2 Sheets—Sheet 1.

R. F. M. CHASE.

Knitting-Machine and Tubular-Knit Fabric.

No. 219,619. **Patented Sept. 16, 1879.**

Fig. 1

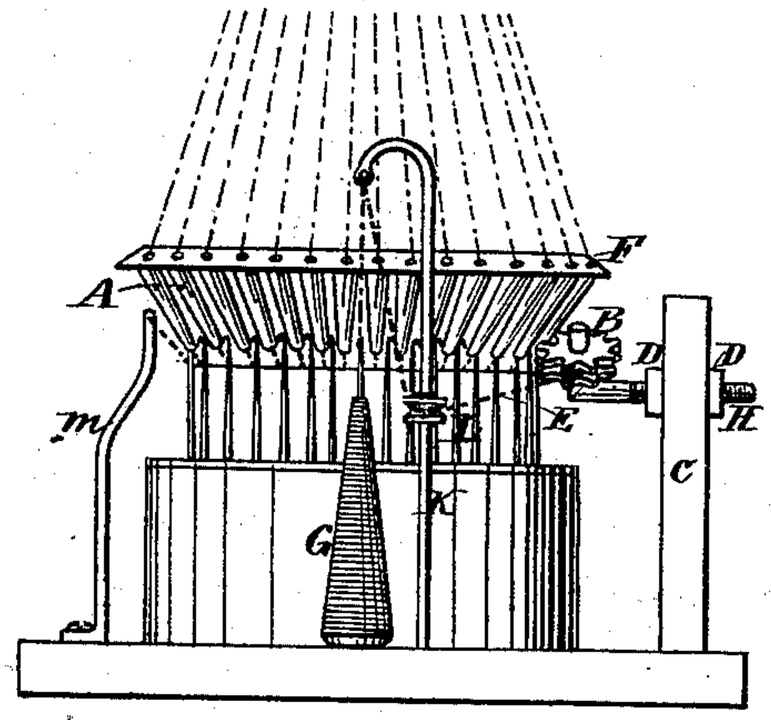


Fig. 2.

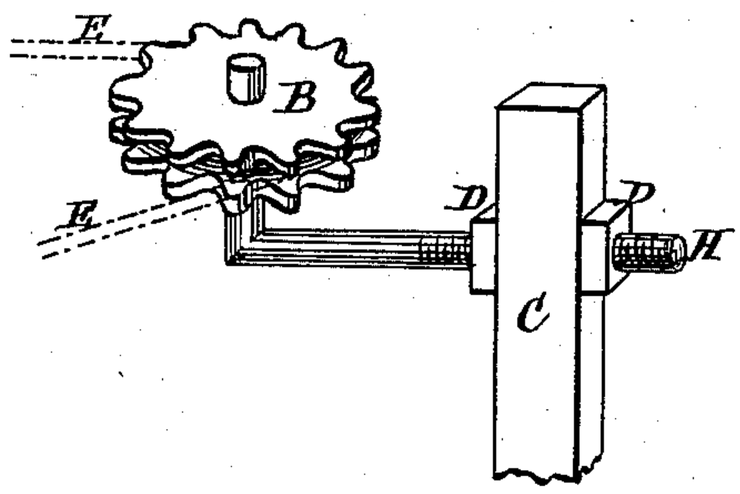


Fig. 3.

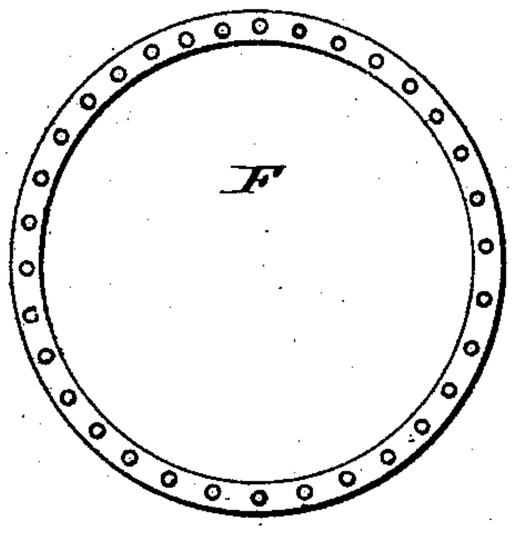


Fig. 4.

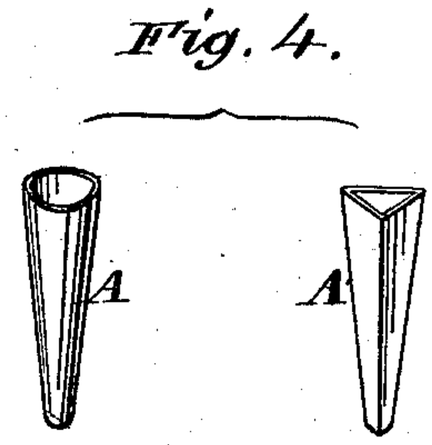
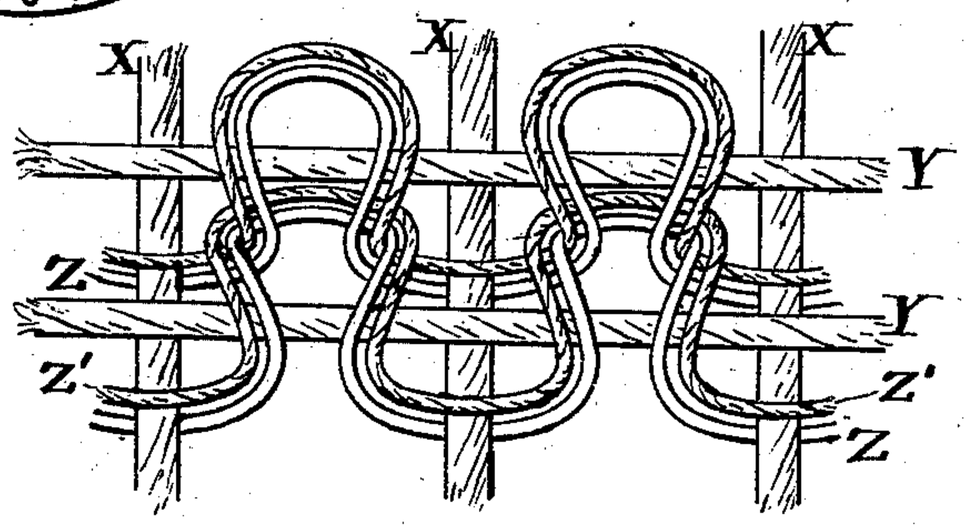


Fig. 5.



Witnesses

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by A. Pollok Jr

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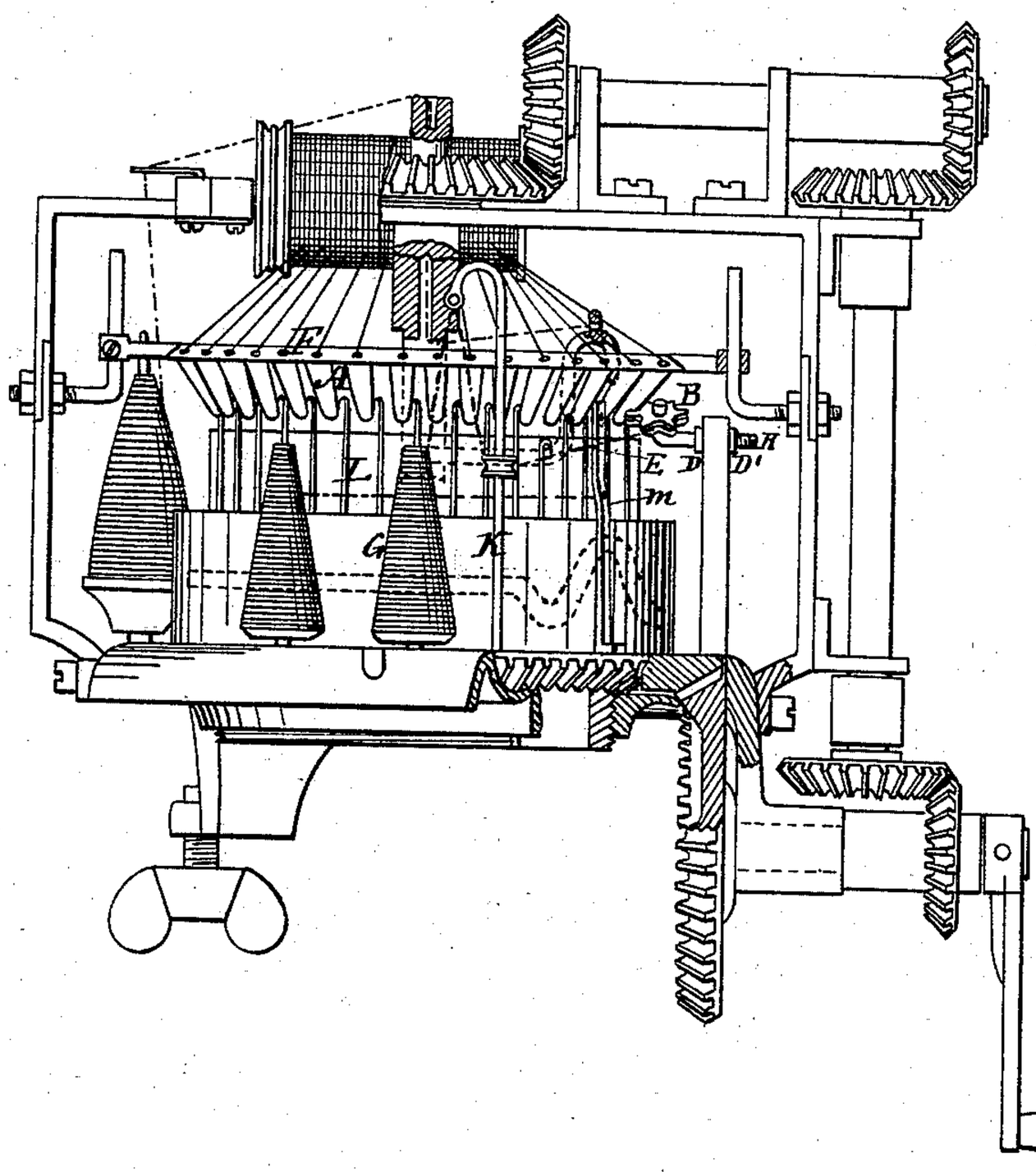
2 Sheets—Sheet 2.

R. F. M. CHASE.

Knitting-Machine and Tubular-Knit Fabric.

No. 219,619. **Patented Sept. 16, 1879.**

Fig. 6.



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UNITED STATES PATENT OFFICE.

RICHARD F. M. CHASE, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND HENRY F. HERKNER, OF SAME PLACE.

IMPROVEMENT IN KNITTING-MACHINES AND TUBULAR KNIT FABRICS.

Specification forming part of Letters Patent No. **219,619**, dated September 16, 1879; application filed June 17, 1878.

To all whom it may concern:

Be it known that I, RICHARD F. M. CHASE, of the city, county, and State of New York, have invented new and useful Improvements in Knitting-Machines and Tubular Knit Fabrics, which improvements are fully set forth in the following specification.

This invention relates to that class of knitting-machines for making tubular and other fabrics in which the warp and a filling-thread at right angles thereto are united by means of knitting-stitch.

In a machine of this class, for which Letters Patent No. 140,635, dated July 8, 1873, were granted to George Merrill, the warp-threads are conducted through small holes in a large horizontal ring located in the upper part of the machine. As this ring is larger than the upright tubular body of the machine, the warps are passed therefrom inwardly at an inclination between the respective needles, and out through the interior of the body. Two threads—one a filler, applied on the outside, and the other a binding or knitting thread, supplied on the inside, of the warps—are used to supply the place of a weft.

This invention consists in certain improvements on the machine described in said patent, and in a new fabric and hose made by the improved machine, as will be hereinafter more fully set forth.

The following description will enable those skilled in the art to make and use my invention.

In the drawings, Figure 1 represents a side view, and Figs. 2, 3, and 4 represent views of detached parts, of my machine. Fig. 5 shows the manner of interlacing the threads to form the fabric, and Fig. 6 is a side elevation, partly in section, showing the manner of applying my improvements to the Merrill machine.

The general construction and arrangement of the upright tubular body of the needles and of the devices for the delivery of the knitting-thread upon the inside of the warp are not substantially different from the construction and arrangement show in the said patent.

The large ring or guide frame, (marked F on drawings and shown detached in Fig. 3,) which serves to deliver the warp-threads at an angle to the line of reciprocation of the needles, has attached thereto metal tubes A.

For every hole in the guide-frame through which a warp-thread passes a metal tube is attached. These tubes, which may be of any suitable shape, as represented in Fig. 4, serve to carry the warp-threads down to the needles, and form, in connection with the ring or frame F, a lantern gear or wheel.

Upon a standard or column, C, a horizontal bar, H, is placed. It bears on an upright journal at one end a horizontal wheel, B, and is adjustable relatively to the standard by two set nuts or screws, D. This construction is represented in Fig. 1 and detached in Fig. 2. The wheel B is provided with spurs or teeth adapted to engage with the lantern-wheel formed by the ring F and tubes A. It has upon its periphery a circumferential groove, cut sufficiently deep to allow one or more filling-threads to lie therein without interfering with the working of the gearing.

Although I have described and shown the wheel B rotated by means of the tubular lantern-gear, yet it is proposed, when single warps are used, to gear the said wheel by means of such warps, and then the tubes may be dispensed with; but when two or more warps are used the tubes are essential to insure perfect operation, as the teeth of the wheel B would not be properly engaged by the warps themselves.

When two or more warps are introduced between every two needles they are passed through the same tube.

E designates the filling-thread. It may be run off from any ordinary bobbin, G, through a guide-ring adjusted on an upright thread-guide, K, and through a tension-wheel, L.

By the operation of the metal tubes the possibility of the warp-threads getting out of place or being caught up by the needle is avoided, and by the grooved gear or spur wheel the filling-thread E is laid properly in place. This filling-thread E does not enter into the formation of the knitting-stitch proper, but lies between the rows of knitting. It corresponds to what is called in the Merrill patent

the "outside weft," which is united to the warp by a knitting-thread, called therein the "inner weft."

In the knitting which serves to unite the warp-threads and the filling E, I employ two threads, one inside and one outside the warp, and united by a double knitting-stitch. The inner thread is delivered, as has been before stated, in substantially the same way as the inner weft in Merrill's patent. The outer thread is delivered by a carrier, *m*, being passed through an aperture therein from a bobbin.

It is, of course, understood that the standard C, the thread-guide K, the bobbin G, and carrier *m* are all connected with the cam-ring (which reciprocates the needles vertically) and revolve with it. The needles, as they descend, first catch the inner knitting-thread on their hooked ends, and then catch the outer knitting-thread thereon, and, after catching this second thread, form the knitting-loop in both in the ordinary way usual in knitting-machines.

The double knitting-stitch thus formed strengthens and thickens the fabric upon the exterior, thus giving a different character to the material manufactured and adding greatly to its strength.

The fabric as made by my invention consists, therefore, of the warp-threads, a filling-thread crossing the same at right angles, in tubular fabrics extending round and round, and an outer and an inner knitting-thread, the latter uniting the warp and the filling, and the former being interlaced with the inner knitting-thread and forming a covering for the fabric.

It is obvious that the same invention may be applied to the manufacture of flat or non-tubular fabrics.

In the drawings, Fig. 5, X represents the warp-threads, Y the weft, and Z Z′ the inner and outer knitting-threads, respectively.

The knitted loops of both fabrics lie on the one side of the fabric, which presents on the opposite side the appearance of a woven fabric.

It will, of course, be readily understood that the mechanism of the Merrill patent (shown in Fig. 6) may be modified, and also that my improvements may be applied to other machines of the same class.

In order to manufacture a hose in acccordance with this invention by the machine before described, the warps are kept at a great tension, which must be evenly applied to each, so that the hose, when in use, will bear the strain equally in all parts, and not be ruptured thereby. The hose is knit round and round, as before described. The knit covering formed by the interlacing of the two knitting-threads protects the warp-threads and renders the hose perfectly water-tight.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, in a machine of the character described, with a series of needles, means for delivering a series of warp-threads between said needles, and devices for delivering thereto thread for knitting, of a grooved gear or spur wheel for delivering properly the filling-thread, substantially as described.

2. The combination, with a series of needles and one or more carriers for delivering thereto thread for knitting, of a ring or frame provided with a series of tubes to guide and deliver warp-threads between the aforesaid needles, substantially as described.

3. The combination of lantern gear or wheel, formed of the guide ring or frame and attached tubes, and the grooved gear or spur wheel, substantially as set forth.

4. In a machine of the class described, the combination, with the upright stationary tubular body, needles, and rotary cam-ring, and enlarged guide ring or frame for delivering the warp at an incline, of mechanism, substantially as described, for carrying at the same feed to the hooked ends of the needles, prior to the formation of the loops, knitting-threads on opposite sides of the warp, as set forth.

5. In combination with the upright stationary tubular body, needles, rotary cam-ring, and enlarged guide or warp frame, a device for delivering a weft, and two thread-carriers adapted to deliver knitting-threads to the hooks of aforesaid needles on opposite sides of the warps stretched at an incline from said warp-frame, between the needles, substantially as described.

6. A fabric consisting of warp and weft threads crossing each other without interlacing, and of two knitting-threads, one of which embraces the straight threads upon the surface opposite the knitted side, the filling-threads being disposed and held between the surface-threads and the knitted part, and between successive rows of loops embracing the surface-threads, substantially as set forth.

7. A hose having a series of straight longitudinal threads of even length, a filling-thread extending round said longitudinal threads without interlacing or interweaving therewith, and two knitting-threads interlaced and looped together to form a knit covering for the hose, one of said knitting-threads embracing the aforesaid longitudinal threads, and the filling-thread being disposed and held in position between the longitudinal threads and the knit covering, and between the successive rows of loops embracing the said longitudinal threads, substantially as described.

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

RICHARD F. M. CHASE.

Witnesses:

LAWRENCE A. SNEDEN,

CURTIS P. GATELY.