No. 706,414. Patented Aug. 5, 1902.

A. HITCHON.

RING SPINNING AND TWISTING FRAME

(Application filed Mar. 14, 1902.) (No Model.) 5 Sheets—Sheet 1.

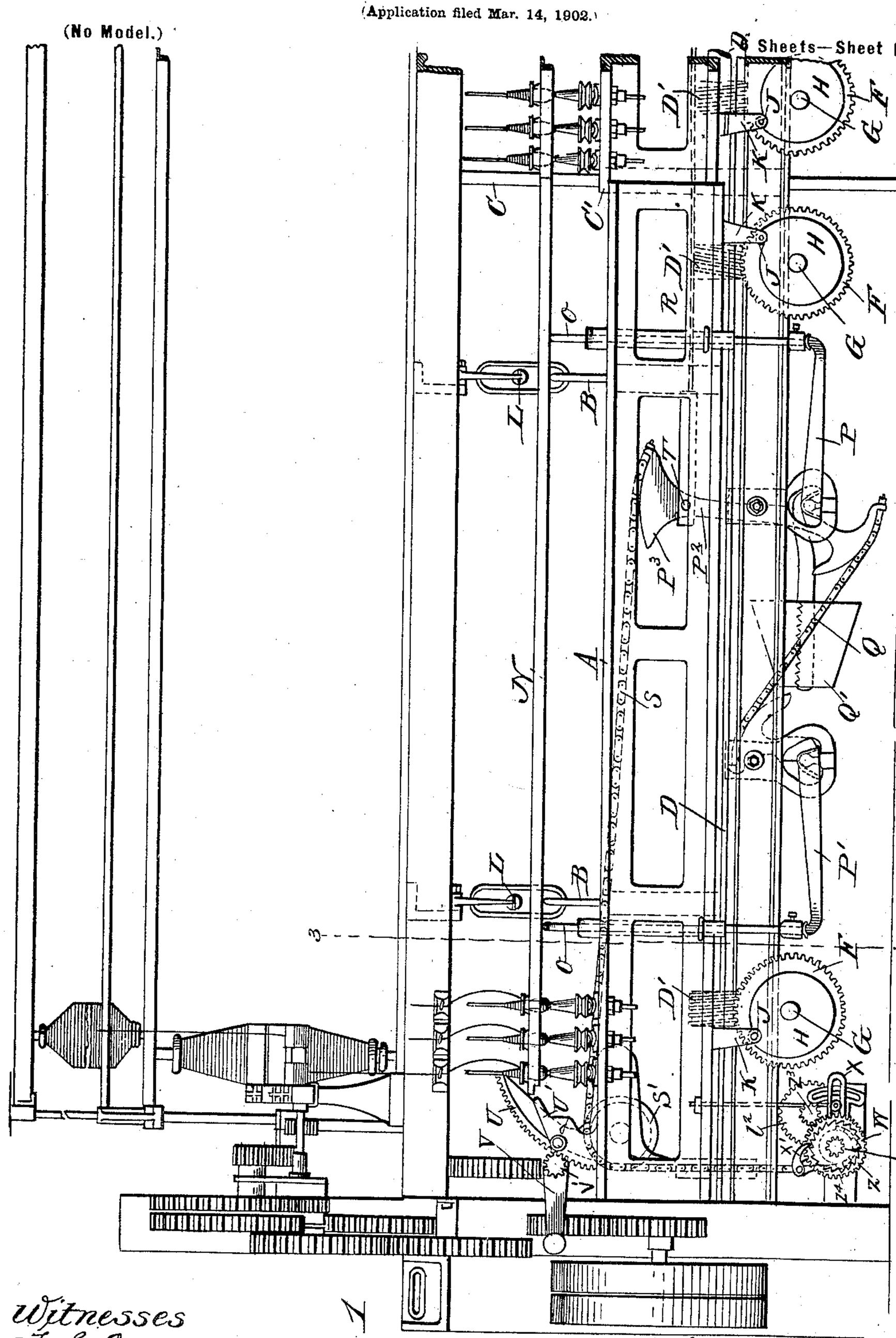


Fig. 1.

Witnesses
F. L. Ourand.
E. K. Lundgr

Inventor:
Alfred Hitchon
by Manuel Bailey
Attorneys

No. 706,414. Patented Aug. 5, 1902.

A. HITCHON.

RING SPINNING AND TWISTING FRAME.

(Application filed Mar. 14, 1902.)

(No Model.) 6 Sheets—Sheet 2.

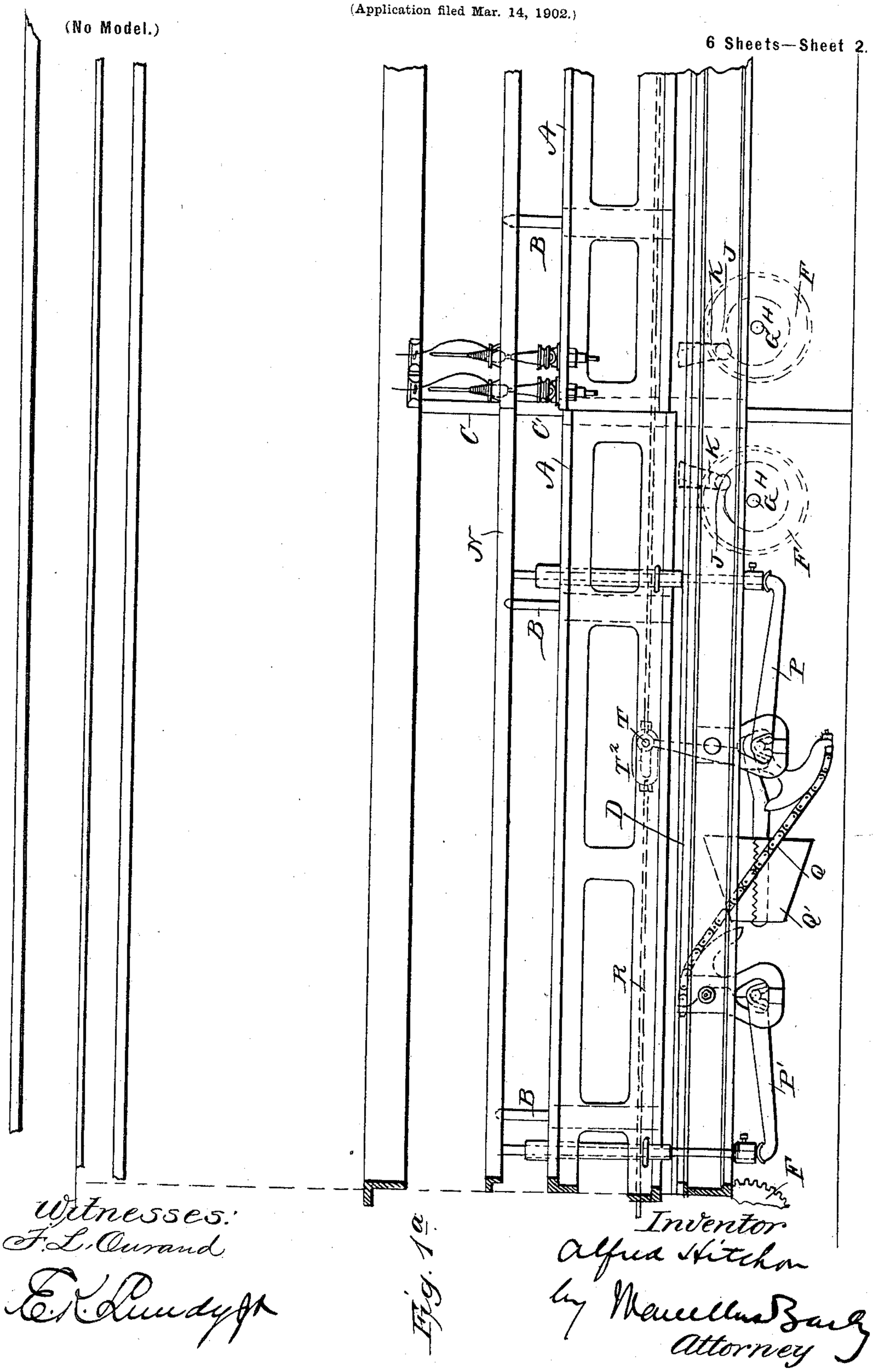


Fig. 1.

Witnesses:
F. L. Ourand
E. K. Lundy Jr.

Inventor:
Alfred Hitchon
by Marcellus Bailey
Attorney

No. 706,414. Patented Aug. 5, 1902.

A. HITCHON.

RING SPINNING AND TWISTING FRAME.

(Application filed Mar. 14, 1902.)

(No Model.)

6 Sheets—Sheet 3

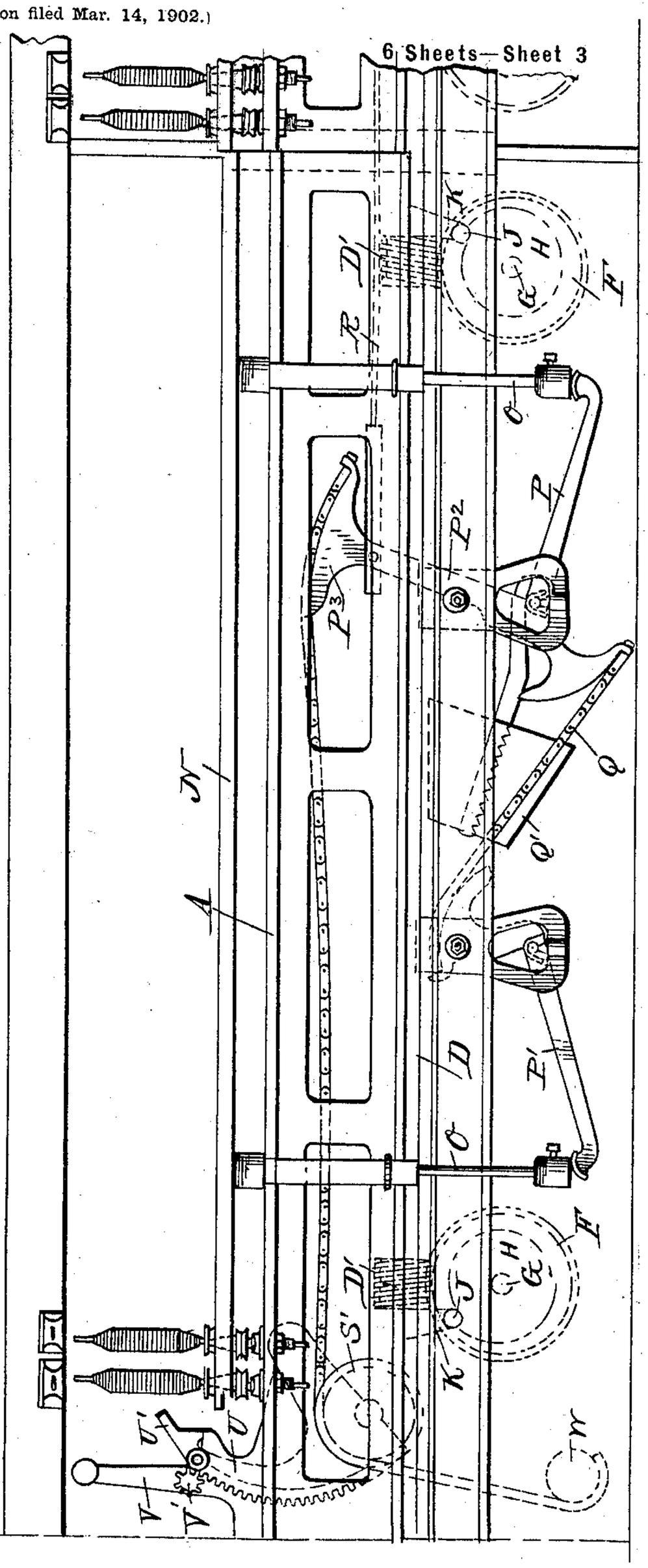


Fig. 2.

Witnesses.
F. L. Ourand
E. K. Lindsley

Inventor
Alfred Hitchon
by Marcellus Bailey
Attorney

No. 706,414. Patented Aug. 5, 1902.

A. HITCHON.

RING SPINNING AND TWISTING FRAME.

(Application filed Mar. 14, 1902.)

(No Model.) 6 Sheets—Sheet 4.

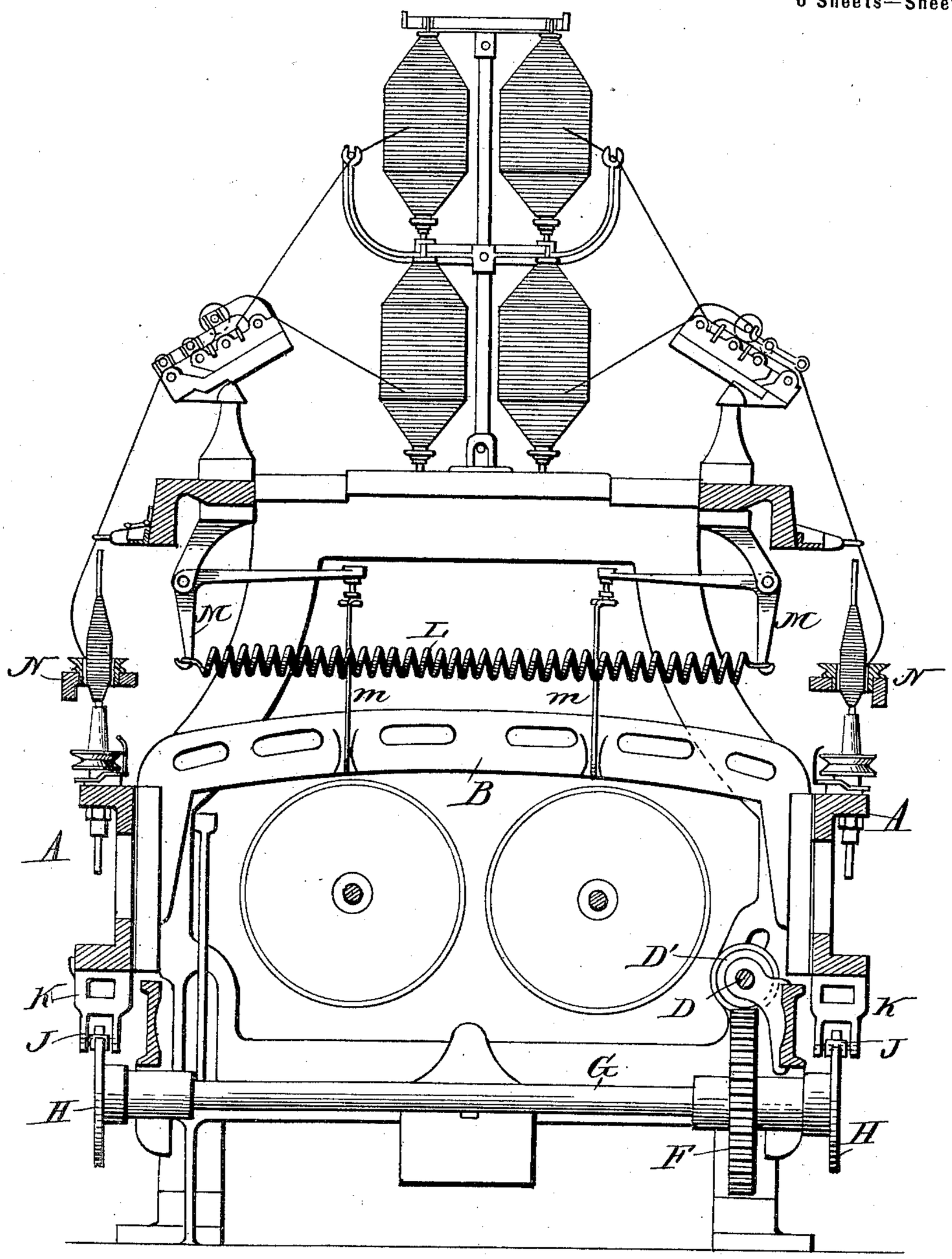


Fig. 3.

Witnesses:
Franck L. Orrand.
E. K. Lindyer

Inventor:
Alfred Hitchon
by Marcellus Bailey
Attorney.

No. 706,414. Patented Aug. 5, 1902.

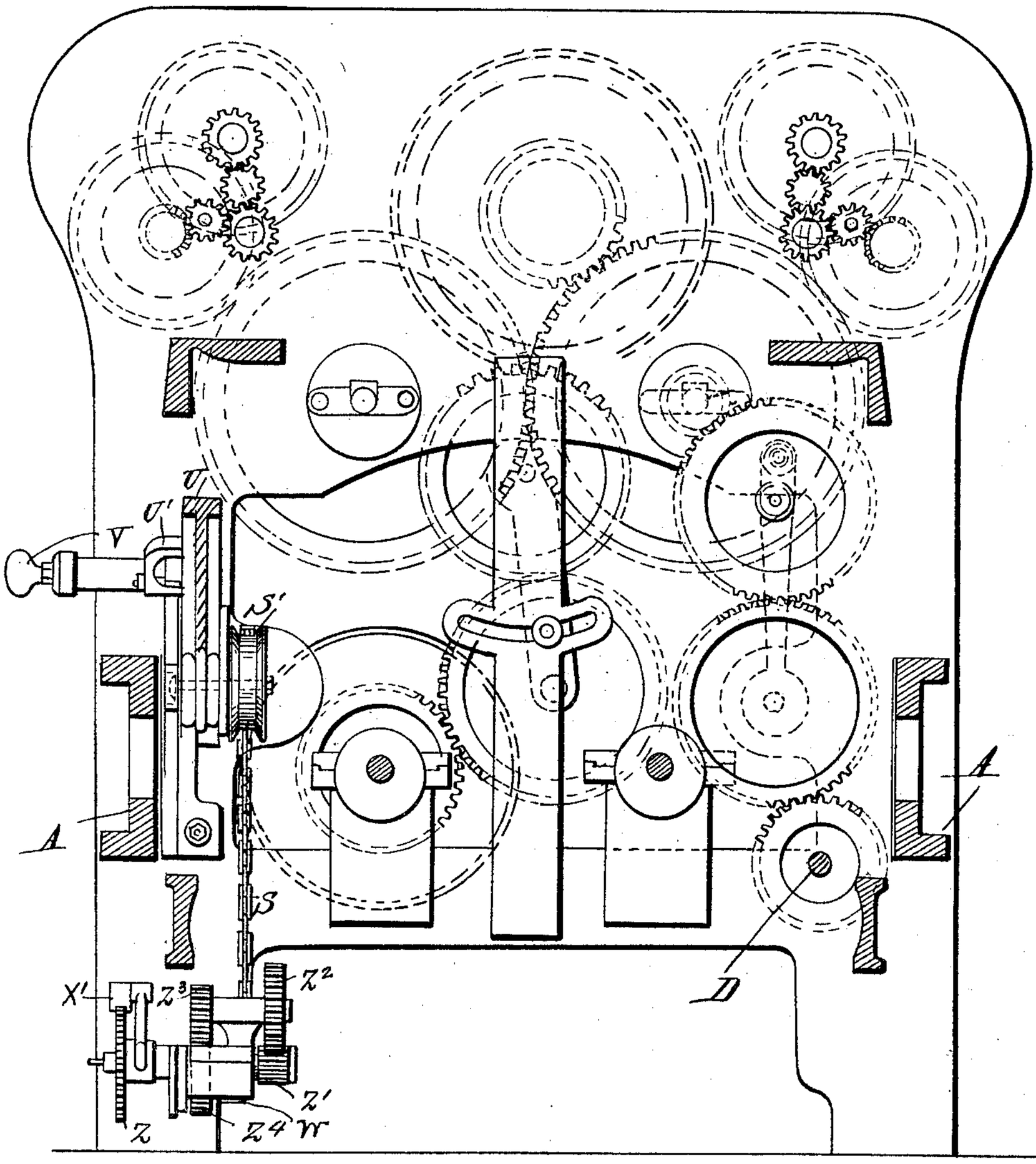
A. HITCHON.

RING SPINNING AND TWISTING FRAME.

(Application filed Mar. 14, 1902.)

(No Model.) 6 Sheets—Sheet 5.

Fig. 4.



Witnesses:
Franck. L. Durand
E. K. Lundy Jr

Inventor
Alfred. Hitchon
by Marcellus Bailey
Attorney.

No. 706,414. Patented Aug. 5, 1902.

A. HITCHON.

RING SPINNING AND TWISTING FRAME.

(Application filed Mar. 14, 1902.)

(No Model.) 6 Sheets—Sheet 6.

Fig. 5.

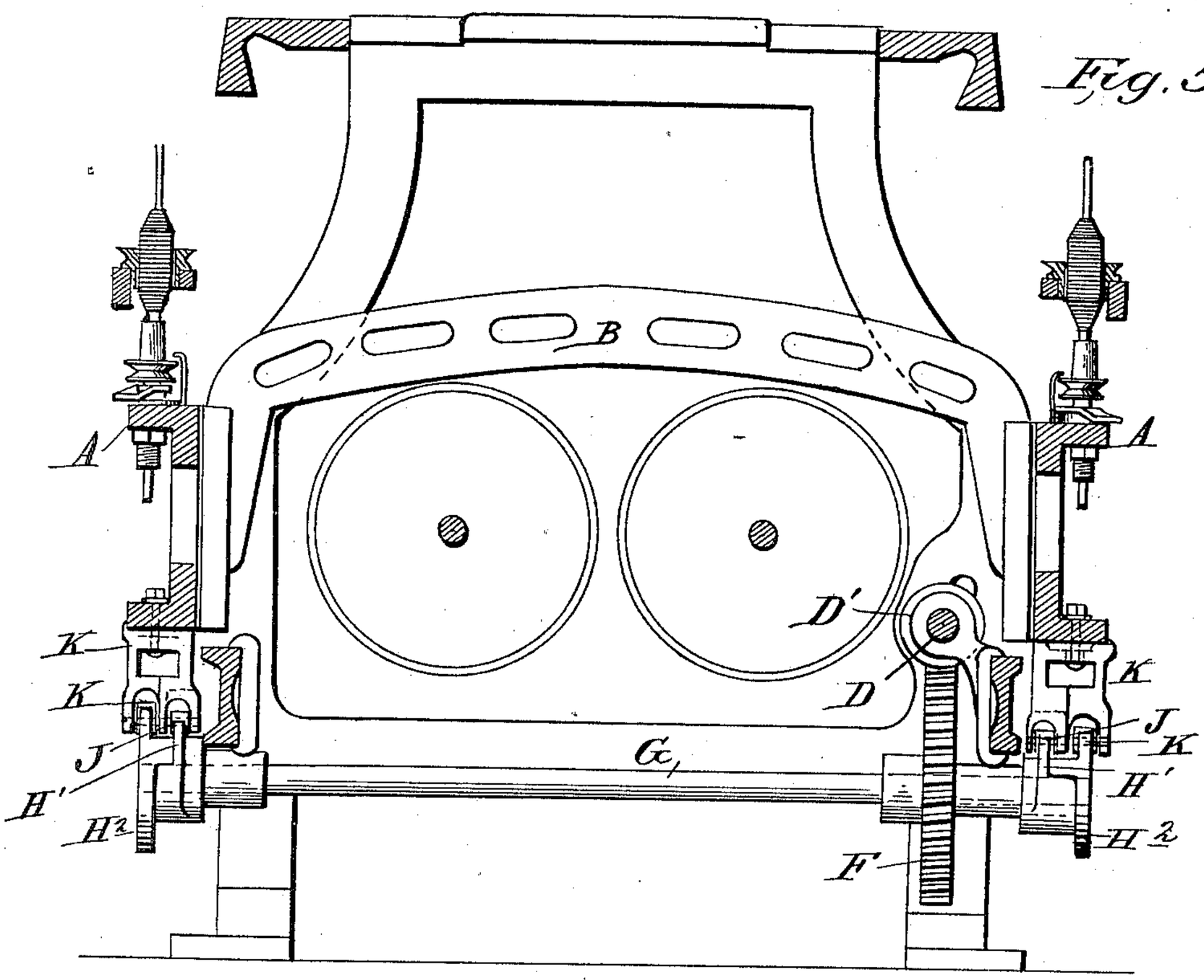
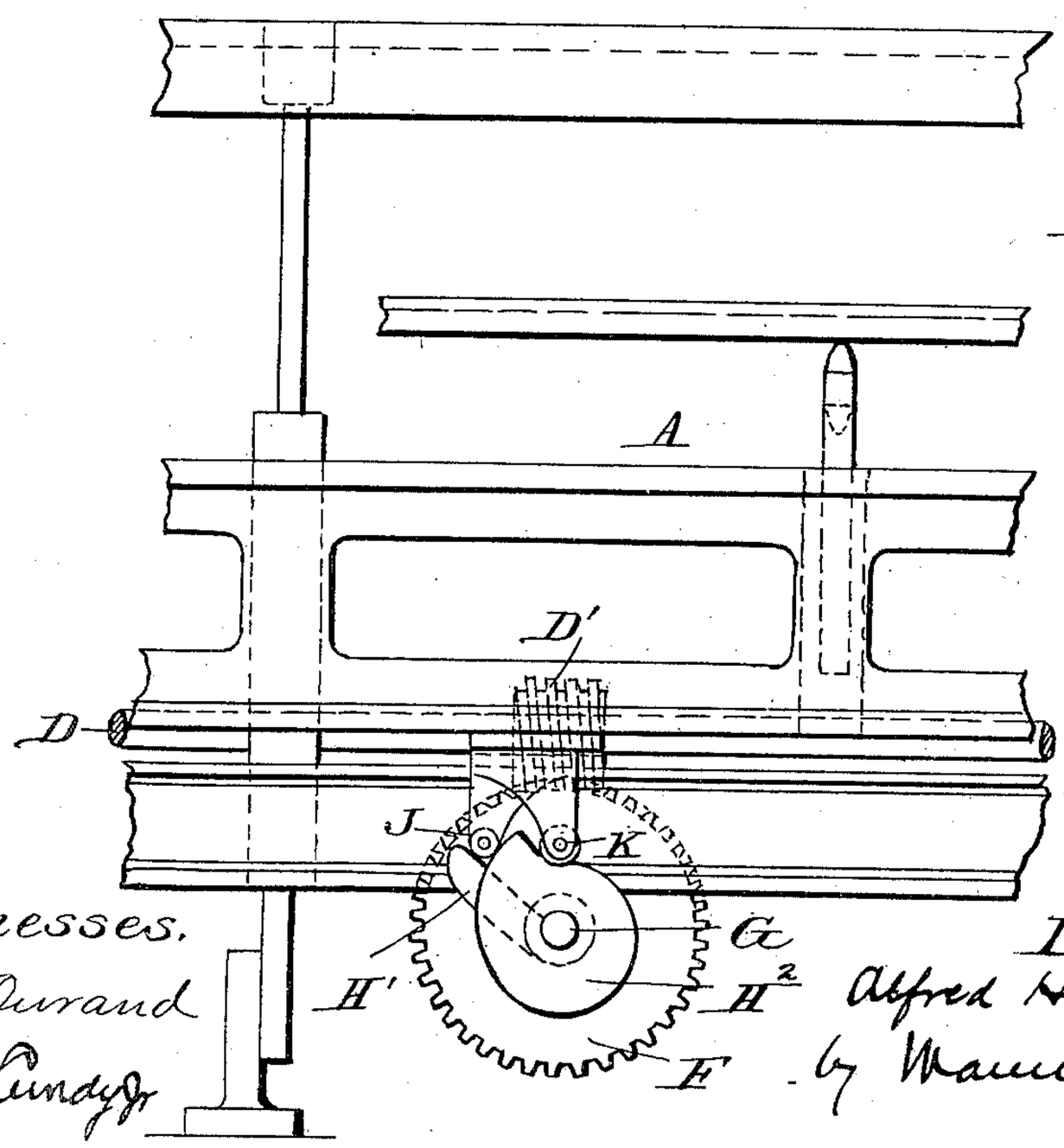


Fig. 6.



Witnesses.
F. L. Ourand
E. K. Lundy Jr.

Inventor:
Alfred Hitchon
by Wanless Bailey
Attorney.

UNITED STATES PATENT OFFICE.

ALFRED HITCHON, OF ACCRINGTON, ENGLAND.

RING SPINNING AND TWISTING FRAME.

SPECIFICATION forming part of Letters Patent No. 706,414, dated August 5, 1902.

Application filed March 14, 1902. Serial No. 98,242. (No model.)

To all whom it may concern:

Be it known that I, ALFRED HITCHON, a subject of the King of Great Britain, and a resident of Accrington, in the county of Lancaster, England, have invented certain new and useful Improvements in Ring Spinning and Twisting Frames, of which the following is a specification.

These improvements in ring spinning and twisting frames relate more particularly to an improved spindle-carrying frame and to operating mechanism therefor for obtaining a more diagonally-crossed chase-winding of the spun or twisted yarn as the latter is being built up to a cop formation, so that while such yarn is being spun or twisted continuously by the well-known ring and ring-traveler devices the upward-traverse movement of the spindles revolving within such traveler-rings may be effected by a positive motion so quickly that taper-pointed cops can during the continuous spinning or revolving of the spindles be firmly cross-wound and built in better imitation of mule-cops, which have to be spun and wound intermittently, and a greatly-increased production can be given to each continuous-spinning spindle.

I preferably divide the spindle-rails into sectional lengths and rigidly secure together the companion sectional lengths on opposite sides of the spinning-frame, thus, in effect, dividing up the usual continuous spindle-rails into a series of independent spindle-carrying frame-sections, each of which is to be provided with its own operating mechanism. This operating mechanism I prefer to form of pairs of cams which act directly upon the frame-sections and serve to lift said sections and to control their descent. The construction and mode of operation of these cams and the appliances in combination with which they operate will be hereinafter more particularly described. I also prefer, for reasons hereinafter stated, to divide the ring-carrying rails into sectional lengths corresponding to those of the spindle-carrying rails.

To enable those skilled in the art to understand and use my improvements, I will proceed to describe more particularly, in connection with the accompanying drawings, the manner in which the same are or may be carried into effect and will then point out in the claims those features which I believe to be new and of my own invention.

In the drawings accompanying and forming part of this specification, Figures 1, 1ª represent a face elevation of a portion of a ring spinning or twisting frame embodying my improvements. In these figures two spindle-carrying frame-sections and a portion of a third, together with their operating appliances, are shown in the position they assume during the continuous spinning, winding, and building operation. The sections are those next to the gearing end of the machine or that end of the machine on which the driving-gearing is located. Fig. 2 is a like elevation of a portion of two spindle-carrying frame-sections, showing the position occupied by the ring-rails when lowered for doffing purposes. Fig. 3 is a cross-sectional elevation on line 3 3, Fig. 1. Fig. 4 is a cross-sectional elevation of the right-hand end or gearing end of the machine. Fig. 5 is a vertical cross-section, and Fig. 6 is a front elevation, of a modification.

It will be understood that the spinning-frame, apart from my improvements, contains the usual pokers, levers, and chain-winding barrel and sundry other parts common to all ring-frames.

The spindle-rails are shown at A. They are divided into sectional lengths on opposite sides of the frame are rigidly connected together by two or more cross-tying stretcher-bars B. Each pair of spindle-rail sections together with their connections B thus constitute in effect a spindle-carrying frame-section, each section being suitably supported so as to be capable of moving up and down independently of the others.

C represents the usual pieces attached to the main frame and having prepared surfaces C′, against which the backs of the spindle-rails bear when sliding up and down.

D is a quick-speeded revolving shaft mounted in suitable bearings in the main or spring frame and extending the full length of said frame. On this shaft are secured pairs of worms D′, one pair for each spindle-carrying frame-section. Of each pair the one worm is right-handed and the other worm is left-handed.

Below the longitudinal shaft D are cross-

shafts G, mounted in suitable bearings in the main frame, there being one pair of cross-shafts G for each spindle-carrying frame-section and each having secured upon it a worm-tooth wheel F. In each pair of cross-shafts the one worm-tooth wheel is for right-hand driving and meshes with the right-hand worm on shaft D and the other worm-tooth wheel is for left-hand driving and meshes with the left-hand worm on shaft D. Thus the cross-shafts are caused to revolve in opposite directions.

Each cross-shaft G has mounted upon it two cams H in duplicate, one at each end of the shaft. The cams on each pair of cross-shafts are alike; but owing to the fact that the one shaft revolves in an opposite direction from the other the two cams on the one shaft are reversely placed relatively to those on the other shaft. The cams, as shown, have a short acutely-inclined surface which is designed to effect the lift of the spindle-carrying frame, and the remainder of their surface is shaped to give the same necessary character of descending movement to the spindle-rail for forming the winding on of the yarn into proper cop-like shape as that hitherto given by the ring-rail cam or "heart-building motion," with the difference, however, that under my invention the cams act directly upon the spindle-rail and the ring-rail has no reciprocating movement to take any part in the building of the cop.

To the under side of the spindle-rails of each spindle-carrying frame-section are fixed brackets K, each carrying a runner or anti-friction-bowl J and being so placed that the bowls rest upon the cams H. Thus the cams when in revolution will effect the necessary vertical reciprocation of the spindle-carrying frame-section to which they pertain. Owing to the fact that the two cross-shafts of each pair, together with their appliances, revolve in opposite directions all end thrust upon the worm-shaft D is greatly reduced, if not entirely removed, and the same is true also as regards the spindle-carrying frame-sections, for as the cams revolve in opposite directions the end thrust of the one pair upon the frame-section will be compensated for and neutralized by the end thrust of the other pair exerted in an opposite direction upon the frame-section. By reason of this fact I am enabled to mount each bearing or runner-bowl on the spindle-carrying frame-section in a position, as shown in the drawings, where it will be considerably to one side of a vertical plane through the center of its cam, thus permitting of the use of cams with an extremely acute incline for effecting the very rapid lift or upward movement of the spindle-rails. This arrangement can be applied even to long spindle-carrying frames by making use of a plurality of pairs of such acutely-shaped cams, each pair being set to take its due share in the lifting of the spindle-rail frame with a minimum frictional waste of power.

In order to reduce to a minimum the friction and wear caused by any tendency of the bowls J to wedge between the opposed pairs of cams H, I may employ instead of a single cam H two cams or a double cam H′ H^2, as shown in Figs. 5, 6, revolving in unison and upon the same axis, the cam portion H′ for effecting the lift and the cam portion H^2 for regulating the descent of the spindle-rail. In connection with these two cam portions I employ two brackets and runner-bowls K J, the one, to coact with the cam portion H′, being set to one side of a vertical plane through the axis of the cam, as hereinbefore explained, and the other, to coact with the cam portion H^2, being set as near vertically over the axis of the cam as possible. The cam H^2 has the same contour as the single cam H, already described; but the lift upon it alone would be ineffective, owing to the vertical placing of its runner J above. The double cam H′ H^2, in fact, is the same in function as the single cam, the cam H′ corresponding to the acutely-inclined lifting portion of the surface of cam H and the cam H^2 corresponding to the gradually-modified remainder of the surface of that cam, the advantage of thus dividing up the cam being that with the one portion a bowl set to one side of the axis of the cam can be used and with the other a bowl that is set vertically over the axis of the cam.

In order to relieve the lifting-cams from undue pressure of the spindle-carrying frame-sections, I provide counterbalancing-springs L, connected to one arm of bell-crank levers M, which are pivoted at their elbows to the main frame and have their other ends connected by links *m* with the stretcher-bars B.

By dividing up the spindle-rails into sectional lengths, constituting a series of independent spindle-carrying rail-sections, I am enabled, as indicated in Fig. 1, by properly adjusting the position of the several sets of cams relatively to one another to cause each of the spindle-frame sections to move up and down in a step manner relatively to its adjacent frame-sections—that is to say, the up-and-down movement of the several sections will be dissimultaneous instead of simultaneous and in unison. By this means a more continuous speed can be maintained and the working power is absorbed at a more uniform rate than would be the case if all of the frame-sections were lifted at the same time and together. This, however, necessitates the division of the ring-rail N into sections of corresponding length, each capable of movement independently of the other. Such an arrangement is illustrated in Figs. 1, 1ª, 2. It is to be noted in this connection that the ring-rail, as hereinbefore stated, has no reciprocating motion to take part in the building of the cop. The only motion it has is a step-by-step upward motion, effected, preferably, by the gearing-end spindle-rail section, which at each ascent actuates, through a ratchet-and-pawl device, lifters by which the ring-rail is

gradually raised upward, so as to give room for a cop to be built to full length. When the ring-rail is divided into independent sectional lengths, as illustrated, then each section of the ring-rail will have its own elevating mechanism operatively connected to and actuated from the gearing-end spindle-carrying frame-section, as illustrated in the figures last above referred to.

Figs. 1, 1ª represent portions of three spindle-frame sections and their companion ring-rail sections and show the position of parts during the continuous spinning, winding, and building operation. Fig. 2 shows the same parts with the ring-rail sections in the position they occupy when lowered for doffing purposes.

Each ring-rail section is mounted upon pokers O, operated by quadrant lifting-levers P P′, having their quadrants connected by a chain Q. The weight of the section is partially counterbalanced by a lever-weight Q′, fast on the rock-shaft of lever P, and upon the same rock-shaft is fastened an upright lever-arm P^2. An operating-rod R extends the length of the frame and has a pin or slot connection with levers P^2, the pin T in this instance being on the lever and the slot T^2 in the rod R. One of the upright levers P^2 (in this instance one of those of the ring-rail section next to the gearing end of the frame) is provided with a quadrant projection P^3, to which is connected one end of the lifting-chain S. While this chain is held taut the greater weight of the ring-rail sections causes the levers P^2 to take a position with their pins T at the extreme ends of the slots T^2; but on slackening the chain for doffing purposes the rod R, by the greater weight of the ring-rail sections acting through the levers P^2, is moved endwise, and each ring-rail section drops onto its appropriate spindle-rail section A, as seen in Fig. 2. Owing to the step manner of arrangement of the sections A the sections N will stop at different levels, as shown, thus causing the upright levers P^2 to vary in position relatively to one another. The clearance-slots T^2 permit of this variation in position. The lifting-chain S passes over a pulley S′, mounted on a toothed quadrant U, pivoted to the frame and controlled by a catch U′ and a handle V and pinion V′, the arrangement, so far as these parts are concerned, being similar to the usual common doffing-handle arrangement. On releasing the catch U′ the quadrant falls, being controlled in its descent by the handle V and pinion V′, and thereby the chain is allowed to go slack, as in Fig. 2. To tauten the chain the handle V is operated to bring the quadrant U to the position shown in Fig. 1, in which position it is locked by the catch U′. By this movement of the doffing-handle V and quadrant U the ring-rail sections have again been brought to the same level.

To give the ring-rail sections slow upward movement during the build of the cop, the chain S is wound upon the usual chain-winding barrel W, to which in turn that rotary movement is imparted from the vertically-traversing spindle-carrying frame-section A next to the gearing end of the frame through operating-rod V, pawl-lever X, pawl X′, ratchet-wheel Z, and gearing Z′, Z^2, Z^3, and Z^4. This mechanism resembles that which is in common use for this purpose and requires, therefore, no detailed explanation.

When the spindles are to be stopped for doffing purposes, the sections of the ring-rail can be let down by the aid of the one handle V for a long frame, so that each section will drop to its own corresponding spindle-rail, as indicated in Fig. 2.

By reason of the fact that in the spindle-carrying frame-sections devised by me the sectional lengths of spindle-rails on opposite sides of the frame are bound and braced together by cross-tying stretcher-bars, as hereinbefore illustrated and described, the pressure brought to bear by the pull of the spindle-driving bands on each side of the spinning-frame will be counterbalanced, thus minimizing friction between the bearings on which the spindle-carrying frame slides.

Having described my improvements and the best way now known to me of carrying the same into effect, what I claim herein as new, and desire to secure by Letters Patent, is as follows:

1. In ring spinning or twisting machines, a vertically-reciprocable spindle-carrying frame, in combination with pairs of reversely-placed and oppositely-revolving lifting-cams therefor, and projections on the said spindle-carrying frame upon which said cams operate, each of said projections being located above its cam and to one side of a vertical plane through the axis of said cam, substantially as and for the purposes hereinbefore set forth.

2. In ring spinning or twisting machines a series of independent vertically-reciprocable spindle-carrying frame-sections, a power-driven worm-shaft extending lengthwise of the spinning-frame and provided with pairs of right and left handed worms, one pair for each frame-section, two cross-shafts for each section provided the one with a right-handed worm-gear to engage the right-hand worm, and the other with a left-handed worm-gear to engage the left-hand worm, a pair of lifting-cams on each cross-shaft, the one pair being reversely placed relatively to the other pair, and projections on the spindle-frame sections, each located to one side of a vertical plane through the axis of its cam, substantially as and for the purposes hereinbefore set forth.

3. In ring spinning or twisting machines a vertically-reciprocable spindle-carrying frame, in combination with pairs of reversely-placed and oppositely-revolving lifting and descent-controlling cams, and coöperating projections upon the spindle-carrying frame,

the projections pertaining to the lifting-cams being located to one side of a vertical plane through the axis of their respective cams, and those pertaining to the descent-controlling cams being located vertically over the centers of their respective cams, substantially as and for the purposes hereinbefore set forth.

4. In ring spinning or twisting machines the combination of a number of independent vertically-reciprocable spindle-carrying frame-sections, and a series of sets of actuating-cams therefor located and adjusted substantially as herein described so that each individual spindle-carrying frame-section will move up and down in a step manner relative to its adjacent spindle-carrying frame section or sections, substantially as and for the purposes hereinbefore set forth.

5. In ring spinning or twisting machines a plurality of independent vertically-reciprocable spindle-carrying frame-sections, and a series of sets of actuating-cams therefor arranged and operating to cause each individual spindle-carrying frame-section to move upward and downward in a step manner relative to its adjacent spindle-carrying frame section or sections, in combination with coinciding sectional lengths of ring-rail, and mechanism whereby, during the vertical reciprocation of the spindle-sections, the rail-sections are gradually raised, substantially as and for the purposes hereinbefore set forth.

6. In ring spinning and twisting machines sectional spindle-carrying frames working in step manner relative to one another as described, coinciding lengths of ring-carrying rails, and means whereby, during the vertical reciprocation of the spindle-carrying sections the ring-rail sections are gradually raised in combination with a doffing-handle common to all the ring-rail sections and connections whereby when the handle is operated the several ring-rail sections are allowed to drop on their appropriate spindle-carrying sections, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 18th day of February, 1902.

ALFRED HITCHON.

Witnesses:

BENJN. THOS. WESTWELL,

EDWIN YATES.