4 Sheets—Sheet 1.

J. J. BOURCART.

SPINNING MACHINE.

No. 335,208. Patented Feb. 2, 1886.

Fig. 1

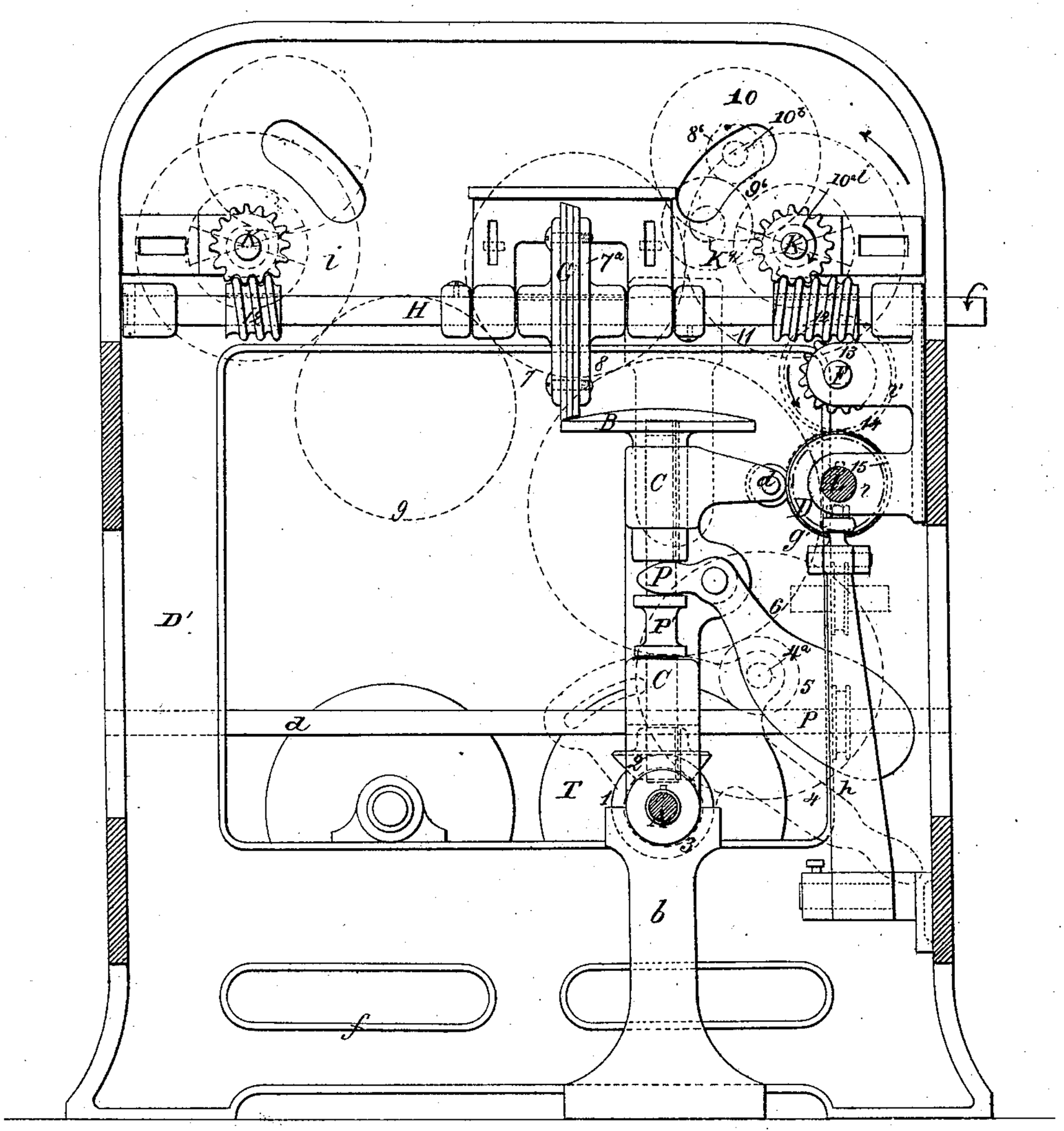

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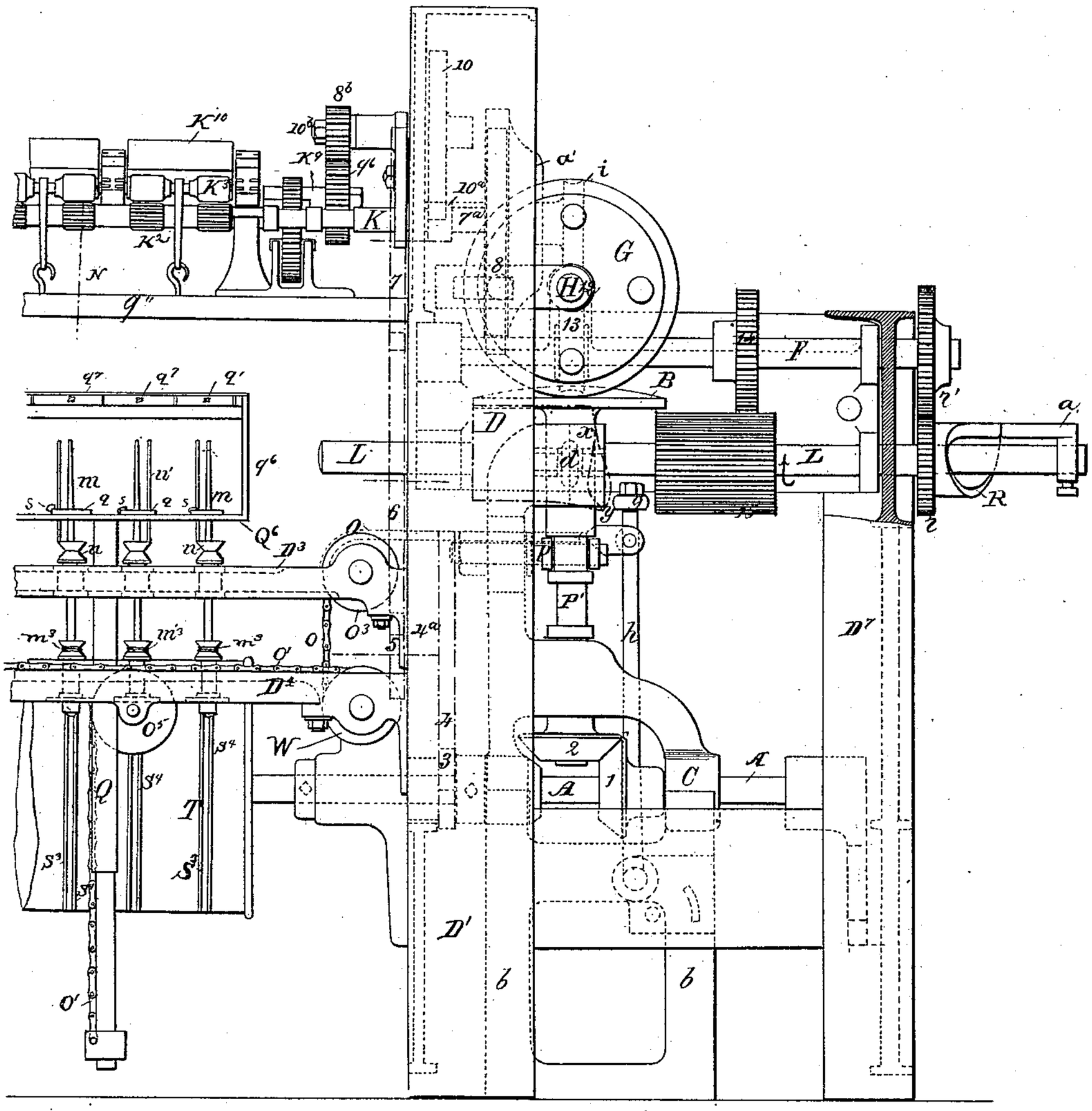
Fig. 2



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SPINNING MACHINE.

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Fig 3.

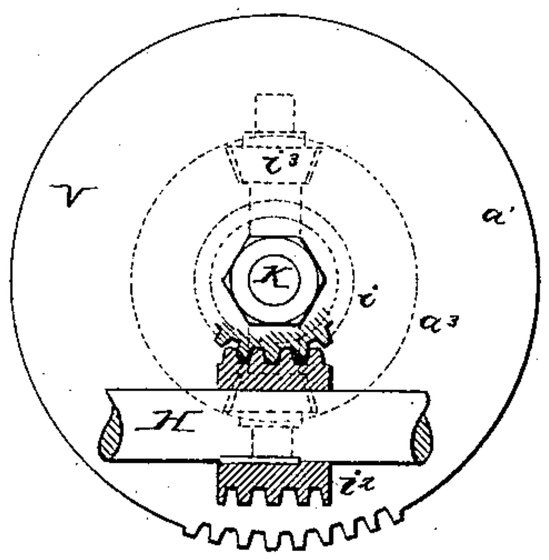
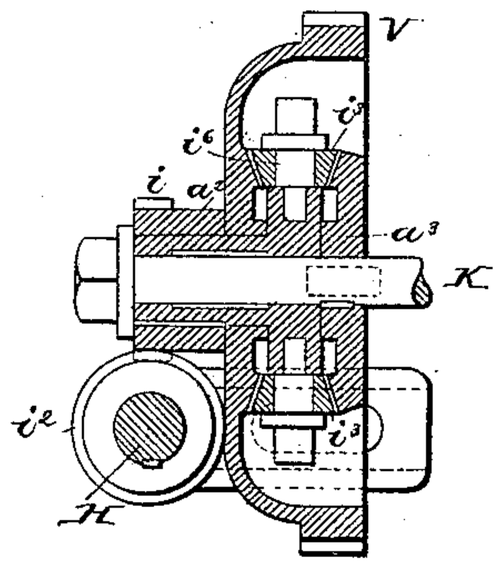


Fig 4.



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4 Sheets—Sheet 4

J. J. BOURCART.

SPINNING MACHINE.

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Fig. 5.

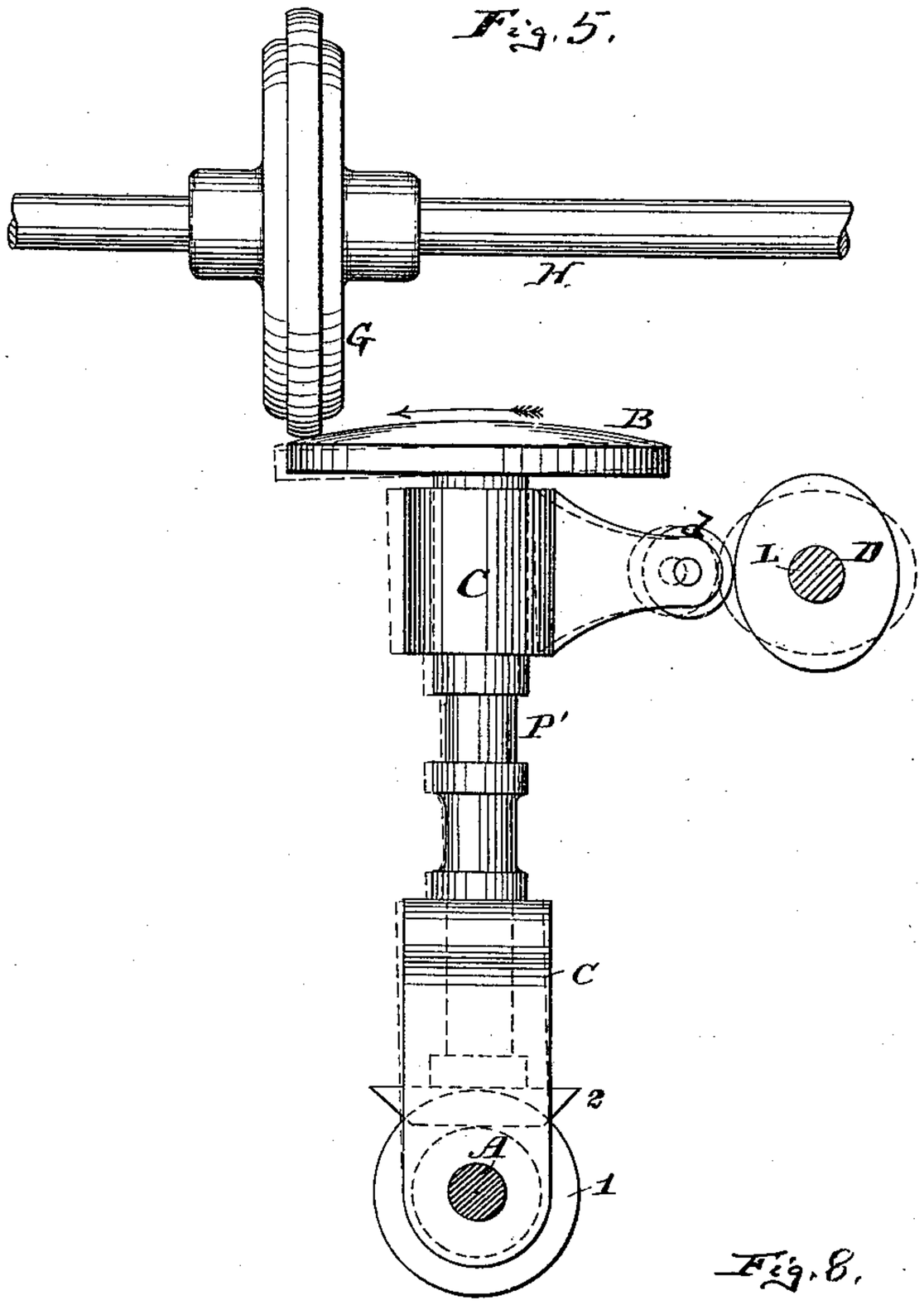


Fig. 6.

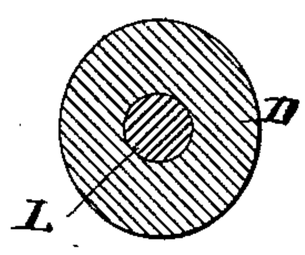


Fig. 7.

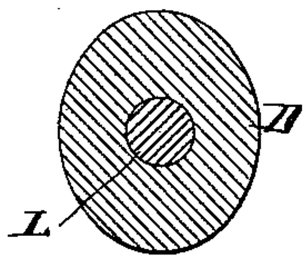
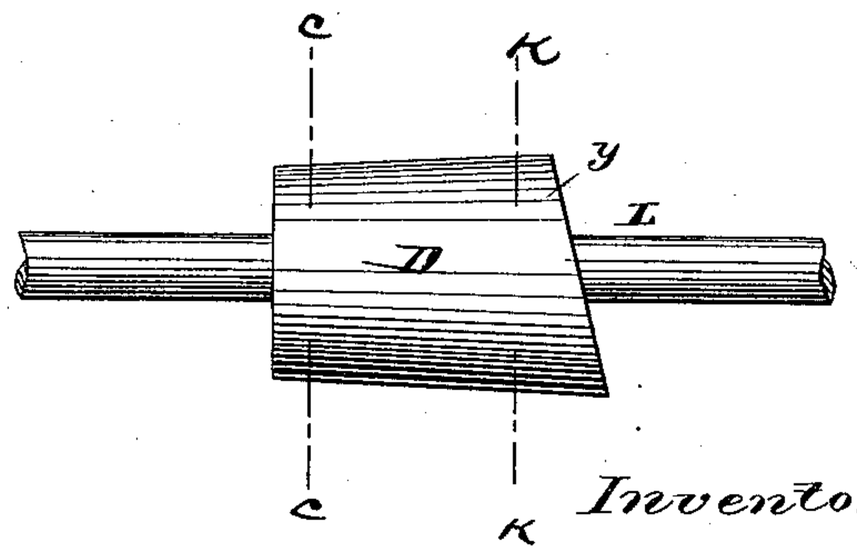


Fig. 8.



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UNITED STATES PATENT OFFICE.

JEAN JACQUES BOURCART, OF ZURICH, SWITZERLAND.

SPINNING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 335,208, dated February 2, 1886.

Application filed November 20, 1879. Serial No. 5,948. Patented in France February 25, 1879, No. 129,299; in England March 4, 1879, No. 870; in Belgium April 11, 1879, No. 47,911; in Italy September 30, 1879, XXII, 198, and in Austria May 24, 1880, No. 34,745.

To all whom it may concern:

Be it known that I, JEAN JACQUES BOURCART, of Zurich, Switzerland, have invented Improvements in Spinning-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed sheet of drawings, making a part of the same.

My invention consists in certain means, fully described hereinafter, whereby to properly lay the yarns with uniform tension upon the bobbin of a ring-spinning machine.

In the drawings, Figure 1 is a vertical transverse section of sufficient of a ring-spinning frame to illustrate my improvement. Fig. 2 is a front elevation of part of the frame, portions being in section. Fig. 3 is a face view, in part section, illustrating the differential wheel and its attachments. Fig. 4 is a longitudinal section of said wheel and of the parts in immediate connection therewith. Fig. 5 is an end view of the main operating-cam, showing the swinging frame, shafts, and gears whereby the motion of the feed-rollers is controlled. Figs. 6 and 7 are cross-sections on the lines *c c k k*, Fig. 8. Fig. 8 is a side view of the main operating-cam.

Before describing the details of the improved apparatus I will set forth the operation of those parts which are employed directly to build up the cop upon the spindle. The spindles *m* revolve in stationary bearings, and each extends through a ring, *q*, which is supported by a ring-rail, Q^6, to which a vertical reciprocating motion is imparted, the ring carrying the traveler *s*. The lower drawing-rolls, k^2, of the set, from which the yarn passes to the guide, are upon a shaft, K, and the upper drawing-rolls, k^3, rest in frictional contact with the lower rolls, and the roving to be spun into the yarn *v* passes between the drawing-rolls of each pair, if more than one pair are used, while the yarn spun therefrom passes through the guide q^7, carried by a standard or frame, q^6, attached to the ring-rail and moving therewith, and then through the traveler *s* to the spindle.

At the rear of the rolls K^3 K^4 are the usual sets of rear drawing-rolls. (Not shown.)

In order to properly build up the cop and maintain a uniform twist and a relatively uniform feed, the movements of the ring-rail and of the drawing-rolls are varied; but the rate of revolution of the spindle is constant, as will now be described. Thus the ring-rail has a vertical reciprocating motion, whereby the yarn is carried up and down and laid in successive coils upon the spindle. It is also lifted gradually higher, so that each reciprocating movement begins and terminates at a higher point than that which preceded it, whereby the height or length of the cop is gradually increased, the gradual lifting of the rail being effected without reducing the extent of the reciprocation of the rail. The speed of the feed-rollers is increased as an increased supply of yarn is required to lay the same upon the larger portion of the cop, the speed of the rollers therefore increasing and decreasing with each vertical reciprocation of the ring-rail, the speed of the feed-rollers being reduced as the ring-rail reaches the limit of its upward movement in completing each layer upon the cop.

Having thus described the operations on the yarn, I will now describe the construction and the operation of the parts by which the movements in proper time are effected. The spindles are provided with wharves or pulleys m^3, and turn in steps or bearings D^9 D^{10}, supported by rails D^3 D^4, extending between the uprights D′ of the frame of the machine, and each spindle is driven by a band, S^3, passing to the wharf from the drum T, which is mounted upon a shaft, A. The feed-roller shafts K and K^9 are supported in bearings on the frame of the machine, and two other shafts, F L, parallel to but above the shaft A, turn in bearings upon the uprights D^7 D′ of the machine-frame. The regular reciprocating motion of the ring-rail Q^6 is imparted from a cam, D, upon the shaft L, which cam has an inclined end, *y*, that bears against the friction-roller *g* upon a lever, *h*, pivoted at the lower end to the frame of the machine, and connected to a cable or chain, *o*, which passes over a guide-roller, o^3, to and is wound upon a drum, W, from which other chains, *o′*, pass over guide-pulleys o^5 to the

lower ends of rods Q, sliding in the rails D^3 D^4, and connected to the ring-rail. The revolution of the cam D reciprocates the lever *h*, which, through the medium of the chains and drum, imparts a corresponding reciprocating motion in a vertical direction to the ring-rail and its adjuncts.

The gradual lifting of the ring-rail is effected through the medium of the devices which I will now describe. A long pinon, 15, upon the shaft L gears with a pinion, 14, of the same diameter upon the shaft F, from which the shaft L is driven, and a pinion, *r'*, upon the end of the shaft F gears with a loose pinion, *r*, of less diameter upon the shaft L, the said pinion *r* carrying a sleeve, R, with an inclined or cam-like edge, against which bears the end of an L-shaped arm, *a*, secured to the shaft L. As the pinion *r'* is larger than the pinion *r*, the latter will be driven more rapidly than the said pinion and at a slightly greater speed than that of the shaft L, upon which the pinion *r* is mounted, the result being that the cam-sleeve R is carried gradually around opposite the end of the arm *a*, and the shaft L is thus gradually moved longitudinally, carrying the upper end of the lever *h* farther and farther to the right, without interfering with the extent of the reciprocating action of the lever imparted by the end of the cam D. This movement gradually lifts the ring-rail to insure the placing of one layer of yarn upon the other and the building up of the cop. After the ring-rail has been lifted to the limit of its upward motion the end of the arm *a* passes from the inclined edge of the cam-sleeve R, when the weight of the ring-frame and its adjuncts will cause the lever *h* to swing to the left in Fig. 2 and carry the shaft L in the same direction until the end of the arm *a* is brought opposite the lower portion of the cam-edge, whereby the ring-rail is caused to return to its lowest position, after which the further travel of the cam repeats the above-described movements.

The varying movement of the feed-rollers is effected by means of the cam D, through the devices which I will now describe. The shaft A, through the medium of bevel-gear 1 2, or by means of friction-wheels, drives the upright shaft P' of a convex friction disk, B, which shaft is carried by a frame, C, swinging around the shaft A, but having its bearings upon a bracket, *b*, to relieve the shaft of the weight of the frame. The disk B is pressed up against the periphery of a leather-faced friction disk, G, by means of a weighted lever, P, which is pivoted to the frame C, and the short arm of which enters between shoulders upon the shaft P'. The frame C is provided with an arm carrying a friction-roller, *d*, which bears against the side of the cam D, the latter being flattened at the outer or inclined end, and gradually merging into a nearly cylindrical shape at the opposite end. Motion is communicated from the shaft A to the shell *a'* of a differential wheel, V, through the medium of a train of wheels, the said shell being thus driven in the direction of the arrow, Fig. 1. The arrangement of this train of wheels is shown in Figs. 1 and 2 in dotted lines. The first wheel, 3, is on the shaft A, and gears with a wheel, 4, on a shaft, 4^a, carrying a wheel, 5, which gears with a wheel, 6, and the latter with a wheel, 7. On the shaft 7^a is another wheel, 8, which gears with the toothed periphery of the shell *a'*.

The shaft K^9 of the rear upper draw-rolls, K^{10}, is driven by means of gears, as follows: A pinion, 10^a, on the shaft K drives a wheel, 10, on a shaft, 10^b, which shaft carries a pinion, 8^b, that gears with a pinion, 9^b, on the back drawing-roll shaft, K^9. The shell *a'* turns loosely upon the shaft K, and is provided internally with an annular rack, i^6, that gears with pinions i^3, carried by studs upon a sleeve, a^2, inclosing the shaft K, and turning loosely thereon, being driven from the shaft H, carrying the disk G, through the medium of a worm, 12, upon the shaft, gearing with a wheel, *i*, upon the sleeve a^2. The same worm, 12, gears with a worm-wheel, 13, upon the shaft F, and drives the latter. A beveled wheel, a^3, is keyed to the shaft K, and gears with the pinions i^3. If the sleeve a^2 were held stationary while the shell *a'* revolved, the result would be to rotate the pinion i^3 and drive the bevel-wheel a^3 and the shaft K in a direction the opposite of that in which the shell revolves, and at the same speed. If, however, the sleeve a^2 is revolved by the worm in a direction the reverse of that in which the shell revolves, the pinions i^3 will not only revolve upon their axis, but they will also be carried around the shaft K, and the speed at which the bevel-wheel a^3 and the shaft are driven will be varied, according to the speed at which the sleeve is rotated. The variation in the rotation of the sleeve results from the varying position of the friction-disk B with respect to the friction-disk G as the frame C is swung in and out by the rotation of the cam D, the speed of the shaft H being increased in proportion as the disk B is carried to the right, Fig. 1, and decreasing as the disk B is carried to the left until the center of the disk B is opposite to the edge of the disk G, when the latter will cease to revolve. As the throw of the cam D decreases as the cam is moved to the right, Fig. 2, and as the position of this cam determines that of the frame C, which determines the speed at which the feed-rollers are driven, and as the position of the cam D also determines that of the ring-rail, it follows that the movements of the feed will be timed and varied to accord with those of the ring-rail, and that the yarns will be fed to the cop in such regular but varying manner as will result in laying them upon the cop with a uniform tension, the uniformity of tension being secured by feeding the roving with a speed proportionate to the speed with which the yarn is laid upon the bobbin—that is to say, when the yarn is being laid on the larger

part of the bobbin the feed is faster, and when the yarn is being laid on the point it is slower.

I claim—

1. The combination, with the driving-shaft A and the feed-roller shaft, of a differential wheel upon said feed-roll shaft, consisting of the gear a^3, shell a', intermediate gears, i^3, and sleeve for carrying said intermediate gears, a swinging frame, a shaft, P′, carried thereby, a disk, B, on shaft P′, gears between the shaft P′ and shaft A, a worm-shaft, H, provided with a worm and a disk in frictional contact with the disk B, a worm-gear upon the sleeve carrying said intermediate gears, and a train of gears between the shaft A and the shell of the differential wheel, substantially as set forth.

2. The combination, with the feed-roll shaft and the driving-shaft, of a differential wheel, V, consisting of a shell, the gear a^3, gears intermediate said shell and gear a^3, and sleeve a^2, carrying said intermediate gears, gearing between the shell and the driving-shaft, and the swinging frame C, shaft P′, gears 1 2, shaft H, friction-disks, and gear-connections, substantially as described, between the shaft H and the sleeve a^2 of the wheel, substantially as set forth.

3. The combination, with the driving-shaft A, spindles and spindle-driving appliances, substantially as described, ring-rail, and vertical guides and supports and feed-rolls, of a cam, D, devices, substantially as described, for rotating it, lever *h*, connected to the ring-rail supports, differential wheel V, having a shell, sleeve, and intermediate gears, gears between the shell of the wheel and the shaft A, swinging frame C, bearing upon the cam D, and carrying a shaft provided with a friction-disk, B, and worm-shaft H, gearing with the sleeve of the differential wheel and carrying a disk in frictional contact with the disk B, substantially as set forth.

4. The combination, with the drawing-roll shaft, the movable ring-rail, and shaft A, of a cam, D, and devices for turning the same, lever bearing on the end of said cam, swinging frame C, bearing on the periphery of the cam, and connections, substantially as described, between the lever and the ring-rail supports and between the shaft A and the drawing-roll shaft, substantially as set forth.

5. The combination of the movable ring-rail, lever *h*, and intermediate connections, whereby the rail is raised and lowered by the movements of the lever, and sliding shaft L, arm *a*, cam D, shaft F, devices for rotating said shaft, cam-sleeve R, and gears 14 15 *r r′*, substantially as set forth.

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