(No Model.)

W. H. JACKSON.

CIRCULAR KNITTING MACHINE.

No. 467,874. Patented Jan. 26, 1892.

Fig. 1.

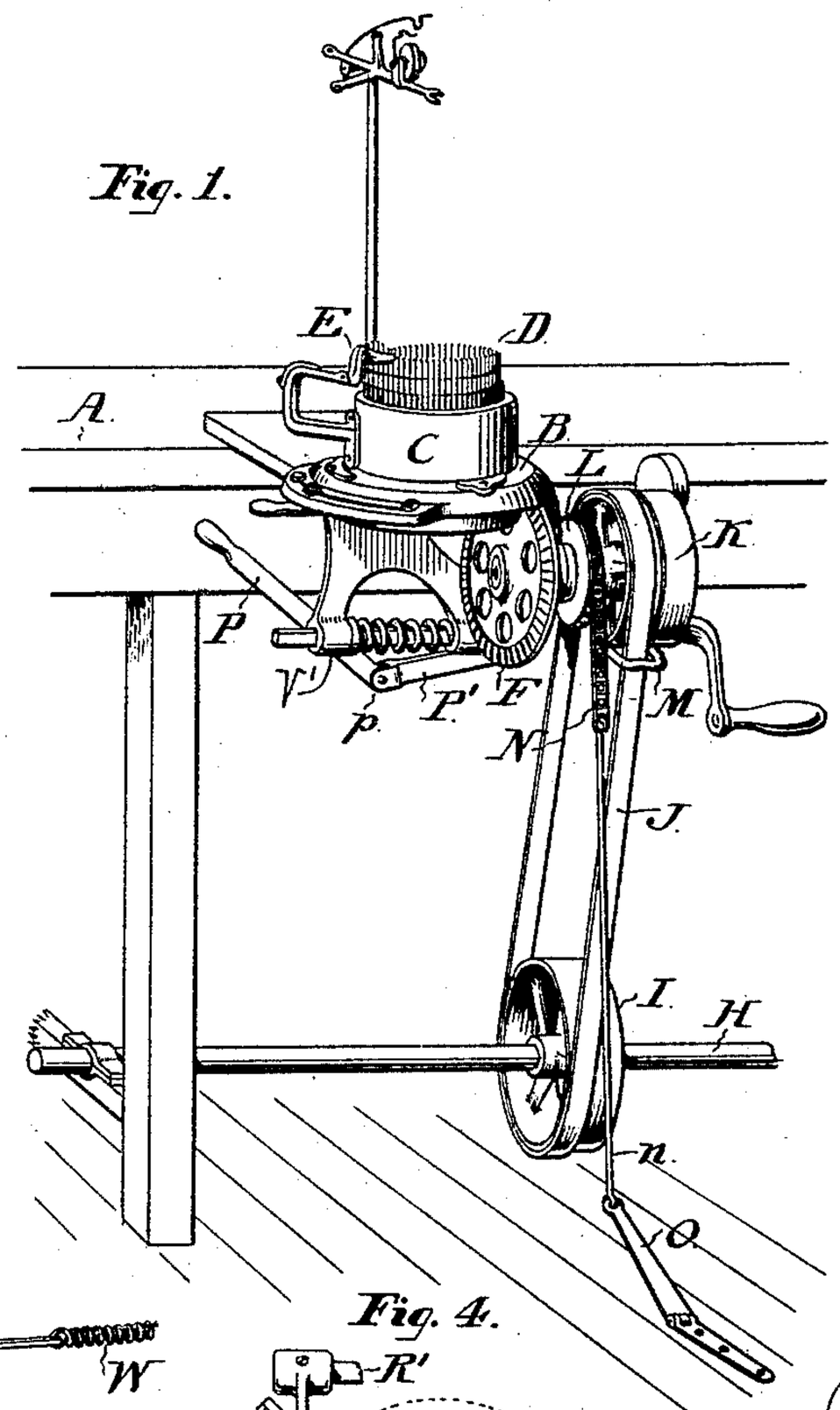


Fig. 3.

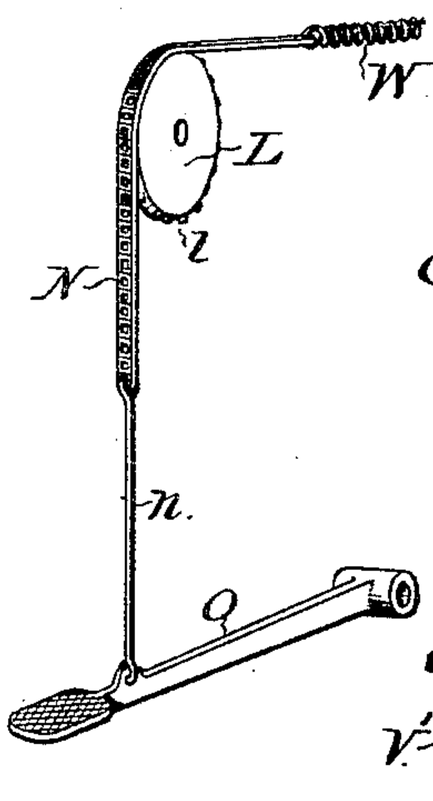


Fig. 4.

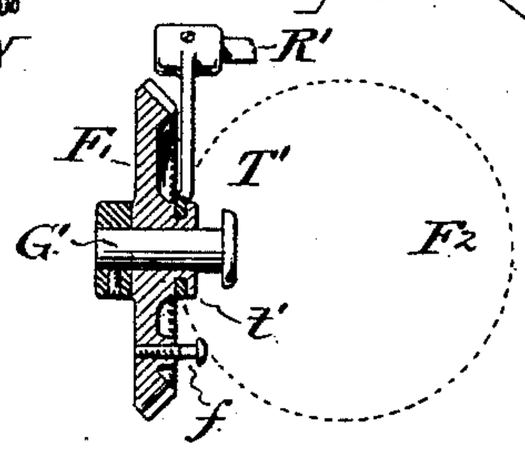


Fig. 5.

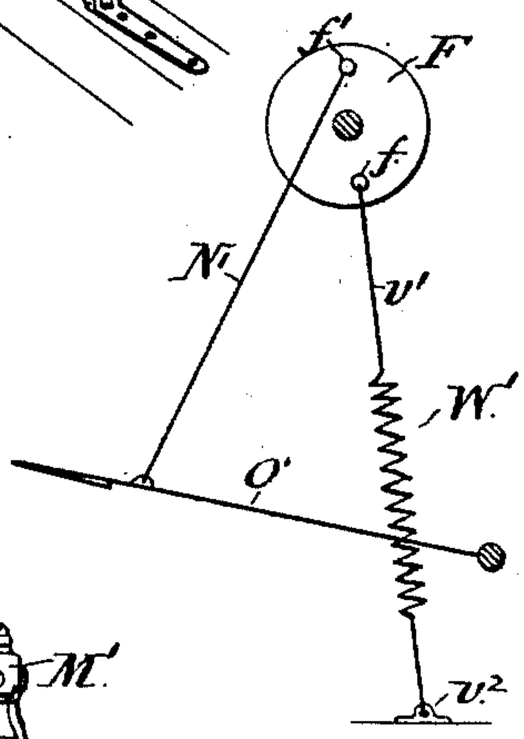
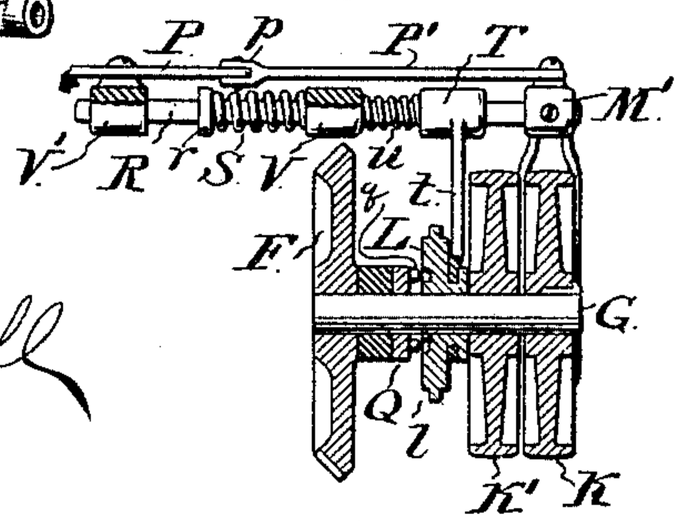


Fig. 2.



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UNITED STATES PATENT OFFICE.

WILLIAM H. JACKSON, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF TWO-THIRDS TO JOHN BLOOD AND EDWARD BLOOD, OF SAME PLACE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 467,874, dated January 26, 1892.

Application filed June 9, 1890. Serial No. 354,701. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. JACKSON, of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Circular-Knitting Machines, whereof the following is a specification, reference being had to the accompanying drawings.

My invention relates to knitting-machines in which, after knitting the leg portion of a stocking by a continuous rotary movement of the cylinder, the heel and toe portions are knit by a reciprocating movement thereof, the necessary narrowing and widening being accomplished by the raising and lowering of needles, as is well understood. In the ordinary non-automatic machines of this class it is usual to effect the continuous rotary movement by power, and when the change is made to reciprocating movement to shift the driving-belt onto a loose pulley and work by hand, a crank or winch being provided upon the driving-shaft for that purpose. The raising and lowering of the needles being also effected by the hands of the operator, much delay and inconvenience results from the necessity of such twofold manipulation.

The object of my present invention is to provide means whereby the operator can reciprocate the cylinder by means of the foot, leaving both hands free to manipulate the needles, the mechanism for this purpose being so combined with the power driving mechanism as to afford no interference therewith.

In the accompanying drawings, Figure 1 is a view in perspective of a knitting-machine embodying my improvements. Fig. 2 is a horizontal section, on an enlarged scale, through the driving-shaft which carries the fast and loose pulleys and showing some of the adjacent parts. Fig. 3 is a partial view in perspective of the treadle and adjacent mechanism. Figs. 4 and 5 are views of an alternative arrangement, Fig. 4 being a partial horizontal section on the line of the prolonged axis of the driving-shaft, and Fig. 5 being merely a diagrammatic view of the treadle mechanism.

Taking first the type shown in Figs. 1, 2, and 3, A represents the table on which the base-plate B of the knitting-machine is mounted, the cam-cylinder being indicated at C, the needles at D, and the thread-guide at E. The cam-cylinder is driven in the usual manner by means of a bevel-gear F, having a hub Q, rigidly mounted upon the driving-shaft G, which carries the fast pulley K and loose pulley K′. The belt J is driven by means of the main pulley I, mounted upon the shaft H. The belt-shifter M is rigidly attached by means of a head M′ to the end of a rod R, sliding horizontally in the guides V V′ and provided with a spring S, compressed between the guide V, and a collar *r*, attached to the rod R, so as normally to tend to throw the belt onto the loose pulley K′. Belt-shifting levers P P′, jointed together at *p*, are connected with the belt-shifter head M′ in such manner as that when they are thrown past the center at their joint the shifter will be locked in position upon the fast pulley.

Between the bevel-gear F and the loose pulley K′, I mount freely upon the shaft G a sliding sprocket wheel or disk L, having holes or seats upon one face to engage with pins *q* upon the proximate face of the hub Q, which, as before stated, is rigidly connected with the shaft G. The other face of the disk L is provided with a shallow hub having an annular groove to permit engagement with a shifting-arm *t*, attached to a head T, which slides upon the rod R. A spring *u*, compressed between said head T and the guide V, tends normally to throw said head away from said guide and thus to throw the disk L out of engagement with the studs *q*. The length of the head T is such that when the head M′ of the belt-shifter moves toward it in the act of shifting the belt onto the loose pulley it will just strike said head after the belt has moved clear of the fast pulley, and thereupon the continuation of the shifting movement for a very slight distance will throw the head T sufficiently along the rod to cause engagement of the studs *q* with their seats of the disk L. When, however, the converse movement of the shifter commences the head T will immediately follow the head M, (by reason of the

tension of the spring *u*,) and before the belt has come into contact with the fast pulley the disk will have been shifted completely out of engagement with the studs *q*, so that no interference can take place between the respective groups of driving mechanism. The sprocket-wheel is provided with a chain belt N, whose openings are adapted to engage with the teeth *l* of the sprocket-wheel, and said chain is attached at one end to a strong spring W, secured to the table, and at the other is connected by means of a rod *n* to the treadle O, suitably pivoted to the floor.

The operation of the device is as follows: Assuming that the leg of the stocking has been knit by continuous rotary movement and by means of the power driving mechanism, when the time for narrowing the heel has arrived, the operator throws the shifting-levers P P′ out of the locked position, and the spring S thereupon throws the rod R to the left and shifts the belt onto the loose pulley K′. In completing this movement the head M′ has shifted the head T also to the left and caused the engagement of the disk L with the studs *q*. The operator then raises one-half the needles by hand and by means of his foot depresses the treadle O, causing a half-reciprocation of the cam-cylinder. Upon releasing the treadle the spring W causes a corresponding reciprocation in the opposite direction, and the operator, with both hands free, lifts needle after needle into the idle series at the end of each reciprocating movement until the necessary amount of narrowing has taken place, when the needles are returned one by one during the intervals of reciprocation. It will thus be seen that a much more rapid manipulation is permitted, since the movement of the treadle in no way interferes with the manipulation of the needles, and not only is much time saved, but the risk of breaking or displacing needles through hasty movements of the hand is avoided. As soon as it is desired to return to the continuous rotary movement of the cylinder the operator has only to throw the belt-shifter levers P P′ in the opposite direction, when the disk L will, by means of the spring *u*, be itself shifted out of engagement with the studs *q*, after which the belt J will then resume its position upon the fast pulley.

An alternative form of device is shown in Figs. 4 and 5. The point of difference between this and the system just described lies chiefly, in the fact that instead of using an intermediate sprocket-wheel, which is alternately coupled to and uncoupled from the driving-shaft G, the treadle appliances are directly connected with a second bevel-gear F′, sliding upon a stationary shaft or axis G′, secured in any convenient position beneath the bed-plate, said bevel-gear being adapted to engage with the horizontal bevel-gear F^2 upon the bottom of the cylinder C, (indicated by dotted lines in Fig. 4,) but being capable of shifting into and out of engagement with the teeth of said gear. The hub *t′* of the gear F′ is provided with an annular groove to engage with an arm T′, mounted upon the end of the belt-shifting rod, which in this instance is indicated by R′. The arrangement of the belt-shifting devices upon the rod R′ and the relation of the fast and loose pulleys thereto are such that when the rod R′ moves to the left in Fig. 4, and consequently throws the gear F′ out of engagement with the gear F^2 upon the cam-cylinder, the belt shall be shifted onto the fast pulley, and conversely the position of engagement between the gears F′ and F^2 shall correspond with the position of the belt upon the loose pulley. In this system the treadle is represented at O′ and is connected by means of a cord N′ with the stud *f′* upon one face of the bevel-gear F′. The return movement is effected by a spring W′, fastened at v^2 to the floor and connected at the other end by means of a cord *v′* to a second stud *f*, mounted upon the face of the gear F′. It will thus be seen that the underlying principle of the two forms is the same, and for the purpose of defining my invention hereinafter I use the term "oscillating wheel" to indicate, broadly, that member of the combination upon which the treadle directly acts, irrespective of whether said member in turn acts directly upon the bevel-gear of the cam-cylinder, as indicated in Fig. 4, or operates through the medium of such parts as the gear F and hub Q, having pins *q* to engage with such oscillating wheel.

Having thus described my invention, I claim—

1. The combination, with the cam-cylinder and a bevel-gear in operative connection therewith, of a shaft, fast and loose pulleys mounted upon said shaft, an oscillating wheel mounted to slide axially and be thrown in and out of operative connection with said gear, a treadle and spring connected with said oscillating wheel, a shifting-rod, a belt-shifter mounted thereon in proximity to the fast and loose pulleys, and a shifting-arm also mounted thereon and connected with said oscillating wheel, substantially in the manner and for the purposes set forth.

2. The combination, with the cam-cylinder and a bevel-gear in operative connection therewith, of a shaft, fast and loose pulleys mounted upon said shaft, an oscillating wheel also mounted upon said shaft and sliding axially thereon, a coupling device whereby said oscillating wheel may be coupled to said bevel-gear, a treadle and spring connected with said wheel, a shifting-rod, a belt-shifter, a head carrying said belt-shifter and rigidly connected with said rod, a shifting-arm connected with said oscillating wheel and provided with a head sliding upon said rod in proximity to the head of the belt-shifter,

and a spring normally tending to throw said shifting-arm toward the head of the belt-shifter to uncouple the oscillating wheel, the respective heads of the belt-shifter and shifting-arm being arranged in such relation upon the rod as that the movement of the belt-shifter onto the loose pulley shall move the shifting-arm to couple the oscillating wheel, substantially as set forth.

WILLIAM H. JACKSON.

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