Sheet 1. 2 Sheets.

E. Colvin.

Knitting Mach.

No. 24,284. Patented Jun. 7, 1859.

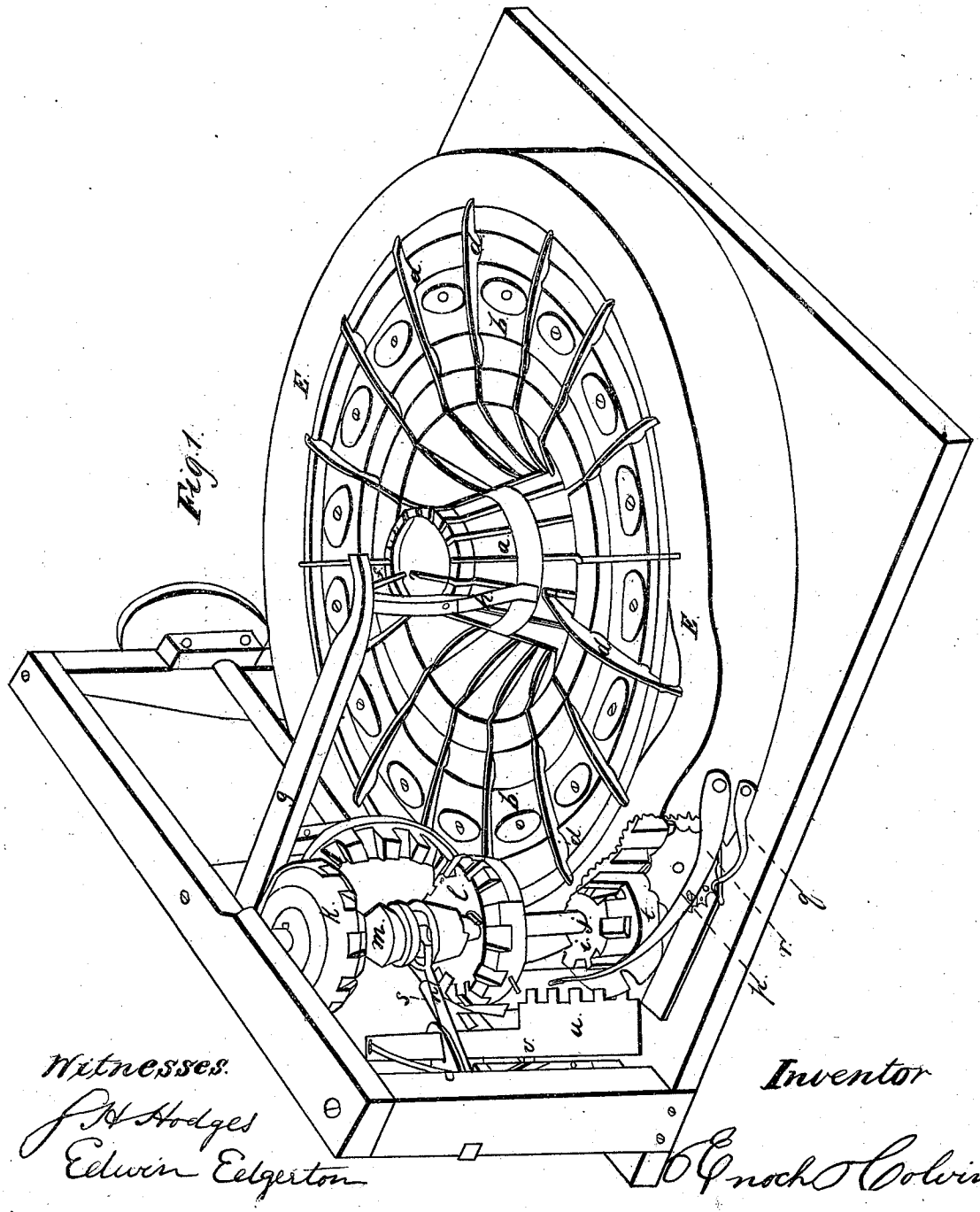

Fig. 1.

Witnesses.

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Sheet 2. 2 Sheets.

E. Colvin.

Knitting Mach.

No. 24,284. Patented Jun. 7, 1859.

Fig. 2.

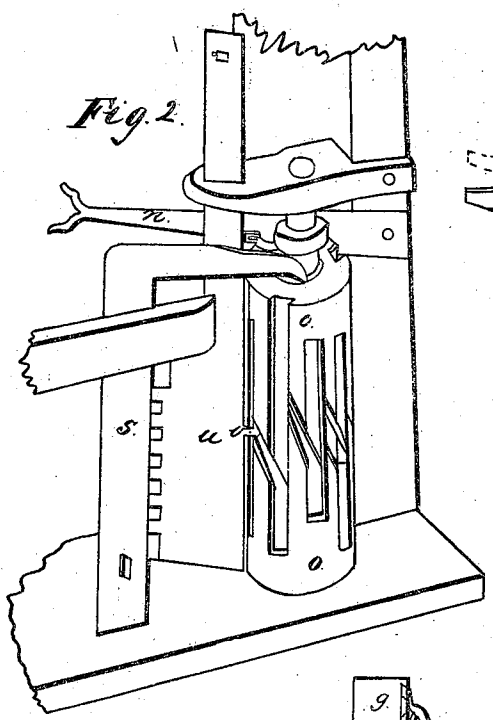


Fig. 5.

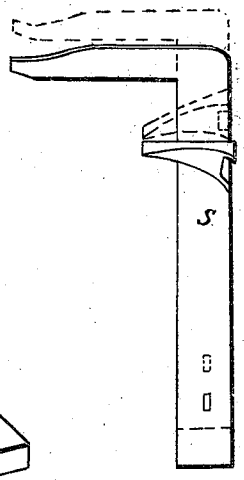


Fig. 6.

Fig. 4.

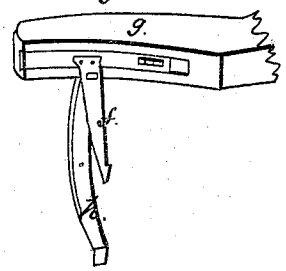
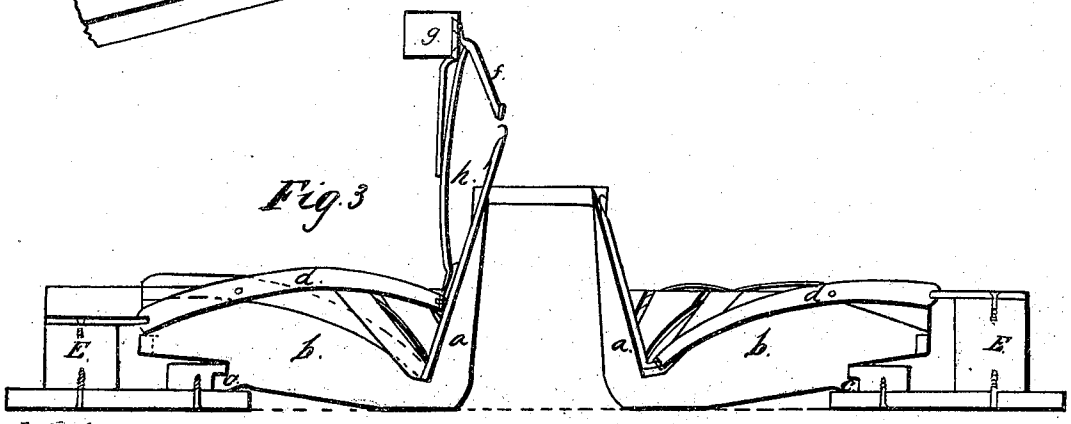


Fig. 3



Witnesses.
J. H. Hodges
Edwin Edgerton

Inventor
Enoch Colvin

UNITED STATES PATENT OFFICE.

ENOCH COLVIN, OF POULTNEY, VERMONT.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. **24,284**, dated June 7, 1859.

To all whom it may concern:

Be it known that I, ENOCH COLVIN, of Poultney, in the county of Rutland and State of Vermont, have invented a new and useful Machine for Knitting Hose with the Toe and Heel Complete; and I hereby declare the following to be a true, full, and complete description of said machine, taken in connection with the accompanying drawings and the letters of reference marked thereon, each letter indicating the same part of the machine in all the figures.

Figure 1 is a view of the whole machine. Fig. 2 is a view of a part from another point. Fig. 3 is a perpendicular section of the body of the machine. Figs. 4, 5, and 6 represent different parts of it, as will be explained.

A hollow conical cylinder *a* carries the needles in perpendicular grooves upon its external surface, and is connected with a ring or circular table *b*, Fig. 3, with which it revolves upon the frame or table of the machine. Upon the lower part of the ring or table *b* is a flange *c*, which runs in the grooves of four blocks secured upon the frame of the machine, so as to give it a steady movement. The needles are of the common form, save that the lower end of each is bent outward at a right angle and inserted through a hole in the end of one of the needle-arms *d*, which is bent aside for that purpose. The needle-arms lie in grooves upon the top of the revolving table *b*, corresponding nearly to the needle-grooves in the conical cylinder *a*. They play upon a wire which runs around through perforations in them, and at the surface of the revolving table *b* and at, say, one-fourth of the distance from the circumference to the center. A ring *e* of the same height with the revolving table *b* encircles it and is secured to the table or frame of the machine. Upon the top of this ring *e* is fastened a flat sheet-iron ring, the inner edge of which projects slightly beyond the other. A notch in the outer ends of the needle-arms *d* rides over this projecting edge. At the proper place the ring *e* has a hollow on the top and the sheet-iron ring is depressed into it. As the needle-arm *d* while revolving with the table *b* reaches this spot, the outer end is forced downward and the needle with which it is connected is raised, and as the table *b* revolves further both are restored to their former position. By this motion a new stitch is formed in the usual way. By having more depressions in the ring *e* and sheet-iron ring upon it several threads may be knit at once upon the same stocking.

Above the conical cylinder *a* is the guide-rod *f*, attached to a stout arm *g*, projecting from the frame of the machine. The guide-rod *f* is riveted to a flat strip of metal, which slides back and forth in a groove in the side of the arm *g* (see Fig. 4) near the end, and may be further secured by a pin driven into the arm through a slot in the sliding strip. From the arm *g* another short arm runs down, on the end of which plays a perpendicular lever *h*. The lower end of this lever *h* presses with some force upon a flat band that encircles the conical cylinder *a* and keeps the needles in their place. The other end is connected with the sliding strip above mentioned. Whenever the motion of the machine is reversed, the cylinder *a* carries with it the lower end of the lever *h* and gives the sliding strip a short movement the other way. By this means the guide-rod *f* is always kept before the needle in action.

The revolving table *b* derives its motion from the cog-wheel *i*, which works into cogs upon the outermost and lower corner of the revolving table, as seen in Fig. 1, by removing a part of the ring *e* and the rim upon it. The shaft *j* of this cog-wheel carries two loose cog-wheels, one *k* above and the other *l* below another cog-wheel, by which both are kept in constant motion, and which is itself carried directly by the power employed to work the machine. Between the wheels *k* and *l* a sleeve *m* slides upon the shaft *j*. On the inner surface of this sleeve is a perpendicular slot or groove riding over a pin fast in the shaft, so that the two must revolve together. When this sleeve is raised, a cam upon its upper end catches a cam upon the lower surface of the upper wheel *k*, which thus becomes engaged with the shaft *j* and communicates motion to it. By a similar device when the sleeve is lowered the lower wheel *l* becomes engaged with the shaft, the motion of which is thereby reversed and that of the whole machine with it.

The position of the sleeve *m* is determined by the elevating-arm *n*, a fork or collar upon

one end of which rides in a horizontal groove on the surface of the sleeve, and the other end is secured by a pivot to a post in the frame. A short arm projecting from the arm *n* rides in a horizontal groove upon the top of the grooved cylinder *o*, which is capable of being raised or lowered, and as it rises or falls the arm *n* follows it and carries the sleeve *m*.

Under the fixed ring *e*, and raised upon a thin block secured to the table of the frame, revolves a flat sheet-iron wheel *p*, with the edge cut into teeth. At every revolution of the table *b* a pin upon its outer edge catches into one of these teeth and forces the wheel around the distance of a notch. Meanwhile it is kept in its place by the spring *q*, which drops into one of the notches.

While the machine is employed in knitting the leg of the stocking, the lower wheel *l* is fast to the shaft *j* and communicates to the body of the machine a continuous motion contrary to that of the sun. When the juncture for commencing the heel arrives, a pin upon the wheel *p* catches a cam upon the long arm *r*, and as one end of it is secured to the frame the pin raises the other end. This end runs into and raises a perpendicular and elevating bar *s*, (see Fig. 5,) on the upper end of which is an arm that rides in the same groove upon the grooved cylinder *o* as that upon the elevating-arm *n*. If this motion were sufficient in length and force, it would obviously raise the grooved cylinder *o*, and with it the arm *n*, until the sleeve *m* engaged with the upper wheel *k* and the motion of the whole machine would be reversed. In order to effect this more certainly, on the inside of the elevating-bar *s* is a cam in the shape of a double inclined plane, (see Fig. 5,) and when the bar *s* is slightly elevated, a pin upon the outer edge of the wheel *l*, which before glided upon the upper surface of the cam, now strikes it below the point, and, gliding along its under surface, (which is an inclined plane, as before observed,) raises the bar *s* with such force and to such a distance as to effectually engage the sleeve *m* with the upper wheel *k* and secure without failure a reverse motion of the machine.

The cam upon the bar *s* is curved so as to correspond with the circumference of the wheel *l*. It is not firmly attached to the bar *s*, but is secured to it by a pivot which allows it a slight play. In consequence of this when the pin upon the wheel *l* first glides under the lower surface of the cam and raises the bar *s* as much as desired, as it proceeds it raises the back part of the cam and tilts the point downward, not so far that the pin will at once strike over it when it next comes around, but so far that it will do this when the bar *s* is very slightly depressed, as hereinafter mentioned. A contrary but similar effect is produced when the pin first glides over the upper surface of the cam.

When the motion of the machine is reversed, as described above, the stitches instead of being carried around the stocking continuously, are reversed and knit backward over the last row knit. This back row may be carried half or two thirds around, as judged best, the machinery about to be described being arranged accordingly.

Upon the shaft *j*, and below the wheel *l* and a little above the table of the frame, revolves a sheet-iron circle or wheel *t*, which is cut through from the outer edge to near the center, (see Fig. 6,) one of the lips formed by this cut, being the one advancing immediately behind the other when the machine has its usual motion and this wheel is going with the sun, is bent downward a short distance. The curve must be rather short or the stitch then forming may be dropped. While the machine is knitting the leg, the edge of this wheel revolves in a gap below the teeth in the toothed bar *u*, which is raised to nearly its utmost height and partly sustained by a spring, as seen in Fig. 1. At each revolution of the wheel *t* the toothed bar *u* is raised by it and dropped again when it reaches the notches on the wheel; but when the motion of the machine is reversed the toothed bar *u* drops down upon the notched wheel *t*, and as the lower lip of the wheel leaves one notch between the teeth on the bar the upper lip enters the notch above it. The bar is thus carried down the distance of a notch at each revolution of the wheel *t* until the backward circle of stitches is knit as far around as desired. At this juncture a pointer *v* upon the toothed bar *u*, which has been meanwhile sliding down in a perpendicular groove upon the surface of the grooved cylinder *o*, strikes the end of the groove (or a pin in it) and depresses the cylinder. This lowers at the same time the elevating-bar *s*, so that the pin upon the wheel *l* now strikes above the point of the the cam upon the bar *s* and depresses it to such a distance and with such force as effectually to engage the sleeve *m* with the lower wheel *l* and restore its direct motion to the machine. The stitches will now be knit over the last part row, and may be continued as far as thought best—say within one stitch of where the previous row was commenced.

If the cam upon the arm *r* were a fixed one, the pin upon the wheel *p* would be thrown behind it by the first reverse motion of the machine, and when the direct motion is resumed, as last described, the pin would again strike the cam and reverse the motion before the proper time. This is prevented by hanging the cam upon a pivot at its upper corner and allowing it to swing backward, so that as the arm *r* is raised the pin upon the wheel *p* carries the cam backward.

When the direct motion of the machine is resumed, as described above, the lower lip of the wheel *t* will at each revolution enter the notch in the toothed bar *u* below that in which it has just been moving and raise the bar. Meanwhile the pointer *v* will rise in the groove upon the cylinder *o*. It directly encounters

a spring lying obliquely across the groove, which forces it through an oblique groove into an adjoining perpendicular groove on the left, the cylinder *o* revolving for that purpose. When the row of stitches then forming has been knit as far as desired, the pointer strikes the end of the groove (or a pin in it) and raises the cylinder. This raises the elevating-bar *s*. The pin upon the wheel *l* now strikes under the point of the cam upon the bar *s*, and the motion of the machine is again reversed. This process is repeated until the heel-piece is knit to a point, the length of each row of stitches being determined by the length of the groove upon the cylinder *o*, in which the pointer *v* is moving at the time. The pointer *v* when moving downward in any groove is retained in it by a spring lying between that groove and the one from which the pointer last came, the spring being secured at the bottom and extending upward above the oblique groove. It is at the same time not so stiff but that it will admit the entrance of the pointer when forced in by the oblique spring in the adjacent groove, and when the heel-piece is completed the pointer will be found moving upward in an open groove without impediment. The machine will then be engaged, of course, in its direct and regular motion. The stitches will be formed around the whole circle, running down one side of the heel, around the part left unwrought while the heel-piece was formed, and over the other side of the heel. By continuing this action the foot of the stocking will be knit with a straight body until the point for forming the toe is reached. Another pin upon the wheel *p* now strikes the cam upon the arm *r*, the motion of the machine is again reversed, and a triangular piece for the toe is formed upon one-half the foot-piece by a process similar to that by which the heel was formed. When the point of this piece is reached, the pointer *v* will be moving upward in a long groove, and the stitches will be formed without interruption down the side of the piece and over the half-circle left unwrought before. The pointer *v* again strikes the end of the groove, reverses the motion, and by a like process another piece is knit for the other half of the toe. When the point of this is reached, a pin upon the cylinder *o* may be used to cast off the power and stop the machine. The halves of the toe are to be joined by hand, which is all the hand-work required for completing the stocking.

It is obvious that the length of the stocking-leg will depend upon the number of teeth upon the wheel *p* before the first pin that throws up the arm *r* at the commencement of the heel, as there must be one tooth for every row of stitches. So also there must be one tooth upon the wheel *p* behind that pin and before the pin that commences the toe for every row of stitches required in the foot of the stocking. Again, the number of rows in the heel-piece will be determined in the same way by the number of grooves in the cylinder *o* between the starting-point and the groove in which the pointer *v* runs out. The number of rows in each toe-piece will be regulated in the same manner by the number of grooves in the cylinder *o* constructed for that purpose.

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

1. The combination of the needle-arm *d* and the iron rim upon the ring *e*, constructed as above described, for raising each needle by itself and completing each stitch before another is begun.

2. The cylinder *o* for reversing and regulating the motion of the machine while forming the heel and toe.

3. The combination of the notched wheel *t*, the toothed bar *u*, with its pointer *v*, the cylinder *o*, the elevating-arm *n*, the elevating-bar *s* and cam thereon, and the pin on the wheel *l*, by means of all which the motion of the machine is reversed back and forth and regulated so as to knit upon a straight hose flaps of the proper form for the heel and toe.

4. The wheel *p* and the elevating-arm *r*, combined with the several parts and devices mentioned in the last preceding claim, as above described, for setting in motion at the proper juncture the machinery for regulating the formation of the flaps for the heel and toe.

ENOCH COLVIN.

Witnesses:
S. H. HODGES,
EDWIN EDGERTON.