

A. C. CAREY.  
KNITTING MACHINE.

No. 47,354.

Patented Apr. 18, 1865.

Fig. 2.

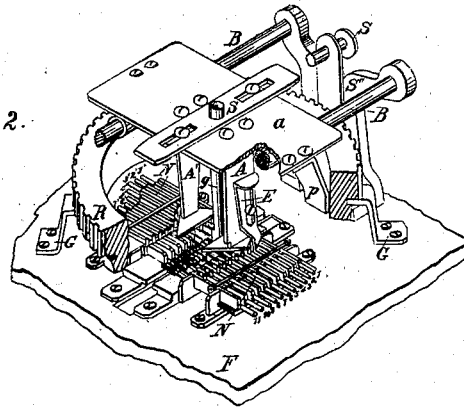
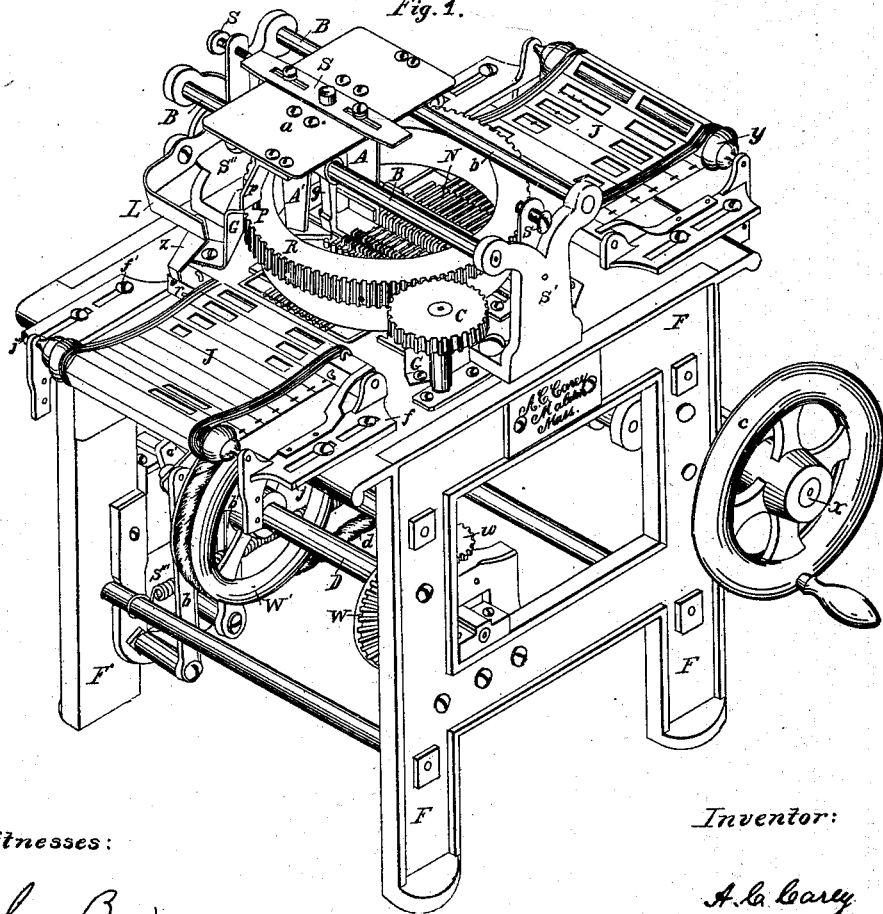


Fig. 1.



Witnesses:

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*F. A. Hatch*

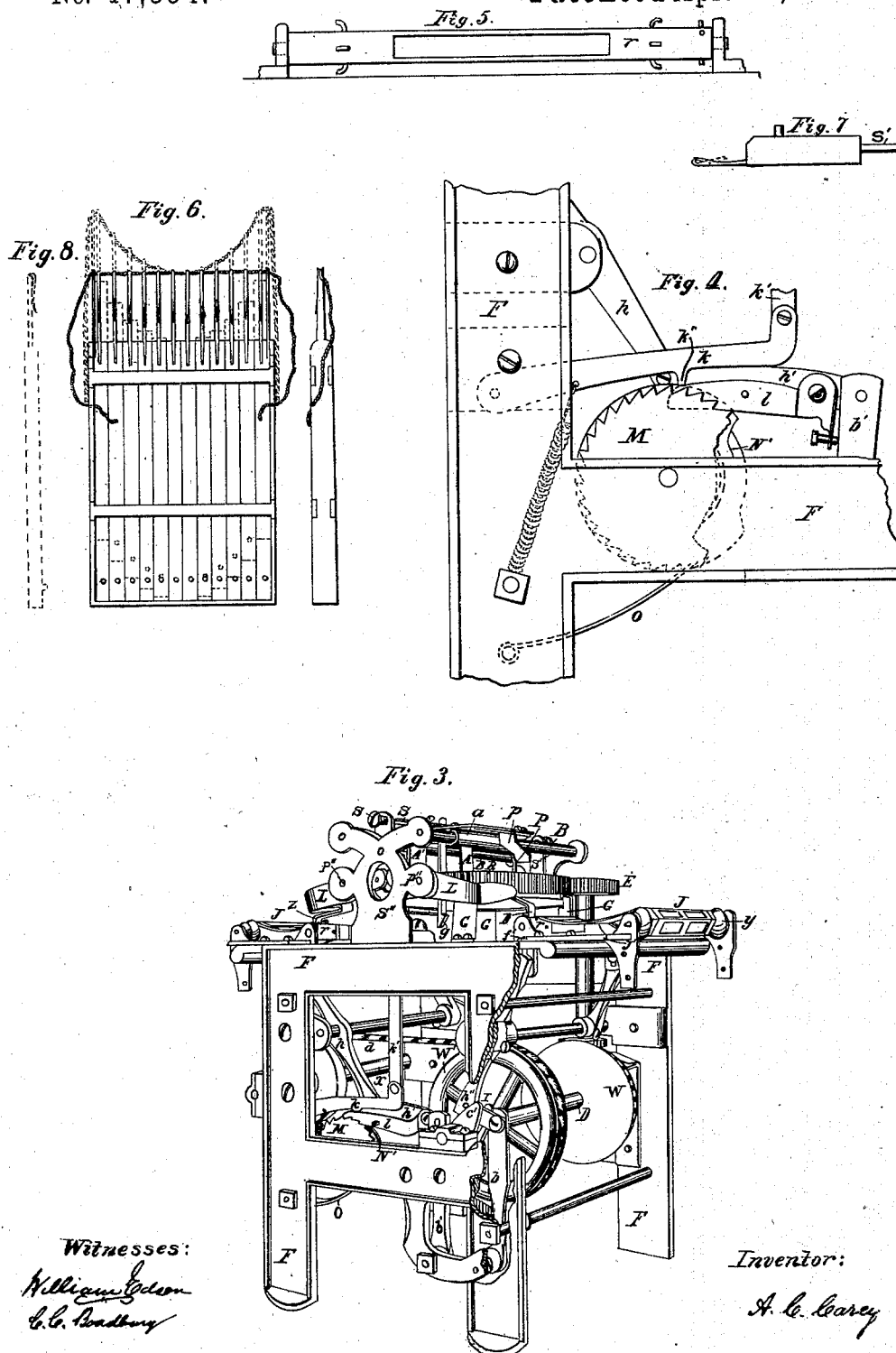
Inventor:

*A. C. Carey*

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Witnesses:

*William G. Dean*  
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# UNITED STATES PATENT OFFICE.

A. C. CAREY, OF MALDEN, ASSIGNOR TO SAMUEL A. BRADBURY, OF DORCHESTER, MASSACHUSETTS.

## IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. 47,354, dated April 13, 1865.

*To all whom it may concern:*

Be it known that I, A. C. CAREY, of Malden, in the county of Middlesex and State of Massachusetts, have invented a new and Improved Knitting-Machine; and I do hereby declare that the following is a full and exact description.

The nature of my invention consists in making a knitting-machine that is capable of knitting tubular work—as, for instance, for mittens, hose, &c.—in a thorough, rapid manner; also, in widening and completing the hose, gaiter, or other similar article at one operation and before it leaves the machine, but, in the case of mittens knitting them complete with the exception of the thumb, which may be formed and attached either by hand or by another machine.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

In the drawings, Figure 1 represents an isometrical view of my machine; Fig. 2, an isometrical view of part of the machine; Fig. 3, a perspective view of the rear of the machine; Fig. 4, an elevation showing details of the snail-wheel and levers; Fig. 5, the jacquard-shaft; Fig. 6, an adjustable weight used in threading up the machine and for keeping a proper tension on the work; Fig. 7, a needle

In the following description similar letters refer to similar parts.

F F F represent the frame of the machine; *c*, the balance-wheel on the driving-shaft *x* with crank-pin attached, by which the machine may be operated; *W*, a wheel attached to the main shaft *D* and driven by the belt *d* from the driving-shaft *x*; *W*, face gear-wheel driving the small gear-wheel *w* and the gear-wheel *C* on the opposite end of the same shaft, which gear *C* meshes into and gives motion to the ring-gear *R*, which is supported and held in position by means of four guides projecting into an annular groove on its periphery. The office of the ring-gear *R* may be better understood after a description of the needles has been given.

N N are two independent series of needles. The needles of each series are parallel to each other and perfectly free to move either in a body together or separately. Any one needle

or any number may be sent forward independently of the others. These two series of needles may be in the same plane or in two planes; it is only essential that the lines in which the points of the needles stand, when all are alike forced either forward or backward, shall be parallel with each other. (The form and construction of these needles may be seen in Drawing No. 7.) The needles in one series are not exactly opposite to the corresponding needles of the other series, but are so placed that when sent forward the needles of one series are between those of the other series.

J J are jacquard-chains; *r*, jacquard-shafts *j f* and *j' f'* are slides attached to the frame of the machine by means of screws in such a manner that each of the jacquard arrangements may be driven backward and forward. This motion of the jacquards sends forward the two sets of needles. Each of the jacquard-chains is made of an endless series of strips of thin metal, perforated or left whole, as shown. It is carried forward by the roller *y* at one end and by the jacquard-shaft at the other, both being supported in bearings in the slides *j f* and *j' f'*, the whole constituting a sliding frame, and this chain may be revolved so as to bring any particular strip onto the operative face of the jacquard shaft. It will be seen that upon the character of the faces of these jacquard strips or cards must depend the number and the location of the needles sent forward, and that at each quarter-revolution of the shaft *r* a new plate, perforated or otherwise, will occupy the operative face of the jacquard-shaft. One of these jacquard-frames is connected with the lever *b'* and cam *c'*, by means of which it is moved backward and forward with the aid of the spiral spring *s'''*. The other jacquard-frame is moved by similar levers and spring, with the single exception that on account of its different positions one lever is shorter than the corresponding lever in the other. Either of these frames may be operated for any length of time with the same face-plate, or the face may be changed at each motion of the frame, or at intervals of any number of motions of the jacquard-frame, that the article being knit may require.

Referring to drawings, Figs. 3 and 4, I will now explain the action of that part of the ma-

chine which causes the jacquard-shaft to revolve. *L L* are levers pivoted at *p''*, and attached to the link *k'*, which in turn is attached to lever *k*. Upon lever *k* is a pointed projection, *k''*, (shown on Fig. 4,) which rests upon the snail-wheel *N'* on a short shaft secured to the inside of the main frame. As the snail-wheel *N'* revolves by the means hereinafter described the lever *k*, and consequently levers *L L*, are raised and lowered thereby. When the snail-wheel *N'* is in such a position that the lever *k* drops, that part *z* of the levers *L L* which hangs over the ends of the jacquard-shaft, and causes it to turn a quarter-revolution at a time is raised up so as to clear the shaft, and then the jacquard-frame may be sent backward and forward, and its shaft *r* will not revolve; consequently the same number of needles will by the action of the jacquard-strips be passed forward at each motion. When the snail-wheel *N'* is in such a position that the lever *k* is raised up, as it is represented to be in Fig. 3 and 4, then the levers *L L* drop, and remain so low that at each passage of the jacquard-shaft the small teeth thereon will come in contact with it, and consequently the shaft will be revolved one quarter-turn, thus changing the face-plate of the jacquard.

Referring to drawing Fig. 2, I will describe the needles and their motions. The numbers 1 2 3 4 5 6 7 8 9 10 11 and 1' 2' 3' 4' 5' 6' 7' 8' 9' 10' 11' are the shanks of the needles. A single needle is shown in Fig. 7. For convenience of reference, I will call that part of the needle *S'* the "shank," and the part *n* the "nib."

I have already described the arrangement by which the needles are sent forward—that is, by the jacquard-frame. Now, in each revolution of the ring-gear *R* the pin *P* thereon, (seen in drawing Fig. 1,) comes in contact with the arm *p*, attached to the cross-head *a*, and thus causes it to traverse on the supporting-rods *B B*, on which it slides by means of sleeves secured to the under side of said cross-head until the pin *P* has passed so far round as to slip off from the arm *p*. Then the cross-head *a*, with the thread-guide *g* attached centrally beneath and traversing with it, and inclines *A* and *A'*, also attached thereto, stop and remain at rest until the pin *P* comes round to the arm *p'* on the opposite side of the cross-head *a*; then the cross-head with its connected parts moves back. Now, the movement of the cross-head, as we have seen, carries backward and forward the inclines *A* and *A'*, which, pressing against the ribs *n n* of the needles, throws them back to the position they were in before the jacquard-frame had thrown them forward. This motion of the needles—that is, forward by the jacquard-frame and backward by the inclines—is the regular action of the machine after the loops are first taken up. The jack *E* is attached to the incline *A* by two screws through a slot in such a manner that the jack can be

drawn up and be made inoperative. In commencing an article the use of the jack *E* is as follows: After the left row of needles is thrown forward the jack *E* is pushed down by hand; then by turning the wheel *c* the cross-head *a* is made to move toward the operator. The incline *A'* on the cross-head throws back the left-hand row of needles in succession, and the thread-guide *g*, passing over the needles at the same time, supplies them with yarn, and the loops are formed on the needles. At the same time the jack *E* throws forward the needles on the right-hand side so far that the yarn will catch on the hooks of a number of needles to correspond with the number of needles thrown forward on the left-hand side. Now the jack *E*, having performed its only duty, is raised, and the machine proceeds to work in the regular manner. The plate *s*, to which the guide *g* is rigidly attached, is attached to the plate *a* by means of screws through slots so that it is free to slide a limited distance. By this means, though the plate *a* always moves backward and forward the same distance, the plate *s* and guide *g* may move comparatively a greater or less distance. The distance through which the guide *g* moves is regulated by the stop-screws *S* and *S'*.

The jacquard-frame is moved forward by cams *c* and *i*, shown on the drawing No. 3, which act through levers *b b' h' h'*, also shown on Fig. No. 3. The jacquard-frame is thrown back by the spring *s'''*. Attached to the bar or lever *h'*, connecting the levers *b* and *h*, is a pall, *l*, (shown on drawing No. 4,) which works backward and forward and consequently revolves the ratchet-wheel *M*, and the snail-wheel attached, one tooth or more at every motion.

In drawing No. 1, *S'* and *S''* are standards to hold the guides *B* and *B'*. *B* and *B'* are bars acting as guides to the cross-head or plate *a*.

The drawing Fig. 6 represents an adjustable weight, which is detached from the machine and is used as hereinafter stated. It is made in this case of twelve small weights, inclosed in a frame, each weight having a hook in the upper end, and so arranged that one or more, as may be necessary, is free to act upon the thread to keep it at a proper tension.

The operation of the machine is as follows: The jacquard-chain and snail-wheel being in such position as is necessary for the work to be done, the adjustable weight is threaded, as shown in Fig. 6, and passed up by hand between the two rows of needles on the machine, bringing the yarn in the hooks of the weight above the needles in the machine, the weight being of a proper width for knitting the stocking or other article to be knit. The number of hook-weights corresponds with the number of needles in each row, and they are the same distance apart as the needles, so as that when brought into action there is a hook passed between each two adjacent needles. A sufficient number of needles to knit the hand of a mit-

ten as far as to the thumb, or the foot of a stocking, always beginning at the tip or toe, is thrown forward by the jacquard on the left-hand side of the machine by turning the wheel *c*. These needles run under the thread which is in the hooks of the weight. The yarn from which the article is to be knit is passed through the guide *g* on the cross head, and drawn down between the rows of needles and held there by hand or a small weight, (I use for this purpose a short piece of wire with a hook on one end,) and after the needles from the left hand row are thrown forward the jack *E* is pushed down; then by continued turning of the wheel *c*, the cross-head is made to move toward the operator. The incline *A'* on the cross-head throws back the left-hand row of needles in succession, and the thread-guide *g*, passing over the needles at the same time, supplies them with yarn, and the loops are formed on the needles. At the same time the jack *E* throws forward the needles on the right-hand side, so far that the yarn from the thread-guide *g* will catch on the hooks of a number of needles to correspond with the number of needles thrown forward on the left-hand side. Thus the loops necessary to knit the toe of a stocking or the tip of a mitten are all taken up and united crosswise and lengthwise, and the adjustable weight, still attached to the yarn which has now been thrown off from the needles, is suspended to the loops formed. This operation is what I call taking up the stitches or loops preparatory to knitting or forming a mitten or stocking. The jack *E*, having performed its only duty, is then raised. The revolution of the wheel *c* necessary to take up the loops also causes the jacquard-shafts *r* to make a quarter-turn, thus bringing over another link of the jacquard chain *j*, having the different perforation needed for the next stage of the work.

If it is desired to make a very pointed toe or tip, it must be commenced by throwing forward two, three, or four needles—first on the left then on the right hand side—in the center of the rows of needles on which the loops are already formed. (On the machine which I now have in actual operation I throw out twelve needles in commencing the toe of a stocking.) Now, at each succeeding quarter-revolution of the jacquard shaft the number of needles thrown forward is increased by one or two until all the needles on which the loops have been taken up are at work, at which time the arms *L L* are thrown up by the snail-wheel *N'* and lever *k*, and the jacquard-frame ceases to revolve; consequently the same number of needles is thrown forward at each motion of the jacquard until the hand of the mitten is knit as far as the thumb, or the foot of a stocking as far as the heel, at which time the snail-wheel has revolved far enough to allow the arms *L L* to drop, causing the jacquard to revolve again.

In knitting a mitten, when I arrive at the thumb the jacquard is revolved one quarter,

turn, and a number of needles sufficient to form a thumb is thrown forward on each side of the machine, in addition to those already at work, and a small threaded weight is hung on to them, causing them to take their loops. The arms *L L* are again raised by the snail-wheel *N'*, and the body of the mitten is knit of a sufficient length, and removed from the machine by breaking the yarn out of the thread-guide *g* and turning the wheel *c*, and thus casting the stitches or loops from the needles; or by repeating the above operation a number of thumbless mittens can be knit in a string and separated afterward.

In knitting the tip of a mitten or the toe of a stocking, the adjustable weight operates as follows: When the first row of loops is formed the weight is cast off from the needles, and is supported by the loops, after which, the center needles commencing to knit first, the center pieces of the weight descend; then the other pieces of which the weight is formed descend in succession as the toe or tip is gradually formed and increased in width, so that when the toe or tip is knit the weight has assumed the form of the toe or tip, or like the letter *U*, thus maintaining an equal strain on all parts of the work.

In knitting a stocking, when the foot has been knit the jacquard commences to revolve, and three, four, or more additional needles, sufficient to take up the stitches necessary for knitting the heel, are thrust forward into action from each side of the machine, next to those already at work. These needles are threaded up, and the loops formed upon them in a similar manner as heretofore described for commencing the toe of a stocking, for which purpose an additional adjustable weight, like Fig. 6, is used. Having taken up the additional number of stitches necessary for knitting the heel, the machine throws forward all the needles used in knitting the foot of the stocking, and next to them, on each side, one of those taken up for forming the heel, adding one, taken up for forming the heel at each quarter-revolution of the jacquard-shaft *r*, until all the needles having loops upon them are thrust forward together, when the jacquard ceases to revolve, and the same number of needles are thrust forward at each motion of the machine until the ankle is knit of sufficient length; then an additional needle is thrown forward on each side every four or five times round, thus widening the calf of the leg until it is of the desired width, when the same number of needles are thrown forward at each motion until the leg is of sufficient length. The thread is then broken off and the stocking removed.

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

1. A knitting-machine so constructed as to be capable of knitting the closed end or tip of a stocking or other tubular article, in the manner and by the means substantially as described.

2. The combination of the two rows of needles, in each of which every needle acts independently of the others, with the inclines A and A' and the jack E, as and for the purpose substantially as herein described.

3. The ring-gear R, in combination with the moving arms *p* and *p'*, the cross-head *a*, the slide *s*, thread-guide *g*, and the inclines A A', substantially as and for the purpose described.

4. The jack E, for the purpose of pushing forward successively the needles of the right or left hand row, while those of the other row are forming the loops preparatory to knitting, substantially as described.

5. The snail-wheel N', in combination with the arms L L and the levers and connections by which it operates said arms, substantially as described.

6. The self-adjusting compound weight, as

and for the purpose herein described and represented.

7. In combination with a jacquard chain or pattern, that has at times a revolving or forward motion independent of its frame, and at times an uniform backward and forward motion with its frame, a series of adjustable weights that are in active operation when the chain has its forward or rotary in connection with its backward and forward motion, for the purpose of widening the work as it is being knitted, and that are in passive operation only when the chain has only a uniform backward and forward motion for continuing the work of uniform size or width, substantially as described.

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Witnesses:

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