

(No Model.)

2 Sheets—Sheet 1.

J. H. PLACE.  
CIRCULAR KNITTING MACHINE.

No. 356,079.

Patented Jan. 11, 1887.

Fig. 1.

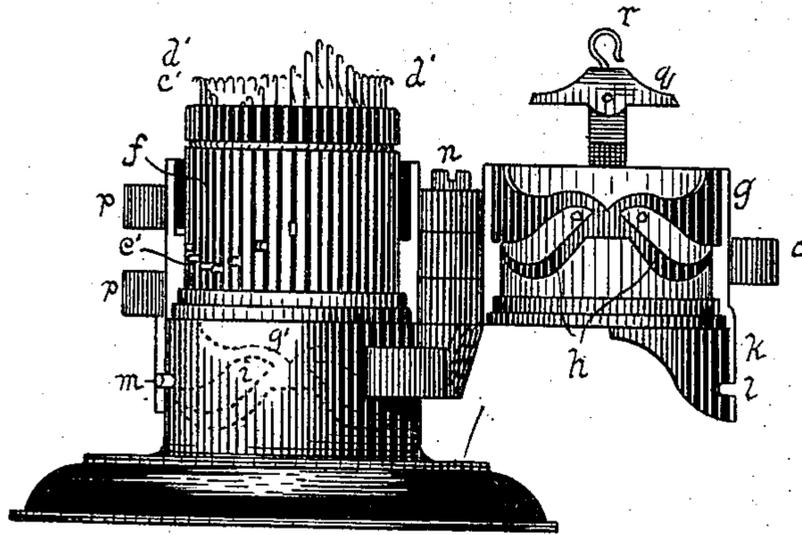


Fig. 2.

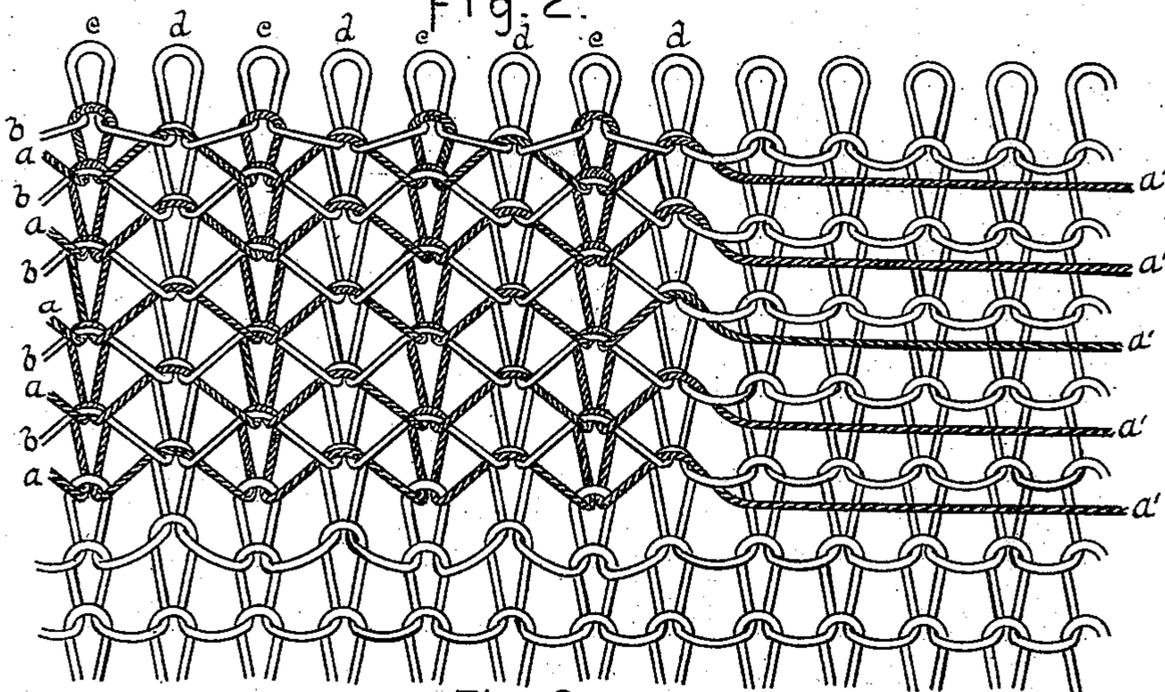


Fig. 3.

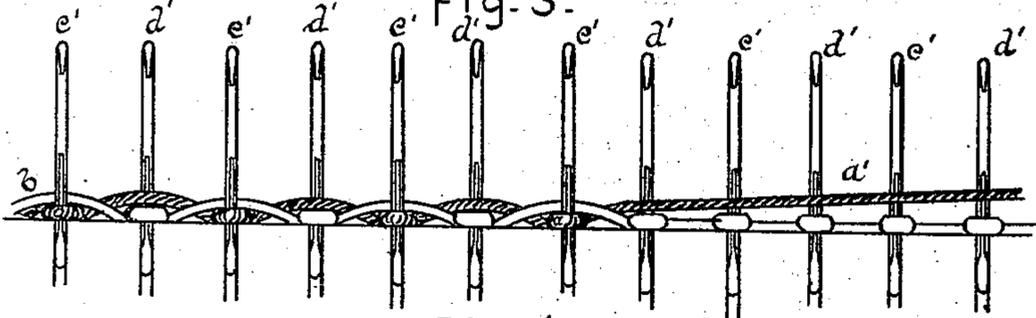
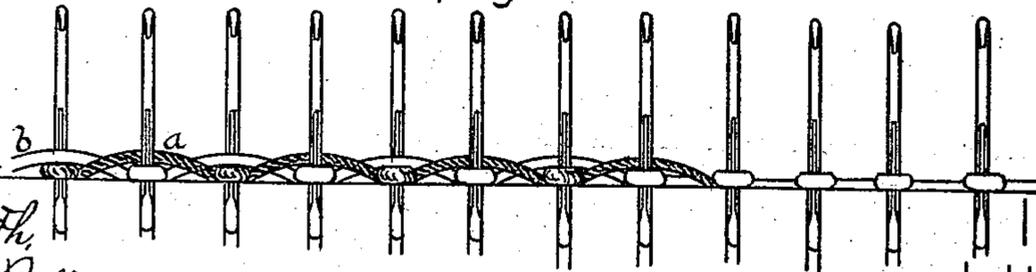


Fig. 4.



ATTEST  
*J. L. Booth,*  
*John A. Mills*

INVENTOR:  
J. H. PLACE.  
By *L. P. Graham*  
*att.*

(No Model.)

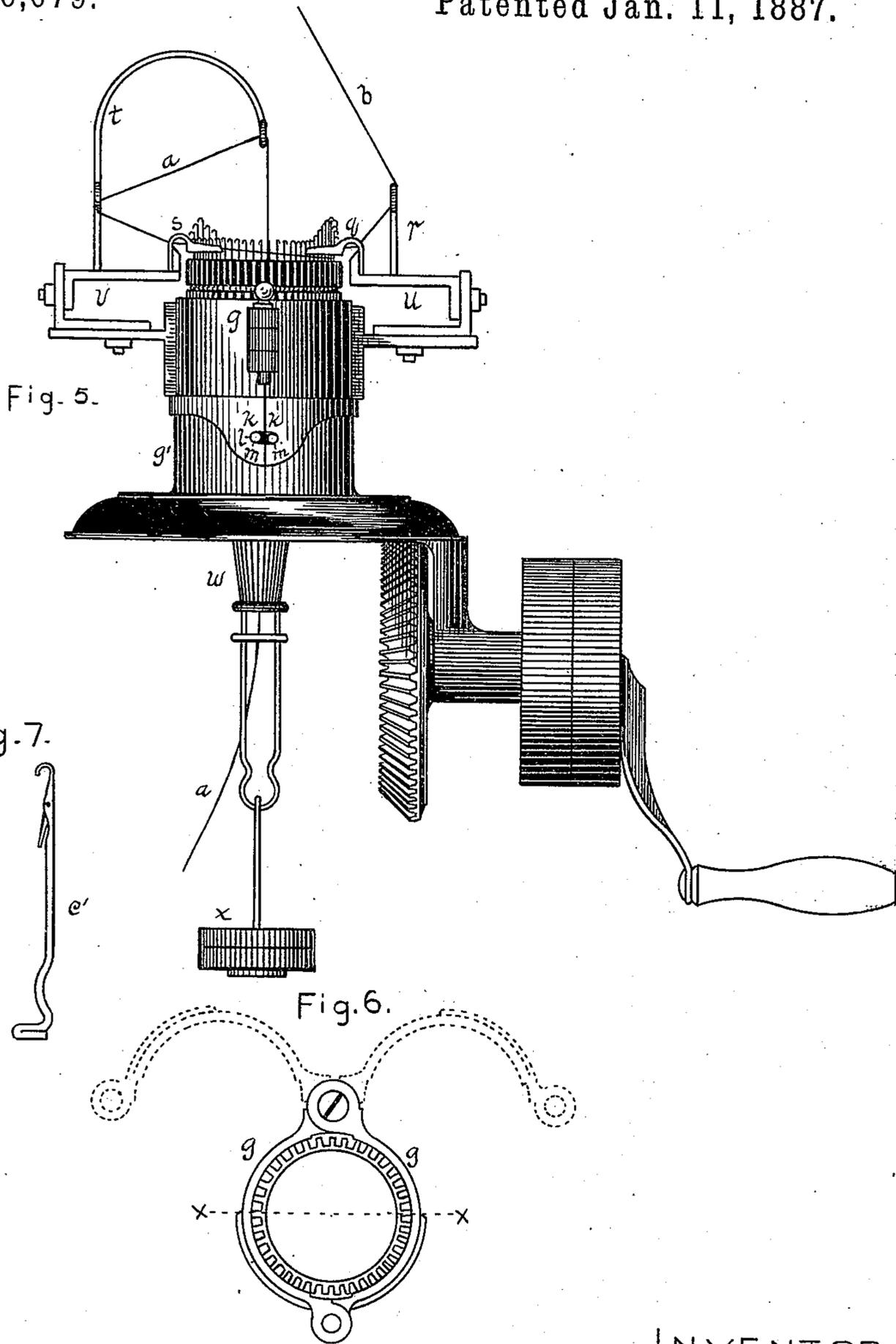
2 Sheets—Sheet 2.

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*John A. Pills*

INVENTOR  
 J. H. PLACE.  
 By *L. P. Graham*  
 Atty -

# UNITED STATES PATENT OFFICE.

JOHN H. PLACE, OF DECATUR, ILL., ASSIGNOR OF TWO-THIRDS TO DAVID R. ALEXANDER AND THOMAS P. MATTHEWS, BOTH OF SAME PLACE.

## CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 356,079, dated January 11, 1887.

Application filed April 15, 1886. Serial No. 199,002. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN H. PLACE, of the city of Decatur, county of Macon, and State of Illinois, have invented certain new and useful Improvements in Circular-Knitting Machines, of which the following is a specification.

The object of my invention is to produce a circular-knitting machine on which may be knitted a two-thread fabric of double thickness, each thread forming independent wales alternately arranged, the connecting-threads of each set of wales being interknitted with the intervening wales, on which may be knitted ordinary single-thread fabric, on which may be knitted the said two-thread fabric and ordinary single-thread fabric combined in any desirable proportion, and on which may be knitted a complete stocking composed in part of the above-mentioned two-thread fabric and in part of ordinary single-thread fabric.

In the drawings accompanying and forming a part of this specification, Figure 1 represents the cam-cylinder and needle-cylinder of my machine, one part of the cam-cylinder being thrown open to show its internal construction. Fig. 2 is an enlarged and distended representation of the inner surface of the product of my machine, showing the single-thread fabric and the two-thread fabric conjointly arranged. Fig. 3 is a representation of a series of needles arranged on a right plane, and provided with two threads in the relative position that the same threads would occupy in the machine immediately after one of the two threads had been knitted. Fig. 4 is a representation of a series of needles arranged on a right plane and provided with two threads in the relative position that the same threads would occupy in the machine immediately after the other of the threads had been knitted. Fig. 5 represents my knitting-machine fully equipped, the cams and lower terminations of the needles being concealed from view by the cam-cylinder. Fig. 6 represents the cylinders as seen from above, the upper portion of the cam-cylinder being indicated as opened by dotted lines. Fig. 7 is a representation of the two kinds of needles used in my machine.

*a* in Figs. 2, 3, and 4 represents a thread used only in the two-thread portion of the fabric shown in Fig. 2.

*b* represents a thread of which the single-thread portion of the fabric shown in Fig. 2 is composed, and which also enters into the composition of the two-thread portion of said fabric.

*a'* represents portions of threads *a* which float loosely while the single-thread fabric is being knitted of thread *b*.

*c*, Fig. 2, represents the wales formed on needles *c'*.

*d* represents the wales formed on needles *d'*.

*f*, Fig. 1, shows my needle-cylinder, the only distinguishing peculiarity of which is its unusual length.

*g* represents the upper portion of the cam-cylinder, which is composed of two semi-circumferential parts hinged together and to the lower portion of the cam-cylinder, each part being provided with recesses capable of receiving operating-cams.

*g'* represents the lower portion of the cam-cylinder, which is provided with one set of cams in the relative position indicated by dotted lines in Fig. 1.

*h* represents a pair of interchangeable cams, which are adapted to be used on either side of the upper portion of the cam-cylinder.

*i* in Fig. 1 represents by dotted lines the permanent location of the only cams in the lower portion of the cylinder.

*k k* represent downward extensions of the upper portion of the cam-cylinder, sufficiently enlarged to encompass the lower part of the cylinder, and provided with recesses *l*, that engage pins *m* when the cylinder is closed, and prevent vertical disarrangement in said cylinder.

*o* represents a perforated lug on one part of casing *g*, and *p p* represent perforated lugs on the other part of the same, said lugs *p p* being arranged to pass on opposite sides of lug *o* and carry their perforations on a vertical line with the perforation in said lug *o* when the cylinder is closed, in order that a securing-pin may be passed through all the lugs, as indicated in Fig. 5.

*q* represents the guide for thread *b*, and *r* is an auxiliary for the same.

*s* is the guide for thread *a*, and *t* represents an auxiliary for the same.

*u* is the frame that carries guides *q* and *r*.

*v* is the frame that carries guides *s* and *t*.

$w$  represents a comb of ordinary construction, and  $x$  is the weight for the same.

To knit single-thread fabric conjointly with two-thread fabric as indicated in Fig. 2, needles  $d'$  are arranged continuously on one side of the cylinder, and alternately with needles  $c'$  on the other side of the cylinder. This will be more readily understood by referring to Fig. 6, in which dots  $x$  indicate a line on one side of which are needles  $d'$  only, and on the other side of which are needles  $d'$  and  $c'$ , alternately interposed. The position of the division indicated by dotted line  $x$  is, however, a matter of choice, and may be varied according as it is desired to vary the proportionate areas of the single-thread fabric and the two-thread fabric. The needles  $d'$  are operated by cams  $i$  only. The needles  $c'$  are operated by cams  $h$  only. The location of cams  $i$  is permanent. Cams  $h$  may be moved from one side of the upper portion of the cam-cylinder to the opposite side of the same, their pivot-pins being fitted loosely to facilitate this result.

When the cams  $h$  are placed directly over cams  $i$ , a single-thread fabric may be knitted precisely the same as if all the needles were of one length and operated by one set of cams, as said needles will all be operated in regular succession, without regard to their arrangement in sets. The cause of the successive action of all the needles, under the circumstances above stated, lies in the vertical coincidence of the two sets of cams and their consequent simultaneous action on their respective needles. Fig. 1 illustrates the relative position of the two sets of needles when subjected to the simultaneous action of the two sets of cams.

By placing cams  $h$  on the side of the cylinder opposite to cams  $i$  and guiding two threads to the needles in the manner indicated in Fig. 5, ordinary single-thread fabric may be knitted of thread  $b$  on the continuously-arranged needles  $d'$ , and the two-thread fabric be knitted of both threads on the alternately-arranged needles  $d'$  and  $c'$ . The wales  $d$  are formed of thread  $b$  on needles  $d'$ , the wales  $c$  are formed of thread  $a$  on needles  $c'$ , and the connecting-threads of each set of wales are interknitted with the intervening wales, as indicated in Fig. 2.

Through the construction of the cam-cylinder and the relative length of the needles the upper ends of said needles project above the cylinder when not in operation, as indicated in Figs. 1 and 5, and the thread that is knitted by one set is laid against the other set. If the needles did not so project, the connecting-threads of the different sets of wales would pass to the inner surface of the fabric, where they would float loosely instead of being interknitted, as shown.

In knitting a compound fabric, as indicated in Fig. 2, the thread used only in the double portion is laid around the single-thread needles, and when said needles are operated passes to the inner surface of the fabric, where it

floats loosely, as shown at  $a'$  in Fig. 2. To facilitate this operation, the needles  $d'$ , on which the single-thread fabric is knitted, are formed as shown in Fig. 7, the customary depression under the latches being dispensed with, in order that said latches may have a greater lateral projection when at rest, and more surely trip on the floating thread, which does not lie so close to the needles as do the ordinary loops.

To knit the two-thread fabric only, the needles  $c'$  and  $d'$  are alternately interposed on all sides of the cylinder.

To knit a complete stocking, the needles of one set are arranged consecutively on one side of the cylinder and alternately with the needles of the other set on the opposite side of the cylinder, the cams  $h$  are placed directly over cams  $i$ , thread  $b$  is fed from above through guides  $r$  and  $q$ , and the stocking is set up in any well-known manner. As the knitting progresses all the needles are operated in regular succession, and an ordinary single-thread fabric is produced until the knee portion is approached, when the upper portion of the cam-cylinder is opened, the cams  $h$  changed to the opposite side of the upper portion of the cylinder, and said cylinder again closed. Thread  $a$  is then fed upward through comb  $w$ , and carried to the needles by guides  $t$  and  $s$ , and the front portion of the knee is knitted double thickness with threads  $a$  and  $b$ , while the rear portion of the knee is knitted single thickness with thread  $b$ . The cams  $h$  are next placed over cams  $i$ , thread  $a$  is dispensed with, and the stocking is completed down to the heel. Up to this time the motion of the cam-cylinder has been continuous rotary; but when the heel portion is reached the said cylinder is given a reciprotating rotation until the heel is completed, when the foot portion is knitted with a continuous rotation of the cam-cylinder in any well-known manner. With a stocking knitted as above stated, the floating threads corresponding with threads  $a'$  in Fig. 2 would lie around the rear portion of the knee, and be finally cut away as the stocking was completed.

Cams  $h$  and  $i$  are of a kind to permit the cylinder to be reciprocatingly operated.

Guide  $t$  permits the operator to keep constant watch over the operation of the machine by leaving the interior of the cylinder comparatively unobstructed.

The shown construction and arrangement of the cams and needles are considered preferable; but it is obvious that the short needles may be arranged continuously on one side of the cylinder, and alternately with the long needles on the other side, and that the upper portion of the cam-cylinder may be integral, while the lower portion is divisible, these changes in structure being considered undesirable modifications of the general principle of my machine.

As a summary of the specification, it may be

stated that in order to knit a complete stocking with a re-enforced knee portion of the structure specified it is necessary that the needle-cylinder be provided with two lengths of needles, one length being arranged continuously on one side of the cylinder, and alternately with the other length on the other side of the cylinder. The cam-cylinder must be in three parts, one of which is circumferential and the other two of which are semi-circumferential, conjunctive, and separable. The circumferential part of the cam-cylinder must have one set of cams in a permanent position. The semi-circumferential parts of the cam-cylinder must each have a recess for cams, and must have in common one set of interchangeable cams. The cams must be of a form to permit reciprocating motion in their cylinder, and the needles must be adjusted to stand above the cylinder when at rest.

In knitting a compound fabric, as indicated in Fig. 2, the cam construction that enables the cam-cylinder to be reciprocatingly operated is not essential.

The needles used in knitting the two-thread fabric may be arranged in alternately-interposed pairs, or one long needle may be interposed between two pairs of short needles, and vice versa; but it is considered preferable in knitting a stocking-knee to arrange them in the singly-interposed manner shown, in order that the outer surface of the re-enforced portion may be more nearly identical in appearance with the other parts of the stocking-leg.

I do not herein lay claim to either the two-thread re-enforcing fabric or to the complete stocking, the former being the subject-matter of my application No. 158,974, filed March 16, 1885, and the latter being the subject-mat-

ter of my application No. 199,005, filed April 15, 1886.

I claim—

1. A knitting-machine consisting in a needle-cylinder, as *f*, having needles, as *c' d'*, of different lengths, alternately interposed and projecting above the cylinder when at rest, and a three-part cam-cylinder composed of one circumferential band, as *g'*, and two conjoining and separable semi-circumferential bands, as *g*, the circumferential band having one permanently-positioned set of cams, and the semi-circumferential bands having each a cam-recess, and possessing in common a set of interchangeable cams, substantially as described.

2. A knitting-machine consisting in a needle-cylinder, as *f*, having needles, as *c' d'*, of different lengths, alternately interposed and projecting above the cylinder when at rest, a three-part cam-cylinder composed of one circumferential band, as *g'*, and two conjoining and separable semi-circumferential bands, as *g*, the circumferential band having one permanently-positioned set of cams; and the semi-circumferential bands having each a cam-recess, and possessing in common a set of interchangeable cams, a thread-guide, as *q r*, adapted to receive a thread from above, and a thread-guide, as *s t*, adapted to receive a thread from below through the cylinder, substantially as described.

In testimony whereof I sign my name in the presence of two subscribing witnesses.

JOHN H. PLACE.

Attest:

C. C. CLARK,  
J. L. BOOTH.