order to effect the elevation of the nut H by a mechanical device which is positive in its action, and in so doing carry out the novel and valuable feature in this invention, we have employed, as a part thereof, the quadrant-arm C, while to operate this arm, and through it the screw and nut at the proper time, we attach to the counter faller-rod O' a curved or bow-shaped bar, P, which bends about and below the rod O, and is pivoted at its lower end to the upper extremity of a swinging rod or "cimeter," R, which it supports, the lower end of such rod, thus suspended, playing within a slotted segmental shelf or bracket, T, whose upper face is nearly or quite concentric with the point of suspension of the rod, and is provided with saw-teeth *m m*, &c., sloping away from the base of the shelf T, in order to intercept and lock temporarily to the latter the "cimeter" R in whatever advanced position the latter may be forced by the tension of the yarn. Sliding upon and to and fro of the "cimeter" R, and engaging with the teeth *m m*, is a tubular pawl or slider, *n*, which engages with some one of said teeth when advanced by the said "cimeter." To the floor of the mule-room, and in the path of the "cimeter" R, we pivot, to a suitable post, *p*, a horizontal latch, *r*, in such manner that it shall be immovable beyond a certain point in a rearward direction, and yielding in the opposite, and return to such point by its own volition, or by the power of a spring applied to it. In the course of winding the cop the tension upon the yarn often becomes too great, and this tension of the yarn lowers in the ordinary manner the faller-wire to which the "cimeter" R is attached; consequently the said "cimeter" is lowered more or less, according to the degree of said tension. As the mule-carriage "goes in" the "cimeter" R will, if too much tension is upon the yarn, be lowered so far as to abut against the stop or latch *r* and lap thereon, more or less, according to the extent of the tension, and this contact of the "cimeter" with the stop advances the former and its pawl along the teeth *m* until the "cimeter" escapes from the latch, the pawl then remaining locked to the tooth which it last passed. On the next ensuing "going out" of the mule-carriage the lower end of the "cimeter" abuts

against the rack E of the arm C or a lateral stud, *q*, applied to it, and, by driving such arm outward, turns, to a greater or less extent, the screw G. This rotation of the screw G elevates the nut H, which, through the agency of the chain attached to it, reduces the speed of the spindles and relaxes the tension upon the yarns. If the relaxation of the tension of the yarn is carried too far the faller-wire rises and elevates the "cimeter" R to such an extent that its pawl *n* is lifted out of contact with the teeth *m* and the cimeter allowed to return by its gravity to the slotted bracket T. This elevation of the "cimeter" raises it above the plane of the stop *r*, and consequently with the next "going in" of the mule-carriage the cimeter passes such stop without impinging against or being advanced upon its rack by it, and therefore the distance to which the rod C is pushed outward by it is much less, and the screw only actuated sufficiently to keep pace with the accumulating cop. Upon completion of the cop the nut H will have reached nearly or quite the top of the arm B and its screw G. To return the nut and chain to their lowest position in starting a new cop, the pendulous rod C is pushed outward until it escapes from contact with the wheel *l* when the motion of the screw may be reversed and the nut and chain lowered. The mule thus becomes self-acting and requiring no attention from the minder from the beginning of the formation of the cop until its completion.

It will be evident that various modifications may be made in the mode of communicating motion from the rod C to the screw G other than that herein shown, and we do not consider ourselves limited to any especial device for the purpose.

As a substitute for the pendulous bar C, we propose to employ the following—that is to say, we apply to the top and bottom of the vibratory or swinging arm B a pulley, and around these two pulleys we place an endless band or chain, which we secure in a proper manner to the nut which actuates the paying-out chain attached to it. We then dispose within suitable bearings applied to the vibratory bar B a horizontally-sliding rod or bar, having a head affixed to one end and a toothed rack formed upon the other to take into the wheel *l*, and operate in manner as with the sectoral rack E before named, the bar being operated by the cimeter in the manner in which the latter operates the said rack.

In lieu of the beveled gear *f* and the pinion *i* united by the sleeve *g*, and serving to communicate motion from the rod C to the screw G, we propose to separate the sleeve and pinion from the gear, and fit them loosely upon the stud *h*, connecting the sleeve with the gear by a pawl and ratchet, or other clutch connection of such nature that as the pinion is rotated toward the mule-carriage it shall be locked to and carry with it the beveled gear *e*, but on the reverse movement shall slip over without actuating such gear. Under this arrangement the wheel

l is to constitute part of the pinion *j* and rotate with it.

We claim as our invention the following:

1. In combination with the vibratory arm, feed-screw, and nut and chain of a spinning-mule, a swinging or pendulous rod connected with said arm, screw-nut, and chain, as described, so as to turn the screw and elevate the nut with the "going out" of the mule-carriage, provided too much tension exists upon the yarn, and to allow the screw and nut to remain motionless upon return or "going in" of said carriage, essentially as and for purposes stated.

2. The pendulous rod *C* suspended from the arm *b*, as stated, and provided at the bottom with a suitable sectoral rack or its equivalent, for operating, through the agency of interven-

ing mechanism, the feed-screw *G*, essentially in the manner and for purposes stated.

3. In combination with the rod *C* and nut *H*, an adjustable stop for determining the comparative drop of such rod with the inward dip of the vibratory arm *b*, substantially as stated.

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