Sheet 1. 2 Sheets.

W. W. Clay.

Knitting Machine.

No. 49,980. Patented Sep. 19, 1865.

Fig. 1.

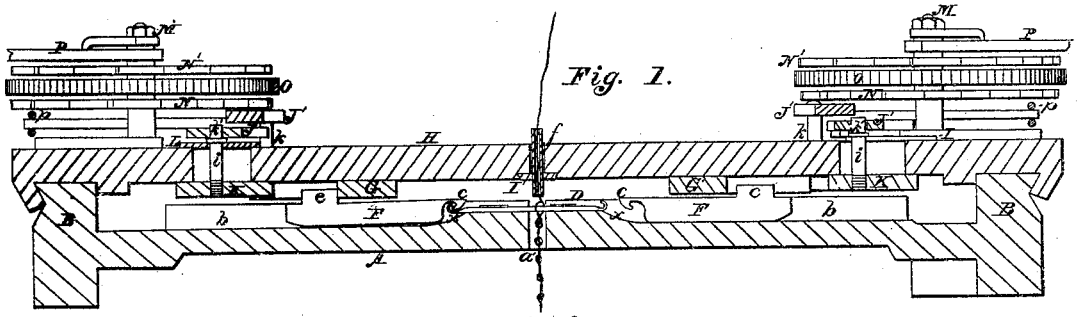
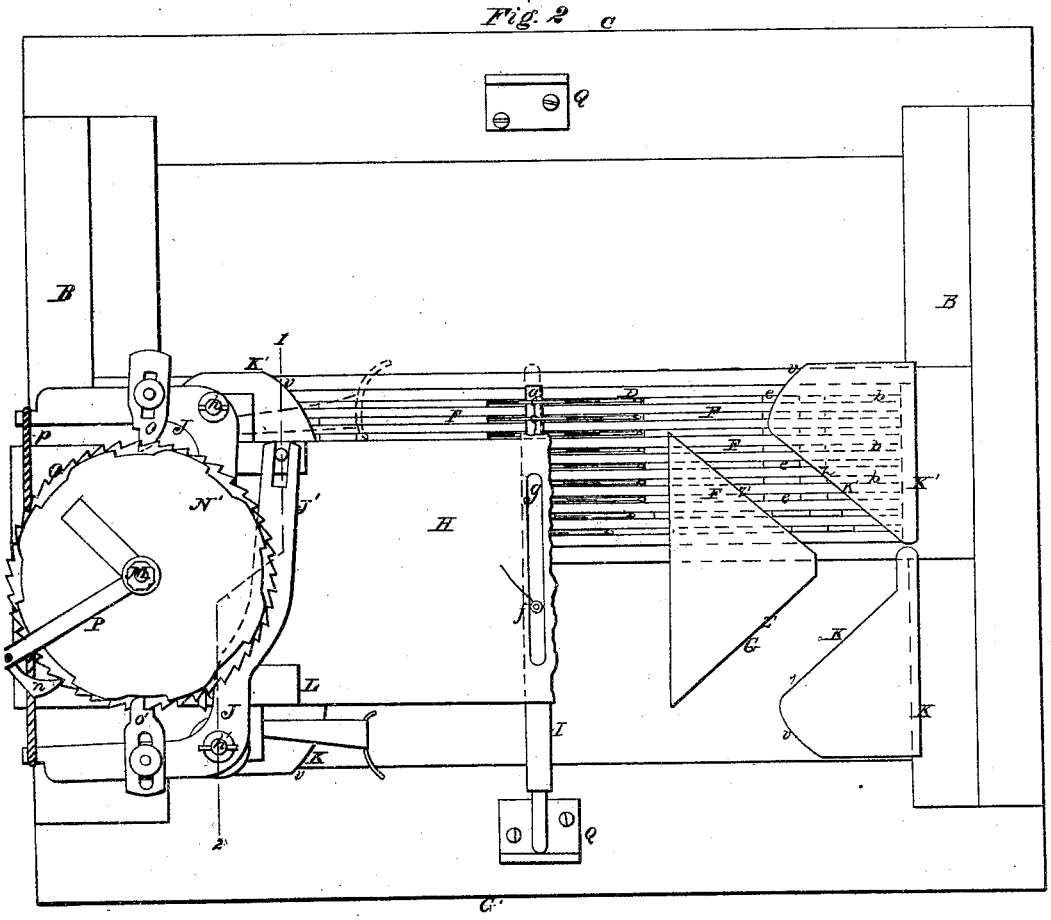


Fig. 2



Witnesses: Wm. Albert Steele.

Inventor: W. W. Clay, by his Attorney, Henry Howson

Sheet 2. 2 Sheets.

W. W. Clay.

Knitting Machine.

No. 49,980. Patented Sep. 19, 1865.

Fig 3.

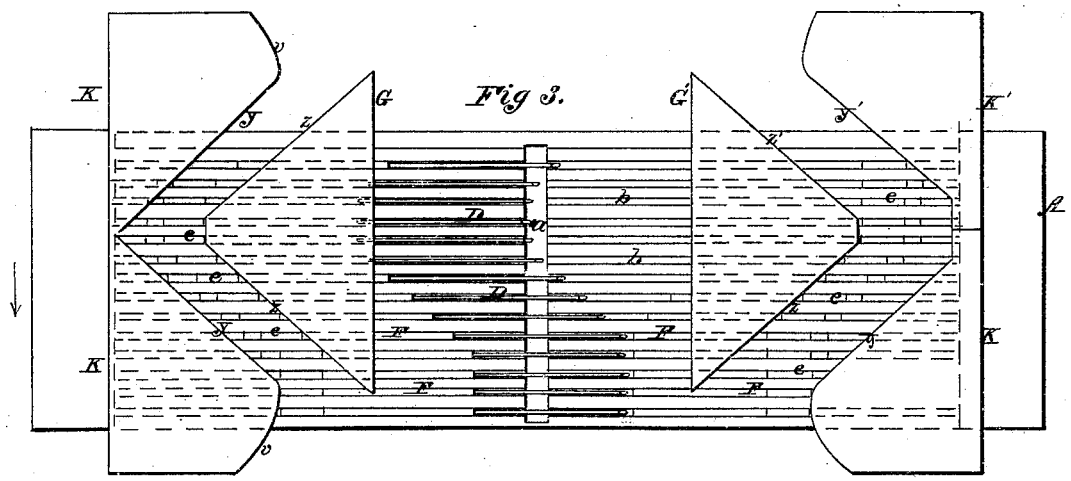


Fig. 4.

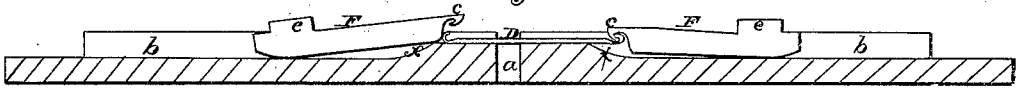


Fig. 5.

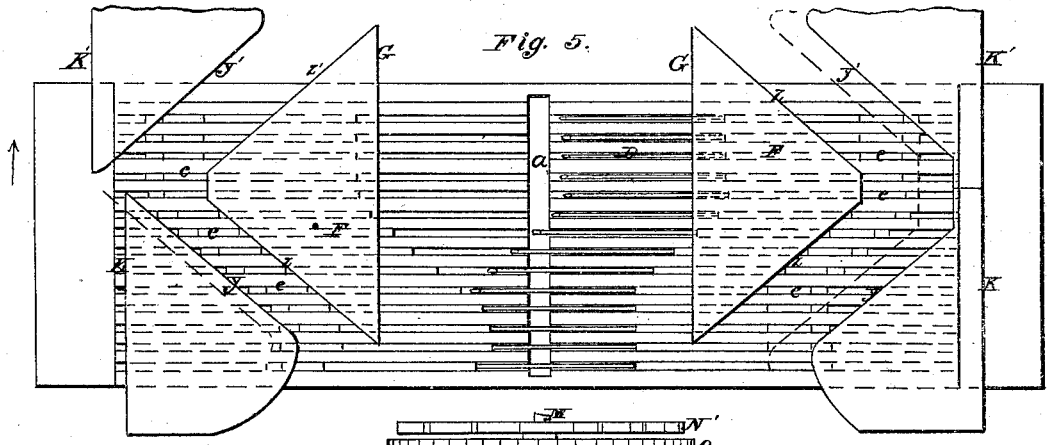
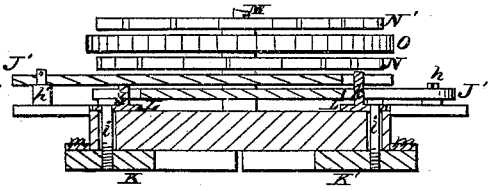


Fig. 6



Witnesses { Wm R Delany
Wm Albert Steel.

W W Clay.
by his Attorney
H. Stevenson

UNITED STATES PATENT OFFICE.

WM. W. CLAY, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **49,980**, dated September 19, 1865.

To all whom it may concern:

Be it known that I, WILLIAM W. CLAY, of Philadelphia, Pennsylvania, have invented certain Improvements in Knitting-Machines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention consists of certain novel mechanism, fully described hereinafter, for producing a knitted fabric of different patterns.

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

On reference to the accompanying drawings, which form a part of this specification, Figure 1, Drawing No. 1, is a sectional elevation of my improved knitting-machine; Fig. 2, a plan view, partly in section; Fig. 3, Drawing No. 2, a plan view of part of the machine with the upper works removed; Fig. 4, a sectional elevation of part of the machine; Fig. 5, a plan view of Fig. 4, and Fig. 6 a transverse section on the line 1 2, Fig. 2.

Similar letters refer to similar parts throughout the several views.

A is the bed-plate of the machine, at the sides of which are parallel guides B B, the latter being connected together by cross-pieces C C′. In the center of the bed-plate is a narrow opening, *a*, and across the plate extend a series of parallel grooves, *b*, the latter being deepest at the opposite outer ends and shallow in the center, where they are adapted for the reception of the ordinary double self-acting needles D, the bottom of each groove being inclined at *x*, Figs. 1 and 4, for a purpose described hereinafter.

To each groove *b*, at each end of the needle D, is adapted a carrier, F, from the inner end of which projects a hook, *c*, having an inclined end, and on the upper edge of each carrier, near the outer end of the same, is a lip, *e*, which projects above the face of the bed-plate.

On the guides B B slides the operating-plate H, on the under side of which are permanently secured the triangular cams G G′, and in the center of the plate slides the thread-carrying bar I, the ends of which project beyond the plate, and through which passes the thread-conducting tube *f*, the latter projecting upward into the oblong slot *g* in the operating-plate.

To a pin, *h*, on a bracket at the rear edge of the said operating-plate H, near each end of the same, is hung a bell-crank lever, J, the long arm of which is forked, and to a pin, *h′*, on a bracket at the front edge of the plate, near each end of the same, is hung a bell-crank lever, J′, which is also forked at the end.

At the under side of the plate, near each of the permanent cams G G′, are two adjustable cams, K K′, each of which is held to the plate H by a bolt, *i*, the latter passing through a plate, L, through a slot in the operating-plate, and screwing into the cam, Fig. 6.

From each plate L projects a pin, *k*, which is embraced by the forked end of one of the levers J J′, so that on moving the lever the plate L and the cam below the same will also be moved, a rib, *m*, at the outer edge of each cam, bearing against the edge of the plate H, so that the cam, while being adjusted, shall move parallel to the edge of the said plate H.

The edge *y* of the cam K, Fig. 3, is parallel to the adjacent edge *z* of the cam G, and the edge *y′* of the cam K′ is parallel to the adjacent edge *z′* of the cam G′, the outer edge, *v*, of each cam K K′ being nearly at right angles to the inner edge of the same.

On a pin, *m*, near each end of the plate H, revolve two pattern-wheels, N N′, having on their edges projections and recesses the purpose of which will be rendered apparent hereinafter, each of the wheels being secured to one side of a ratchet-wheel, O, to the teeth of which is adapted a pawl, *n*, on an arm, P, hung to the pin M.

To the short arm of the lever J is secured an adjustable plate, *o*, the end of the latter being in contact with the edge of the pattern-wheel N, which thus controls the lever, a similar adjustable plate, *o′*, being secured to the short arm of the lever J′ and being in contact with the edge of the pattern-wheel N′, and which thus controls the said lever J′, the short arms of the two levers being connected together by a spring, *p*, which causes the adjustable plates *o* and *o′* to bear with sufficient force against the pattern-wheels.

To the center of each cross-piece C C′ is se-

cured a vertical stop, Q, for a purpose described hereinafter. When the pattern-wheels have been turned so that their projections are brought against the plates *o* and *o'* the levers will be so operated as to move back the cams K and K' from the adjacent permanent cam G. When, however, the pattern-wheels are turned so that the plates *o o'* are in the recesses of the same the cams K and K' will be moved toward the adjacent permanent cam.

When a fabric is to be made upon the machine each of the carriers F on the left of the opening *a* is first brought forward so as to seize the needle D, as shown in Fig. 1, and the pattern-wheels N and N' are then so turned as to move the adjustable cams K and K' at the left of the operating-plate toward the cam G, while the cams K K' on the opposite end of the plate are moved back from the cam G', the parts of the machine now occupying the position shown in Figs. 1, 2, and 3. The yarn is now passed through the conducting-tube *f* and is placed on the needles D, one loop on each, and the operating-plate H is moved back and forth over the bed-plate on the guides B B. As the plate H is moved forward in the direction of the arrow, Fig. 3, the thread is laid onto the needles by the carrier I, and the edge *v* of the cam K' will be brought into contact with the lips *e* of the carriers F, and will move the latter forward until the lips are brought into contact with the edge *z* of the cam G, when the carriers, with their needles, will be moved back until the ends of the latter project into the opening *a*. As the needles slip through the loops of old fabric the latter closes the pawls of the needles onto the new thread and slips over the pawls and off the ends of the needles over the new thread on the latter, thus forming a series of new loops. As the forward motion of the plate H is continued the edge *y'* of the cam K' is brought into contact with the lips *e*, and the carriers and their needles are moved forward, the latter slipping through the loops just formed, which open the pawls preparatory to the introduction of the thread on the backward motion of the plates. As the operating-plate H is brought toward either end of the machine the end of the thread-carrier I strikes against the stop Q, the movement of the carrier being thereby arrested, while that of the plate is continued until the tube *f* is adjacent to the opposite edge of the plate, so that on the return movement of the latter the thread will be carried before the same and will be laid onto the needles prior to the pawls of the latter being closed.

So long as the above-described motions are continued a plain fabric will be produced. Should it be desired, however, to form a transverse rib on the fabric, it will be necessary to move the needles onto the opposite side of the opening *a*, which is accomplished in the following manner: The operating-plate H is first brought to the limit of its forward motion, and the pattern-wheels N and N' are turned so that the cam K' is withdrawn from the cam G, while the cam K, owing to the action of the pattern-wheel N, is moved slightly forward, the cams now occupying the position shown in Fig. 5. The operating-plate H is now again moved backward, when the edge *z'* of the cam G will be brought into contact with the lips *e* and will move the carriers and their needles back as before. As the edge *y* of the cam K is brought into contact with the lips *e*, however, the carriers F, owing to the forward position of this cam, will be moved so far forward that they will push the needles toward the opposite carriers, so that the opposite hooked ends of the needles will slide beneath and be seized by the hooks *c* of these carriers, while the carriers to the left of the opening *a* pass up the inclined edge *x* until their hooks *c* are disengaged from the adjacent hooked ends of the needles, as best observed on reference to Fig. 4. After the plate H reaches the limit of its backward motion, the cam K on the left of the opening *a* is moved back to the position shown in red lines, Fig. 5, and the cams K and K' on the right of the said opening are moved forward to the position shown in red lines, after which the plate H is moved back and forth as before, the character of the work being similar to that first made, except that the stitches are thrown on the opposite side of the fabric. If after several rows of stitches have been thus knitted with the needles on the right of the opening *a* they are transferred to the opposite side, a transverse rib will be produced on the fabric of a width proportionate to the number of rows of stitches knitted.

If desirable the needles may be transferred across the opening *a* at every movement of the plate H, in which case the fabric will be composed of alternate narrow ribs and depressions in lines transverse of or across the fabric.

The character of the fabric may be still further varied, if desired, by placing the needles alternately on both sides of the openings *a*, removing the opposite carriers, and adjusting the cams so as to operate on both sides of the opening at the same time, longitudinal ribs—that is, ribs running the length of the fabric—being thus made.

It will be apparent that by altering the shape of the pattern-wheels N N' and by fixing stops to the frame of the machine so as to operate the arms P, and thus turn the pattern-wheels, the operation of the machine may be entirely automatic, and fabrics of almost any desired pattern may be produced.

The character of the fabric may be still further varied by connecting each of the carriers F to the harness of a Jacquard apparatus, so that it may be attached to or disengaged from the needle, according to the pattern determined by the cards.

Although I have illustrated my improvement as applied to a machine with parallel grooves *b* and an operating-plate moving back and forth over the same, the bed-plates may

be circular with radiating grooves, and a circular operating-plate revolving continuously in one direction may be employed.

Without desiring to confine myself to the precise construction and arrangement herein described,

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

1. The combination of the hooked carriers F, the cams herein described, or their equivalents, for operating the said carriers and the self-acting needles, whether the latter are arranged to operate in parallel grooves in conjunction with a reciprocating thread-carrier or in radial grooves in conjunction with a rotating thread-carrier, all substantially as described.

2. The bed-plate A, its opening *a*, and grooves *b*, with their inclined edges *x*, adapted for the reception and operation of the needles D and carriers F, substantially as specified.

3. The combination of the said movable cams with the pattern-wheels, when the latter are operated by the machine through the medium of the devices herein described or the equivalents to the same, for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WM. WMS. CLAY.

Witnesses:
CHARLES E. FOSTER,
W. J. R. DELANY.