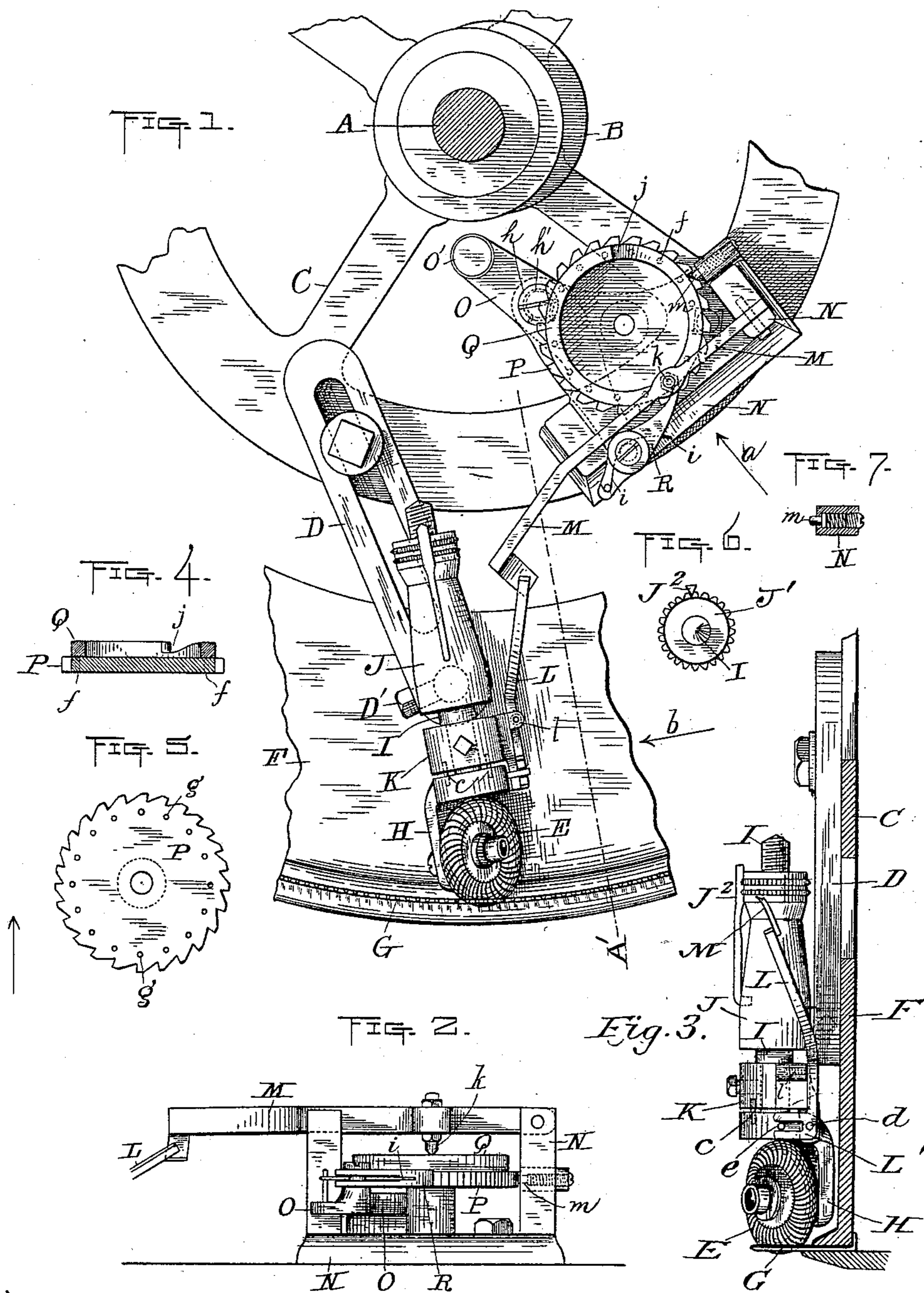


(No Model.)

F. H. GATES.
CIRCULAR KNITTING MACHINE.

No. 448,954.

Patented Mar. 24, 1891.



Witnesses;

Walter B. Nourse,

G. Forrest Mason.

Inventor;

Frank H. Gates.

By A. A. Barker Att'y.

UNITED STATES PATENT OFFICE.

FRANK H. GATES, OF WARE, MASSACHUSETTS, ASSIGNOR TO THE OTIS COMPANY, OF SAME PLACE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 448,954, dated March 24, 1891.

Application filed June 4, 1890. Serial No. 354,204. (No model.)

To all whom it may concern:

Be it known that I, FRANK H. GATES, of Ware, in the county of Hampshire and State of Massachusetts, have invented certain new and useful Improvements in Circular-Knitting Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a horizontal section through the upright shaft of a knitting-machine, looking down, and showing a plan of so much of said machine as is necessary to illustrate my improvements thereon. Fig. 2 is a side view of part of my improved device, looking in the direction indicated by arrow *a*, shown in Fig. 1. Fig. 3 is a vertical section on line A' through a portion of the bed-plate and the horizontal supporting wheel-frame of the machine, also representing beyond said section-line a side view of another part of the device, looking in the direction indicated by arrow *b*, shown in Fig. 1; and Figs. 4 to 7, inclusive, represent views of various parts of my improved device, which will be hereinafter more fully described.

The object of my invention is to render the action of the usual knocking-over wheels of a knitting-machine automatic by combining therewith mechanism actuated by a cam on the upright shaft of said machine, whereby the desired forward intermittent movements are imparted to said wheels, as will be hereinafter more fully set forth.

To enable others skilled in the art to which my invention appertains better to understand the nature and purpose thereof, I will now proceed to describe it more in detail.

Referring to the drawings, A represents the upright shaft of the machine. To said shaft is rigidly secured a cam B, and to frame C are in turn adjustably secured the usual plates D for supporting the knocking-over wheels E over the usual rotating cylinder-bed F, in the upper outer edge of which are secured the needles G. Several of said knocking-over devices, it will be understood, are in practice located radially at various points around the central shaft, adapted to engage with the needles at said points in the knit-

ting operation. They are moved forward and back with short intermittent movements to produce different designs of fabrics in the manner hereinafter described. In knitting the body or stronger portion of the fabric the wheels bear against the needles, this being their normal position; but when colored or tender yarn comes into action in producing the design the wheels are moved back from the needles to relieve the pressure and prevent said yarn from breaking. As said operation of the knocking-over wheels between the needles and the purpose thereof are both well understood by those skilled in the art to which this invention relates, it will be unnecessary to further describe the same.

My invention relating only to the mode of operating said wheels, as previously stated, the description will be confined mainly thereto, and, for convenience in said description, to one device, as shown in the drawings.

The knocking-over wheel E is arranged to turn on an inclined stud secured in a movable frame H, which is fitted in any convenient manner to work out and in a short distance on the outer end of the spindle I, and at the same time is prevented from turning thereon, as is shown in Figs. 1 and 3. Said spindle is fitted in the usual hollow swivel-bearing J, mounted horizontally on the supporting-plate D and having the set-screw D' for holding said bearing in position from turning on its swivel after adjustment. The spindle I is held from longitudinal motion in swivel-bearing J after adjustment by the circular lock-nut J' on the swivel-bearing J, having a longitudinally-serrated periphery, and a spring-latch J², secured to said swivel-bearing and adapted to engage with said serrated surface to hold the nut from turning. (See Figs. 1, 3, and 6.) Just inside of the frame H is secured on spindle I a collar K, which serves to hold said support from turning, (through the medium of pins *c* in this instance,) and at the same time as a fixed bearing for a rocking lever L, which is pivoted at *d* thereto. The outer end L' of said lever is bifurcated or fork-shaped (see Fig. 3) and fits over a pin *e*, projecting out laterally from the upper part of the frame H, while its inner end rests on the outer end of a swinging lever M, pivoted at

its opposite end upon a suitable frame N, secured to wheel-frame C. Said frame N also serves to guide the lever M in its vertical movements, which are imparted by a ratchet-wheel and pawl device actuated from the cam B through the lever O in the following manner: The ratchet-wheel P of said device is arranged horizontally and fitted to turn on a suitable bearing in frame N. It is so arranged as to bring a ring Q, fitted to the top side thereof, in line vertically with the lever M, as is shown in Fig. 1. Said ring rests on the wheel just inside of its teeth, and is adapted to be adjusted circularly thereon to vary the time at which the knocking-over wheel is required to be moved forward or back in producing the desired design of fabric, being detachably fastened to the wheel by means of pins and holes *f* and *g*, respectively, as is indicated in Figs. 4 and 5. Back action of the ratchet-wheel P is in this instance prevented by means of a spring-actuated stud *m*, fitted in a suitable socket in frame N and adapted to engage with the teeth of said wheel, as is shown in Fig. 1. Lever O is pivoted to the base of frame N at *h*, and its inner end is adapted to engage with cam B, while upon the opposite end thereof is pivoted the pawl R, which engages with the teeth of the ratchet-wheel, being held in engagement therewith by a suitable spring *i*. A suitable spring *h'* is also disposed around the pivot *h* of said lever to force it back into its normal position when the pressure of the cam on end O' is removed. A depression or notch *j* is formed in the top of ring Q, and the lever M is provided with a projection or pin *k* on its under side, preferably made vertically adjustable and adapted to rest on the top of said ring, as is shown in Figs. 1 and 2. The device being thus constructed and arranged, it is obvious that at each revolution of upright shaft A the ratchet-wheel and its ring are turned one notch forward. While the projection or pin *k* on lever M rests on the level surface of ring Q during the above operation, it will also be apparent that, owing to the inner end of lever L being held in an elevated position, the wheel E is held in its forward or outer position between the needles G; but upon the depression *j* in ring Q arriving under said pin *k* the latter naturally drops into it, thereby permitting the abutting ends of levers L M also to descend a short distance, and in consequence said wheel E is drawn back the distance required through the connections previously described. Unless the inner end of lever L is sufficiently weighted to overbalance the weight outside of its fulcrum and the frictional resistance of the wheel E in pulling back the same, a suitable spring must necessarily be employed for depressing said inner end when the latter is permitted to descend, as previously described. In this instance I accomplish said result by means of a spiral spring *l*, interposed between the top of the

lever (back of its fulcrum) and a fixed point above said lever.

Any other equivalent means for the above purpose may be employed in lieu thereof, if desired. I also reserve the right to make such modifications in the other parts of my improved device as may be deemed advisable under different circumstances in carrying out the principle of my invention.

The intermittent reciprocating movements of wheel E may be varied in length, duration, and frequency by employing rings Q of different sizes and thicknesses, by varying the size, depth, and number of their depressions *j*, and by constructing the other parts of the device to conform therewith, according to the yarns and fabrics to be knitted.

It will thus be seen from the foregoing specification that I am enabled by the use of my improved device to obtain any desired longitudinal movements of the knocking-over wheels, and that, too, by an automatic operation, thus rendering the operation of knitting more accurate and perfect, and, in consequence, resulting in the production of a superior grade of goods at less expense than by the old method.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a knitting-machine, an intermittent laterally-reciprocating knocking-over wheel, in combination with a rocking lever engaging at one end with the bearing of said wheel, a swinging lever engaging with said rocking lever, a ring mounted on a ratchet-wheel, engaging with said swinging lever, said ratchet-wheel, its pawl, a lever upon which said pawl is mounted and which engages with a cam on the upright shaft, and said cam, substantially as and for the purpose set forth.

2. In a knitting-machine, the combination of rotary knocking-over wheel E, its movable support H, and spring-actuated lever L, pivoted to a suitable support and connected with said part H, with lever M, operatively connected with a cam on the upright shaft through a ratchet-wheel, its pawl, a ring on said wheel, and a cam-lever and said cam, whereby the inner end of said lever L is intermittently depressed, substantially as and for the purpose set forth.

3. In a knitting-machine, the combination of lever L, pivoted to a suitable support and having means for imparting vertical movements to its inner end, with the movable frame or bearing H and knocking-over wheel E, substantially as and for the purpose set forth.

4. In a knitting-machine, the combination of lever M and means, substantially as described, for operating the same, including a cam on the upright shaft, with lever L, whose outer end L' is adapted to engage with a pin on frame H, said frame H fitted to work toward and from the needles G, and knocking-over wheel E, fitted to turn on said frame H, substantially as and for the purpose set forth.

5. In a knitting-machine, the combination of knocking-over wheel E, its support, and lever L, with lever M, having the projection or pin *k* and pivoted upon frame N, said frame, 5 ratchet-wheel P and its ring Q, means for holding the ratchet-wheel against back action, spring-actuated pawl R, its lever O, and cam B on shaft A, substantially as and for the purpose set forth.
- 10 6. A device for automatically operating the usual knocking-over wheel of a knitting-machine, comprising in combination with a cam on the upright shaft, a lever O, the spring-actuated pawl R, mounted on its outer end, ratchet-wheel P, having means for holding it 15 against back action, adjustable ring Q, mounted on said ratchet-wheel and having a notch *j* in its upper side, lever M, having the projection or pin *k*, lever L, collar K, movable frame H, mounted on the usual knocking-over 20 spindle I, and knocking-over wheel E, fitted to turn on said movable frame, substantially as shown and specified.

FRANK H. GATES.

Witnesses:

A. A. BARKER,
W. B. NOURSE.