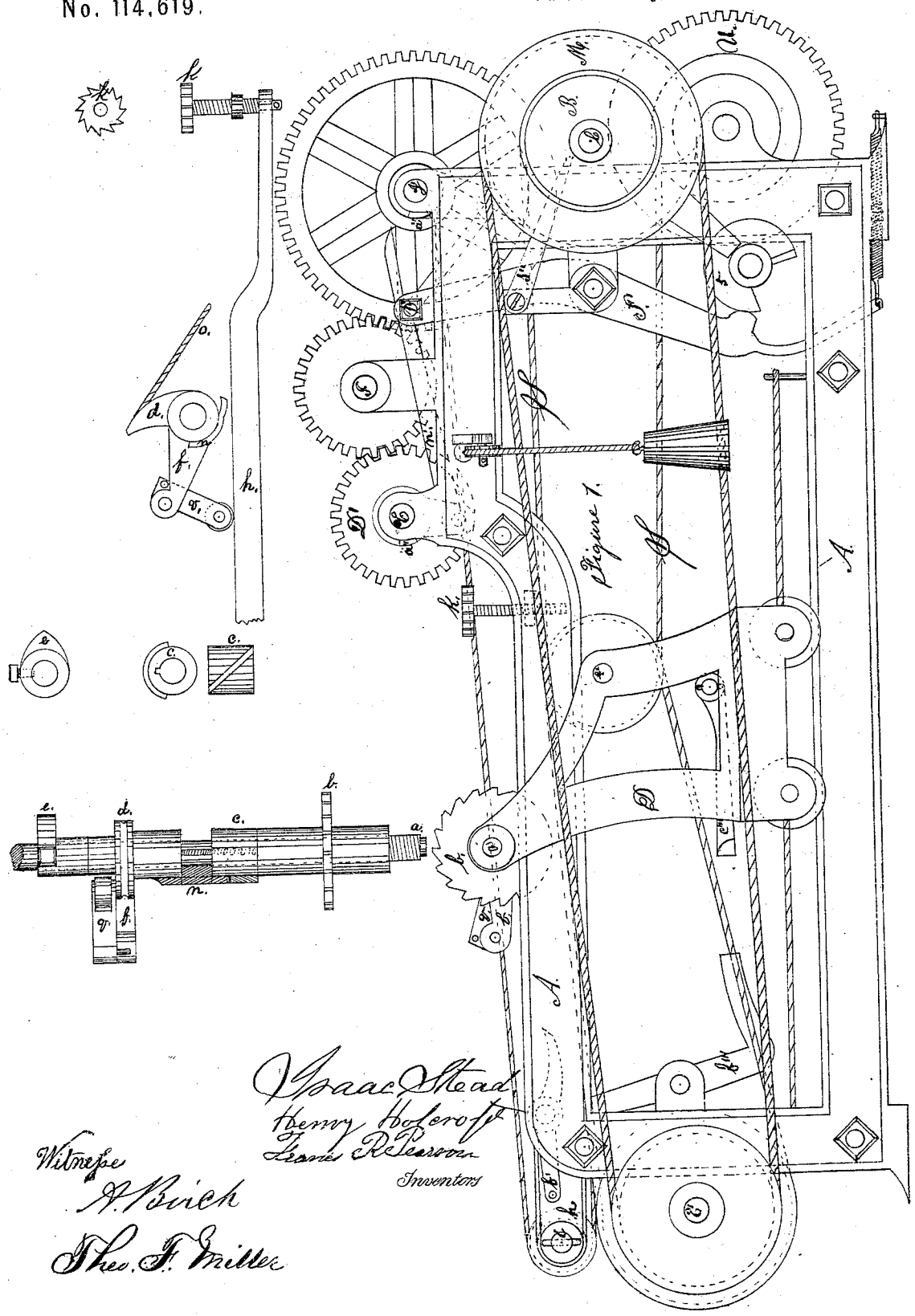
4 Sheets--Sheet 1.

I. STEAD, H. HOLCROFT & F. R. PEARSON.

Improvement in Self-Acting Mules for Spinning.

No. 114,619. Patented May 9, 1871.



Witnesses
A. Bruce
Theo. F. Miller

Isaac Stead
Henry Holcroft
Francis R. Pearson
Inventors

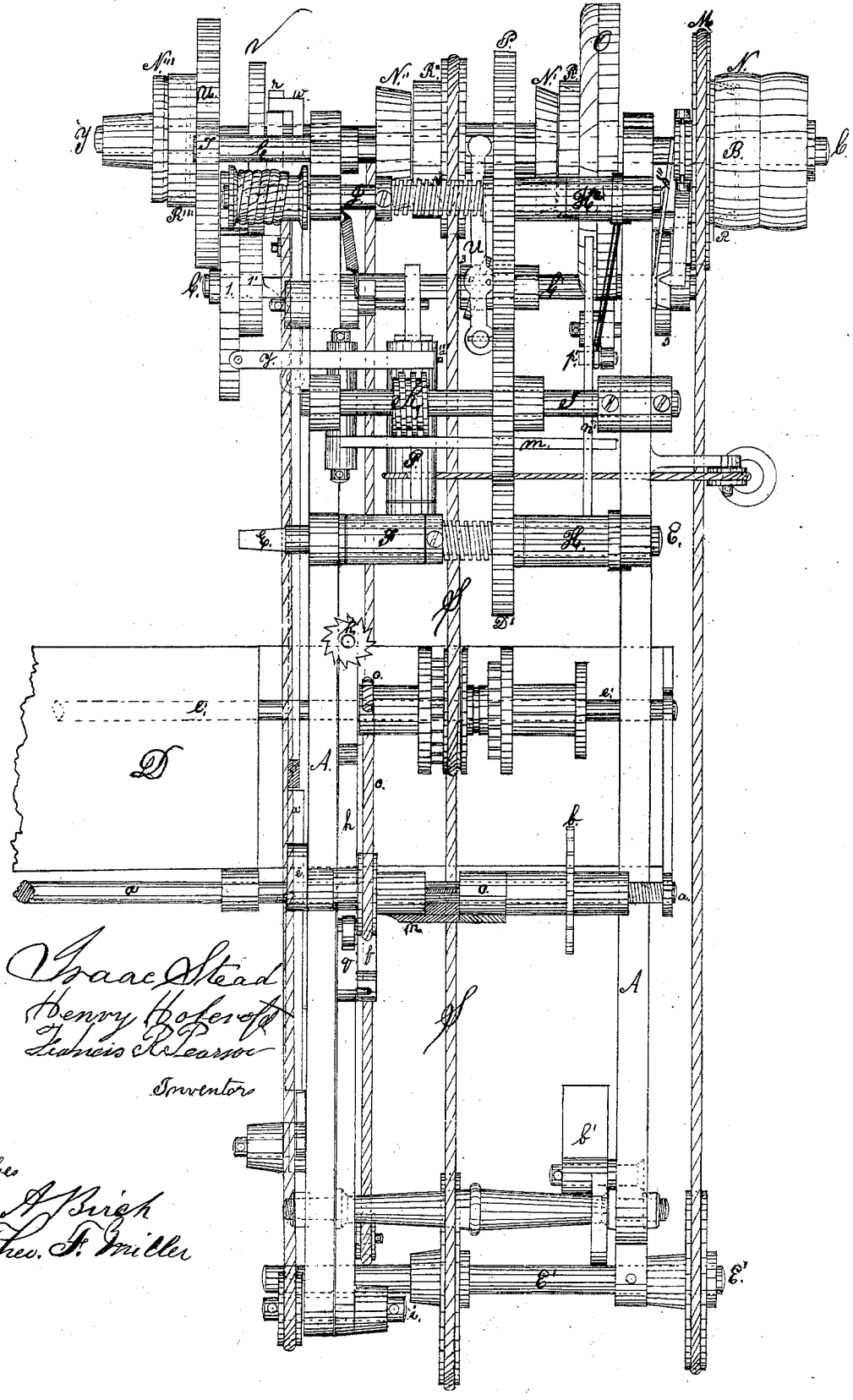
A.M. PHOTO-LITHOGRAPHIC CO. N.Y. (OSBORNE'S PROCESS.)

4 Sheets--Sheet 2.

I. STEAD, H. HOLCROFT & F. R. PEARSON.

Improvement in Self-Acting Mules for Spinning.

No. 114,619. Patented May 9, 1871.



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AM. PHOTO-LITHOGRAPHIC CO. N.Y. (OSBORNE'S PROCESS.)

4 Sheets--Sheet 3.

I. STEAD, H. HOLCROFT & F. R. PEARSON.

Improvement in Self-Acting Mules for Spinning.

No. 114,619. Patented May 9, 1871.

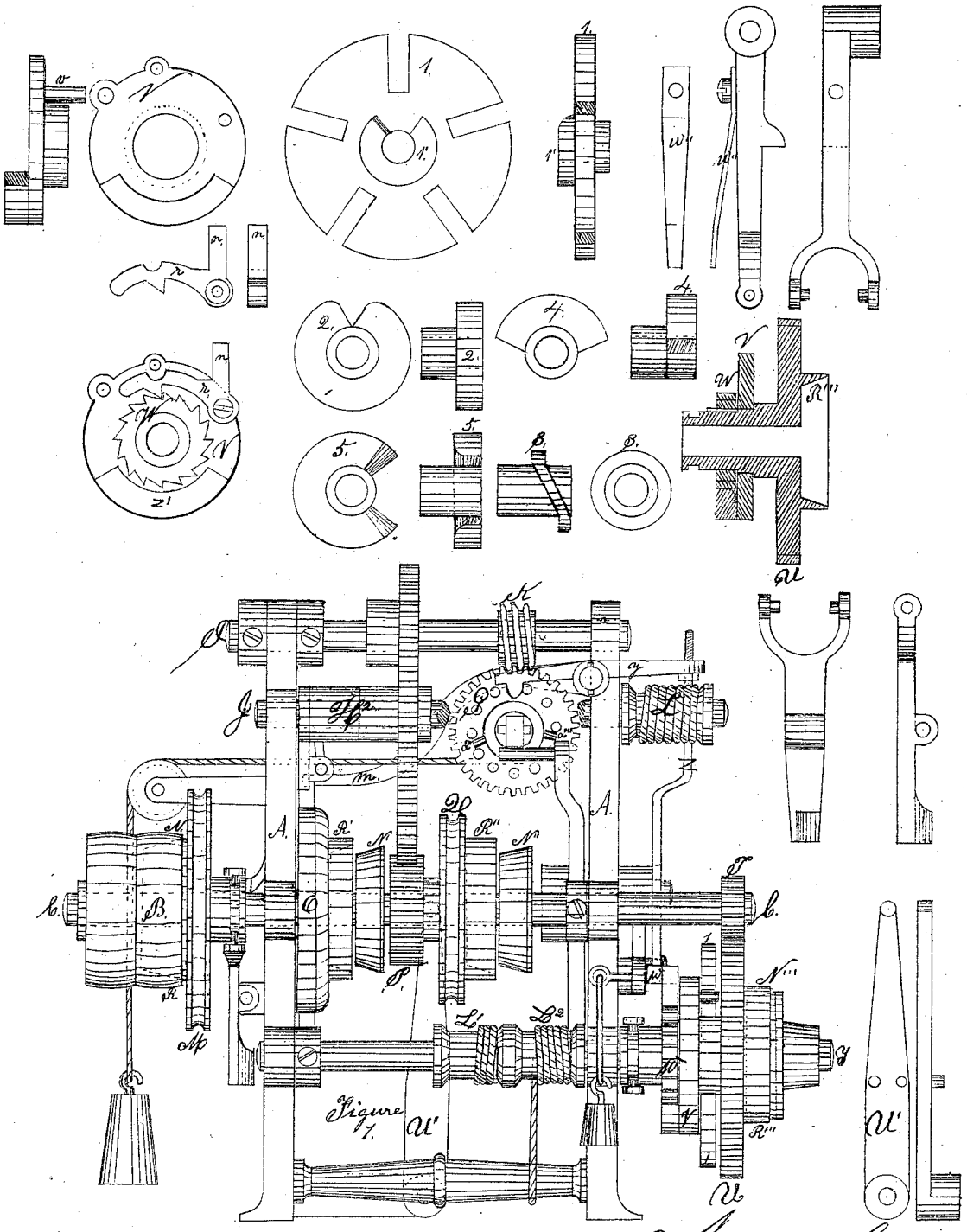


Figure 7.

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4 Sheets--Sheet 4.

I. STEAD, H. HOLCROFT & F. R. PEARSON.

Improvement in Self-Acting Mules for Spinning.

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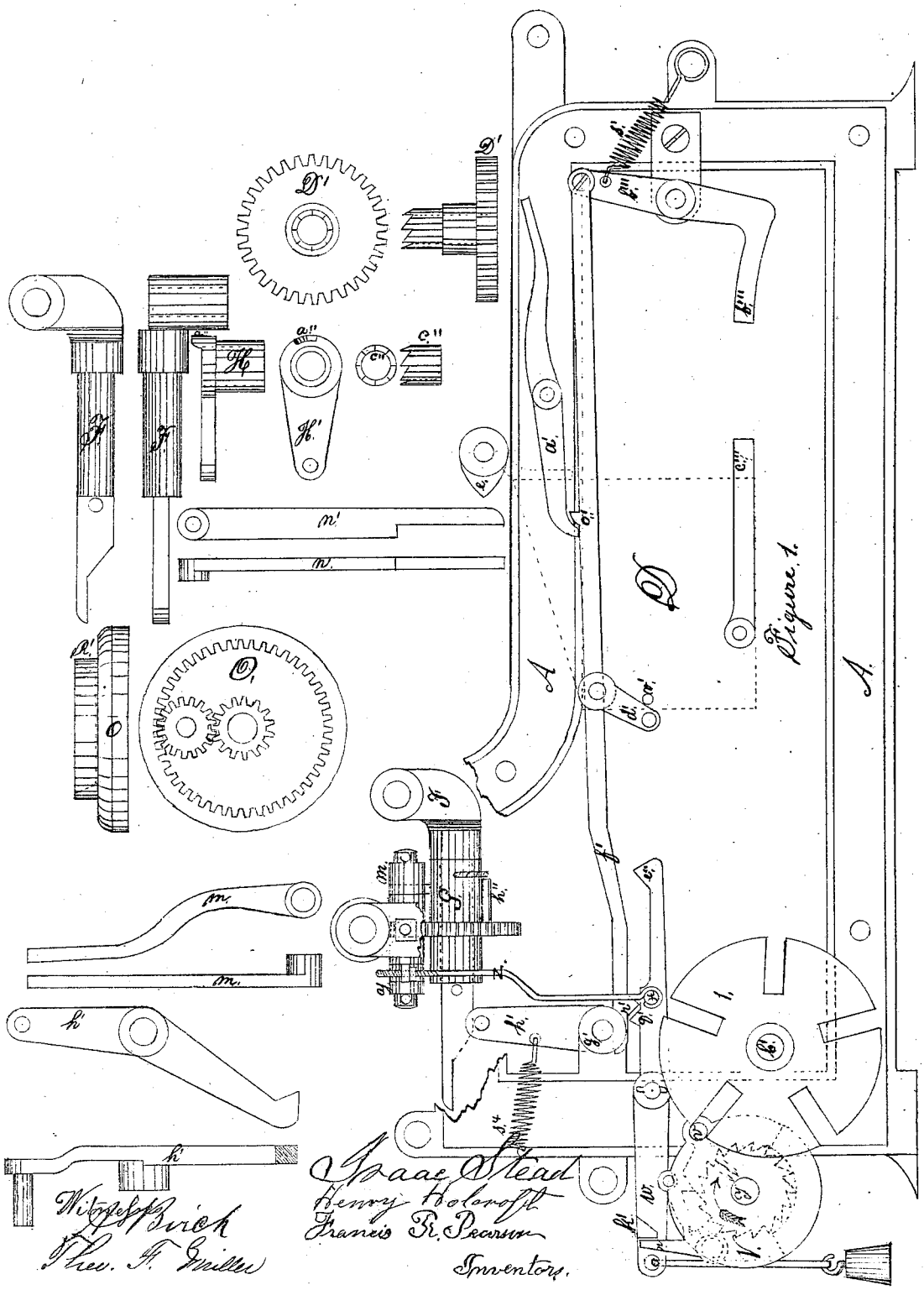


Figure 1.

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United States Patent Office.

ISAAC STEAD, OF PHILADELPHIA, HENRY HOLCROFT, OF MEDIA, AND FRANCIS R. PEARSON, OF GERMANTOWN, PENNSYLVANIA.

Letters Patent No. 114,619, dated May 9, 1871.

IMPROVEMENT IN SELF-ACTING MULES FOR SPINNING.

The Schedule referred to in these Letters Patent and making part of the same.

I, ISAAC STEAD, of Philadelphia and State of Pennsylvania, and I, HENRY HOLCROFT, of Media, county of Delaware, and State of Pennsylvania, and also I, FRANCIS R. PEARSON, of Germantown, county of Philadelphia and State of Pennsylvania, have jointly and together invented certain Improvements in Self-Acting Mules for Spinning Yarns, of which the following is a specification.

Nature and Object of the Invention.

The first part of our invention relates to the combination and peculiar arrangement of a ratchet-wheel, plate or disk-wheel, catch and stud, operating a slotted disk fastened on and to a shaft having on it several cams for moving the various clutches, levers, and cams, to produce various movements requisite in a self-acting mule, which will be hereafter explained.

The second part of our invention relates to a peculiar mechanical arrangement for operating the catch of the above-mentioned ratchet-wheel by a worm and worm-wheel, (called the twist-wheel,) to produce the movements for an increased speed of the spindles, (for twist,) also for the back-off.

The third part of our invention relates to an arrangement for operating the above-mentioned catch and ratchet-wheel by the outward movement of the carriage for the purpose of stopping it when the carriage has run out the full length of the stretch, and the arrangement to operate the said catch by the inward movement of the carriage to produce the movement to run the carriage out, and gear and twist-wheel and other parts that are necessary to gear when the carriage begins to run out.

The fourth part of our invention relates to an arrangement for operating the faller, whereby we are enabled to place the copping or building-rail at the top of the frame.

The fifth part of our invention relates to a peculiar arrangement of machinery for building the cop or bobbin, which we place on the faller-shaft.

Description of the Accompanying Drawing.

Figure 1, sheet 1, is a side elevation of a machine embodying our invention.

The other figures are sections and details of the building motion.

Sheet 2 is a plan of the same.

Figure 1, sheet 3, is an elevation showing that end of the machine which is at the right hand in fig. 1, sheet 1.

The other figures in this sheet are sections and parts in details.

Figure 1, sheet 4, is a side elevation, the opposite to that shown in sheet 1.

The other figures in this sheet are sections and parts in detail.

Same letters and figures in the drawing refer to like parts.

A is the frame of the machine, which frame should be substantially constructed to resist vibrations of the operating parts.

B is the driving-pulley, which is hung on the main shaft C of the machine, and from the latter motion is communicated to the operating parts.

D is the carriage.

E is the shaft to be attached to the front roller, and on this shaft is hung the sleeve-stud, F, on which the worm or twist-wheel G is hung, and also the ratchet clutch H.

The construction of the ratchet-clutches is shown in detail on sheet 4.

H is a sleeve attached to the arm H^1.

On the left of the sleeve is a small lug, a'', which impinges against the frame A.

Inside of the sleeve H is a collar, C", and on one end of the collar are formed ratchet-teeth.

This collar is pinned or keyed fast to the shaft E.

The hub of the wheel D' is turned down to the size of collar c'', and formed on the end with ratchet-teeth, to gear in those in collar c''.

The sleeve H projects over and against the collar turned on the hub of the wheel D'.

The ratchet-clutch H^2 on shaft J is constructed the same as above.

Attached to the arm of the sleeve H on the shaft E is one end of a lever, n', the other end resting on the pin p' in lever F'. (See sheets 1 and 2.)

The shaft I forms a carrier between shaft E and shaft J, and on the shaft J is placed the worm K, for driving the worm-wheel G.

On the shaft J is placed the scroll-pulley L, which is used to draw the carriage out.

On the other end of this shaft J is the ratchet-clutch H^3, for throwing the shaft and scroll in and out of gear.

On the main shaft C is hung the large grooved pulley M, for giving an increased speed to the spindles for twist.

Fastened to this grooved wheel is the cone friction-pulley N, which fits to and is driven by the cone friction-box R, formed in the main driving-pulley B.

O is a spur-wheel, having internal cogs or teeth, and driven by two small pinions, one on the shaft C, and the other on a stud fastened to the frame A, the intermediate pinion being used as a carrier-wheel.

On and fastened to the wheel O is a cone friction-box, R'. (See detail, sheet 4.)

On the shaft C is hung loosely the pinion-wheel P.

To the hub of this pinion, on one side, is attached a cone friction-pulley, N′, and on the opposite side of this pinion, and fastened to the hub, is a grooved pulley, Q, and cone friction-box R″.

On and fastened to the shaft C is the cone friction-pulley N″.

The pinion-wheel P communicates motion to the shafts J, I, and E.

The grooved pulley Q communicates motion to the spindles by means of the round band S.

On the end of the shaft C, opposite to the pulley B, is a small pinion-wheel, T, which gears into and gives motion to the large spur-wheel U on shaft Y, and on one side of and fastened to this wheel is a cone friction-box, R‴.

On the opposite side of this wheel is a long hub, on which hub is fitted loosely the disk V, and keyed to the hub is the ratchet-wheel W.

On the end of the hub of the wheel U is turned a groove. (See detail, sheet 3.)

On the extreme right end of shaft Y is a cone friction-pulley, N‴, which is fastened to shaft Y and gives motion to the scrolls L′ and L″, which are used to draw the carriage in, one being used as a balance-scroll to steady the motion of the carriage. One scroll unwinds as the other winds up.

On and fastened to shaft C′ is the slotted disk-wheel 1.

The hub 1′ of this disk forms and operates as a cam to shift the friction-box on the wheel U, to operate scrolls L′ and L″ on shaft Y.

On the shaft C′ is fastened the cam 2, for gearing the twist-wheel G.

On the same shaft C′ is the snail-cam 3, for shifting pinion and cone N′ and cone-box R″ on shaft C.

On and fastened to shaft C′ is cam 4, for gearing the ratchet-clutches H and H².

On and fastened to the left end of shaft C′ is the cam 5, for shifting the grooved pulley M.

All of the cams on the shaft C′ are fastened by set-screws, as they require to be nicely adjusted.

On and fastened to shaft E′ are two grooved pulleys, one larger than the other, the smaller one acting as driver for the spindles when the mechanism for giving increased speed is in gear for twist.

a represents the faller-shaft, on the right end of which is cut a screw-thread.

b represents a ratchet-wheel, in the hub of which is cut a screw-thread to fit the thread cut on the faller-shaft *a*.

To the left of the ratchet-wheel *b* is a collar, *c*, sliding on a feather set in the faller-shaft *a*.

Diagonally across the periphery of this collar is a feather or wing. (See detail, sheet 1.)

Further to the left, and next to the sliding collar *c*, is the quadrant *d*, for the purpose of drawing the faller down.

On the hub of this quadrant is a small shell or projection, *n*, which impinges against the feather or wing on collar *c*.

The quadrant *d*, being loose on the faller-shaft, the shaft gets its motion from the collar *c*.

From this quadrant passes the cord *o* to a pulley on the drum-shaft *e′* of the carriage.

Extending from the hub of this quadrant is an arm, *f*, to the end of which is pivoted a small arm, *q*, in one end of which is a small roller.

As the carriage moves in, the roller runs on the slip or copping-rail *h*, which is pivoted on a stud, *i*, at the left end of the frame A. (See sheets 1 and 2.)

To the other end of the copping-rail is attached a vertical screw, which is fitted to a nut fastened to the frame A, and on the top of the screw is a small ratchet-wheel, *k*.

To the left of the quadrant *d*, and fastened to the faller-shaft *a* by a set-screw, is a small cam, *e*.

On the outer end of the frame A, on a stud, is the catch *b′*, for working the ratchet-wheel *b*. On one end of this catch should be a spring or weight.

The disk-wheel V and catch *r* are formed as shown in detail, sheet 3.

At the top of the disk is the catch *r*, and at the bottom of the disk is fastened a piece, *z′*, to act as a counter-balance.

The small pin at the top of the disk is to prevent the catch from falling out as the disk revolves.

The pin or stud *v* is fitted to work in the slots of the disk 1.

On sheet 4, to the left, is shown the lever *w*, on one end of which is hung a weight, and on the same end is also a stop-lug, *k′*.

On the other end and on the top are two V-shaped lugs, *q* and *e″*.

On the same end is pin *x*, and from this pin is a rod, *z*, connected at its other end to the lever *y*. (See sheet 3.) By this rod *z* connection is made from the twist-wheel G.

On the opposite end of the same stud to which lever *y* is pivoted is a lever, *m*, which connects with lever *n′*. (See sheets 1 and 4.) This forms the connection from twist-wheel G to clutch-box H on shaft E.

On sheet 4 may be seen the connecting-rod or bar *f′*, one end of which rests on the lever *w*, the other end being connected to lever *b‴* by a small screw, on which it works freely.

To the lever *b‴* is fastened a spiral spring, *s′*.

On the bar *f′* is a small lug or stop, *o′*, and just above this bar is the lever *a′*, pivoted on a stud fastened to the frame A, that end of the lever marked *a′* being the heavier to insure it always resting on the bar *f′*.

Hung on a small stud fastened to the carriage D is a small lever, *d′*, resting against the pin *v′*.

Also, to the carriage D (which is shown on sheet 4 by dotted lines) is hung on a small stud the lever *c‴*. This lever rests on the bottom of the carriage-frame. (See sheets 1 and 4.)

The twist-wheel G we construct with holes in the face. Into each of these holes we tap a screw-thread, and into one of these holes we screw a pin or stud, *h″*, and around the periphery of the hub, on the other side of the wheel, screw-holes are drilled.

Into two of these holes we screw pins or lugs *a″* and *a‴*, one for the twist and the other for the back-off.

(For a fuller description of the twist-wheel, see patent granted November 26, 1867, to F. R. Pearson.)

The operation of our improvement is as follows:

The carriage, as shown in the drawing, is supposed to be running out, and all of the parts are in gear as when the carriage commenced to move out.

The first move made is the pin *h″* in twist-wheel, which lifts lever *m*, and this raises lever *n′* from catch-pin *p′* on lever F′, which disengages the ratchet-clutch H on shaft E and stops the front roller, which has given out sufficient slubbing for one stretch when spinning woolen yarn.

If cotton yarn is being spun, the front roller continues to run to the full end of the stretch of the carriage.

After the slubbing is out of gear the next move is by the pin *a″* in twist-wheel, which raises lever *y*, causing the connection-rod *z* to move lever *w*, raising lug *k′*, which allows catch *r* to engage the ratchet-wheel W, (which has a continuous motion in the direction of the arrow, see sheet 4,) and carries the disk V, which then makes one revolution, and, through the pin *v* and disk 1, moves the cam-shaft C′ one-fifth of a revolution, the disk 1 being divided into five equal parts.

The cam 5 is so adjusted that spring *s″* will force the cone-clutch on pulley M into the clutch-box in

pulley B, when it becomes the driver, and will give the increased speed to the spindles, the object being that time may be gained in putting in the twist, it being understood that the pins or lugs in the twist-wheel are movable, and we are able to give any length of slubbing desired; and the increased speed may be put on at any suitable part of the stretch either before, at the same time, or after the slubbing-gear is thrown out, all of which are at the option of the spinner.

The next and second move made by the disk on cam-shaft is to stop the carriage, which is done by the lever c''' as the carriage is moving out pressing lever b''', which moves bar f', and as the V-shaped lugs r' and q' on lever w and bar f' press against one another, the bar, being prevented from rising by the hub g', will raise the lug k', as before described, and give to the disk V motion, which shifts the cam-shaft C', and causes cam 4, through the lever F' and ratchet-clutch H^2 on shaft J, to disengage scroll L and stop the carriage.

The twist-wheel, continuing to turn the pin a''', moves lever y, and, as before described, gears and moves slotted disk-wheel and cam-shaft, and the snail-cam 3 moves lever u'; and through this lever the cone-clutch N' and R' on shaft C' are geared with the internal spur-wheel O, which reverses the motion of grooved pulley Q; and the band S reverses the spindles for the back-off, and at the same time laps the band O around the drum on shaft e', and raises the arm f on quadrant d. (See sheet 1.) The roller in short arm q then rests on the building-rail h.

The movement of the quadrant moves the collar c, which moves the faller-shaft a, and as the carriage moves out each stretch the ratchet-wheel b will come in contact with the catch b', and as it revolves will move the collar c from the quadrant d, and the faller will move less at each stretch as the cop or bobbin is filling upon the spindles.

As the carriage runs in the arm q will run down on the rail h, which lets the arm q down and raises the faller.

At the inward part of each stretch a catch will move the ratchet-wheel k, which raises the slip h gradually till the bottom of the cop or bobbin is made, the ratchet and slip being old and well known by those accustomed to operating on self-acting mules.

In the backing-off and drawing down of the faller the cam e on faller-shaft will trip the lever a' and disengage the end of it from the lug o' and bar f', when the spiral spring s' will draw it back, and as it is being drawn back it will depress the lug q' and raise the lug k' on the other end of lever w, which allows the catch to again engage the ratchet-wheel and give motion to the slotted disk 1.

The hub of this disk 1 is so adjusted that it will then allow the spring w'' pressing against frame A to shift the forked lever, and through the hub and lever the cone-box on wheel U is forced on the cone-pulley N''', which gives the requisite motion to the scrolls L' and L'' to draw the carriage in.

As the carriage is running in the winding of the yarn on the spindles is done by a quadrant and chain on the drum-shaft of the carriage, which arrangement is not shown in the drawing, as it is old and in general use on self-acting mules.

The next move is to gear the head and start the carriage out, which is as follows:

The pin in the lever d' on the carriage will, as the carriage moves in, press the lug e'' on lever w, which disengages the catch r, and motion, as before, is communicated to cam-shaft C' and the cam 4, and clutches H and H^2 on the shafts J and E are engaged and give motion to the scroll L to draw the carriage out, and also to shaft E, which gives motion to the front roller and gives out the slubbing for the next stretch.

The cam 2, by means of the lever h', at this move of the disk and cam-shaft, also gears the twist-wheel, and the snail-cam 3 and lever u gear the cone-clutches N'' and R'' on main shaft, which gives motion to the spindles.

The head is now geared complete for the stretch, and the movements then follow as above described. First, the slubbing is thrown out of gear, the increased speed is put on, the carriage is stopped, the back-off is performed, the scroll for drawing in the carriage is geared, and the carriage is run in and geared, as before described.

Claims.

We claim—

1. The combination and arrangement of catch r, ratchet-wheel W, disk V, pin v, and slotted disk 1, for working the cam-shaft, as and for the above-described purpose.

2. The combination of lever w, lug k', arm n on catch r, for the purpose of holding the catch r up and disengaging it from the ratchet-wheel W, as shown and described.

3. The combination of bar f', levers w, b''', and c''', as shown and described, for operating catch r by the outward movement of the carriage, for the above-described purpose.

4. The combination of cam e on faller-shaft, lever a', lug o', bar f', and lever w, for the purpose of operating catch r and producing the movement to run the carriage in, as described.

5. The combination of levers d' and w, lug e'', and catch r, as described, and for the above purpose.

6. The combination of twist-wheel G, lever y, rod z, lever w, and catch r, as described, for the above purpose.

7. The ratchet-wheel b, collars c n, and quadrant d, in combination with the screw-threaded faller-shaft, as shown and described, for the above purpose.

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