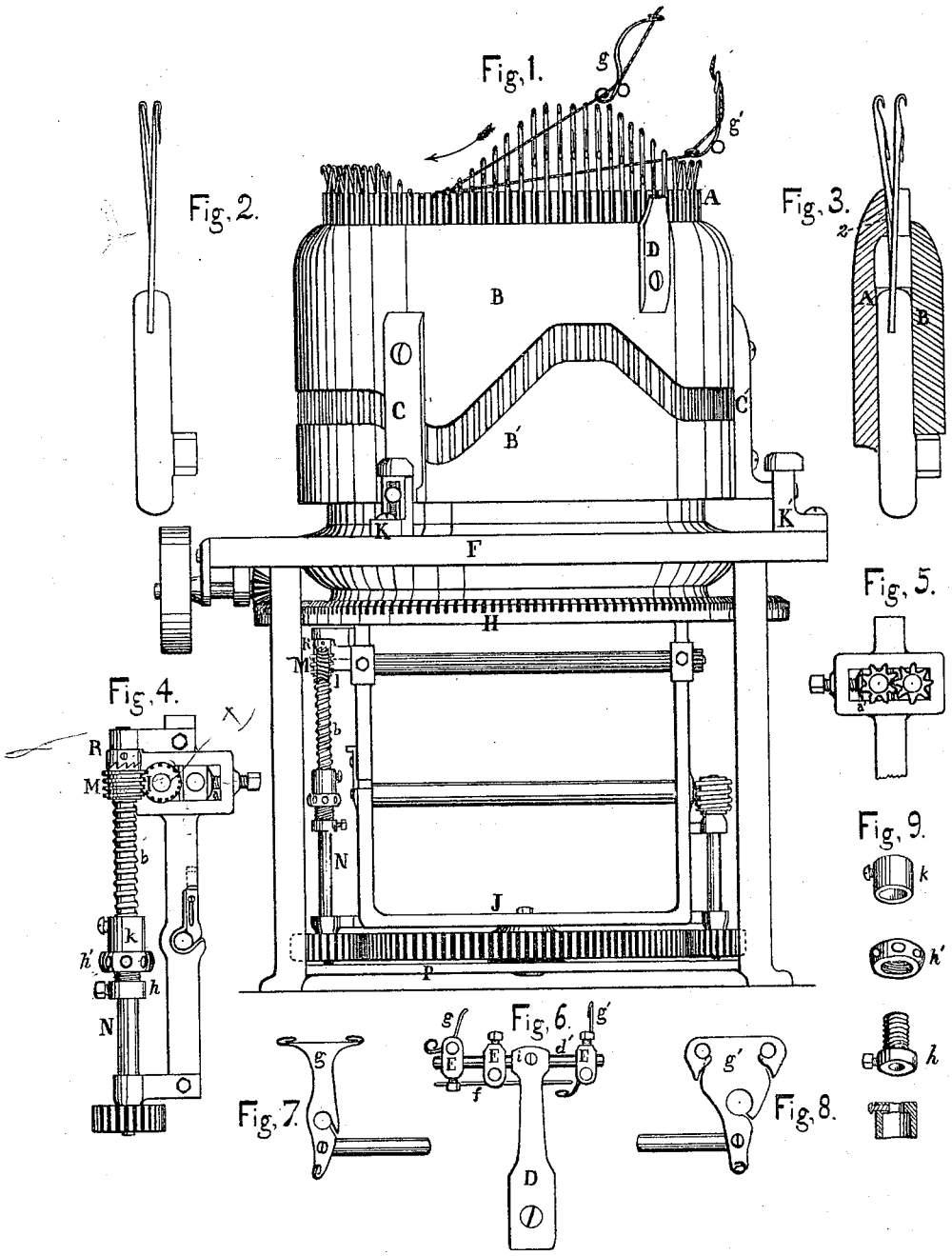
C. L. SPENCER & S. W. PINGREE.

WEFT-THREAD KNITTING-MACHINE.

No. 185,411. Patented Dec. 19, 1876.



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IMPROVEMENT IN WEFT-THREAD-KNITTING MACHINES.

Specification forming part of Letters Patent No. **185,411**, dated December 19, 1876; application filed June 7, 1876.

To all whom it may concern:

Be it known that we, CHARLES L. SPENCER, of Providence, in the county of Providence and State of Rhode Island, and SAMUEL W. PINGREE, of Lawrence, in the county of Essex and State of Massachusetts, have invented certain new and useful Improvements in Weft-Thread-Knitting Looms; and we do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 represents a front elevation of our loom. Fig. 2 is an elevation of one of the needle-jacks, and showing two barbed needles. Fig. 3 is a sectional elevation of a portion of the revolving cylinder which carries the needles, and of its casing, a jack being shown in position between them, in which is inserted a latch-needle, a second needle being shown for the purpose of illustrating the position of the needles with reference to each other when in use. Figs. 4, 5, 6, 7, 8 and 9 are detailed parts of our device.

The object of this invention is to provide, in a barb or latch needle knitting-machine, a simple and positive means whereby a weft-thread may be interwoven into the fabric with the loops or stitches without danger of injury to the reciprocating needles, or the straining or breaking of the yarn or thread, or dropping of stitches, and to equalize the taking up of goods as fast as formed, by maintaining a uniform tension at all times between the reciprocating needles and the rollers of the take-up, as hereinafter described.

Our invention relates to that class of knitting-machines whereby a weft or filling thread is inserted or woven into the stitches of the goods for the purpose of producing a fabric that may be finished equal to cloths woven upon looms of the usual construction. To do this it is necessary that the weft or filling threads be inserted in such a manner as to be positive in passing under the latches of the needles, and between them, in order that the desired style of goods may be produced.

Our invention consists in so arranging the needles in the jacks, by inclining such needles to any required angle therewith, that the upper ends of said needles may stand in a zig-zag line when projected above the cylinder which carries them, without the employment of wheels or any other extraneous mechanical device for preserving their alignment, a portion of said needles being set or inclined outwardly, and another portion being set or inclined inwardly, thus forming a continuous channel or space for the insertion of the weft or filling when the needles are elevated for the purpose; and it further consists in the construction of a mechanical take-up for the cloth, as hereinafter described, it being automatic in its operation, and operating with reference to the movement of the needles in the manufacture of all kinds of goods.

In the accompanying drawing, A represents the revolving cylinder for carrying the reciprocating needles and their jacks. The casing of the cylinder is shown at B B′, it having one or more cam-shaped grooves formed in it for operating one or more sets of needles and their jacks, and being provided with a suitable number of braces or supports, C C′, secured externally, for the purpose of holding the casing in position and securing the sections B B′ at a suitable distance from each other to cause them to form a double helical cam for the projections formed upon the needle-jacks to move in, and thus give the required motion to the needles.

Externally on the upper end of the casing B a standard, D, is arranged, and secured thereto, having a cross-bar, *d′*, extending through its upper head, as shown in Fig. 6, it being made adjustable and held in position by a set-screw, *i*. To this cross-bar are fitted the adjustable clamp-blocks E E, for holding the latch-guard *f* and the thread-guides *g* and *g* in their proper positions. F, Fig. 1, represents the top plate of the frame of the machine in which the cylinder A is made to revolve, said cylinder being provided at its lower end with a gear-wheel, H, having at the center an annular opening to admit of its being connected with the cylinder. By means of this wheel motion is imparted to the other moving parts of the machine, it receiving its motion

from a small beveled pinion turned by a crank or by means of a pulley, as shown in Fig. 1 of the drawing, the wheel H also serving to hold the cylinder in position.

Brackets K K′ are secured to the top of plate F of the frame, and are provided with vertical slots. The lower projecting ends of the supports C C′ of the case are fitted therein, so as to be raised or lowered with a screw passing through their centers.

By this arrangement the reciprocating needles may be adjusted to form the proper length of stitch required in different numbers or run of yarn.

In order that the path or passage heretofore alluded to may be formed between the upper ends of the reciprocating needles for the reception and passage of the weft or filling thread, as it passes from the guide *g′*, the slots in the upper ends of the jacks are cut at an angle to their axis, so that the upper ends of the needles, when elevated, may stand divided or in different concentric lines, as represented in Figs. 2 and 3 of the drawings.

This method of constructing the jacks enables the constructor to use needles which are straight in their general outline, and consequently are more easily and accurately formed, and when made and secured in the jacks are far less liable to be broken, because the change in position of their upper ends when in use is produced by a springing of the entire length of the needle, and not by a bending at a particular point, as is the case in needles that are bent at or near the jacks for the purpose of giving them the requisite angle when elevated.

It will, however, become necessary in forming different patterns of goods to set or incline two or more adjacent needles outwardly, and two or more inwardly, alternately. The weft-thread is inserted between the advancing needles at or near the point where they begin to rise, as represented in Fig. 1, the cam-groove being so formed that the top ends of the advancing needles, before they begin to rise, range on a line, or nearly so, with the lower ends of the hanging latches of the same when elevated to the highest point, and thus the desired result, a positive insertion of the weft-thread below the latches, is attained without the use of any of the mechanical devices heretofore employed for that purpose.

This last-described feature of our improvement constitutes an important feature of our invention, as it removes all danger of injury to the needles, enables us to produce a more perfect character of goods, and enables the machine to be run at a higher rate of speed, and so produce a greater amount of cloth in a given period of time than could otherwise be done.

To insure the proper operation of the latches of the inwardly-inclining needles, and the insertion between them and said needles of the warp or looping thread—which thread is inserted in advance of the weft—the needles are brought forward as they descend by the inclined surface of the upper end of the groove in the cylinder, as shown at 2 in Fig. 3. The outward movement of the needle at this point has the effect to press it against the weft or filling thread. The lower ends of the latches come in contact therewith, and they are thus carried up and made to clasp the warp or knitting thread between themselves and their needles just before the stitch is formed, the outwardly-inclined needles being drawn into a line with the others by the tension of the cloth put upon it by the take-up, soon to be described. The guard *f* is situated in front of the needles between the two thread-guides, to prevent the latches from flying out of place when the needles are rising or descending, and before they pass beyond the warp or looping thread.

For the purpose of equalizing the taking up of the cloth as formed, we employ two fluted rollers, arranged in a frame, represented at J, Fig. 1, the upper ends of the vertical parts of which are secured to the gear-wheel H, in order that it may revolve with the cylinder A. At a suitable distance below their upper ends these vertical portions of the frame are enlarged, as shown at Figs. 4 and 5, for the purpose of causing them to receive and hold in position boxes in which the take-up rollers revolve, said rollers being geared at one of their ends, so as to be caused to turn together, and they are made adjustable in their approximation toward each other by two set-screws, which press against elliptic springs *a* and *a′*, arranged in contact with the boxes of one of the rollers, for the purpose of giving a yielding pressure thereto, and making it equal at each of their ends, so that the cloth may pass between them as fast as formed.

For operating the rollers above alluded to, a worm-wheel, I, is placed upon one end of them, to which a worm, M, placed upon the upper end of a vertical shaft, N, gives motion. Upon the upper end of worm M a ratchet-surface is formed, the worm being fitted loosely upon its shaft so as to turn thereon, said shaft extending from the top to a short distance below one side of frame J, it being attached thereto so as to revolve in suitable bearings, its lower end being provided with a small gear-wheel, which meshes into a stationary wheel, P, situated at the base of the machine. The frame J is opereted by the gear-wheel H, and in connection with the cylinder A, it turning upon a stud at the center of its base, and above the wheel P, which is stationary, the consequence of which is that a rotary motion is imparted to the shaft N, to the upper end of which a collar, R, is secured, having ratchet-teeth formed upon its lower surface, and made to fit those on the worm M. By this arrangement the two ratchet-surfaces may be held in gear by a spiral spring, *b*, on the shaft N, said spring being made to act with the required pressure

against the lower surface of the worm M. In order that the required pressure for regulating the action of the take-up rollers may be brought to bear upon the worm, a hollow screw, *h*, with a nut, *h'*, placed thereon, is provided, and a cap, *k*, is made to slide over the end of the screw, the details being shown at Fig. 9, and the parts in position in Fig. 4, of the drawings, where the parts are shown as being held in position by a set-screw fitted through the side of the hollow screw *h*. The fluted rollers of the take-up are positive in their action when the spiral spring is properly adjusted, and are self-regulating in the taking up of the cloth as fast as formed, and at the same time they exert an even strain on the selvage-edge thereof, or on the stitches as they are being formed. To avoid any slack in the cloth between the needles and the rollers, it is necessary to have said rollers revolve with a greater speed than is absolutely necessary to take up the same, and to permit this to be done without injuring the goods or the needles of the machine, the clutch upon the worm and the collar R are provided, and so arranged that when in gear a positive action is given to the rollers, which, in consequence of the fact that their surfaces move faster than the cloth can be formed, causes a strain to be put upon the cloth, and thus draws one portion of the needles into position while the stitch is being taken, as previously described, and at the same time, owing to the action of the goods upon the rollers, the worm M, operated upon by the worm-wheel I, when too much strain is exerted upon the cloth, compresses the spring *b*, carrying the teeth of the worm-wheel away from those on the ring or collar, R, thus disconnecting the clutch, and allowing the shaft N to revolve freely while the worm remains stationary; but as soon as the knitting has proceeded to such an extent as to relieve the strain upon the goods, the worm is relieved from its downward pressure, and the spring returns it to its original position, where it again clutches with the collar or ring, and the positive connection is restored, and thus a self-regulating and suitable strain or tension is put upon the goods throughout the whole operation.

For receiving the goods from the fluted rollers, a cloth beam or roller may be arranged in the center of the frame, and motion may be imparted to it by any suitable mechanism; or the goods may be led to any other position, and then wound upon a beam, or folded, as as desired.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a machine for knitting cloth, in which a filling-thread is inserted or woven into the stitches, that portion of the jacks which carry the needles constructed with an inwardly-inclined slot or surface for the needles to rest in or against, and the alternate ones with an outwardly-inclined slot or surface for the needles, substantially as and for the purpose set forth.

2. The combination of the take-up rollers with the shaft N, ratchet R, worm M, spring *b*, and regulating mechanism *h*, *h'*, and *k*, the parts being constructed and arranged to operate substantially as and for the purpose set forth.

3. The combination of the gear-wheel H, revolving frame J, fixed wheel P, and shaft N, with its automatically-operating worm-wheel M, the parts being arranged to operate substantially as set forth.

In testimony that we claim the foregoing as our own invention we affix our signatures in presence of two witnesses.

CHARLES L. SPENCER.
SAMUEL WHITE PINGREE.

Witnesses:
T. W. ROLLINS,
TRUE W. ROLLINS, Jr.