3 Sheets—Sheet 1.

H. P. BALLOU.

Machine for Knitting Over-Gaiters, &c.

No. 197,079. **Patented Nov. 13, 1877**

Fig. 1.

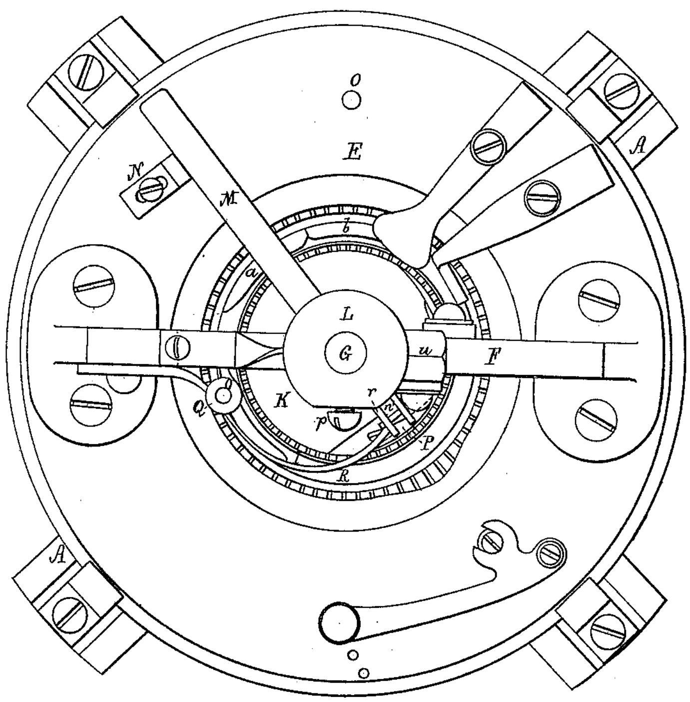
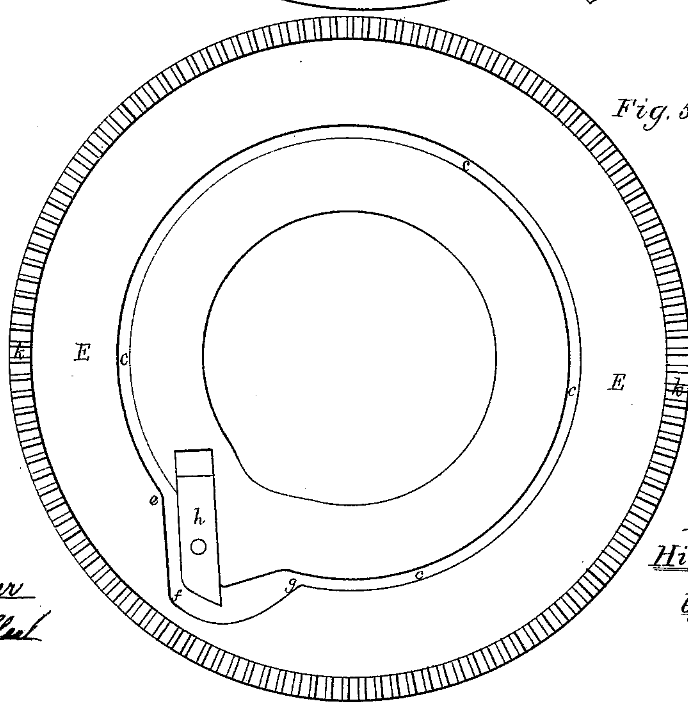


Fig. 5.



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R. H. Eddy

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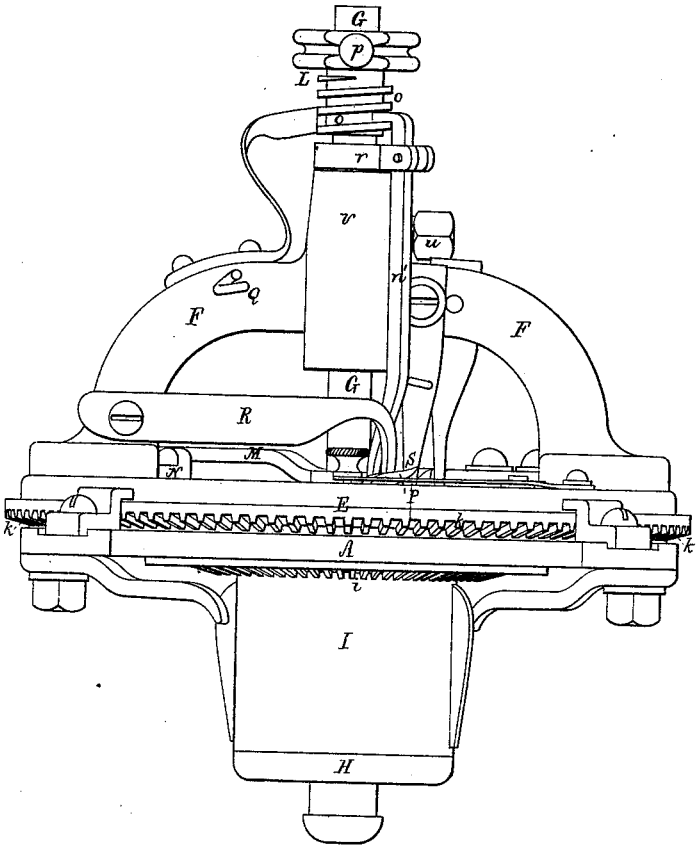
Fig. 2.



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Machine for Knitting Over-Gaiters, &c.

No. 197,079. **Patented Nov. 13, 1877.**

Fig. 3.

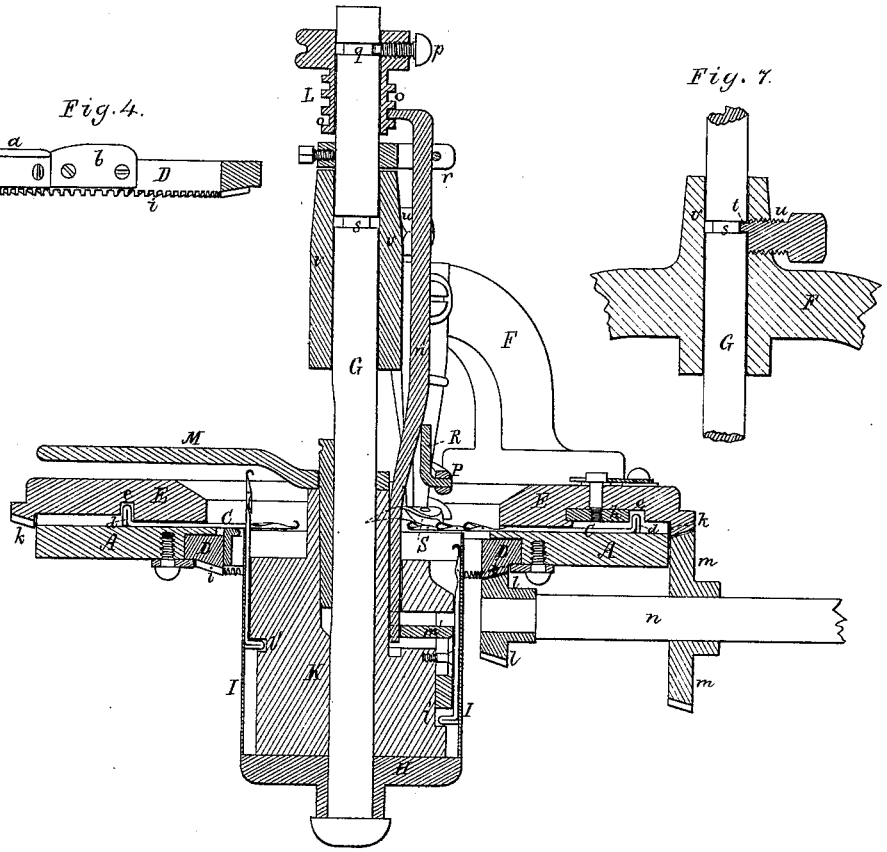
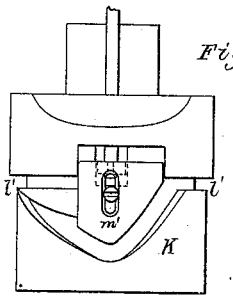


Fig. 4.

Fig. 7.

Fig. 6.



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UNITED STATES PATENT OFFICE.

HIRAM P. BALLOU, OF NEEDHAM, ASSIGNOR TO HIMSELF AND ISAAC A. HATCH, OF BOSTON, MASSACHUSETTS.

IMPROVEMENT IN MACHINES FOR KNITTING OVER-GAITERS, &c.

Specification forming part of Letters Patent No. **197,079**, dated November 13, 1877; application filed June 23, 1877.

To all whom it may concern:

Be it known that I, HIRAM P. BALLOU, of Needham, of the county of Norfolk and State of Massachusetts, have invented a new and useful or Improved Machine for Knitting Hosiery, Over-Gaiters, or what are termed "Cardigan Jackets," or the sleeves therefor; and I do hereby declare the same to be described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a top view, Fig. 2 a front elevation, and Fig. 3 a transverse section.

Such other figures as are necessary to the illustration of my invention are hereinafter referred to and described.

The machine is particularly intended to knit the cuff and sleeve of a Dardigan jacket, or the upper and lower and intermediate portions of a lady's over-gaiter. It is also adapted to knit hose or various other articles wherein two kinds of knitting—viz., the "rib" or "jacket" stitch and plain or "one and one" stitch—are employed. For this purpose it has two circular ranges or sets of hooked needles, each needle of each set being provided with a "latch" to its hook.

My improvements consist, first, in mechanism for adjusting the movable portion of the grooved cam for operating or moving the vertical needles up and down, such consisting in a helically-grooved rotary head, and a bar inserted in the groove of the head, and connected with the said movable part of the said cam; second, in the combination, with the vertical needle-cam, of mechanism for revolving it within a determined arc, and arresting it at the termini thereof, such being for effecting the changes required for the machine to knit either the cuff or the sleeve; third, in the combination, with the thread-guide for the vertical needles, of mechanism for raising such guide out of action with the said needles, such being to enable the machine to knit the cuff, which is accomplished with one thread only, the remainder or part termed the "sleeve" being knit with two threads; fourth, in mechanism for adjusting the vertical relatively to the horizontal needles; fifth, in the combination, with the two sets of needles, of mechanism for forcing upward certain of the horizontal needles while the vertical needles may be descending, such being for the purpose hereinafter explained.

In the drawings, A denotes the stationary bed-plate or annulus, which is grooved radially to receive the series of horizontal needles C. Concentric with such bed-plate, and within it, is the rotary cam-ring D, which is shown, in transverse section in Fig. 4, as not only provided with the usual work-supporter *a*, but with a cam, *b*, which is to force up certain of the horizontal needles while the vertical needles are descending. The object of this is to make the sleeve-loops longer than they otherwise would be, such being not only to prevent the said loops from being broken by the vertical needles, but to render the knitting of the fabric sufficiently loose. The rotary cam-plate of the horizontal needles is shown at E as over the bed-plate A. It is grooved on its under side, as represented at *c* in Fig. 5, to receive the studs *d* of the shanks of the horizontal needles, the groove being circular, with the exception of the part *e f g* thereof, by which the needles are moved forward and backward. Heretofore, so far as I have been able to learn, it has been customary to make this portion of the cam-groove V-shaped—in other words, to make each of the two branches *e f f g* of it straight on their outer edges. In lieu thereof, I make the outer edge of the part *f g*, by which the needles are moved in or toward the vertical axis of the machine, curved, as shown.

The adjustable slide for the cam-groove *e f g* is shown at *h*. The cam-ring D and the cam-plate E rotate synchronously, and are provided with gear-teeth *i k*, to engage with two bevel-gears, *l m*, fixed on a driving-shaft, *n*, arranged as shown.

There is erected upon the plate E an arch, F, which supports, or has extended down through it, at its crown, a vertical spindle, G, having upon its lower end a disk, H, for supporting the drum or hollow cylinder I, which carries the vertical needles, such drum being grooved vertically to receive them.

Stops projecting from the cylinder I and

from the bed-plate A keep the former from revolving while the machine is at work, such being common to other machines of this kind.

Within the drum I is the grooved cam K for operating the vertical needles, such cam being shown in side view in Fig. 6. It is or should be keyed to the spindle G. Its cam-groove is shown at l', it being made in the usual form, and provided with an adjustable slide, m'.

From the said slide a rod, n', is extended upward, and near its upper end it is bent inward and into a helical groove, o, made in and around a rotary nut or head, L, applied to the spindle G, so as to be capable of being revolved thereon. A screw, p, screwed into the heads and extended into a groove, q, formed in and around the spindle, serves to hold the head at its proper elevation. By means of the said helically-grooved head L and the rod n', the slide m' may be readily moved up or down while the machine may be at work, without the necessity of stopping it, (the said machine.) The rod n' passes through and is supported by a furcated clamp, r, fixed on the spindle G. In and around the said spindle is a groove, s, into which a stud, t, projecting eccentrically from the end of a screw, u, extends. This screw is screwed tightly into the neck v of the arch F. By turning the screw when the stud t is in the groove s, the vertical needles may be moved vertically, in order to bring them into proper adjustment with the horizontal needles. The groove s and stud t allow of the spindle being partially revolved by means of a lever or arm, M, fixed to it, and projecting over the cam-plate E, and between two stops, N O, suitably applied to the said cam-plate. These stops limit the movements of the arm M.

Fig. 7 is a section showing the screw u, stud t, neck v, groove s, and spindle G, as hereinbefore mentioned.

When the arm is against one of the stops, the cams for working the horizontal and vertical needles are in their proper relations to cause the needles to perform the "cuff-knitting" with a single thread; but when the arm is against the other stop, the cams are in their proper relations for the needles to perform the "sleeve-knitting" with two threads. Preparatory to knitting the cuff, the thread-guide P, which is fixed to the lower end of a bent arm, R, pivoted to the arch, should be raised above the vertical needles, and its thread should be broken at or near the fabric, and turned up and hitched upon a belaying-hook, Q, projecting from the arch F.

The thread carrier or guide for the horizontal needles is shown at S, it being fixed to the arch, and extended down from such.

To perform the cuff-knitting with the single thread, the vertical needles are to be in such positions with relation to the horizontal ones as to cause the thread-guide S to lay the thread in the hooks of the horizontal needles above the latches thereof; but in performing the sleeve-knitting with the two threads, the vertical needles require to be first so raised relatively to the horizontal ones as to cause the thread for supplying the horizontal needles to be laid on the vertical ones below their latches. When the thread is so laid on the vertical needles it will turn their latches as the needles are depressed, and will pass off the needles without taking into their hooks. This will explain why the arm M has to be moved from one stop to the other in order to effect the proper adjustment of the cams for operating the needles to produce either the cuff-knitting with the single thread or the sleeve-knitting with two threads, such kinds of knitting being well understood by knitters.

To the arch I usually affix a spring or friction brake, to bear against the outer surface of the rotary head L with friction sufficient to prevent it from being accidentally revolved.

I have not shown, nor is it necessary to describe, other appliances commonly used with the two sets of needles to cause them to perform their functions, such being no part of my invention.

What I claim in the above-described machine may be stated as follows:

1. In combination with the spindle G and the adjustable part m' of the needle-cam K, the helically-grooved rotary head L and the bar or rod n', arranged with and applied to such spindle and movable part, substantially as set forth.

2. In combination with the vertical needle-cam K, mechanism for turning it around laterally and stopping it, as and for the purpose explained, such mechanism being the arm M and the stops N O, arranged substantially as set forth.

3. In combination with mechanism for turning the needle-cam laterally and stopping it at the extremes of its arc of motion, as and for the purpose described, the vertical needles' thread-guide applied so as to be movable into or out of action with such needles, as specified.

4. In combination with the two sets of needles, mechanism for effecting the vertical adjustment of the vertical set relatively to the horizontal set, such mechanism being the screw u, its eccentric-stud t, and the groove s, applied to the arch and the spindle, substantially as specified.

5. In combination with the two sets of needles, mechanism for forcing upward certain of the horizontal needles while the next adjacent vertical ones may be descending, such mechanism being the cam b, applied to the cam-ring D, such being substantially as and for the purpose as explained.

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