

No. 610,461.

Patented Sept. 6, 1898.

C. T. STETSON, Dec'd.

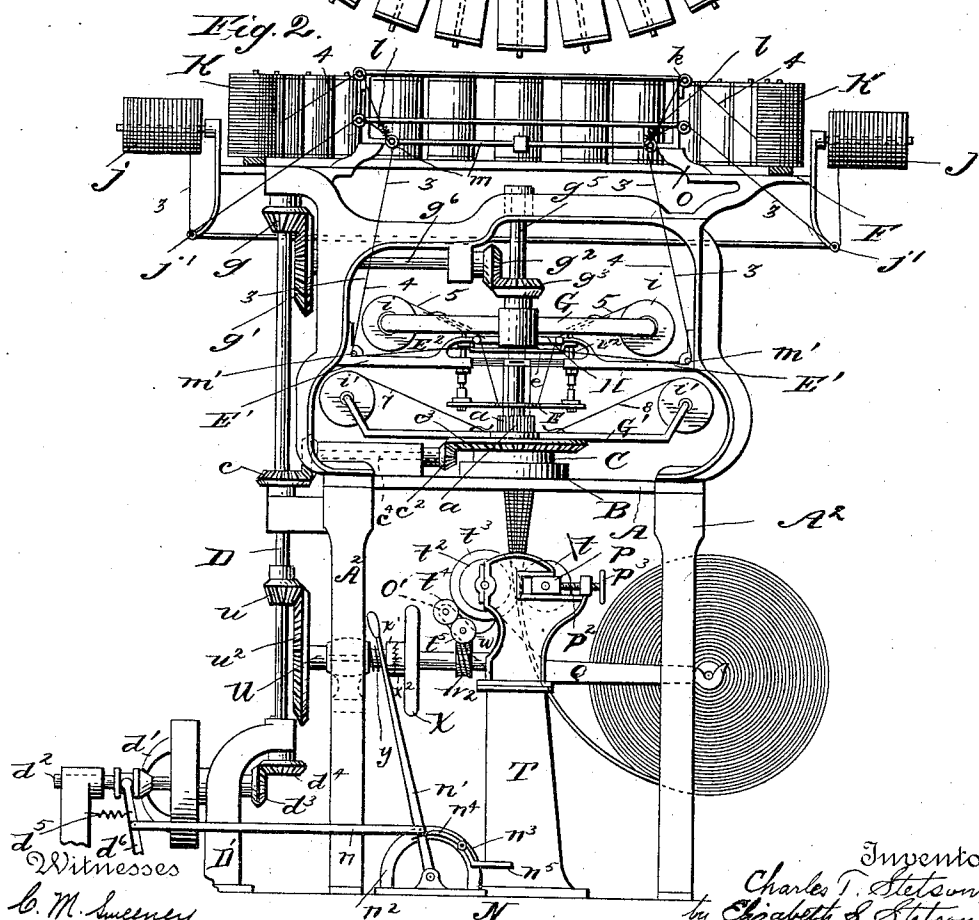
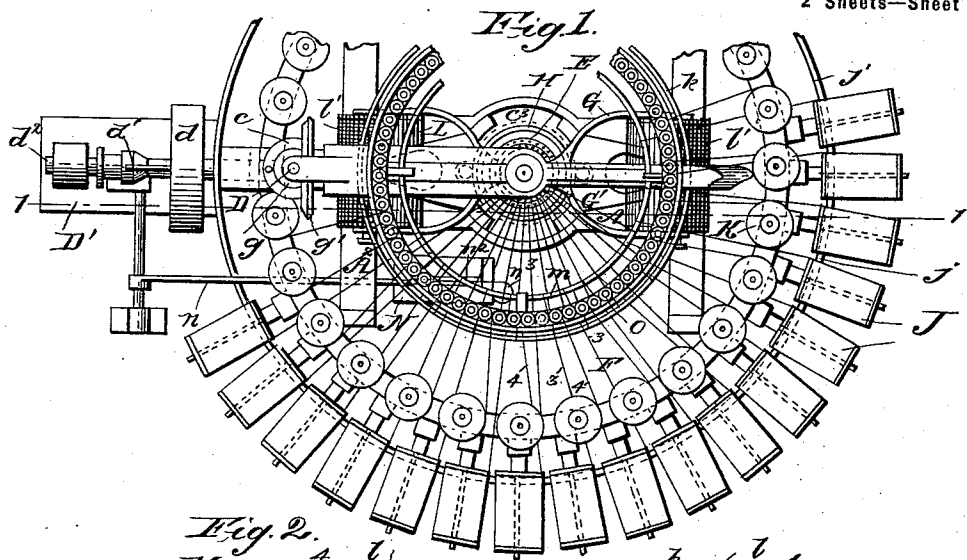
E. S. STETSON, Executrix.

CIRCULAR KNITTING MACHINE.

(Application filed Oct. 5, 1896.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses

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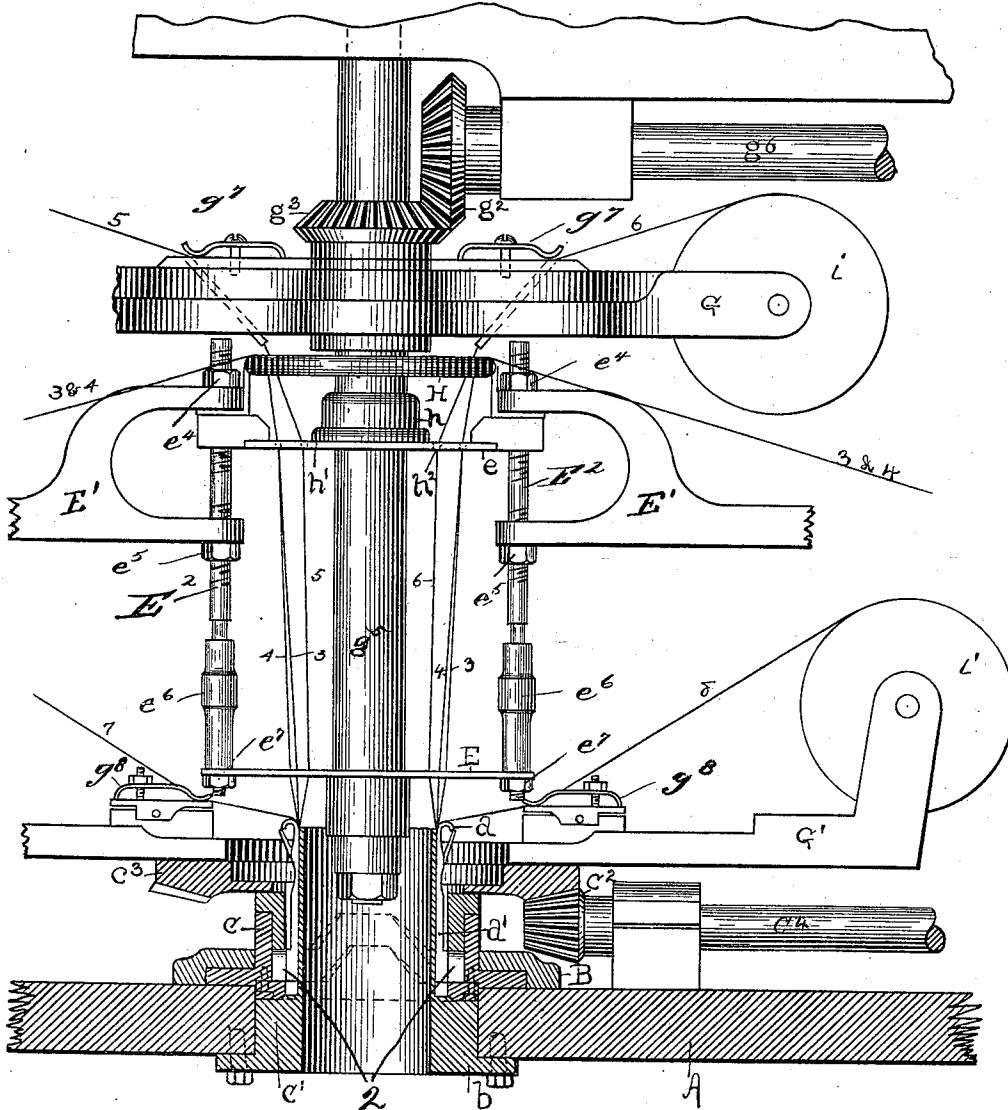
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2 Sheets—Sheet 2.

Fig. 3.



WITNESSES

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CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 610,461, dated September 6, 1898.

Application filed October 5, 1896. Serial No. 607,973. (No model.)

To all whom it may concern:

Be it known that CHARLES T. STETSON, deceased, late a citizen of West Hanover, in the county of Plymouth and State of Massachusetts, did invent certain new and useful Improvements in Circular-Knitting Machines, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention relates to knitting-machines for the production of tubular-knitted fabrics, and is intended as an improvement upon that class of knitting-machines shown in United States Patent No. 430,300, patented June 17, 1890, and which are more specifically designated as "complete" machines which are capable of knitting a fabric of several plies embodying two or more sets of warp-threads which are bound together by the loops of knitting-threads.

In carrying out this invention a number of serious faults have been avoided which appear in the machines shown in Patent No. 393,189, granted to Stowe November 20, 1888; also, Patent No. 537,317, granted to Stowe April 9, 1895; also, No. 130,866, granted to Ramsdell August 27, 1872; also, No. 246,288, granted to Callahan August 30, 1881, and No. 430,593, granted to Sibley June 17, 1890. In these three latter machines, which are constructed upon the same general principles, the warp-holding frame is made in such a manner as to rotate around the vertical axis of the machine, which besides being dangerous obscures the concentrated vision of the operator upon the knitting-point of the fabric being constructed, so that the knitting is not properly watched, as it should be. The form of construction referred to above complicates the machine and renders its operation unsteady and liable to produce a reciprocating motion, which produces an uneven and unsatisfactory waviness in the fabric being produced. An objection is also found in Patent No. 430,300 to Rhome and Herkner and No. 393,189 to Stowe in that the warp-carrying frames are so situated as to be in the way of the operator and to prevent a clear and unobstructed view of the machine.

This invention is intended to be an im-

provement upon these patents above mentioned, because both sets of the warp-threads are situated upon a stationary non-rotating frame entirely above the line of vision of the operator, and the warp-threads are so led to the knitting-point of the machine as to be practically out of the line of sight of the operator until they arrive directly at the knitting-point. The two sets of weft-bobbin-carrying arms are placed one above the other in as close proximity as is possible and as near to the knitting-point as is practical, so as to concentrate the moving parts of the machine in as small a space as is possible and in as low a position relative to the knitting-point as is practical, so as to lower the center of gravity of the machine without necessitating, as in some of the machines above referred to, leading all the warp-threads through a hollow sleeve where they are not easy of access. There is also provided an easy means of removing the knitting-needles from the machine, in case of their becoming broken or damaged, in the easiest possible manner without disturbing the rest of the machine, and also a starting, stopping, and take-up mechanism in conjunction with the main machine, which is at the same time positive and efficient, and yet readily thrown in and out of operation.

The principal features of this machine or invention can best be understood by referring to the accompanying drawings.

Figure 1 is a front elevation of a knitting-machine embodying the invention with the front portion of the warp-carrying frame cut away on the line 1 1, so as to more clearly show the guide-rings, the position of the tension mechanism, and the leading of the warp-threads to the knitting-point. Fig. 2 is a horizontal plan, in part, of this machine with some of the warp-spools left out on the left-hand side, so as to more clearly show a plan of the starting, stopping, and driving mechanism. Fig. 3 is a part vertical elevation showing the knitting and weft bobbin-carrying arms and guide-rings with their supporting parts in elevation and a part-vertical section of the frame, needle-carrying cylinder, cam-ring, knitting-needles, and knitting-cam

in section, all on a larger scale than that shown in Figs. 1 and 2.

Referring to these several figures, A² represents the supporting-frame of the machine; 5 A, the frame supported thereon; B, a stationary plate resting upon frame A, and *b* a stationary needle-carrying cylinder having a flange on its lower part by which it is fastened to the frame A and is provided with 10 vertical grooves in which fit the shanks *a'* of the knitting-needles *a*. The cam-ring C has fastened to it at the top a bevel inverted crown-gear *c*³, which is driven by the bevel-pinion *c*², which in turn is situated on the 15 horizontal shaft *c*⁴, on the other end of which is placed the bevel-pinion *c'*, which in turn receives its motion from the bevel-pinion *c*, which is situated on and receives its motion from the vertical driving-shaft D. The rotating of this cam-ring C serves to give the 20 usual vertical reciprocating motion at the proper time to the needles *a* by means of the irregular-shaped slot 2, bounded by its upper and lower half. The warp-threads 3 and 4, 25 which are carried upon the warp-frame F, are led down into longitudinal position parallel with the needle-cylinder *b* and into proper relative position to knitting-needles *a* by means of the guide-rings H, *e*, and E, which are supported on studs E² carried by the arms 30 E' on the main frame A of the machine.

The knitting-threads 5 and 6 and the weft-threads 7 and 8 are supported on bobbins *i* and *i'*, carried by revolving arms G and G', 35 which revolve about the central axis of the machine. Both sets of threads pass beneath the spring take-ups or tension devices *g'* *g*⁸, carried by the arms G G', respectively, so that the proper tension is given to the threads as they pass to the knitting-point. It will be 40 seen that the studs E² are adjustable in the arms E', so that the position of the guide-rings H, *e*, and E may be changed to vary the run of the threads which are controlled 45 by said guide-rings in their passage to the knitting mechanism. Said studs E² are locked in their different positions by means of the nuts *e*⁴ *e*⁵. The guide-ring E has an adjustment independent of the adjustment just described, said second adjustment being accomplished by means of the sleeves *e*⁶, which 50 slide on the lower ends of studs E² and support the ring E, said sleeves being held in their adjusted positions by means of the nuts *e*⁷. 55 The arms G are driven from the vertical main driving-shaft D through the medium of the gear-wheel *g*, situated thereon, gear-wheel *g'* on the horizontal shaft *g*⁶, bevel-gear *g*², situated upon the other end of this shaft, and 60 bevel-gear *g*³, situated upon the central vertical shaft *g*⁵, while the arms G' are fastened on the upper side of the inverted bevel crown-gear *c*³, previously referred to, and are rotated by it. The knitting-threads are guided 65 into their proper positions by being passed through the diagonal tubes in the arms G, inside the warp guide-ring H, then between the

flange *h'* of guide-ring *h* and ring *e*. Said flange *h'* is fastened to and rotates with the arms G on the central shaft *g*⁵ of the machine. 70 By this construction the knitting-threads are brought into proper position inside of the line of warp-threads 3 4. The weft-threads 7 and 8 do not need to be so guided, as they 75 pass directly to the knitting-point without obstruction. The warp-threads 3, which come from the line of bobbins J, pass under the guide-ring *j*, which is carried by warp-frame F up over the guide-ring J' through the tension devices *l* over the guide-ring *m*, which is 80 carried by the tension-frame O, and, together with the warp-threads 4, under the guide-ring *m'*, which is common to both warp-threads, then over the guide-ring H through the eyes *h*² in the guide-ring *e*, then through the holes 85 in the lower guide-ring E to the knitting-point, where they are brought into conjunction with knitting-threads 5 and 6 and weft-threads 7 and 8, and in this way do not obstruct a proper view of the knitting-point by 90 the operator. The warp-threads 4, which are wound upon bobbins K, are carried up over the guide-ring *k*, down through the tension-fingers *l*, over the guide-ring *m*, under guide-ring *m'*, and thence over the guide-ring H, 95 and then through the eyes in the guide-ring *e*, thence through the eyes in the lower guide-ring E, and are thus brought down parallel and in proper relation to needles *a*, in conjunction with the knitting-threads 5 and 6 and 100 the weft-threads 7 and 8, the two knitting operations being performed at the same time at different points on the circumference of the fabric, the internal cam C for giving motion to the needles *a* being of the proper shape to 105 produce two reciprocations of the needles to one complete revolution of the cam.

At the lower end of the driving-shaft D is situated the driving-stand D', having the driving-pulley *d*, friction-clutch mechanism 110 *d'*, of any preferred construction, shaft *d*², miter-gear *d*³, engaging with the miter-gear *d*⁴, which is keyed to the main shaft D, and the spring *d*⁵ to pull the clutch-lever *d*⁶ back, and thus disengage the clutch mechanism *d'*. 115 From the clutch-lever *d*⁶, which is fulcrumed to the driving-stand D, a reach-rod *n* leads to a lever *n'*, which is fulcrumed to the operating-stand N. On this stand is a quadrant *n*², carrying a latch *n*³, which is provided with a 120 spring *n*⁴ and foothold *n*⁵, which latch engages with the operating-lever *n'* to hold it in such a position as to throw into contact the clutch mechanism *d'* and cause the driving-shaft D to revolve, while a pressure of the foot 125 upon the foothold *n*⁵ causes the latch *n*³ to fly up and release the lever *n'* and disengages the clutch mechanism *d'*, stopping the motion of the driving-shaft instantly.

Situated directly beneath the center of the 130 knitting-point of the machine is the take-up stand T, provided with the small friction take-up rollers *t* and *t*². Situated on the same shaft as the intermediate gear *t*³ is the worm-

wheel w , which meshes with the worm w^2 , which is carried on a sleeve on the take-up shaft U, to which motion is imparted by the gear u on the driving-shaft D and the gear u^2 , which is keyed fast to the take-up shaft U. On the sleeve carrying the worm w^2 is a hand-wheel x , which derives its motion through the medium of the clutches x' and x^2 , which latter is keyed fast to shaft U, but has a lateral movement parallel to its axis. The two faces of the clutches x' and x^2 are kept in contact by means of the spring y . The shaft on which the take-up roller t is located is carried in boxes p , which are pressed up so as to draw upon the completed fabric by motion of the screws p^2 and hand-wheel p^3 . The take-up stand is also provided with two longitudinal arms Q, the ends of which are hooked, so as to carry a spindle upon which the completed fabric may be wound. Arms O' project from the opposite side of the stand T and form supports for the gears t^4 t^5 . The operation of the devices thus described is as follows:

The knitting-bobbins i and weft-bobbins j' and the warp-bobbins J and K being provided with knitting weft and warp threads, the warp-threads being led over the guide-rings and through the guide-eyes in the rings E and e and the knitting-threads led to the knitting-point, as described, motion is imparted to the main shaft D by the belt driving the clutch-pulley d . Then by means of the mechanism described rotary motion is imparted to the bobbin-arms G and G' and a reciprocating motion to the knitting-needles a by means of the cam-gear c^3 and the cams located inside of the cam-ring C. The needles in succession rise each in its turn. The knitting-needles a draw the knitting-threads 5 and 6 through the warp-threads 3 and 4, making loops around the weft-threads 7 and 8, passing the end of one loop through the bight of the next preceding loop, thus binding the fabric together and making the well-known knitting-stitch. The continued repetition of the above operation produces a tubular fabric which as it is formed passes down through the interior of the stationary needle-cylinder b , where it is caught between the two take-up rollers t and t^2 , which have a peripheral speed in such proportion to the size of the knitting-threads 5 and 6 and weft-threads 7 and 8 as to draw away the completed fabric as fast as it is made. The completed fabric after passing through these rollers t and t^2 passes under them and is coiled on a spindle carried by the longitudinal arm Q. The hand-wheel x , previously described, is to enable the taking up of the fabric to be accelerated and assisted by hand when it is desired.

Having thus fully described the construction and method of operation of this machine, what is desired to be claimed, and secured by Letters Patent is as follows:

65 1. In a circular-knitting machine for the production of tubular fabrics, the combination with a suitable supporting-frame, of a se-

ries of stationary warp-thread bobbins mounted on said frame, a second series of stationary warp-thread bobbins carried by said frame in close proximity to the first-mentioned warp-thread bobbins, knitting mechanism comprising a cam-cylinder and knitting-needles, means for rotating said cylinder, horizontal arms carried by said cylinder, weft-thread bobbins carried by said arms, so that said bobbins rotate in a plane above the knitting-point a vertical shaft depending from the top of the supporting-frame, means for rotating said shaft, horizontal arms secured to said shaft, knitting-thread bobbins carried by said arms, two arms carried by the main frame and projecting inwardly between the planes of rotation of the weft and knitting thread bobbins, vertical studs mounted in the inner ends of said inwardly-projecting arms, and guide-rings carried by said studs which control and direct the two lines of warps and the weft-threads to said knitting mechanism.

2. In a circular-knitting machine for the production of tubular fabrics, the combination with a suitable supporting-frame, of a series of stationary warp-thread bobbins mounted on said frame, a second series of stationary warp-thread bobbins carried by said frame in close proximity to the first-mentioned warp-thread bobbins, knitting mechanism comprising a cam-cylinder and knitting-needles, means for rotating said cylinder, horizontal arms carried by said cylinder, weft-thread bobbins carried by said arms, so that said bobbins rotate in a plane above the knitting-point a vertical shaft depending from the top of the supporting-frame, means for rotating said shaft, horizontal arms secured to said shaft, knitting-thread bobbins carried by said arms, two arms carried by the main frame and projecting inwardly between the planes of rotation of the weft and knitting thread bobbins, vertical studs adjustably mounted in the inner ends of said inwardly-projecting arms, and guide-rings carried by said studs which control and direct the two lines of warps and the weft-threads to said knitting mechanism.

3. In a circular-knitting machine for the production of tubular fabrics, the combination with a suitable supporting-frame, of a series of stationary warp-thread bobbins mounted on said frame, a second series of stationary warp-thread bobbins carried by said frame in close proximity to the first-mentioned warp-thread bobbins, knitting mechanism comprising a cam-cylinder and knitting-needles, means for rotating said cylinder, horizontal arms carried by said cylinder, weft-thread bobbins carried by said arms, so that said bobbins rotate in a plane above the knitting-point a vertical shaft depending from the top of the supporting-frame, means for rotating said shaft, horizontal arms secured to said shaft, knitting-thread bobbins carried by said arms, two arms carried by the main frame and project-

- ing inwardly between the planes of rotation of the weft and knitting thread bobbins, vertical studs adjustably mounted in the inner ends of said inwardly-projecting arms, two 5 guide-rings carried at the upper ends of said adjustable studs, sleeves sliding on the lower ends of said studs, a guide-ring carried by said sleeves, and nuts to hold said sleeves and ring in adjusted position.
- 10 4. In a circular-knitting machine for the production of tubular fabrics, the combination with a suitable supporting-frame, of a series of stationary warp-thread bobbins mounted on said frame, a second series of 15 stationary warp-thread bobbins carried by said frame in close proximity to the first-mentioned warp-thread bobbins, knitting mechanism comprising a cam-cylinder and knitting-needles, means for rotating said cylinder, horizontal arms carried by said cylinder, weft-thread bobbins carried by said 20 arms, weft-thread tension devices on said arms, so that said bobbins rotate in a plane above the knitting-point, a vertical shaft depending from the top of the supporting- 25 frame, means for rotating said shaft, horizontal arms secured to said shaft, knitting-thread bobbins carried by said arms, tension devices on said arms, two arms carried by 30 the main frame and projecting inwardly between the planes of rotation of the weft and knitting thread bobbins, vertical studs adjustably mounted in the inner ends of said inwardly-projecting arms, two guide-rings 35 carried at the upper ends of said adjustable studs, sleeves sliding on the lower ends of said studs, a guide-ring carried by said sleeves, and nuts to hold said sleeves and ring in adjusted position.
- In testimony whereof I, ELIZABETH S. 40 STETSON, have signed my name to this specification, in the presence of two subscribing witnesses, on this 11th day of September, A.D. 1896.
- ELIZABETH S. STETSON,
Executrix of the estate of Charles T. Stetson,
deceased
- Witnesses:
 WM. D. HUBBAR,
 CHAS. W. HOWLAND.