(No Model.) 2 Sheets—Sheet 1.

W. SCHOFIELD.

SELF ACTING MULE.

No. 245,228. Patented Aug. 2, 1881.

FIG. 1.

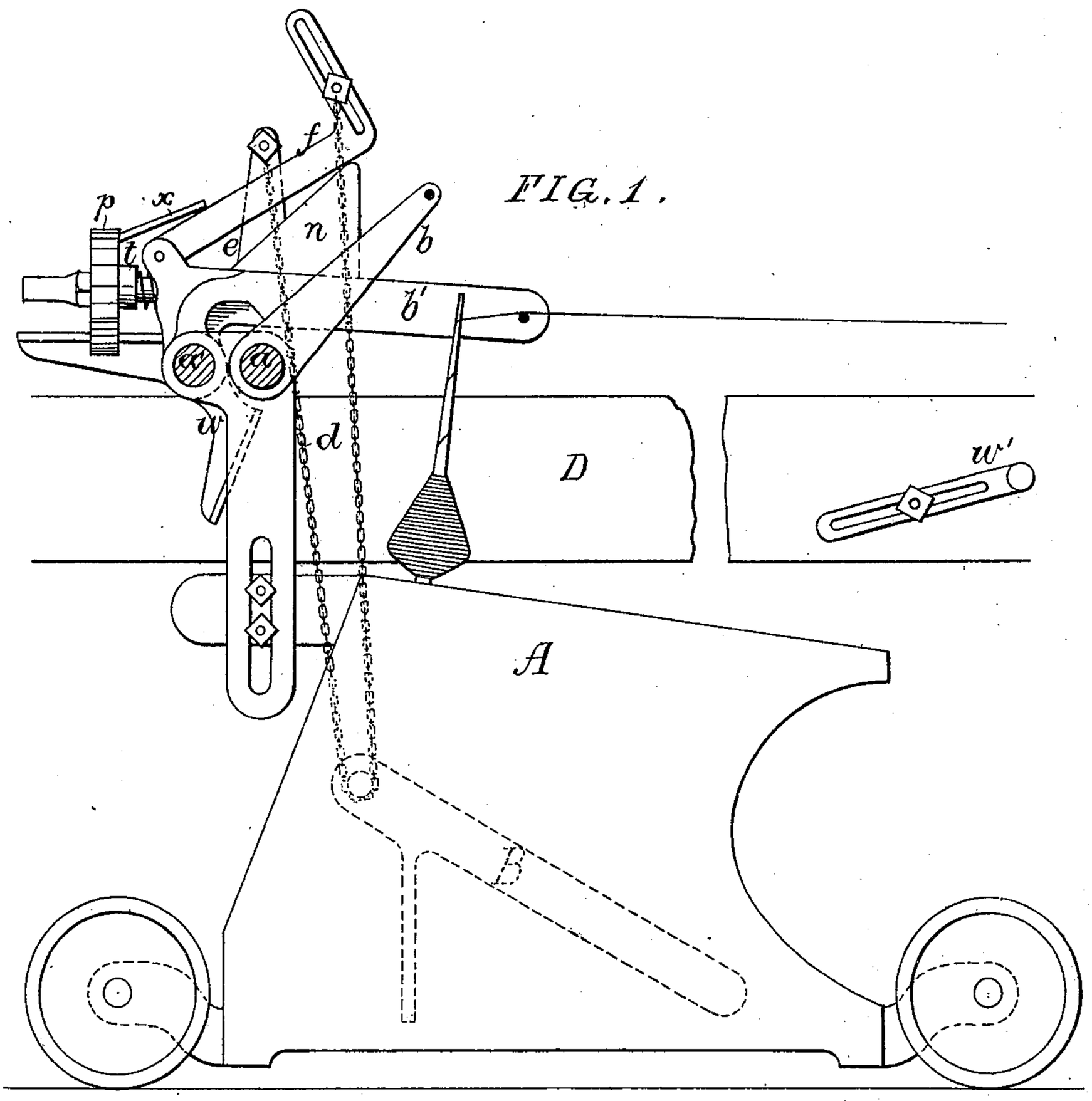
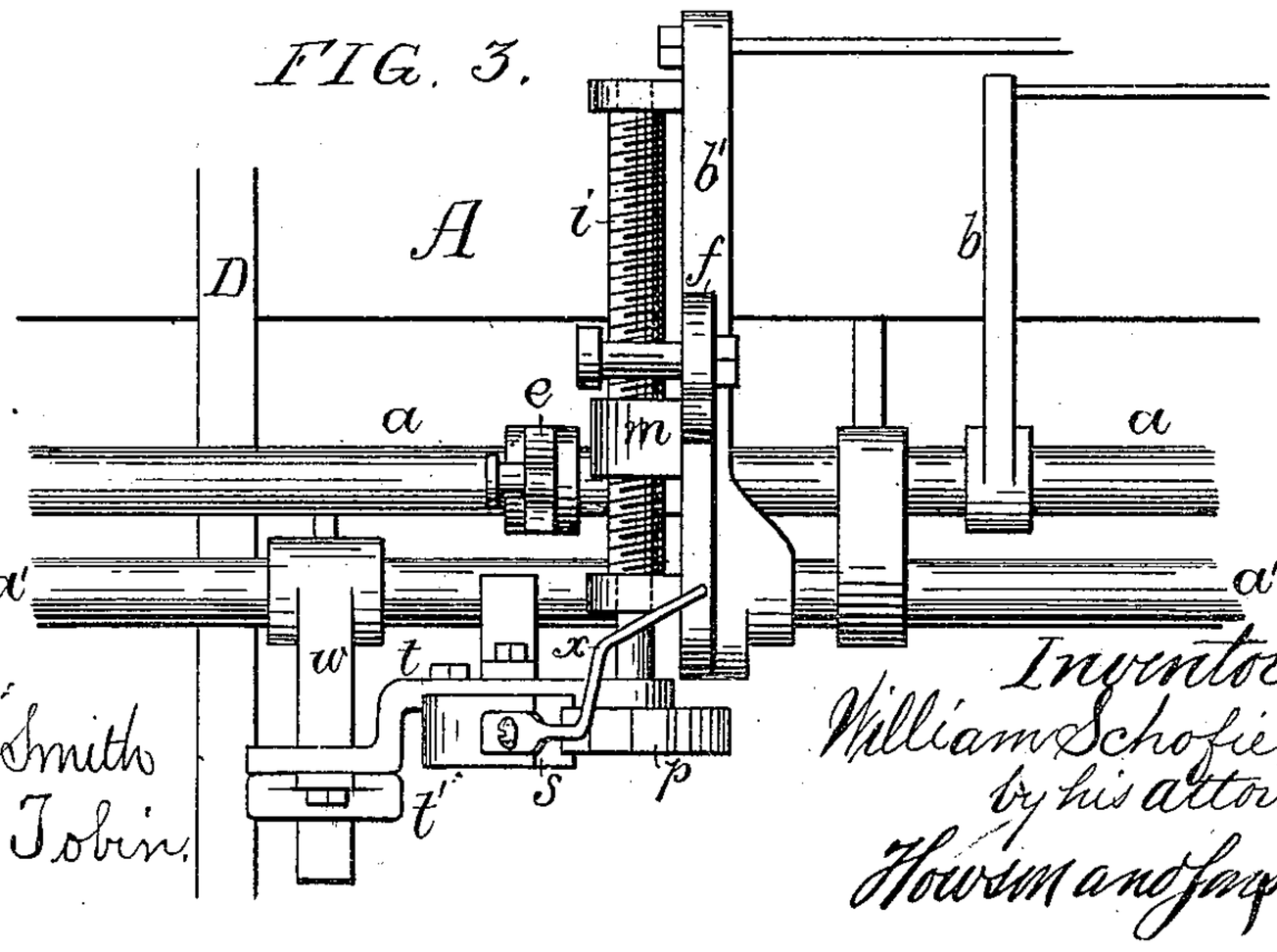


FIG. 3.



Witnesses:
Harry Smith
Jas. F. Tobin.

Inventor:
William Schofield
by his attorneys
Howson and Sons

(No Model.) 2 Sheets—Sheet 2.

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SELF ACTING MULE.

No. 245,228. Patented Aug. 2, 1881.

FIG. 2

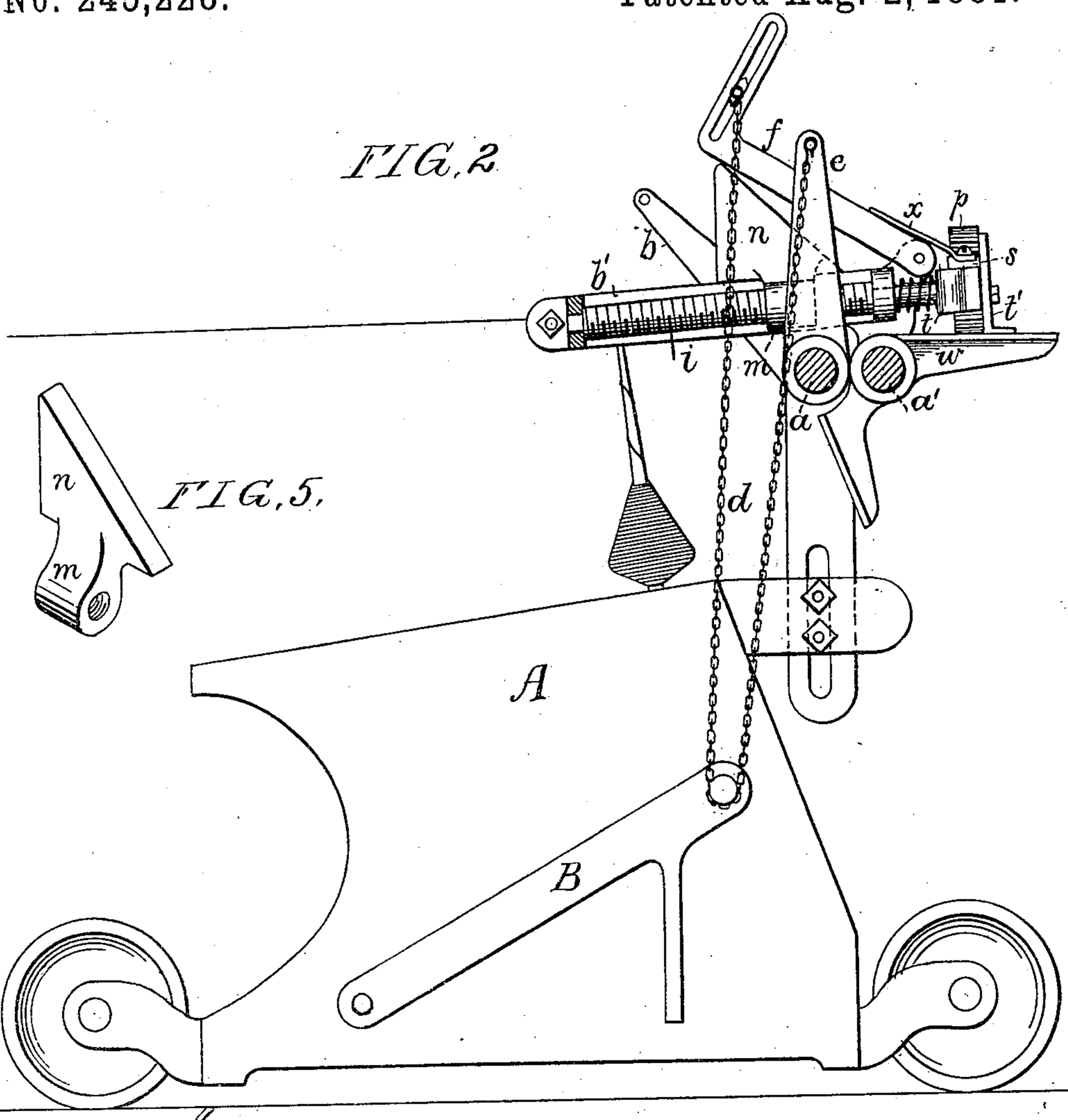


FIG. 5.

FIG. 6.

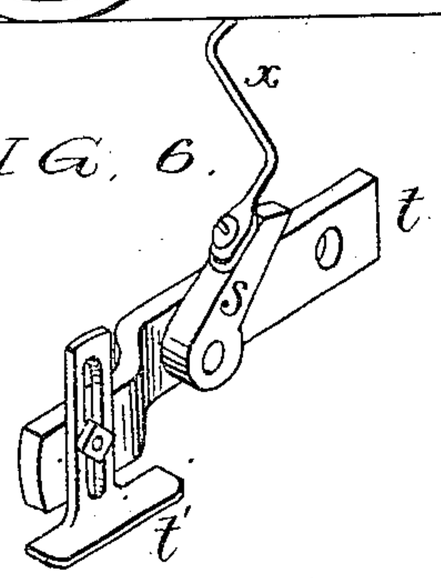
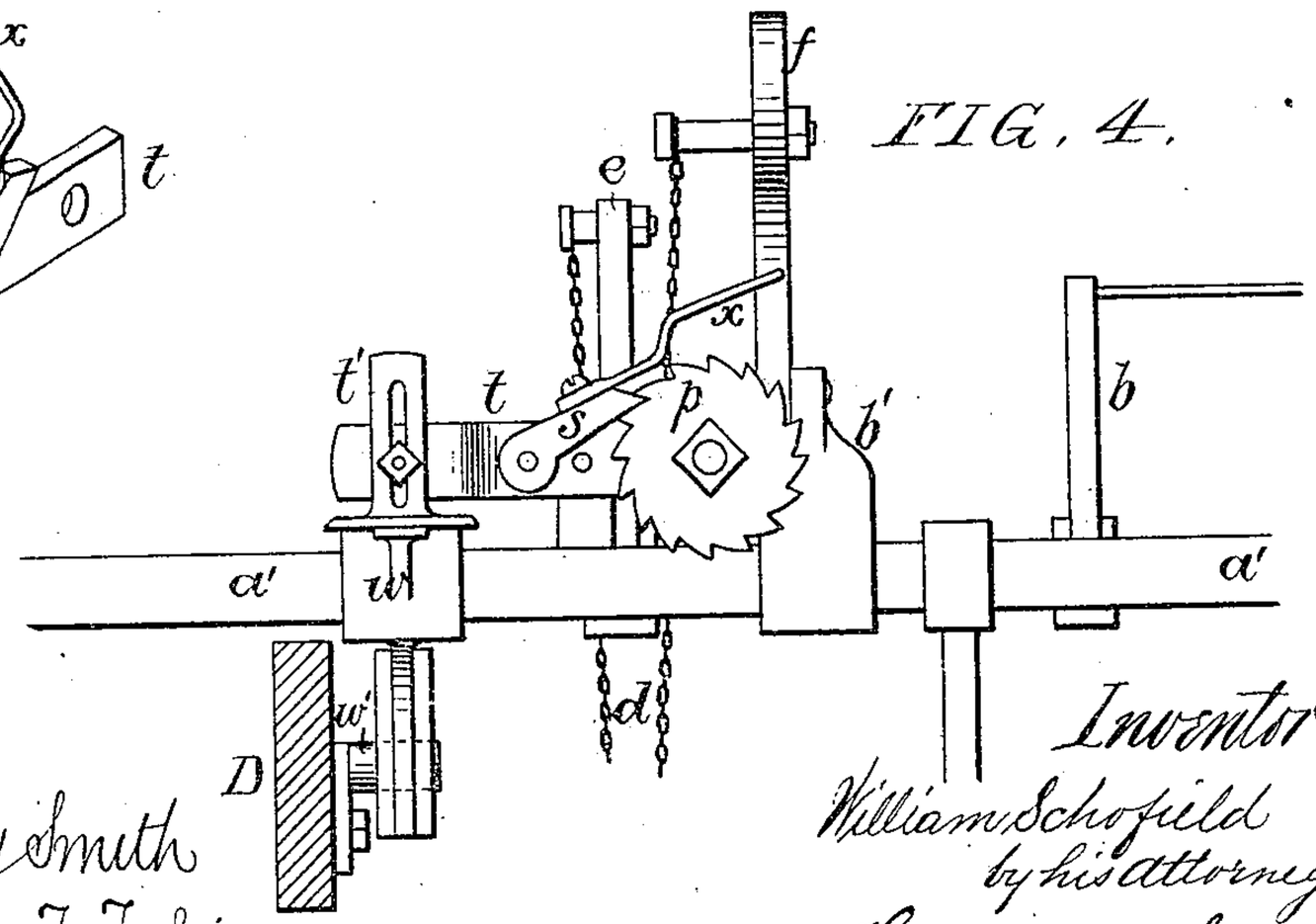


FIG. 4.



Witnesses:
Harry Smith
James F Tobin

Inventor
William Schofield
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Howson and Sons

UNITED STATES PATENT OFFICE.

WILLIAM SCHOFIELD, OF PHILADELPHIA, PENNSYLVANIA.

SELF-ACTING MULE.

SPECIFICATION forming part of Letters Patent No. 245,228, dated August 2, 1881.

Application filed April 25, 1881. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SCHOFIELD, a citizen of the United States, residing in Philadelphia, Pennsylvania, have invented an Improvement in Self-Acting Mules, of which the following is a specification.

The object of my invention is to effect the automatic adjustment of part of the "governor-motion" of the mule during the beginning of the operation of winding the cop, thus freeing the attendant from the performance of this duty and insuring such a regular gradation in the speed of the spindles as to prevent the formation of snarls in the yarn.

Figure 1, Sheet 1, is an end view of sufficient of a mule to illustrate my invention; Fig. 2, Sheet 2, an end view looking in the opposite direction; Fig. 3, Sheet 1, a plan view of part of Fig. 1; Fig. 4, Sheet 2, a front view of part of Fig. 2, and Figs. 5 and 6 detached perspective views of parts of the device.

A represents part of the spindle-carriage of the mule, to bearings in an adjustable bracket on which are adapted the inner and outer faller-shafts, *a a'*, carrying arms *b b'*, with the usual rods, whereby the proper application of the yarn to the spindle is effected. At the beginning of the winding operation, and while the cop is being formed, the spindles require to be driven at a varying speed—that is to say, the speed of the spindles decreases as the diameter of the cop increases, and this variation in speed is effected through the medium of what is known as the "governor-motion," the latter being controlled in its action so far as regards this variation in the speed of the spindles by an arm, B, hung to the carriage at one end, and supported at the other end by a chain, *d*, one end of which is connected to an arm, *e*, on the inner faller-shaft, *a*, and the other to an arm, *f*, pivoted to a lug on the arm *b'* of the outer faller-shaft, *a'*. Usually one end of the chain *d* is connected to an adjustable stud on the arm *b'*, and the vertical elevation of the arm B is effected at intervals by elevating said stud and securing it in its elevated position, thus drawing up one end of the chain *d*. During the formation of the cop the close attention of the attendant is required, in order to properly operate this stud, a failure to effect this operation at the proper times resulting in a defective shape of the cop and tending to produce snarls in the yarn, owing to a want of regularity in the speeding of the spindles in respect to the speed of the sliver-delivering rollers.

In order to overcome these objections, I provide for the automatic operation of the arm *f* in the following manner:

On the back of the arm *b'* are bearings for a screw-spindle, *i*, to which is adapted a nut, *m*, secured to or forming part of a wedge-block, *n*, on which the arm *f* rests. One end of the spindle *i* projects beyond the bearing on the arm *b'*, and is furnished with a ratchet-wheel, *p*, with which engages a pawl, *s*, pivoted to an arm, *t*, the latter being hung to the projecting end of the spindle *i*, and being capable of vibration thereon, a lug on the back of the arm bearing on the shaft *a'* when the said arm is at rest.

A bell-crank lever, *w*, is hung to the shaft *a'*, and on each inward movement of the carriage one arm of this lever comes into contact with a lug, *w'*, on the fixed frame D, and is operated thereby so as to cause the other arm of the lever to strike a stud, *t'*, adjustably secured to the arm *t*, a vibrating movement being thus imparted to the said arm, and an intermittent movement imparted to the ratchet *p* and spindle *i*, so as to effect the movement of the wedge-block *n* toward the outer end of the arm *b'*—that is to say, the end carried by the faller-shaft *a'*, which is on the outside of the carriage A. The effect of this movement is a gradual elevation of the arm *f* and of the end of the lever B, which is supported by the chain *d*.

In order to effect the automatic stoppage of the device when the arm *f* has reached its proper elevation, I provide the pawl *s* with a projecting arm, *x*, the end of which projects over the arm *f*, so that when the latter reaches its proper elevation the pawl *s* will be lifted from the teeth of the ratchet and the operation of the latter and of the screw-spindle *i* will be stopped. On starting to wind a fresh cop the spindle *i* is rotated by hand until the nut *m* is moved to the inner end of the arm *b'* and the arms *f* and B occupy their lowest po-

sitions. It will be evident that by this method of adjusting the lever B the action of the governor motion is rendered perfectly uniform and the snarling of the yarn is prevented, while the attendant has his time free to attend to the piecing of broken threads.

I have in the drawings shown my invention applied to one of Platt Brothers' self-acting cotton-mules; but it may be applied to other mules having governor motions of like construction. It has not been deemed necessary to show more than the lever B of the governor motion, as the general construction of the latter is well known and forms no part of my invention.

Although I have shown a pivoted arm, a sliding wedge-block, and a screw-spindle for operating the latter, and although I prefer this construction, as it has been found to be effective in practice, various modifications of the same within the scope of my invention will readily suggest themselves to those skilled in the art to which said invention relates. For instance, a cam secured to a longitudinal shaft and acting directly on the arm *f* may be used in place of the wedge and actuating screw-spindle, or the end of the chain might be connected directly to said cam, if desired. Or, in some cases, one end of the chain *d* might be connected to a rack adapted to suitable guides on the arm *b'*, and engaging with a pinion on a longitudinal shaft, which receives an intermittent movement from the lever *w* through the medium of pawl-and-ratchet mechanism, as described.

I claim as my invention—

1. The combination of the spindle-carriage A of the mule and its faller-shafts *a a'*, the arm B of the governor-motion, the arm *e* of the shaft *a*, the supporting-chain *d*, and devices, substantially as described, whereby the automatic elevation of one end of said chain is effected, as set forth.

2. The combination of the spindle-carriage A, the arm B, the faller-shafts *a a'*, having arms *b b'*, the supporting-chain *d*, the arms *e* and *f*, the wedge *n* and its nut *m*, the screw-shaft *i*, and devices, substantially as described, for intermittently operating said screw-shaft, as set forth.

3. The combination of the spindle-carriage, the arm B, the faller-shafts and their arms, the supporting-chain *d*, devices, as described, for elevating the end of said chain, the actuating shaft or spindle *i* for said devices, having a ratchet, *p*, the arm *t*, having a pawl, *s*, the lever *w* for actuating said arm, and the stud *w'* on the fixed frame, for actuating the lever, as set forth.

4. The combination of the chain-elevating arm *f* or equivalent device, as described, the operating shaft or spindle *i*, having a ratchet, *p*, the arm *t*, with pawl *s*, actuating devices for said arm, and an arm, *x*, secured to the pawl and adapted to be acted upon by the arm *f*, whereby the shaft *i* is thrown out of gear, as set forth.

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

WILLIAM SCHOFIELD.

Witnesses:

ARMES F. MCCORMICK,

HARRY SMITH.