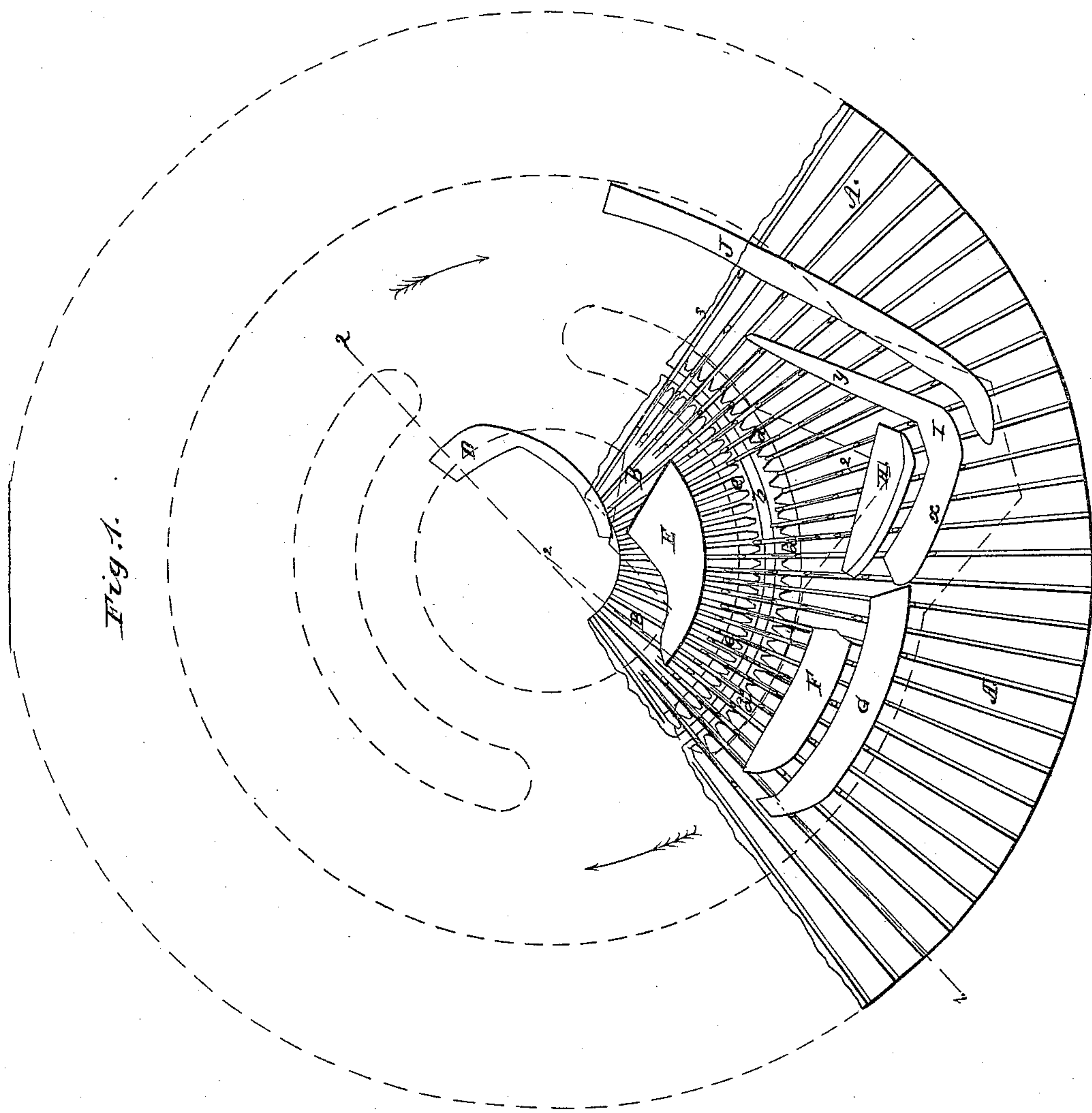


Sheet 1, 3 Sheets.

T. Langham.
Circular Knitting.

Nº 34,210.

Patented Jan. 21, 1862.



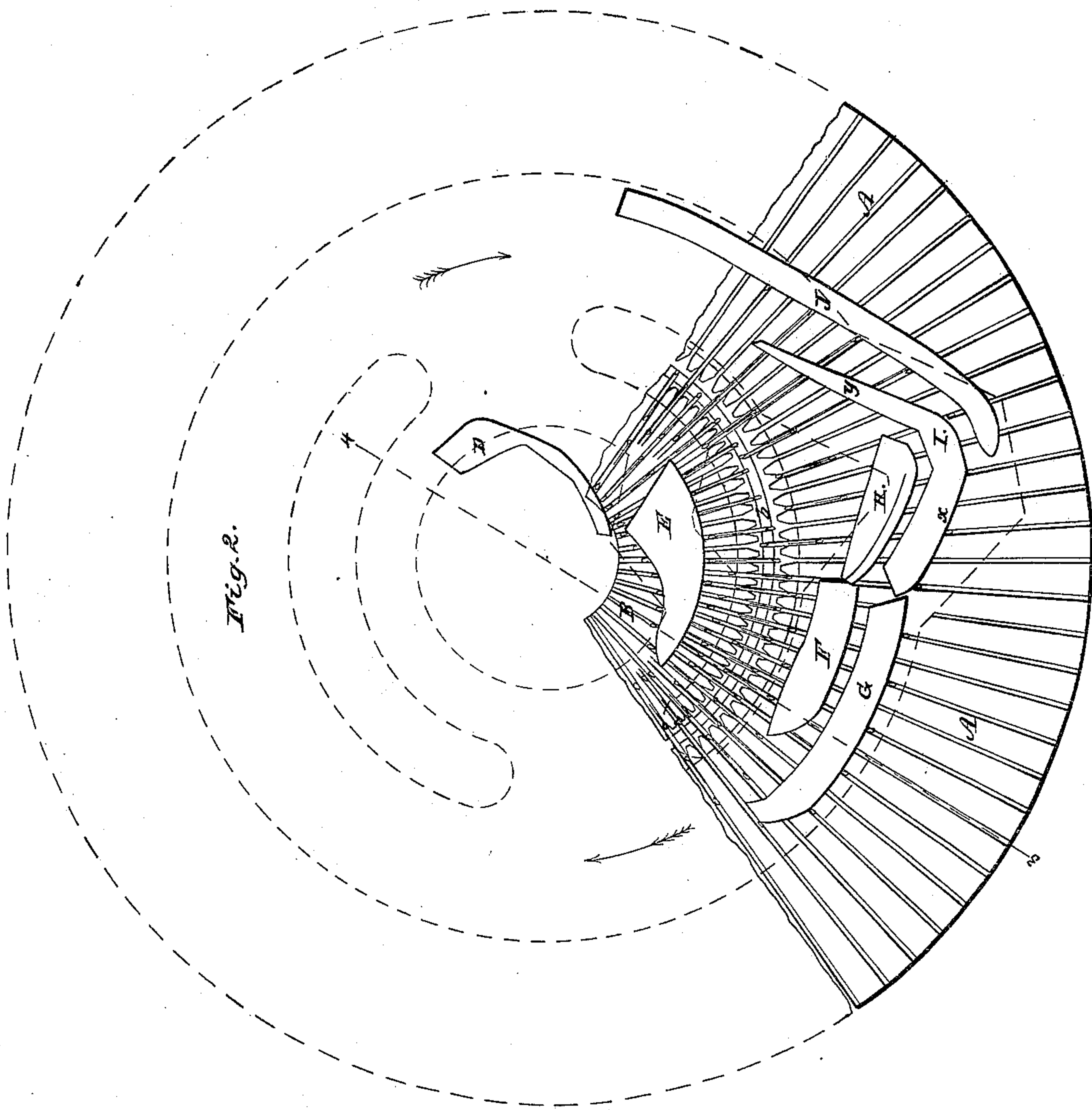
Witnesses.
Charles E. Foster
Charles Houston.

Inventor
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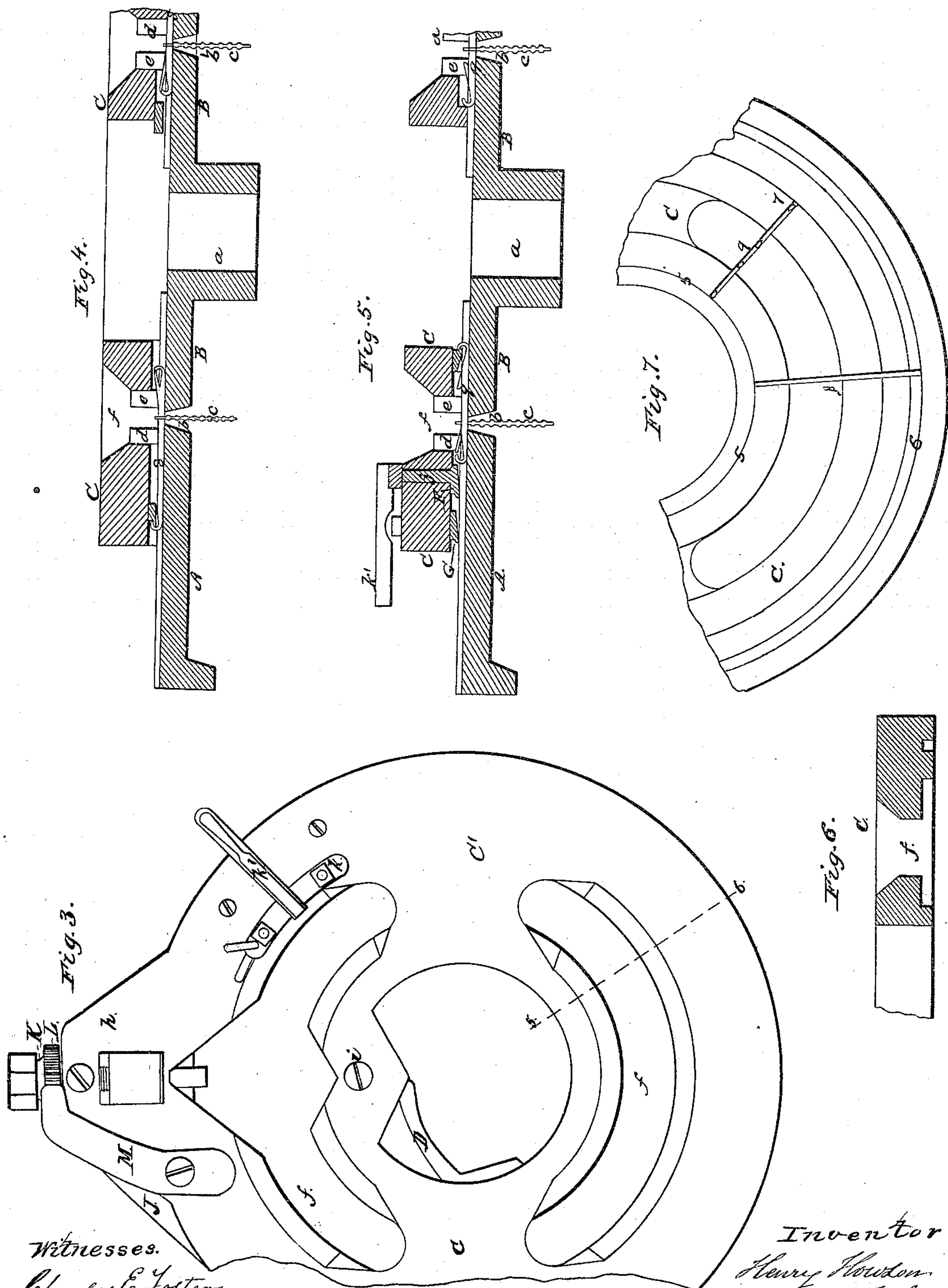
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Patented Jan. 21, 1862.



UNITED STATES PATENT OFFICE.

THOMAS LANGHAM, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN KNITTING-MACHINES.

Specification forming part of Letters Patent No. 34,210, dated January 21, 1862.

To all whom it may concern:

Be it known that I, THOMAS LANGHAM, of Philadelphia, Pennsylvania, have invented certain new and useful 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 and figures of reference marked thereon.

My invention consists in producing a circular ribbed fabric by means of a series of self-acting needles so arranged in radial grooves of two stationary plates and so operated that some of the needles shall operate on the outside of the fabric while others operate on the inside of the fabric, as described hereinafter.

My invention further consists in the employment of radial reciprocating needles made self-acting at both ends, combined with the devices hereinafter described or their equivalents, whereby the said needles may be so transposed as to operate either on the inside or outside of the fabric without any interruption of the process of knitting.

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, Figures 1 and 2 are plan views of sufficient of my improved knitting-machine to illustrate the operation of the needles. Fig. 3 is a plan view of the driver; Fig. 4, a transverse section on the angular line 1 2, Fig. 1; Fig. 5, the same on the line 3 4, Fig. 2; Fig. 6, a section of part of the driver on the line 5 6, Fig. 3; and Fig. 7, an inverted plan view of part of the driver.

Similar letters and figures refer to similar parts throughout the several views.

A is an annular plate having throughout its entire upper surface a series of radial grooves situated at equal distances apart from each other, and within this plate, but free from contact with the same, is a second annular plate B, which has also a series of radial grooves coinciding with those of the plate A. It should be understood that the latter plate is secured to the platform or table of the machine, while the plate B is suspended by a rod

passing through its central hub *a* to the framework above the table, thus leaving an uninterrupted annular space *b*, Figs. 4 and 5, between the two plates for the free passage downward of the circular fabric *c* which the machine has to produce. It will be seen that between each radial groove and its adjacent one of the plate A there is a projection *d* near the inner edge of the said plate, and that the plate B has similar projections *e e* near its outer edge—one projection between each groove and its adjacent one.

C is the cap or driver, having an annular opening *f*, which fits snugly over the projections *d* and *e* of the plates A and B, so that as the driver revolves it always retains its proper position concentric with the said plates.

On the under side of the driver C is a series of curved or irregularly-formed plates. (Seen distinctly in Figs. 1 and 2 and marked D, E, F, G, H, I, and J.) The position which these plates occupy on the driver will be seen by reference to the outline of the latter, (Shown in red lines in both these views.) The plates E, H, and I are so secured to the driver as to be capable of a slight adjustment thereon in a radial direction from and toward the center of the driver's rotation, the position of the plates H and I being under the control of a set-screw K, which screws into the end of the projecting portion *h* of the driver, this screw being furnished with a small cog-wheel L, into the teeth of which the end of the spring M engages (see Fig. 3) and serves to retain the screw and with it the plates H and I in the position to which they have been adjusted. The plate E is secured to the driver by means of a set-screw *i*, which can be moved to a limited extent in a radial line and thus afford a means of adjusting and securing the said plate. The plate F is secured to a pin *j*, Fig. 5, which passes through a slot *k*, Fig. 3, which is so curved that the said plate can be moved to and fro to a limited extent in a line concentric with the center of rotation of the driver, the pin being furnished with an arm *k'*, by means of which the proper movement is imparted to the plate. The remaining plates D, G, and J are permanently secured to the driver.

In the present instance needles of two dif-

ferent lengths are employed in my improved machine, the long needles 8 being shown distinctly in Fig. 4 and the short needles 9 in Fig. 5. As seen in Figs. 1 and 2, it will be observed that the needles are deposited in the radial grooves of the plates A and B, a long needle being placed in one groove, a short needle in the next groove, and so on throughout the series. Each long needle 8 (seen in Fig. 4) has at its outer end a simple hook of such a form as to receive the outer edge or lip of the plates G and I, the inner end of the needle having also a hook, but in addition to the latter a loose pawl or barb, so as to form with the hook what is known to those familiar with knitting-machines as a "self-acting needle." The short needle 9, Fig. 5, is made at both ends self-acting, or similar to the inner end of the long needle, for the reason that will be rendered apparent hereinafter.

The needles have to slide in the grooves of the two plates A B toward and from the center of the said plates and across the annular space *b*, the thread taken from a spool above being carried around with the driver C and maintained in such a position as regards the above-mentioned annular space that each needle in succession may as it crosses receive the thread, form a loop, and add it to the circular fabric *c*, which passes downward through the said space, as seen in Figs. 4 and 5. The method of forming the loops by means of reciprocating self-acting needles is too well understood by those familiar with knitting-machines to need minute description.

The long needles are arranged to move along the grooves of the plate A, their inner ends passing across the space between the two plates and a given distance into the grooves of the plate B and back again into the grooves of the plate A. The short needles are arranged either to have the same movement or to be transposed to the plate B, when their outer ends will move from the grooves of the latter plate across the annular space *b*, a short distance along the grooves of the plate A, and back again to the plate B. In other words, the long needles are arranged to operate from the plate A, while the short needles may be made to operate either from the plate A or from the plate B.

In Fig. 1 the whole of the needles are shown as operating from the plate A to the plate B, in which case a plain knitted fabric will be produced. In Fig. 2, however, the operation of the short needles has been transposed, so that they operate from the plate B to the plate A, in which case a ribbed fabric will be produced, for the reason that in the former case all the needles are operating on the outside of the fabric, and in the latter case one needle is operating on the inside and the adjacent needle on the outside of the fabric throughout the series.

The object of making the short needles self-acting at both ends will now be evident,

as either one end or the other may be required to form the loops of thread and add them to the fabric.

I will now proceed to describe the manner in which the movement of the needles is effected.

As the driver C, Fig. 4, moves in the direction of the arrow, the front curved end of the plate G bears against the inside of the hook at the outer end of the long needles and partially withdraws them from the grooves of the plate B to the proper position for receiving the thread, and in this position they are maintained until, as the driver continues to revolve, the inclined edge *x* of the plate I catches the hooks and by the further movement of the driver draws the needles to the limit of their outward movement—namely, to the position occupied by the needle 2, Fig. 1. As the driver continues its movement, the inside edge of the inclined plate J pushes the needles back until they occupy the position of the needle 3, Fig. 1. In like manner the short needles are drawn outward by the plates F and H and pushed back by the inclined end *y* of the plate I. As long as both long and short needles continue to operate as described a plain knitted fabric will be produced.

It will be observed that the point of the plate E revolves in a circle within the range of the inner ends of the short needles and would therefore catch into the hooks of the same were it not for the plate F, the point of which catches the outer hooked ends of the needles and withdraws the latter beyond the range of the point of the said plate E. Now, this plate F can be readily moved from the position shown in Fig. 1 to that shown in Fig. 2, when its point is in the rear instead of in advance of the point of the plate E. Consequently the latter point will catch the inner hooked end of the short needles, as clearly shown in Fig. 2, and the plate will draw these needles inward along the grooves of the plate B, the plate D pushing them back, so that their outer ends shall cross the annular space between the two plates. The short needles will thus continue to operate from the plate B or on the inside of the fabric, producing ribs on the latter as long as the plate F retains the position shown in Fig. 2.

The needles should of course be stationary at all other times excepting when the plates are acting on them. In order that they may be certain to maintain this stationary position the under side of the driver is throughout the greater portion of its circumference recessed, as best observed on reference to Fig. 7, so that the long needles 8 are confined between the shoulders 5 and 6, and the short needles 9 between the shoulders 5 and 7, these shoulders being of course discontinued at the points where the needles have to reciprocate, as described above.

It will now be seen without further description that either a plain or ribbed circular

fabric may be knitted by the above devices and that the plain fabric may be converted to a ribbed fabric, and vice versa, without stopping the machine, all that is required for this purpose being the simple movement of plate F. The leg of a stocking or sock, which generally consists of a plain surmounted by a ribbed fabric, can thus be completed at one operation, thereby dispensing with the usual tedious practice of attaching the ribbed top after the plain fabric has been completed.

It will also be seen that the above-described arrangement of the long and short needles in the grooves of the plates is not compulsory, as two or more short needles may be arranged between two long needles or two or more long needles between two short needles. In fact, the width of the ribs must depend upon the arrangement of the long and short needles.

It has been heretofore remarked that the plates E, H, and I are so secured to the driver as to be capable of a slight adjustment thereon to and from the driver's center. By means of this adjustment the movement of the needles, the length of the loops formed thereby, and consequently the tightness or looseness of the fabric may be regulated at pleasure.

It is not absolutely necessary that long and short needles should be used for producing

the results described above, as they may all be of the same length, providing the plates on the driver are arranged accordingly.

Without confining myself, therefore, to the precise form or arrangement herein described of the plates D, E, F, G, H, I, and J, I claim as my invention, and desire to secure by Letters Patent—

1. Producing a circular ribbed fabric by means of a series of self-acting needles so arranged in radial grooves of two stationary plates and so operated that some of the needles shall operate on the outside of the fabric while others operate on the inside of the fabric, as specified.

2. The employment of radial reciprocating needles made self-acting at both ends, combined with the devices herein described or their equivalents, whereby the said needles may be so transposed as to operate either on the inside or outside of the fabric without any interruption of the process of knitting, as herein set forth, for the purpose specified.

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

THOMAS LANGHAM.

Witnesses:

HENRY HOWSON,
JOHN WHITE.