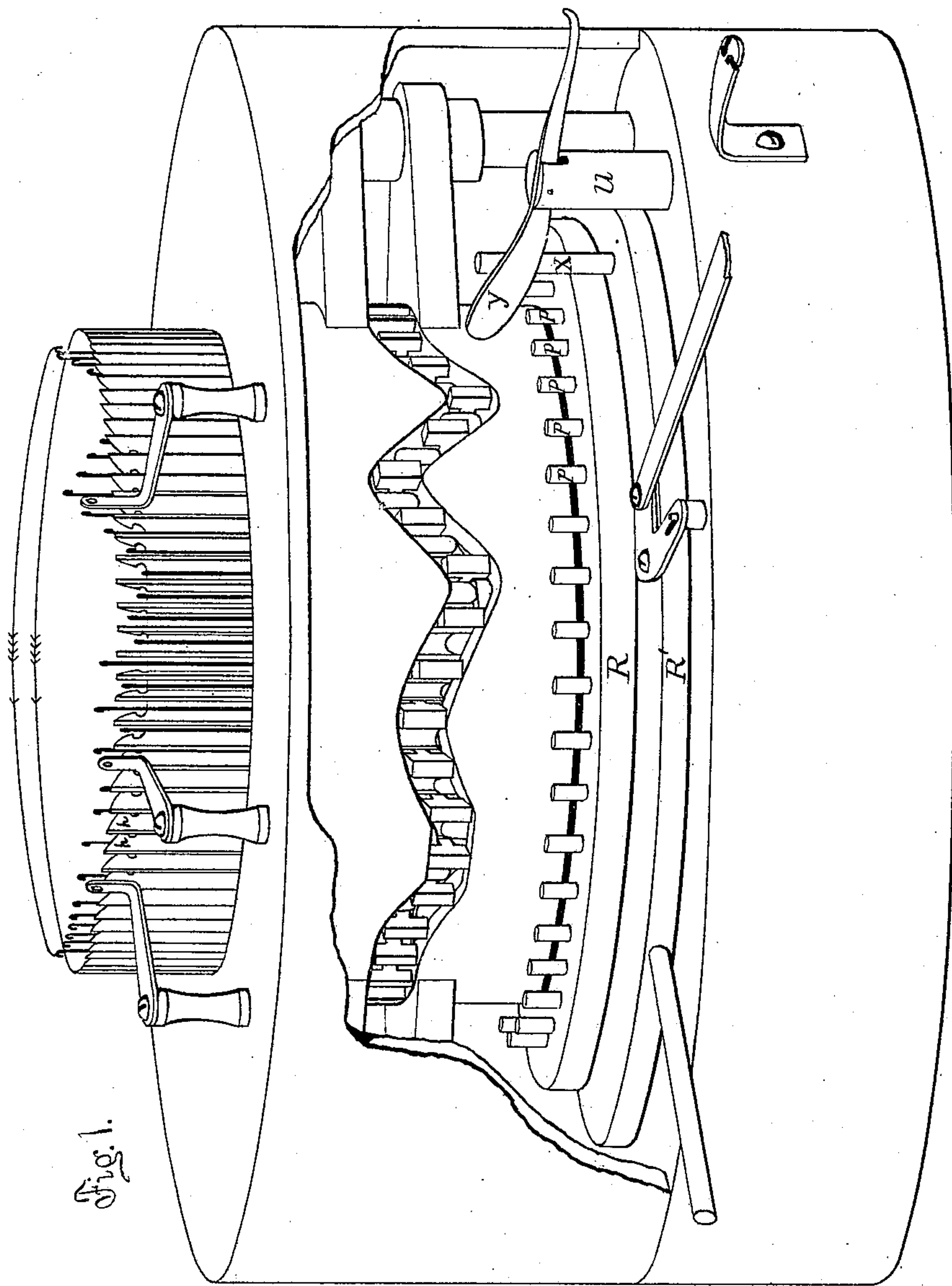


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Weft-Thread Knitting-Loom.

No. 212,269.

Patented Feb. 11, 1879.



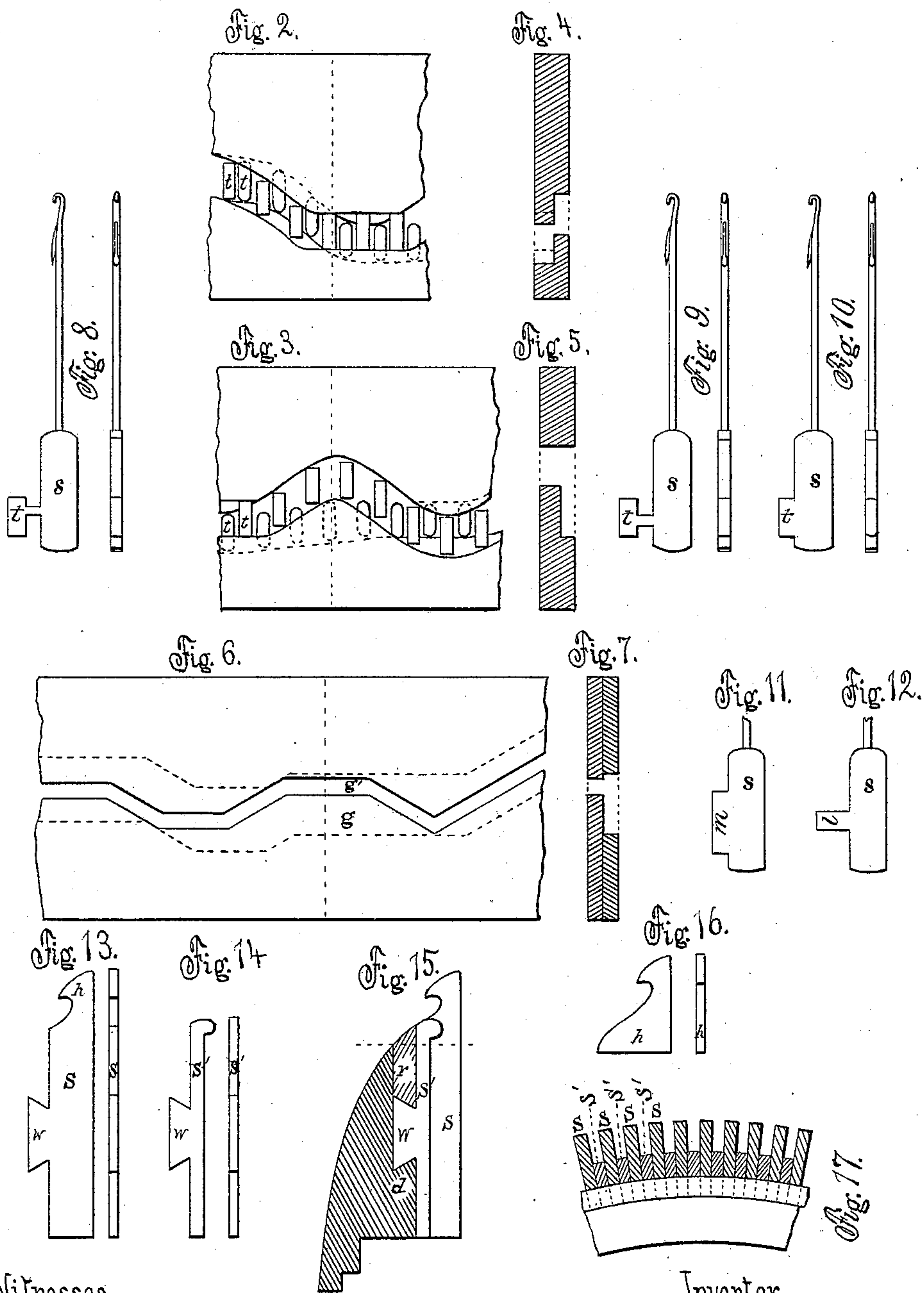
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# UNITED STATES PATENT OFFICE.

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## IMPROVEMENT IN WEFT-THREAD KNITTING-LOOMS.

Specification forming part of Letters Patent No. **212,269**, dated February 11, 1879; application filed January 12, 1878.

*To all whom it may concern:*

Be it known that I, LEVI E. SALISBURY, of the city and county of Providence, and State of Rhode Island, have invented certain Improvements in Weft-Thread Knitting-Looms, of which the following is a specification:

My invention relates to weft-thread knitting-loom—that is to say, circular-knitting machines in which, in addition to the loop-thread, one or more threads are laid into the fabric analogous to the weft or filling in a loom, and not composing any part of the stitch or loop. The weft-thread is to be carried between the needles in such a manner that it will lie in front of some needles and behind others, and is thrown off with the loops. The interlacing of the weft-thread among the needles, and the management of it until it becomes a part of the fabric, have heretofore been found to be a matter of difficulty. Attention has been principally directed to a division or separation of the needles by throwing some of them out of the line, or causing the tops to arrange themselves in two lines at the point where the thread is introduced, thus making a path between the needles for the introduction of the thread, the needles being afterward brought together again into a single row or line, and the thread being governed from that point by wheels which conduct it to its proper position.

By means of my invention I dispense entirely with all devices for springing or diverting the needles laterally out of their line, and also with all wheels used for controlling the weft-thread.

The rising and falling of the needles being controlled by cams, I cause certain needles to descend below their neighbors, leaving in the more elevated position those only to which I desire to present the thread. These needles, taking the thread in the hooks, descend, and others rise to be supplied in the same way, in case more than one weft-thread is to be used. Thus I divide or separate the needles vertically or longitudinally instead of laterally, and by means of cams instead of wheels.

Another feature of my invention, and already above referred to, relates to the devices for conducting the weft-thread to the rear of those needles not having it in their hooks, or,

in other words, in corrugating the thread, and for controlling it after being thus interlaced, and carrying it below the latches or beards of the needles preparatory to being thrown off with the loops.

The weft-thread, as it is carried down by the needles having possession of it, is thrown behind the other needles by being drawn over inclined surfaces, hereinafter described, and situated between the needles. Thus the weft-thread, or several weft-threads in succession, are laid behind certain needles and in front of others, producing the interlacing sought.

My invention further relates to an improved construction around or upon the exterior surface of the cylinder, whereby the grooves are formed in which the needles play.

In the accompanying two sheets of drawings, Figure 1 is a perspective view of my invention. Fig. 2 is a portion of the cam, showing how some of the needles are dropped below others to introduce a filling-thread. Fig. 3 is another portion of the cam, continuous with Fig. 2 from left to right, showing needles drawn down after having received the filling-thread, and others lifted to receive their filling and afterward drawn down. Figs. 4 and 5 are vertical transverse sections of the circular cams 2 and 3, respectively. Fig. 6 is another form of cams to produce the same effect on the rising and falling of the needles as Figs. 2 and 3. Fig. 7 is a vertical transverse section of Fig. 6. Fig. 8 is two views of one form of slide and toe used in cams 2 and 3. Figs. 9 and 10 are another form of slide and toe adapted to cams in Fig. 1. Figs. 11 and 12 are slides and toes used in cam 6. Figs. 13 and 14 are devices or parts employed in constructing the channels or grooves for needle-slides. Fig. 15 is a part of the cylinder, in vertical section, showing the parts making up my construction of the slide-grooves in position. Fig. 16 is a hook set into the top of the cylinder in the spaces between the needles, being a device performing the double office of throwing the filling-thread behind those needles which have not taken it, and of afterward holding the filling-thread down while the latches are carried above it. (It may constitute a part of Fig. 13.) Fig. 17 is a top view of a portion of the cylinder with the



pieces making up the exterior construction in position.

My improvements are applicable to the ordinary circular-knitting machine with rotary cylinder, and, consequently, many parts of the machine need no description to understand my invention.

Taking the cylinder provided with the parallel longitudinal grooves for the reciprocating needles, I insert in the top of such cylinder, in the spaces between the needles, the hook *h*, Figs. 1 and 16. The point of this hook should be about flush with the backs of the needles, and of such height as to allow the needles to take the yarn above them.

The reciprocating movements of the needles are governed by the cams situated around the cylinder, acting in connection with the toes *t*, attached to the slides *s* of the needles, and in producing the reciprocations desired the conformation of both the cams and the toes must be considered.

In Figs. 1, 2, and 3, I have shown an arrangement of cams and toes for the purpose of operating the needles, as follows: first, one series of alternate needles is depressed; next, and a little farther on, the second series is depressed, at the same time taking the filling-yarn; next, the first series go up to take their yarn and are again depressed, after which they all rise to the same height to take the looping-yarn, and the ordinary process of knitting follows.

The above operation supposes the use of two filling-threads. If, however, only one filling-thread is used, the first series need not be raised again after their first depression until they rise with the others preparatory to taking the knitting or looping thread. In such case one cam is dispensed with and space economized; but this change is not necessary, the work being performed equally well without any change of the cams, the single filling-thread being supplied to either series.

It is sufficiently plain, without further detail, that more filling-threads can be employed by multiplying the cams and repeating the steps now shown.

Figs. 1, 2, and 3 show sections of upper and lower cams adapted to needles, one series of which has the long hooked or T-shaped toe, as shown in Figs. 8 and 9, while the other series has the short toe shown in Fig. 10.

The hooked toe rides on the outer irregular surface and the short toe on the inner, the former striding over the interior elevations without being affected by them, and the latter passing within the outer elevations. The dotted lines indicate the cutting away of interior portions.

In Figs. 1, 2, and 3, the hooked toes are purposely drawn with square corners and the short toes with rounded corners, in order to easily trace them with the eye.

Fig. 2 shows part of the series of hooked toes dropping lower than the short toes, the latter continuing at the same relative eleva-

tion as before, sustained by the inner raised portion of the cam-face until it comes their turn to descend, at the same time taking the filling-yarn.

Fig. 3 shows the hooked toes passing up over the outer elevation, while the short toes pass behind this raised portion of the cam-face without rising. This construction forms in effect two sets of cams, or two irregular grooves or tracks, in which the two kinds of toes, respectively, move. Now, these two irregular grooves may be entirely independent, one above the other, no portions of them being coincident, in which case the toes are simply made to fit the grooves; or the track of one may lie entirely within the track of the other, as seen in Fig. 6, where the long toe *l*, Fig. 12, travels in the narrower, and the short toe *m*, Fig. 11, in the wider, groove.

It is obvious that I am not confined to feeding the filling to alternate needles, but can adopt any order desired, whether for the purpose of giving different appearances to the surface of the fabric, or for any other reason.

Having described the various alternating movements of the needles in taking the filling; it remains to be added that when the needles having the filling-thread are drawing it down over the sloping tops of the hooks *h*, the other needles should stand with their tops as high as the points of the hooks *h*, in which case the thread, on springing over these points, cannot get in front of the last-mentioned needles. For example, in Fig. 6, the needles governed by the narrow groove *g'* drop out of the way of the others, to enable the latter to take the thread, but stop before their tops are below the points of the hooks *h*, and run on horizontally until they begin to rise to take the thread themselves. Those governed by the wide groove *g* descend low enough to draw the thread below the points of the hooks, and then rise sufficiently to be covered in turn when the thread is drawn down by the others. The thread then lies along in the hollows of the hooks *h*, and when the needles all rise to take the knitting-thread the weft-thread is held down by the hooks, and is thus freed from the latches and laid along on top of the loops previously formed.

No latch-guard is required in this machine, as the loops need never be drawn below the latches while putting in the weft thread or threads, and when the latches do finally rise above the loops, just prior to introducing the knitting-thread, this latter thread is laid along against the latches, and itself acts as a latch-guard.

In my construction of the needle grooves or channels upon the exterior of the cylinder, I make the walls or divisions between the needle-spaces by means of flat strips *S*, of metal, set up longitudinally around the cylinder, and separated by narrower strips *S'*, which form the back of the needle-channel. These pieces are bound to the face of the cylinder by a shoulder, *d*, thereon, making an acute angle



with the face, which shoulder locks with the wings *W* of the construction-pieces *S S'*. When these pieces are packed around the cylinder and the ring *r* is driven snugly home, the pieces are dovetailed firmly to the cylinder.

When the needle-channels are made in this way, I extend the piece *S* above the top of the cylinder, and form the hook *h* from such extended portion, which then becomes a substitute for the hook *h*, before explained. The work of plowing out the needle-channels is a matter of considerable nicety and mechanical skill, and involves much more labor, care, and skill than to construct the same in the manner here shown.

The surfaces on which the needles slide can be more easily made smooth and regular, any piece can be removed if damaged and replaced by a new one, and a cylinder can be changed to adapt it to coarser or finer needles by substituting thicker or thinner metal.

The ring *r*, if placed around the bottom of the cylinder instead of the top, would be more conveniently removed, and I think it better for that reason to place it there.

My stop-motion consists of a flat wheel or rim, *R*, Fig. 1, around the base of the cylinder, at right angles to it and turning with it.

The upper surface of the wheel is studded with a row of pins, *P*. Outside the wheel *R* is a second wheel, *R'*, ordinarily at rest, but capable of revolution. Outside the latter wheel a stud, *u*, is placed, which turns in its socket, and mounted on this stud is a lever, *Y*, very nearly balanced.

The yarn, in passing from the spool or bobbin to the needles, is made to draw over the outer end of the lever *Y*. A convenient arrangement is to pass the yarn through a guide situated below the lever, then over the outer end of the lever, then down through a guide, and thence to the needles. The tension thus produced holds the heavier arm of the lever above the pins *P*. When the yarn breaks or runs out, the lever falls between the pins in wheel *R*, and is carried around against the stud *X*, setting the wheel *R'* in motion. This latter wheel operates suitable disconnecting or shipping mechanism arranged to stop the

machine. The stop-motion above described is not here claimed.

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

1. In a weft-thread knitting-loom, the combination, with the reciprocating needles, of mechanism, substantially as described, whereby they are vertically divided for the introduction of the weft or filling thread.

2. In a weft-thread knitting-loom having a rotating cylinder and reciprocating needles, and mechanism for vertically dividing the same for the introduction of the weft or filling thread, the hook *h*, operating to assist in laying the weft thread or threads behind some needles, to produce the interlacing or intertwining described, and also to hold down the weft thread or threads when the needles rise to take the knitting-thread, and prevent the weft-thread from being formed into loops.

3. The combination, substantially as set forth, of the hooks *h*, the needles, and operating mechanism, whereby said needles are reciprocated and vertically divided to take the filling thread or threads.

4. In combination with the needles, the cams *g g'*, or their equivalents, operating to produce the vertical reciprocations described of said needles, for the introduction of the weft-thread, the combination being and operating substantially as described.

5. The combination of the cams *g* and *g'*, or their equivalents, the needles operated by said cams, and the hooks *h*, all substantially as described, and operating substantially in the manner and for the purpose specified.

6. The rotary cylinder of a knitting-machine or knitting-loom having the needle-channels constructed of the pieces *S* and *S'*, substantially as described.

7. The combination of the hooks *h*, the cylinder needle-channels constructed of the pieces *S* and *S'*, and the reciprocating needles actuated by the cams bounding the grooves *g* and *g'*, all substantially as described, and for the purposes specified.

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