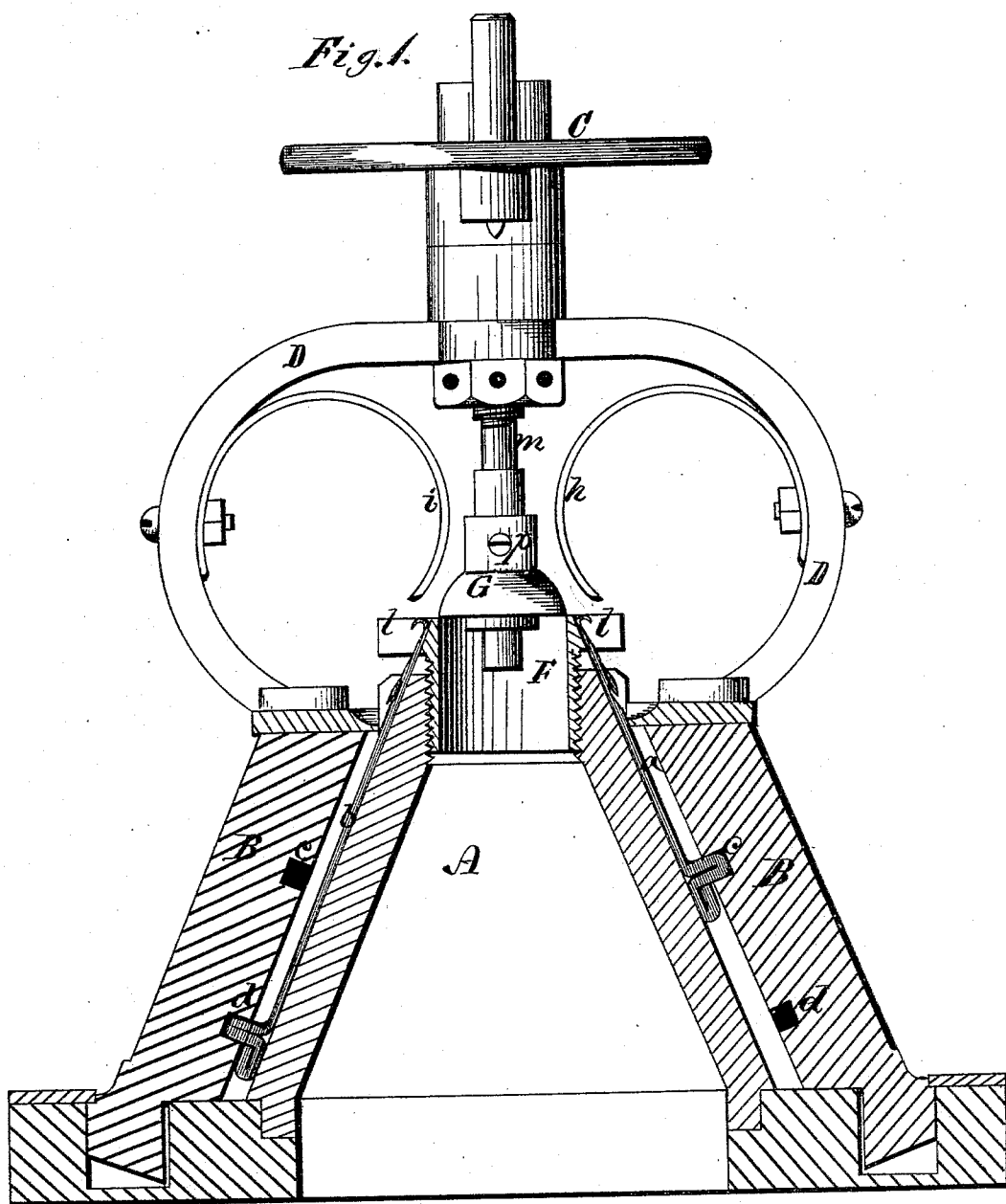


W. H. ABEL.
CIRCULAR KNITTING-MACHINE.

Patented March 7, 1876.

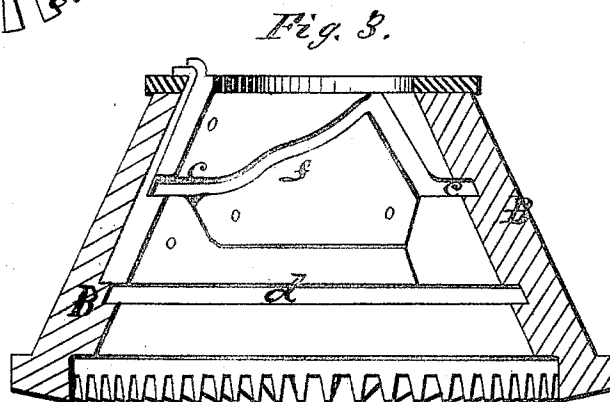
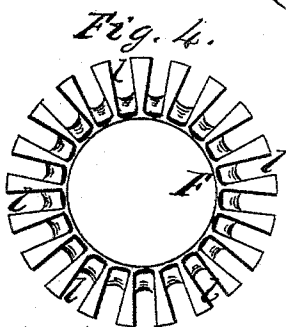
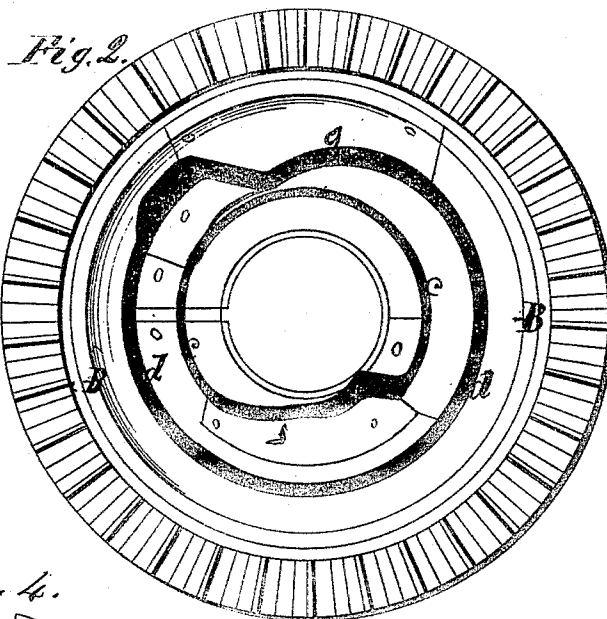
No. 174,401.



WITNESSES
C. M. Gallaher.
J. B. Townsend.

INVENTOR
William H. Abel,
By J. S. Brown, his ATTORNEY

W. H. ABEL.
CIRCULAR KNITTING-MACHINE.
No. 174,401. Patented March 7, 1876.



WITNESSES
C. M. Gallaher,
T. B. Townsend

INVENTOR
William H. Abel,
By J. S. Brown, his ATTORNEY

UNITED STATES PATENT OFFICE.

WILLIAM H. ABEL, OF BRISTOL, NEW HAMPSHIRE.

IMPROVEMENT IN CIRCULAR-KNITTING MACHINES.

Specification forming part of Letters Patent No. **174,401**, dated March 7, 1876; application filed April 13, 1875.

To all whom it may concern:

Be it known that I, WILLIAM H. ABEL, of Bristol, in the county of Grafton and State of New Hampshire, have invented an Improved Circular-Knitting Machine; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings making part of this specification—

Figure 1 being a central vertical section of the machine, parts being shown in elevation; Fig. 2, an under-side view of one of its parts; Fig. 3, a central vertical section of the same part; Fig. 4, a top view of another part thereof.

Like letters designate corresponding parts in all of the figures.

My improvements are upon circular-knitting machines employing latch-needles, and adapted to the purpose of knitting goods with two or more colors of yarn or thread.

For each yarn or thread I employ a set of needles, alternating in position with the other set or sets of needles, and differing in length therefrom, so that each set of needles has a separate cam-groove to guide and determine their motions, and one set does not interfere with the other set or sets.

In the drawings, which represent a knitting-machine for knitting striped goods of two colors of thread or yarn, both sets, *a b*, of needles are mounted in the same needle-cylinder A, (or in a cone, as represented, for knitting small tubes, such as mitten-thumbs,) being of different lengths, as shown in Fig. 1, and moving, respectively, in two cam-grooves, *c d*, in the outer revolving cam cylinder or cone B, which guides and determines the movements of the two sets of needles up and down in their seats. These two sets of needles are arranged one by one in the needle cylinder or cone; and the elevating part *f* of the upper cam-groove *c* is located in a position opposite to that of the elevating part *g* of the lower cam-groove *d*, as shown in Fig. 2. If more than two sets of alternating needles and of cam-grooves are employed, the elevating-cams are situated at about equal distances apart around the periphery of the cam cylinder or cone. This cylinder or cone may be made of a single casting, and the cam-grooves *c d* therein may be formed by turning in a lathe, except the elevating parts

f g, which may be formed by shaping separate pieces, and attaching them in cavities formed by casting or otherwise in the inner surface of the cylinder or cone, as represented in Figs. 2 and 3.

The thread or yarn bobbins are mounted on a bobbin-stand, C, secured to a bow or bent support, D, which is attached to the top of the cam cylinder or cone B, and revolves with it; and to the inside of the bow D are secured the two thread-guides *h i*, which, respectively, carry the two threads around and hook them upon the needles as the latter are raised to a position to receive the same by the cams *f g*; and since the two sets of needles are raised alternately, or on opposite sides of the needle cylinder or cone, and the threads follow each other alternately in opposite positions, one thread-guide hooks its thread exclusively on one set of needles, and the other thread-guide hooks its thread exclusively on the other set of needles, whereby the two threads or yarns are caused to make the alternate rounds of stitches, respectively, thus interlocking the two threads or yarns, and producing the striped goods of two colors.

For varying the length of the stitches, and consequently the closeness or looseness of the work, I employ a head, F, screwed into the upper end of the needle-cylinder A, and notched in its periphery with notches *l l*, corresponding in number and positions with the upright grooves or channels in which the needles slide up and down, so that the needles move in these notches, and regulate the length of stitch-loops by the distance which they draw the threads down into these notches, the parts of the threads between the individual loops resting on the partitions between the notches of the head. By simply turning the head one way or the other it is elevated or depressed; and since the needles at the termination of their downward movement are at uniform heights, the raising and lowering of this head determines the length of the stitches made.

The knit work, as fast as it is produced, is drawn down through the middle of the machine, through the head F, and the needle cylinder or cone A. It is required to hold this tube of knit work down close to the upper inner edge of the head F in the proper relation to

the needles. My improvement for this purpose consists of an inverted circular cup, disk, or ring, G, reaching nearly down to the stitch-regulating head F, and nearly equal in diameter to that of the central aperture in the said head, through which the knit tube is drawn downward. The disk G is made adjustable up and down, so that it may hold the knit work down to the head as close as desired. The disk G is attached to a downwardly-projecting rod, *m*, attached to the bow D, and is adjustable up and down on the said rod, and held in position by a set-screw, *p*.

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

1. In a circular-knitting machine, two or more sets of alternately-situated needles, *a b*, the needles of the different sets being of differ-

ent lengths, to move in different cam-grooves *c d*, in combination with thread-guides *h i*, one for each set of needles, for knitting goods of two or more colors of yarn, substantially as herein specified.

2. In combination with the adjustable head F, the adjustable cap or ring G, nearly covering the central aperture in the said head, and secured upon a vertical rod, *m*, projecting downward from the fixed bow D, substantially as herein specified.

Specification signed by me this 5th day of April, 1875.

WM. H. ABEL.

Witnesses:

SAM. HODGSON,
L. H. FRENCH.