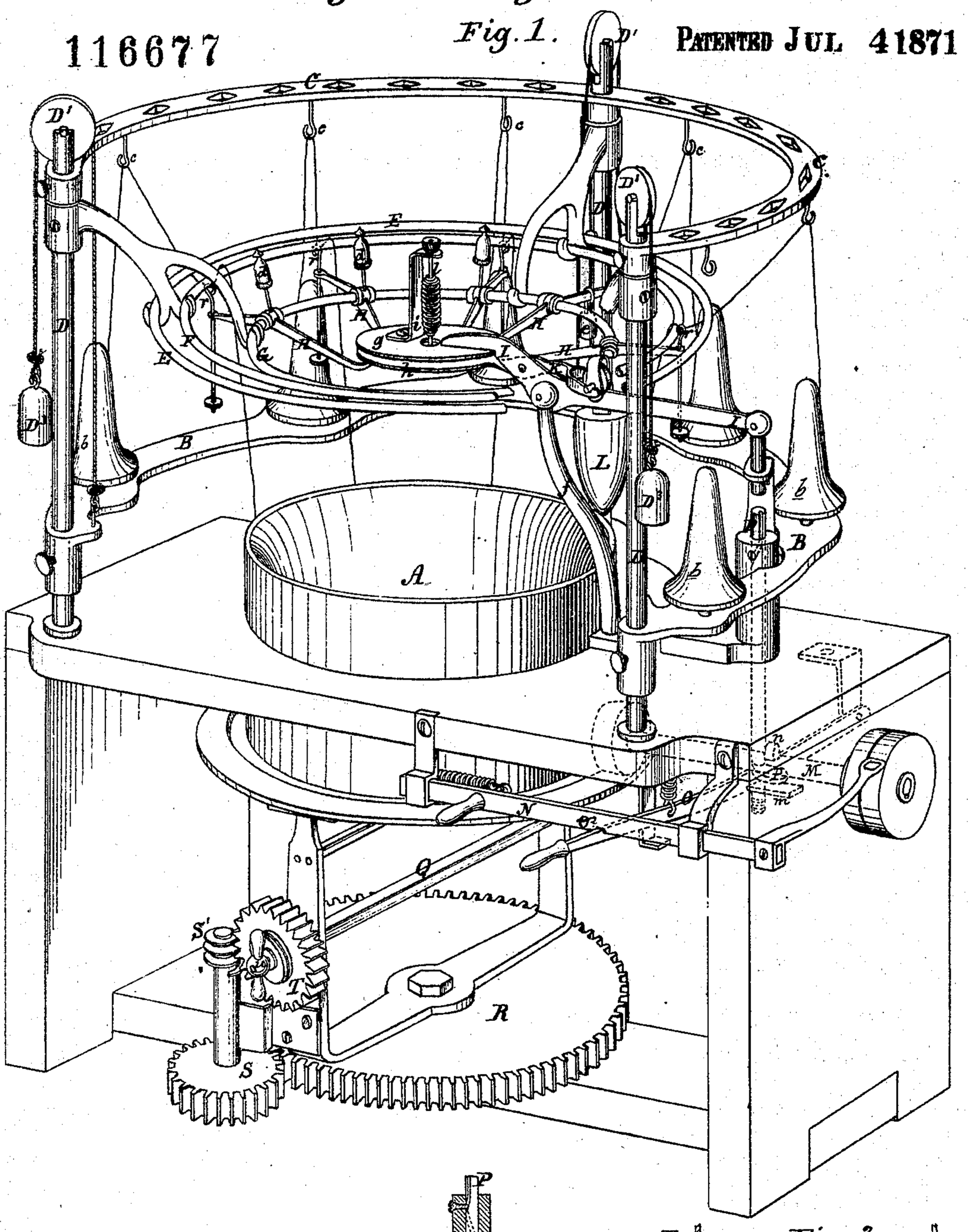
H C Bradford,

Rotary Knitting Machine.

116677

Fig. 1.

PATENTED JUL 4 1871



Witnesses.

Phil. F. Larner.

F. A. Jackson.

Fig 2.

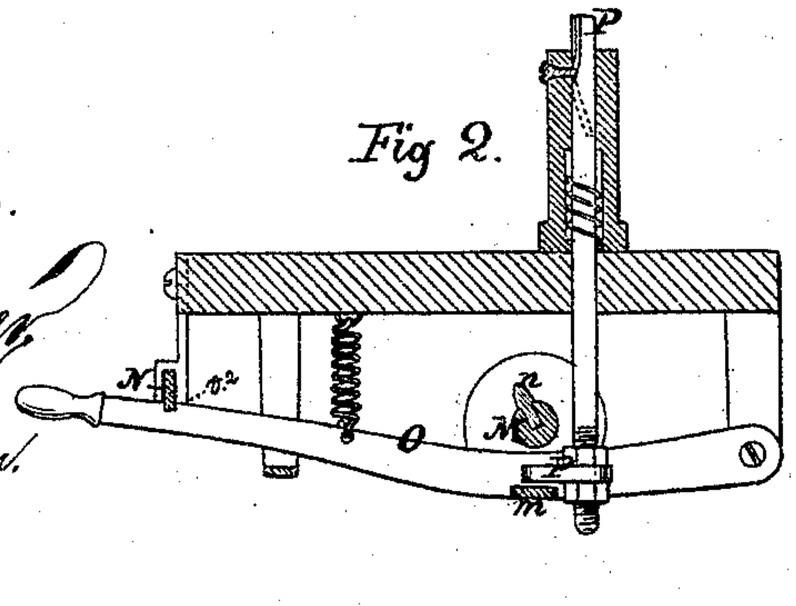
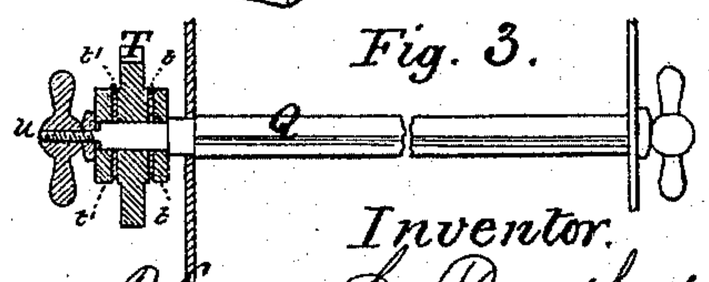


Fig. 3.



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116,677

UNITED STATES PATENT OFFICE.

HORACE C. BRADFORD, OF PROVIDENCE, RHODE ISLAND.

IMPROVEMENT IN STOP-MOTIONS AND CREEL-STANDS FOR KNITTING-MACHINES.

Specification forming part of Letters Patent No. 116,677, dated July 4, 1871.

To all whom it may concern:

Be it known that I, HORACE C. BRADFORD, of the city and county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Rotary Knitting-Machines.

My improvements consist, 1st, in a certain novel stop-motion, so applied that upon the breaking of one of the several yarns the machine will be stopped by a shipping of the belt from a fast to a loose pulley; and 2d, in a novel arrangement of the creel, by means of which the operative can elevate the full set of spools and give free access to the cylinder from either side; and I do hereby declare that the following specification, taken in connection with the drawing furnished and forming a part of the same, is a clear, true, and exact description thereof.

As my several improvements are particularly applicable to such a machine as is described in Abel's patent of July 28, 1870, my drawing and description are prepared as if they were so attached.

Referring to the drawing, Figure 1 represents, in perspective, a machine having my several improvements attached. Fig. 2 represents, in detail, in semi-cross vertical section, the shipper-actuating device and adjacent parts. Fig. 3 represents, in longitudinal vertical section, the racking-up bar, its operating-gear and friction device.

The same letters of reference are used to designate certain parts in all the figures.

A is the revolving cylinder to which the needles are attached. B is the creel on which the yarn-bobbins *b* are mounted. C is a semicircular crown-plate sustained by posts D. The under side of this crown-plate is provided with yarn-hooks *c*. E and F are circular tension-bars, each having the form of a hoop. Both are sustained by brackets from the posts D. The latter F is smaller in diameter than the bar E, and is placed within it, on about the same horizontal plane. The yarn passes from the bobbins *b* upward through the yarn-hooks *c*, then down under the bar E from the outside, up over the bar F, thence downward to the needles in the cylinder. G is a fulcrum-bar of round wire in the form of a ring, with a small section removed. It is smaller in diameter than the tension-bar F, and is placed within and slightly below it. This ring is also supported by arms of the same brackets which support the tension-bars. H, in each case, represents one of several yarn-levers. They are all nicely balanced and mounted on the ring G, which serves as a common fulcrum for as many yarn-levers as there are bobbins employed. Said levers are provided with weights so adjusted that when their outer ends are depressed the weights, by their shifted position, will contribute to the elevating power of the inner ends of the levers. Two kinds of weights are shown; one a fixed weight, *d*, provided with a stem, which is inserted in the lever at a point nearly vertical with the center of the fulcrum-bar, while the lever is horizontal. So long as this weight *d* is thus held aloft, it can exercise little or no influence in deflecting the lever, but when inclined outward its deflecting power increases in proportion as it departs from a right line. The weights *e* are like ordinary bar-scale weights, and are provided with hooks, which embrace the levers and rest upon the edge of their outer ends. When placed adjacent to the fulcrum-bar they exercise but little deflective force; but when once started from that position their leverage increases until, sliding to the outer end, their maximum power of deflection is attained. These yarn-levers are provided with hooked fingers *r* at their outer ends, which embrace and rest upon the yarn as it passes between the tension-bars. I is the main stop-motion lever. It has for its fulcrum a stud in a standard, *f*, rising from the bed of the machine and inclining somewhat over the cylinder. The inner end of said lever is in the form of a disk, *g*. The outer end is straight and so formed that its upper edge will incline downward from the fulcrum to the end. Its outer end is provided with a pendent arm. K is the auxiliary stop-motion lever, and is, in fact, a part of the main lever. Its inner end consists of an actuating-disk, *h*, corresponding in form with the disk *g* of lever I. Its outer end is forked. Said lever is connected by a fulcrum-stud to the main lever at a point adjacent to the main fulcrum, and between that and the inner end of the main lever. The two levers are so formed and connected that the actuating-disk *h*, at the inner end of auxiliary lever K, is exactly below, and with its face parallel with the under face of the disk *g* at the inner end of the main lever, and also so that the outer or forked end of said auxiliary lever K will be above the upper edge of the main lever at a point adjacent to its fulcrum,

but slightly advanced therefrom toward its outer end. The two arms of the forked end curve upward slightly, and are parallel with the main lever slightly above it, and equidistant laterally therefrom. The inner ends of all the yarn-levers bear upward with a gentle pressure against the under side of this disk *h* of the auxiliary lever. On the upper side of the disk *g* is a standard, *i*, from which a wire, *l*, is suspended, which passes vertically through both disks, and is provided with a nut on its lower and upper ends. By means of this wire the relative positions of the two disks may be adjusted, in order to nicely balance the auxiliary lever. L is the main weight for actuating the main lever. It is provided with a curved shank, in which a grooved pulley is mounted on a pin which projects from each side of the shank. The upper edge of the outer end of the main lever has a knife-edge for receiving the grooved pulley. The projecting ends of the pin in the weight-shank constitute a means of connection between the forked arm of the auxiliary lever K and the weight. When suspended upon the forked end of said lever the grooved wheel is free from contact with the edge of the main lever. The weight is counterbalanced by the weight of the disk at the inner end of the auxiliary lever, and is sustained thereon until its outer end is deflected by the elevation of the disk. Following this deflection, the weight leaves the forked end of the auxiliary lever, rests upon and rapidly runs to the extreme outer end of the main lever, and exercises its full deflective force thereon. M is the main shaft, provided at its outer end with a tight and loose pulley. Its inner end, with a bevel-gear keyed thereon, drives the needle-cylinder. N is a spring-shipper, so set that, when its spring can exercise its retractile power, it will carry the belt to the loose pulley. O is a controlling-lever, pivoted at its rear end and sustained at or near its outer end by a spring, having a tendency to hold its top edge in close contact with a notch or slot, o^2, in the lower edge of the shipper-bar. About midway between its ends this controlling-lever has an arm, *m*, projecting at right angles horizontally therefrom toward the driving-pulley. Immediately over this arm *m* is a projecting cam, *n*, on the main shaft, which is free to revolve with the shaft without coming in contact with said arm. This lever O is so guided that it is capable only of a vertical movement. P is a vertical spring-spindle, provided with a housing mounted upon the top of the bed-plate. Its spring is so set that it will sustain the entire weight of the spindle. Near its upper end the spindle is provided with a longitudinal and semi-spiral groove, with which a fixed stud in the housing engages in such a manner that the spindle will partially revolve during its downward movement and resume its original position on its upward movement. Its lower end is provided with a rigid arm, *p*, standing at right angles, and capable of vertical adjustment by means of nuts and a screw-thread cut on the spindle. When said spring-spindle is elevated to its fullest height by the sustaining-spring this arm *p* is located adjacent to the main shaft, on a parallel line therewith. When the screw-spindle is pressed downward it turns this arm *p* toward the main shaft, and so on until it is at right angles thereto, resting upon the projecting arm *m* of the controlling-lever O, and subject to the action of the cam *n* on the main shaft. It will be observed that the top of the spring-spindle P supports the pendent arm of the main stop-motion lever I.

Having thus described in detail the parts pertaining to the stop-motion, I will explain its operation, assuming that the yarn-levers H are all in proper position, their inner ends bearing upward lightly against the under side of the disk *h*, the yarn-fingers *r* embracing the yarn between the tension-bars, the main weight L supported by the forked end of the auxiliary lever K, the spring-spindle elevated, and the shipper so set that the main shaft is revolving, and the machine in operation. On the breaking of a thread the thread-finger *r* falls, deflecting slightly the yarn-lever H until assisted by the weights *d* or *e*, and then raising the inner end of said lever, and then, by contact, the disk *h* of the auxiliary lever, thereby deflecting the forked end thereof and freeing the main weight L, which rapidly slides to the outer end of the main stop-motion lever I, deflecting the spring-spindle P and partly turning the same, thereby causing its arm *p* to extend immediately over the arm *m* of the controlling-lever O. As the main shaft revolves the cam *n* engages with the upper side of the arm *p*, forces it downward on the arm *m*, and carries with it the controlling-lever O, which releases the shipper by leaving the slot o^2, and allows the spring to draw the belt from the tight to the loose pulley, and thus stop the machine. Fair results can be attained by having the main lever I rigid in its standard, with the upper edge of its outer end on a sharp quick incline downward from the standard, and terminating at a point above the top of the spring-spindle, which should be provided with a broad cup-shaped cap, for receiving the weight on leaving the incline. The auxiliary lever, when separately considered, constitutes a tripping device for releasing the main weight from the position where it is securely yet delicately withheld from contact of its wheel with the upper edge of the bar. The inner end of the main lever, when used in conjunction with the auxiliary lever, exercises no specific function, save as a support for the adjusting device which controls the proper elevation of the disk *h*. It is obvious, however, that an adjusting device of the same character can be placed on the outer end of the main lever, and arranged to depress the outer end of the auxiliary lever, and thus accomplish the same result.

I will now proceed to explain the construction and operation of my creel improvement. The creel B is fitted to slide vertically on the posts D, and by means of thumb-screws it can be held firmly at any desired elevation. In the upper ends of the posts D grooved pulleys D^1 are mounted. Cords attached to the creel are passed upward over these pulleys, and provided with weights D^3 of sufficient capacity to counterbal-

ance the weight of the creel and cause it to remain at any desired position. By this means, when free access to the cylinder is required from all sides, the thumb-screws may be loosened and the creel raised nearly to the crown-plate, where it will remain entirely out of the way until the machine is ready for starting. Heretofore the creel-bars have been fixed, or at least not balanced, and were incapable of an easy and ready movement to allow of free access to all parts of the cylinder.

It now remains for me to describe the racking or take-up motion. The racking-bar Q is square, as in other similar machines. It is mounted in vertical supports attached to and turning with the cylinder. R is a stationary gear, mounted in a cross-bar below the rack-bar Q. Its center is on a true vertical line with the center of the cylinder, and a stud placed in the center of the gear serves as an axis for the frame-work which supports the rack-bar. S is a pinion engaging with the gear R. It is keyed to the lower end of a vertical shaft sustained in a hanger attached to the rack-bar frame. At the upper end of this shaft is a worm, S′. T is the rack-gear, mounted loosely upon one end of the rack-bar. Its teeth engage with the worm S′, keyed to the bar. On the inside of the gear is a washer, *t*. On the outer side of the gear there is another washer, *t′*. Between each of these and the gear a friction-washer of raw-hide or other suitable material is placed. At the end of the bar is a screw-thread, and a suitable nut, *u*, for increasing or decreasing the degree of pressure on the gear, for it is by this frictional contact wholly that motion is imparted to the rack-bar. Whenever the strain on the gears is greater than is desirable for the fabric, the gear will slip and thus prevent injury to either machine or fabric.

I am aware that a variety of take-up motions has been devised for rotary knitting-machines, and that some of them are operated by frictional surfaces.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination of the yarn-levers, the actuating or tripping-lever, and the shifting weight, when arranged and operating substantially as described.

2. The combination of the spring-spindle P provided with an arm, *p*, and capable of a partial rotary movement, the cam *n* on the main shaft, the controlling-lever O provided with an arm, *m*, and the spring-shipper N so arranged that the depression of the spring-spindle will cause the shipper to be released, substantially as described.

3. The combination of the spring-spindle, the shipper, and the intermediate operative mechanism with the yarn-levers, the actuating or tripping-lever, the shifting weight, and a suitable connecting device, so arranged that the weight, when released by the breaking of a single yarn, will be directed to and allowed to exercise its deflective force upon the spring-spindle, and thereby release the shipper, substantially as described.

4. The combination of the posts D, the vertical sliding creel B, and the balance-weights D^3, substantially as and for the purposes specified.

HORACE C. BRADFORD.

Witnesses:

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