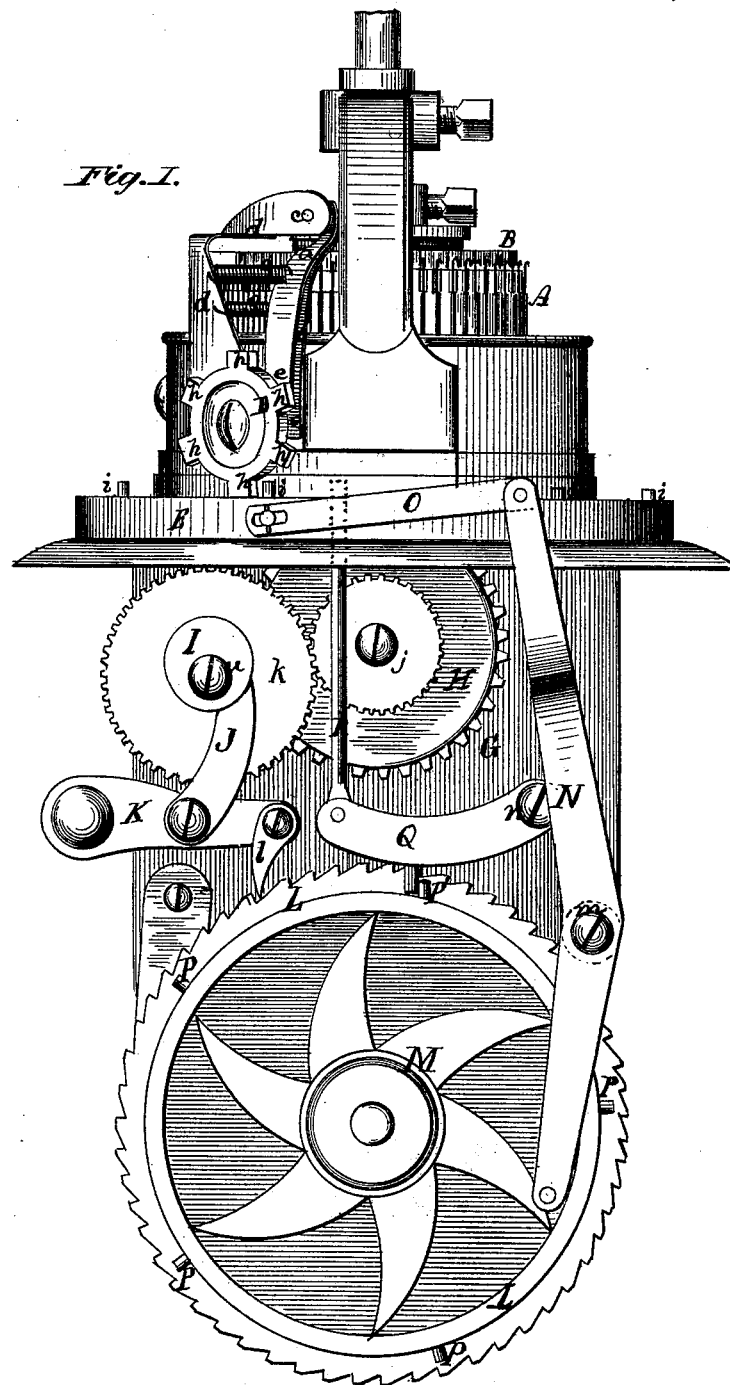


W. D. HUSE.
Knitting-Machine.

No. 220,924.

Patented Oct. 28, 1879.



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Fig. 2.

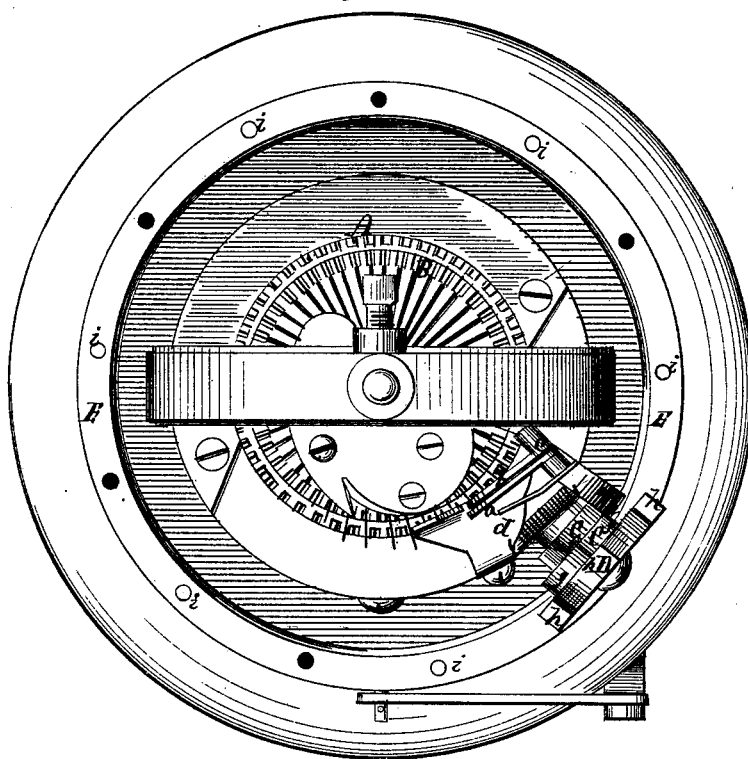
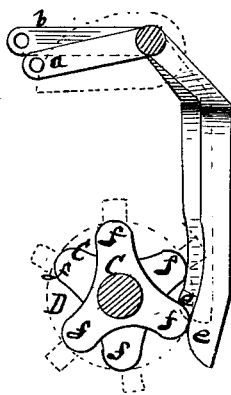


Fig. 3.



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UNITED STATES PATENT OFFICE.

WARREN D. HUSE, OF LACONIA, NEW HAMPSHIRE.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **220,924**, dated October 28, 1879; application filed August 1, 1878.

To all whom it may concern:

Be it known that I, WARREN D. HUSE, of Laconia, in the county of Belknap and State of New Hampshire, have invented an Improved Knitting-Machine for knitting with two or more colors of thread in various figures; 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 is a side view of a circular knitting-machine constructed and arranged for knitting with two or more colors of yarn at the same time for producing various figures; Fig. 2, a top view of the same, and Fig. 3 a view of a part detached.

Like letters designate corresponding parts in all of the figures.

My knitting-machine is constructed and arranged to knit with two or more colors of thread at the same time, bringing alternately one color and then another most prominently into view, and producing figures of various forms, such as longitudinal, cross, spiral, and zigzag stripes, checks, and diamond forms.

The drawings represent a circular knitting-machine knitting with two sets of needles, one set arranged in a cylinder, A, and the other working at right angles thereto in radial grooves of a disk, B. These and other ordinary parts of such a knitting-machine, not being peculiar for my purpose, I do not specifically describe; but for the first part of my invention, as represented in the drawings, the following parts are added or specially arranged.

I employ two thread-guides, *a b*, as shown, for two colors of thread. If more than two colors of thread are to be used at the same time, then a corresponding number of thread-guides is to be employed; but the machine is represented as constructed for knitting with simply two threads at the same time. These thread-guides are to be in positions side by side, and are to have such movements imparted to them that one thread-guide shall at one time be raised higher than the other, which act brings one color prominently into view in the knit fabric, and then, on reversing the positions of the thread-guides, the other color of thread being brought prominently or principally into

view in the fabric, these effects depending on the fact that when two threads are knit together in such a knitting-machine as described the thread which lies highest when caught by the needles comes to the front surface in the knit fabric, and thus the alternation of the positions of these thread-guides at various times and in various positions of the machine produces all the varieties of figures in the fabric which I herein describe. The devices for alternately bringing one and then the other thread-guide, thus one above or below the other in various ways, constitute the subject-matter of my invention and improvements in the machine.

The thread-guides are pivoted at *c* to a suitable holder or carrier, *d*, secured to the revolving cylinder of the machine, and they have lever-arms *e e* extending downward into position to be shifted in their movements by a revolving double cam or two cams, C C, one back of the other, the operative projections *f f* thereof alternating in position, so that whatever the position of the cams or double cam one thread-guide will bear on one of them, and will hold it in its lowest position, and the other thread-guide will bear between the cam projections, and will be held in its highest position over the needles, and each movement of the cams on the axis thereof alternates the positions of the two thread-guides. Springs *g g* hold the lever-arms of the thread-guides to the cams.

To produce the shifting movements of the cams C C, a disk, D, is formed therewith, or attached thereto, so as to turn with them, and on the periphery of the disk are projections *h h*, equal in number to that of all the projections *f f* on both cams.

As the disk and cams are carried by the revolving cylinder of the knitting-machine, fixed pins or stops are arranged in or brought into the pathway of the disk, one projection *h* of which after another strikes the same, and is thereby caused to turn the disk part of a revolution equal to the angular distance of one projection *h* from another in order.

The arrangement and operation of the pins or stops for producing the movement of this disk and the cams to knit the various figures and styles herein set forth will now be speci-

fied. First, for knitting longitudinal stripes on goods, a set of fixed pins or stops, *i i*, is arranged around the entire circle, under the pathway of the disk, as many as there are to be stripes on the goods knit, and equidistant apart if the stripes are to be of uniform width, but at unequal distances, as required, if the stripes are to be unequal in width. These stops require no movement, since, as the knitting-cylinder revolves, a pin, *h*, on the disk *D*, one after another, strikes the stops in succession and changes the color of the knitting each time, consequently as many times in each round of knitting as there are stops around the circle. These stops or pins may be arranged in any fixed part of the knitting-machine and be removable, to change their positions, or to replace them with other stops. As represented in the drawings, they are arranged in holes in a movable ring, *E*, which rests on the knitting-machine, outside of and around the revolving needle-cylinder, and which may be stationary or have some movement given to it, but of course is to be stationary when knitting straight longitudinal stripes, as just set forth. But by giving a variety of movements to the ring while knitting the figuring of the goods may be variously changed.

The mechanism which I employ to communicate the desired movements to the ring is substantially as follows: The mechanism is mounted on a flange or part, *G*, of the frame of the machine, projecting downward from the main body thereof at one side. First, a cog-wheel, *H*, gears into the main gear-wheel attached to the revolving needle-cylinder, and transmits, through gears *j k*, a revolving motion therefrom to an eccentric disk or cam, *I*, the diameters of the several gear-wheels being such as to produce the requisite speed of the eccentric, which generally, as shown in the drawings, is to be at the same rate as the needle-cylinder. The eccentric *I* acts upon an arm or wiper, *J*, pivoted at *u*, and attached to or connected with a pawl-lever, *K*, which carries a pawl, *l*, and is counterweighted at the opposite end, or otherwise arranged to hold the wiper turning therewith always in contact with the eccentric *I*.

The pawl *l* engages with the teeth or notches of a ratchet-wheel, *L*, by which the various movements of the ring *E* are effected, and which turns intermittently, but constantly, to the extent of one notch or tooth at its periphery at each revolution of the needle-cylinder, and, consequently, at each round of stitches knit by the machine.

The precise figure of the goods knit is determined by a cam, *M*, attachable to the ratchet-wheel *L* or its shaft, so as to turn therewith, this cam acting on the lower end of a vibratory lever, *N*, pivoted at *m* to the frame, and connected at its upper end by a link, *O*, or its equivalent, with the ring *E*. Different forms of the cam *M* are secured at different times to the ratchet-wheel or disk, according to the

particular pattern or style of goods required.

One or two styles will here be specified to illustrate the mode of producing various figures and patterns with the machine. The ring *E*, having the pins or stops *i i* therein, as many as desired for stripes, as before specified, when it is desired to make zigzag stripes, a reciprocating movement is communicated to the said ring on its axis, first forward to meet the motion of the needle-cylinder, and then backward, the extent of this reciprocating movement determining the extent or width of the zigzag figures. This movement of the ring *E* is produced by the cam *M* acting on the vibrating lever *N* and connecting-rod *O*. The form of the cam *M* determines the extent of its action on the said lever. This zigzagging may be regular by having all the projections of the cam *M* alike and equidistant, or varied by otherwise forming the cam.

Again, for producing checks or plaids, a similar forward-and-backward movement of the ring *E* may be produced, of the desired extent for the width of checks required, by a sufficiently abrupt cam, *M*, to move the ring the whole width at once, or by giving greater leverage motion to the upper end of the lever *N*, then leaving the cam inoperative for the requisite number of rounds of stitches till the proper dimensions of the checks in the longitudinal direction are obtained, and then having the cam at once bring the ring back to its first position.

For producing spiral stripes on the goods, instead of connecting the lever *N* with the ring *E* by the connecting-rod *O*, a pawl is to be mounted on the upper end of the lever to take into ratchet-teeth on the ring. This produces a continual forward movement and no backward movement of the ring.

To produce stripes around the goods, instead of a cam-and-lever connection between the ratchet-wheel *L* and ring *E*, lifting cam projections *P* are employed on the ratchet-wheel, operating on a horizontal vibratory lever, *Q*, pivoted at *n* to the frame of the machine, and formed substantially as shown; and a rod, *R*, extends from the movable end of this lever upward through a stationary part of the machine as a guide, and projects high enough through the ring *E*, if in place, to be struck by the projections on the disk *D*, when the lever *Q* is held raised by the cam beneath, at each revolution of the needle-cylinder, but to be below it out of reach of the disk projections when the lever drops from the cam projections *P*. The arrangement of the projections *P P*, however, is such that each holds the rod *R* up only long enough for knitting one round of stitches, the movement of the ratchet-wheel one notch again throwing the lever *Q* therefrom.

The width of each stripe is determined by the distances between the successive projections *P P*, and if the stripes are to be of equal width the distances are all equal; but if the

stripes are designed to be unequal in width the distances between the successive cams are to be correspondingly unequal.

The cams P P, lever Q, and rod R may also be arranged to knit checks or plaids by raising the rod R at the proper time to turn the cam-wheel one movement, then dropping it out of the way for a certain number of rounds till the required size of plaid is produced, then raising it again for one round.

In some cases, particularly when the pattern is complicated, or the length of the articles comparatively great, instead of cams on the ratchet-wheel L, I mount a Jacquard chain thereon, which is constructed to operate or control the movements of the ring G or rod R.

As the mode of operation of the Jacquard chain or cords is well understood, I need not describe it here, the principle of its action being the same in all cases.

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

1. The combination of the cam-cylinder with the disk D, having projections *h h* thereon, the cams C C turning with the said disk, and stops *i i* on a stationary part of the machine, substantially as and for the purpose herein specified.

2. In combination with the cam-cylinder, the intermittently-revolving cam-disk D and pins or stops *i i*, capable of arrangement or adjustment in the pathway of the disk's movement, substantially as and for the purpose herein specified.

3. In combination with the disk revolving with the cam-cylinder, a movable ring, E, arranged beneath the pathway of the said disk, and bearing-stops *i i* to act upon the disk, substantially as and for the purpose herein specified.

4. In combination with the movable stop-bearing ring E and ratchet-wheel L, a cam or cams, M, on the said regularly-moving ratchet-wheel and the connecting-lever N and rod O, substantially as and for the purpose herein specified.

5. The ratchet-wheel L, provided with the cam projections P P, in combination with the lever Q, stop-rod R, and cam-disk D, substantially as and for the purpose herein specified.

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Witnesses:

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