(No Model.)

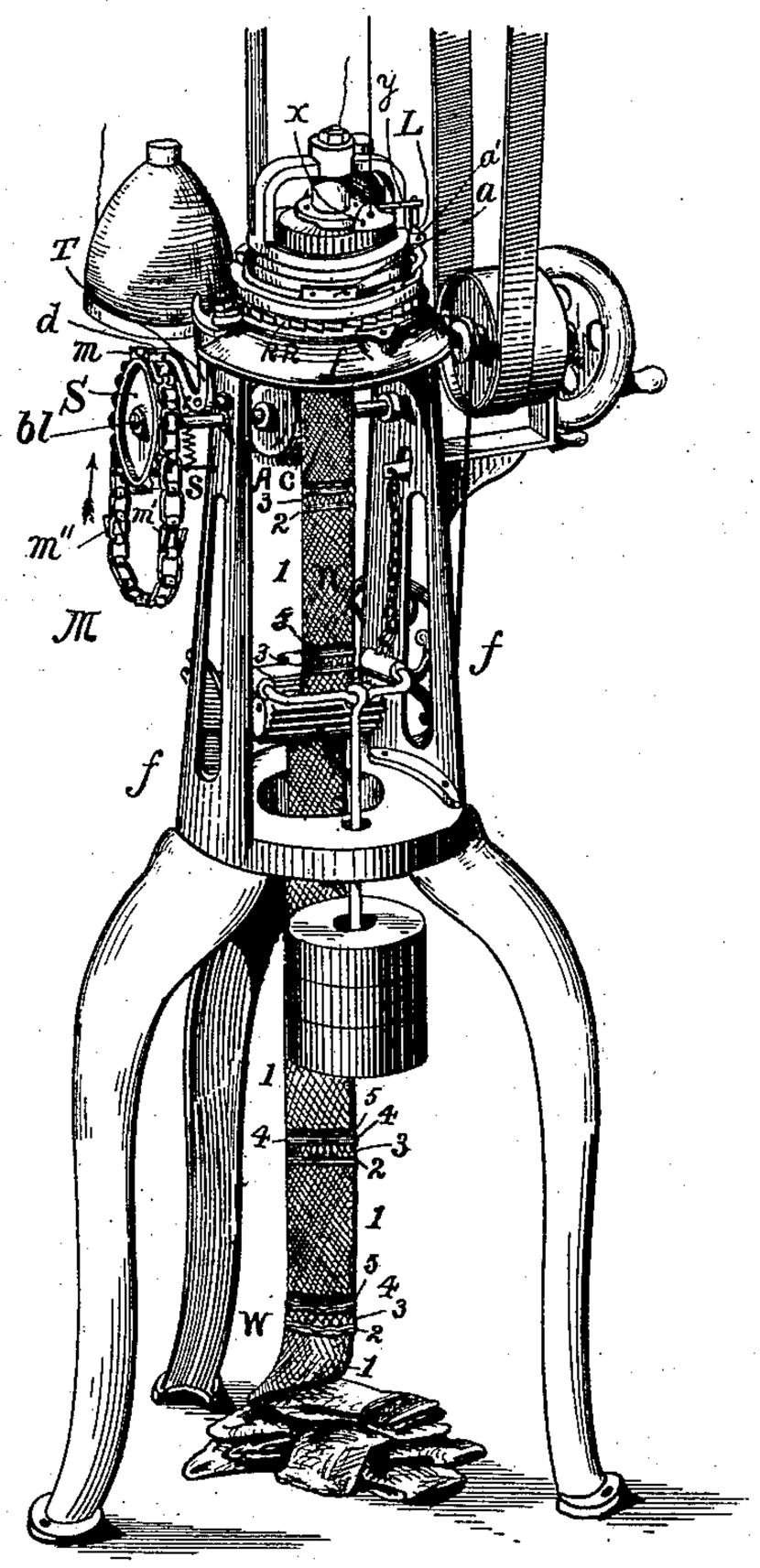
6 Sheets—Sheet 1.

J. L. BRANSON.

KNITTING MACHINE.

No. 334,338. Patented Jan. 12, 1886.

Fig. 1.



WITNESSES:

A. H. Seubert

John Nolan.

INVENTOR

James L. Branson,

per Joshua Pusey, atty.

(No Model.) 6 Sheets—Sheet 2.

J. L. BRANSON.

KNITTING MACHINE.

No. 334,338. Patented Jan. 12, 1886.

Fig. 2.

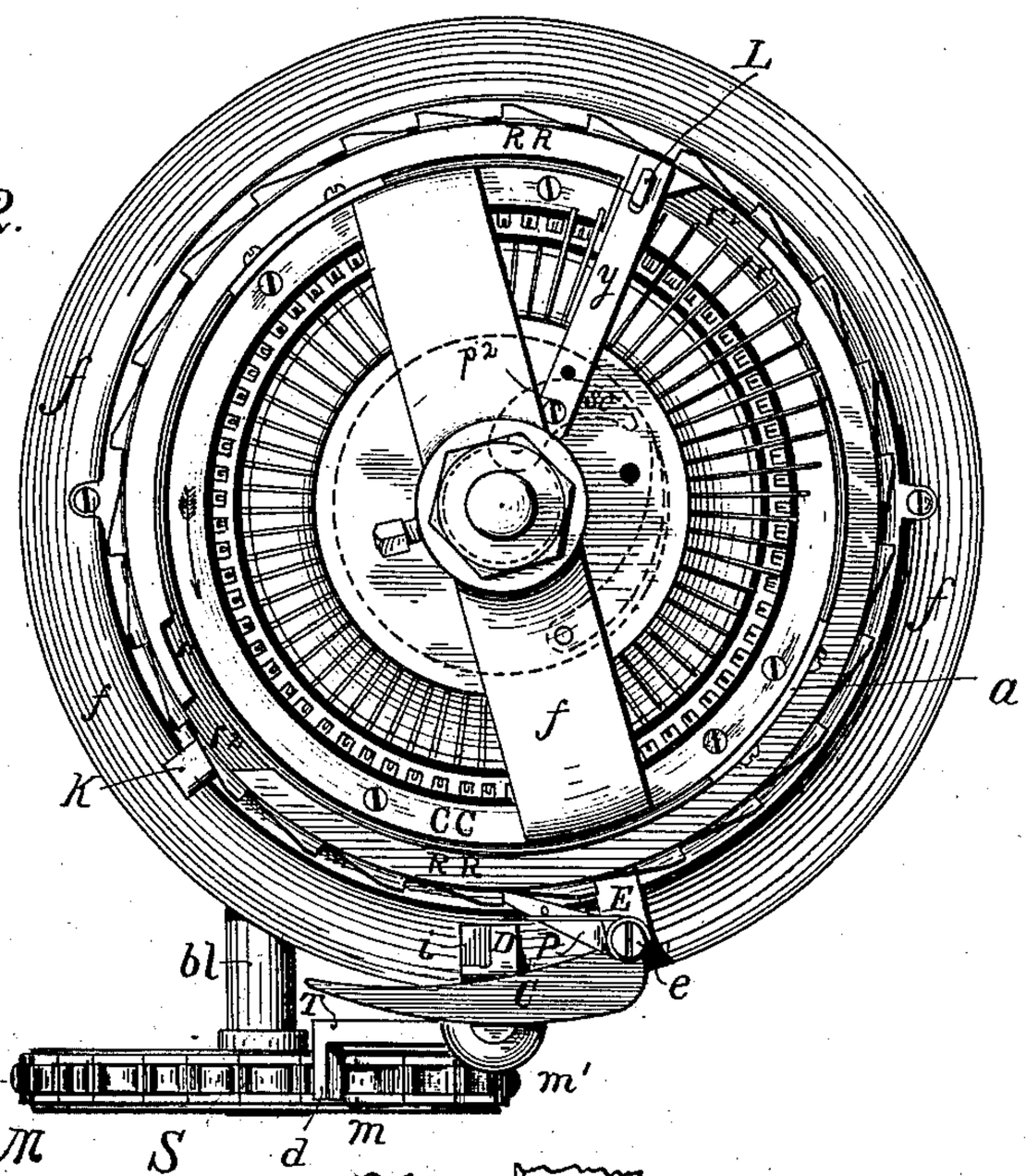
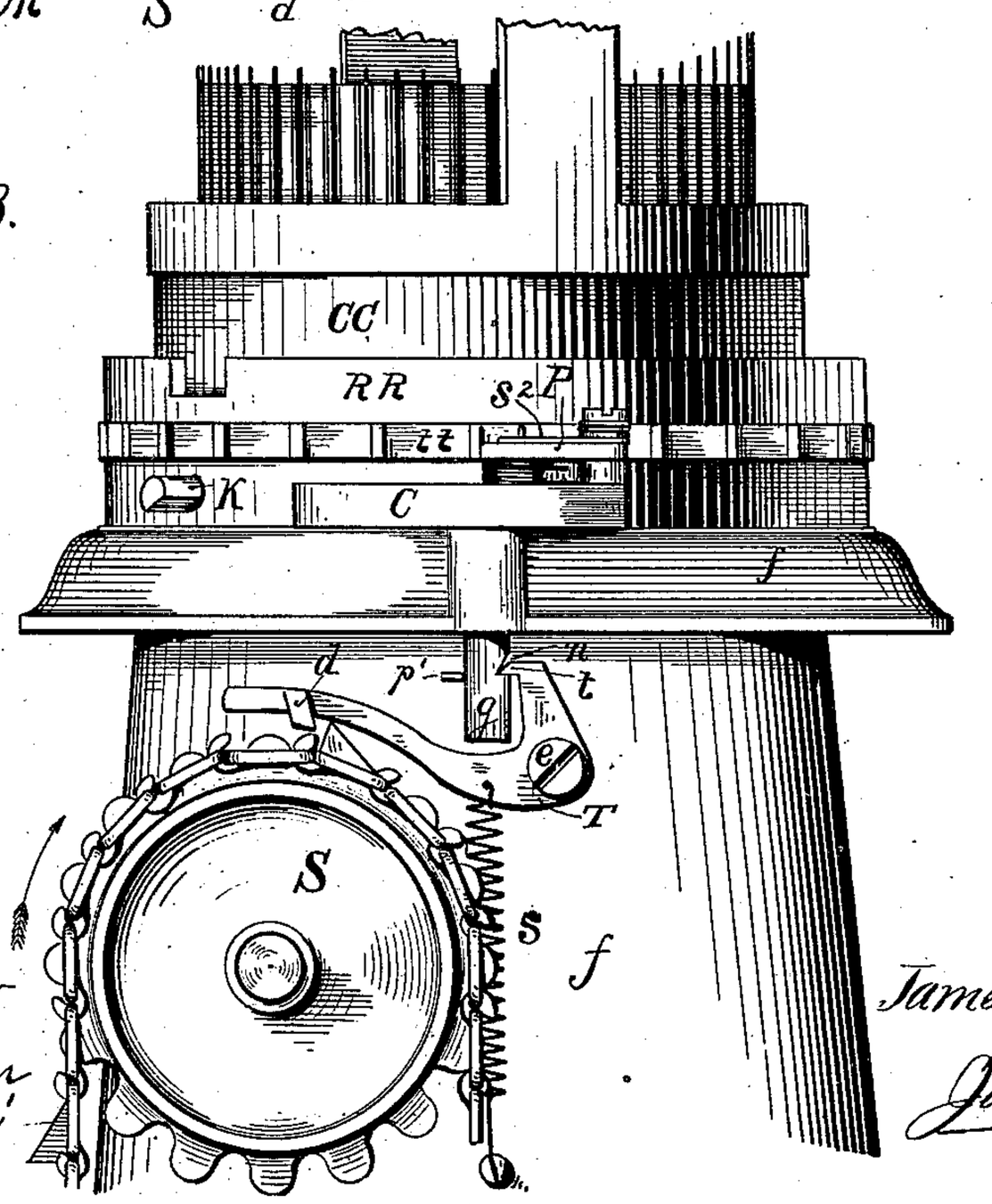


Fig. 3.



WITNESSES:
A. H. Heilbor
John Nolan

INVENTOR
James L. Branson,
per his atty
Joshua Pusey

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 6 Sheets—Sheet 3.

J. L. BRANSON.

KNITTING MACHINE.

No. 334,338. Patented Jan. 12, 1886.

Fig. 4.

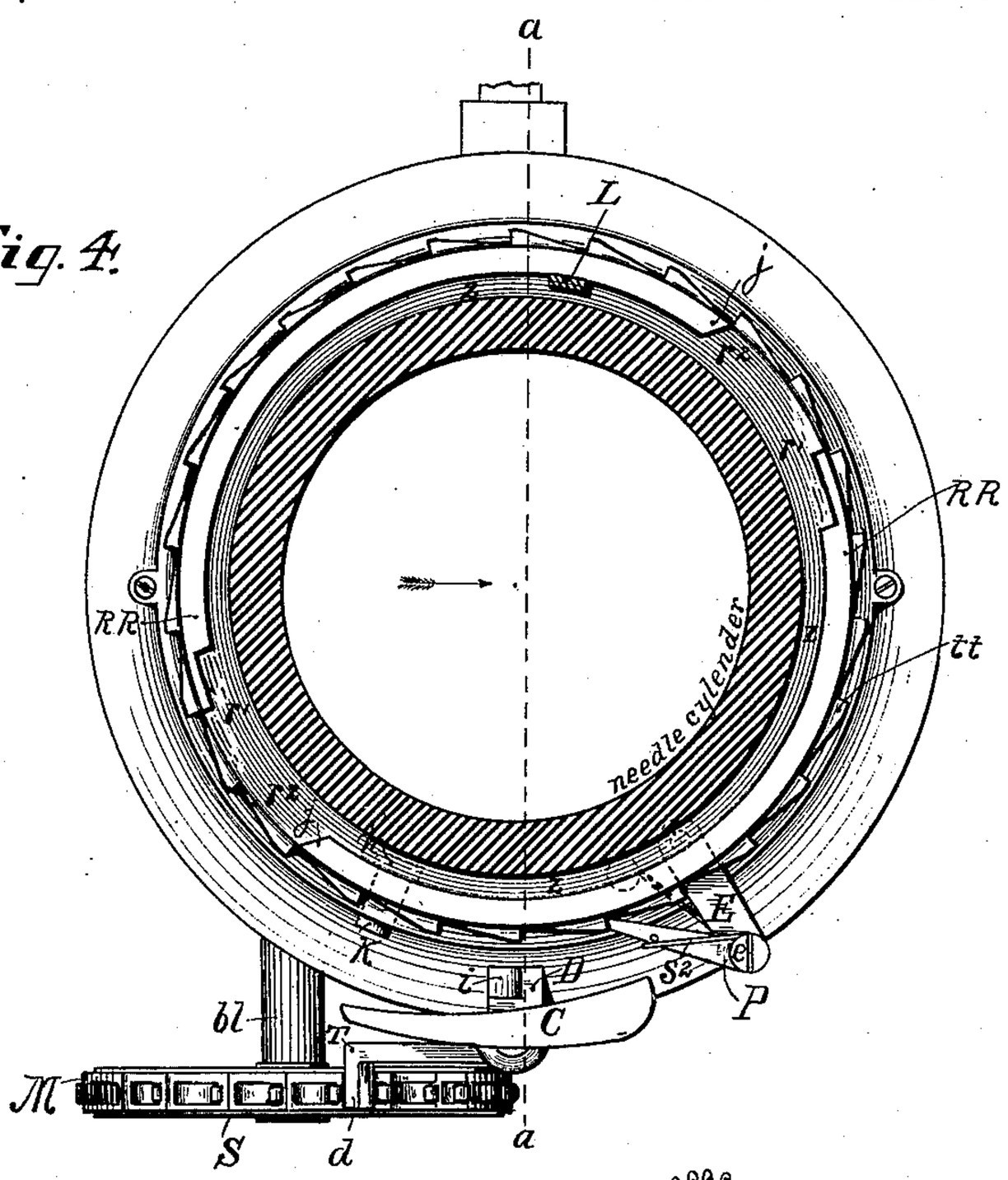
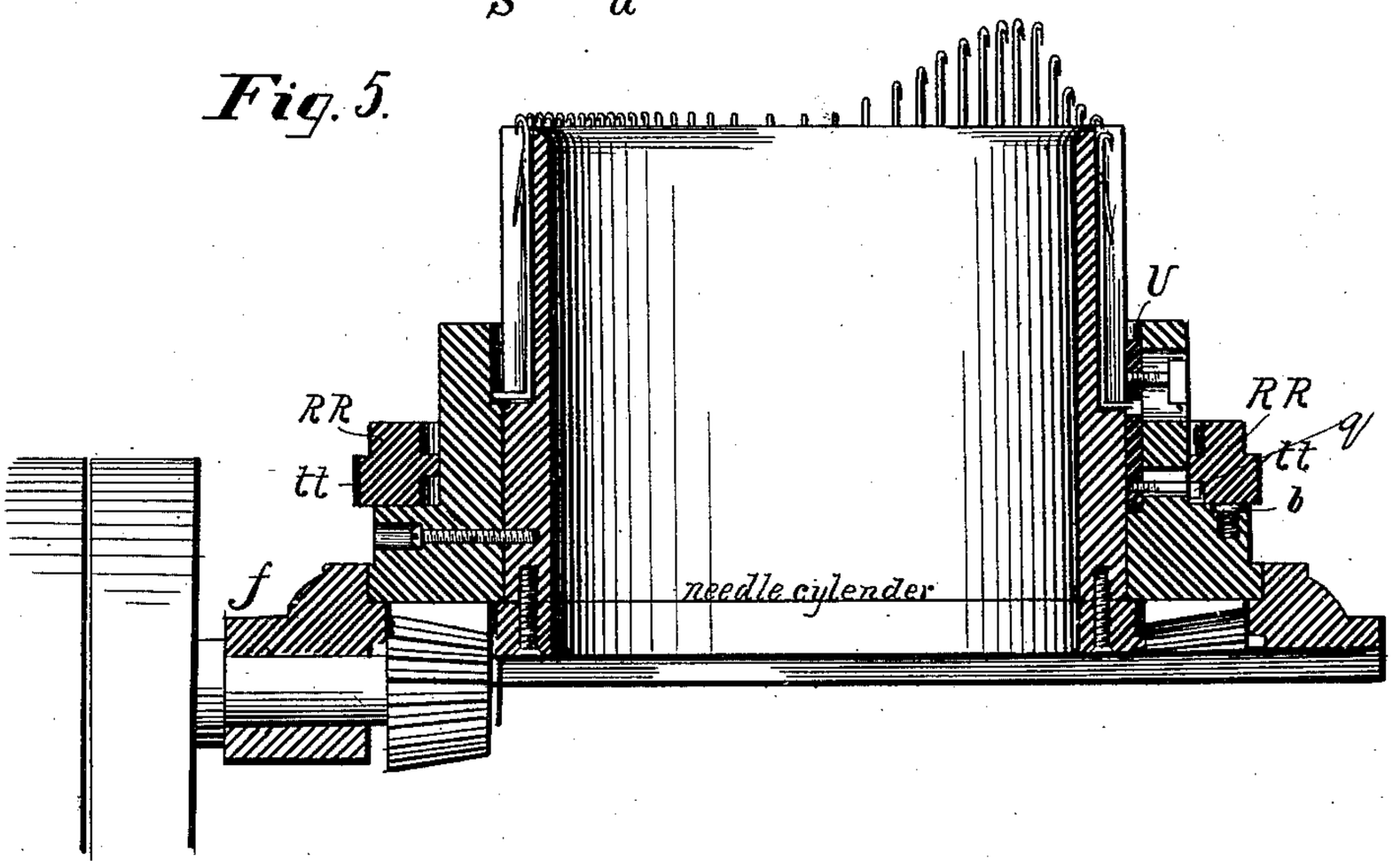


Fig. 5.



WITNESSES:

N. H. Culver

John Nolan

INVENTOR

James L. Branson,

per Joshua Pusey, atty

(No Model.)

6 Sheets—Sheet 4.

J. L. BRANSON.

KNITTING MACHINE.

No. 334,338. Patented Jan. 12, 1886.

Fig. 6.

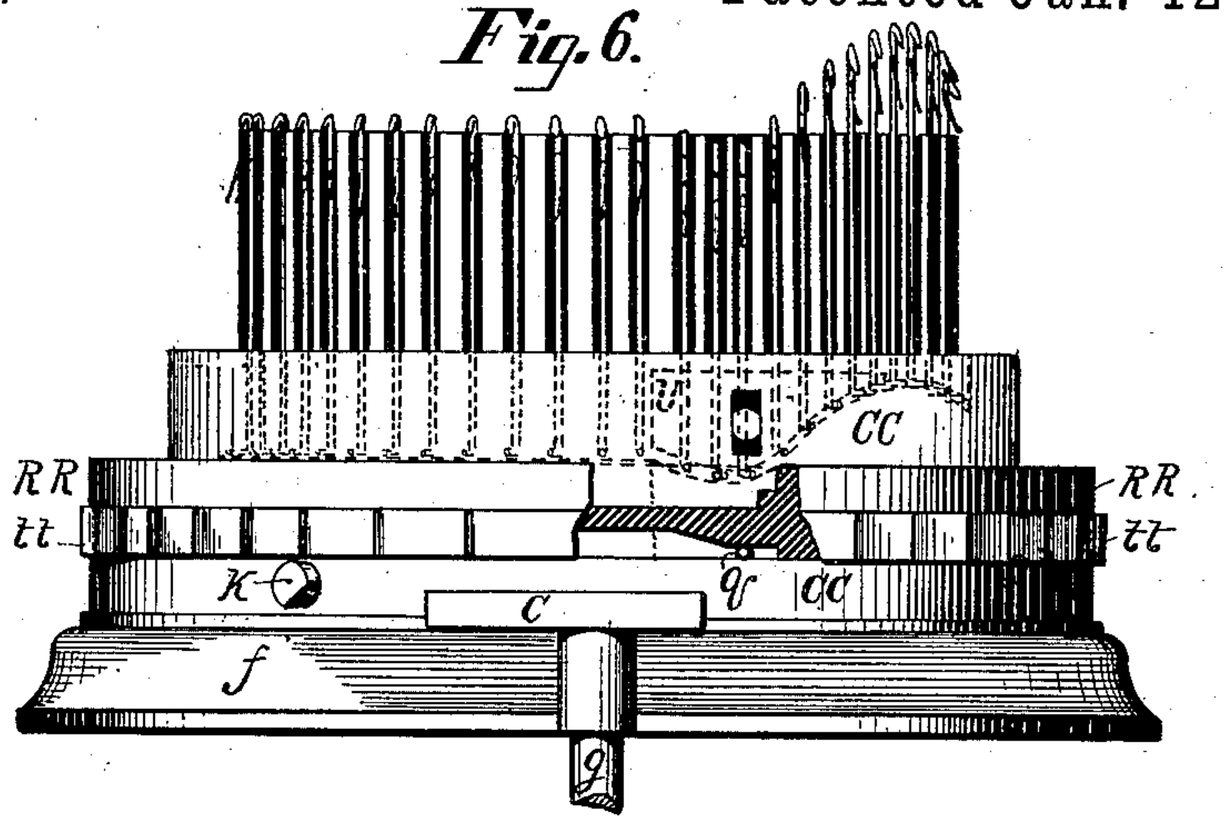


Fig. 10.

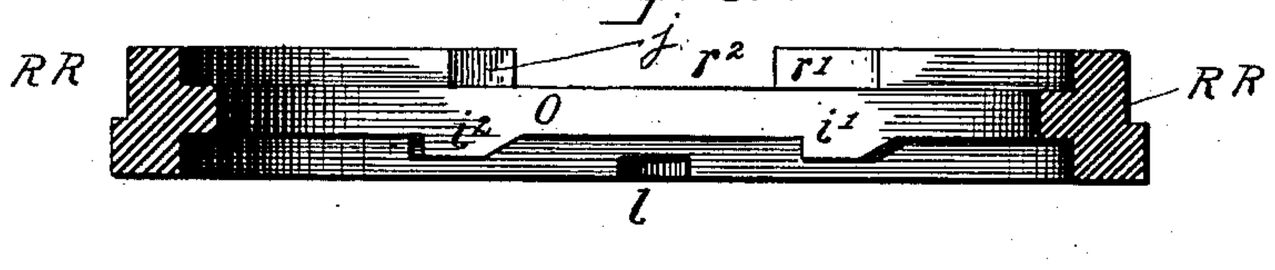
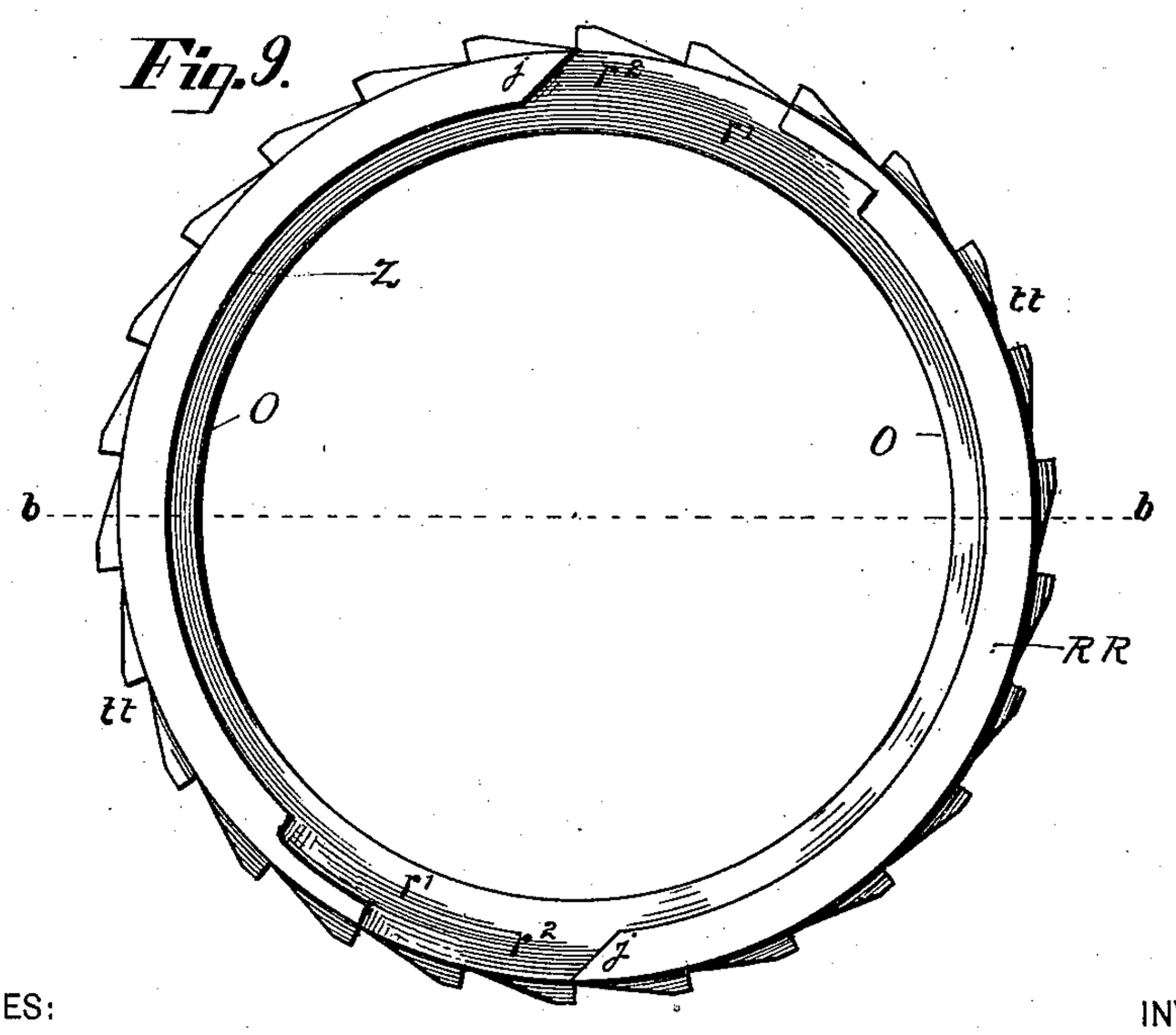


Fig. 9.



WITNESSES:

N. H. Conlon

John Nolan

INVENTOR

James L. Branson,

per Joshua Pusey atty

(No Model.) 6 Sheets—Sheet 5.

J. L. BRANSON.

KNITTING MACHINE.

No. 334,338. Patented Jan. 12, 1886.

Fig. 7

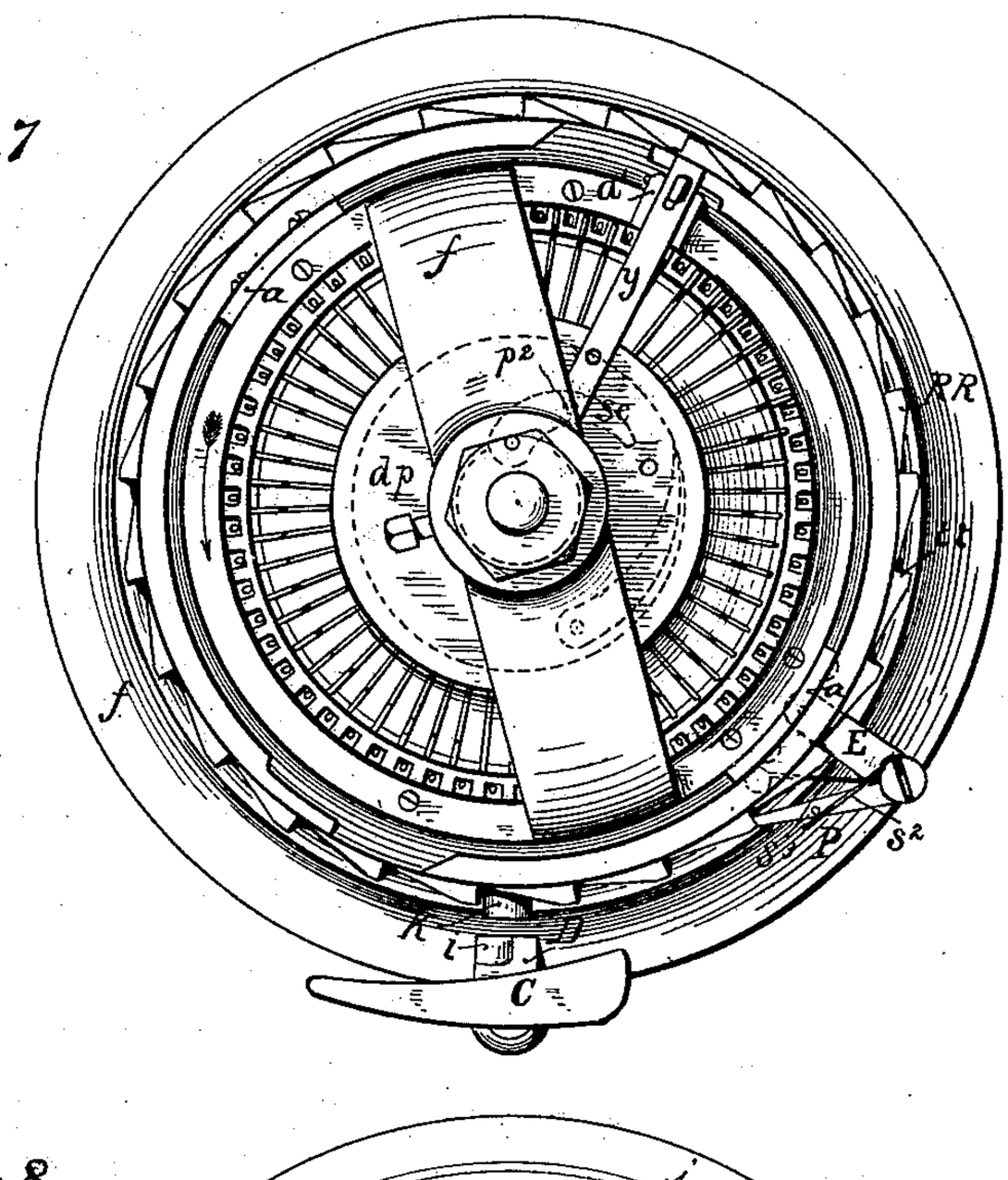
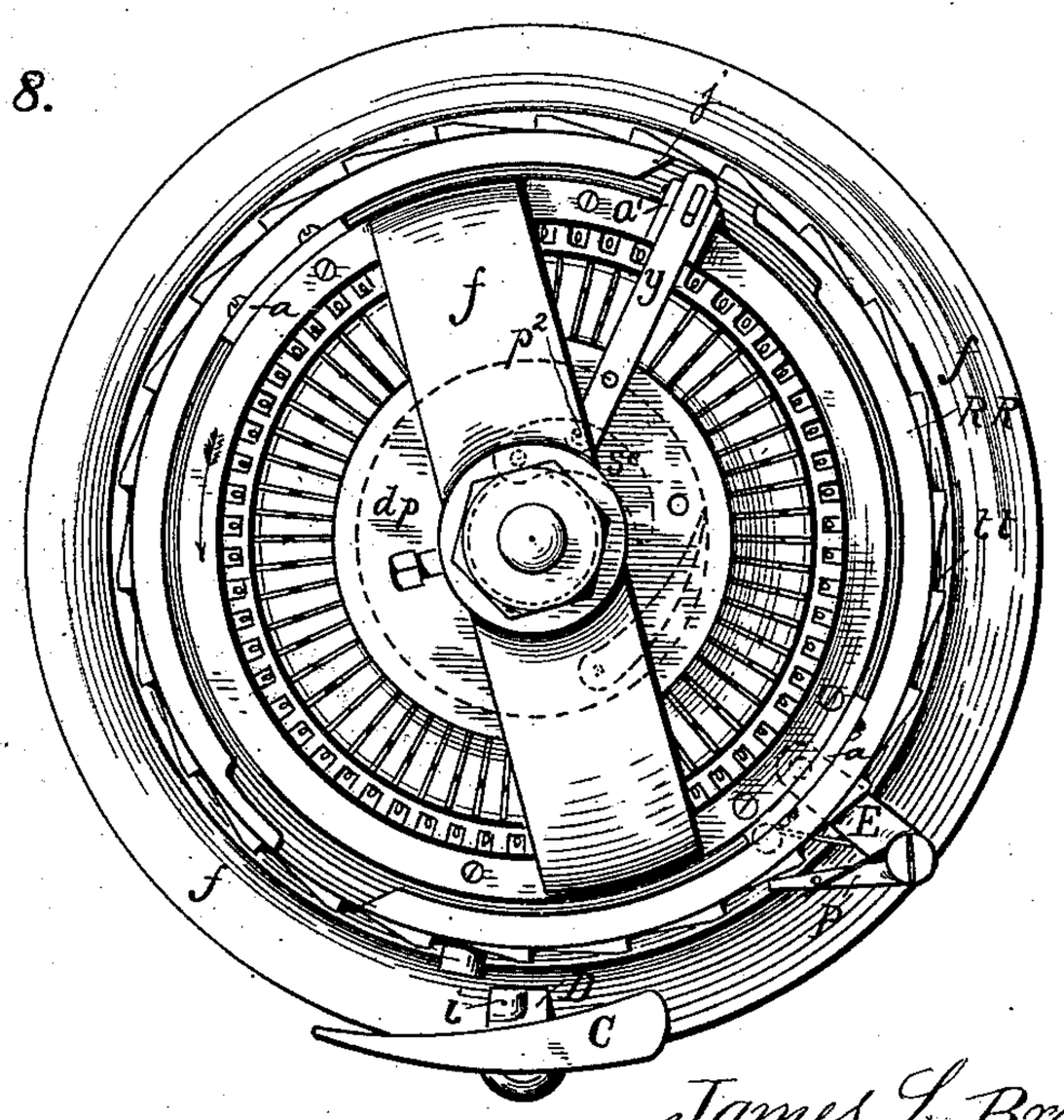


Fig. 8.



WITNESSES:

M. Mulvey

John Nolan.

INVENTOR

James L. Branson,

per Joshua Pusey, atty

(No Model.) 6 Sheets—Sheet 6.

J. L. BRANSON.

KNITTING MACHINE.

No. 334,338. Patented Jan. 12, 1886.

Fig. 11.

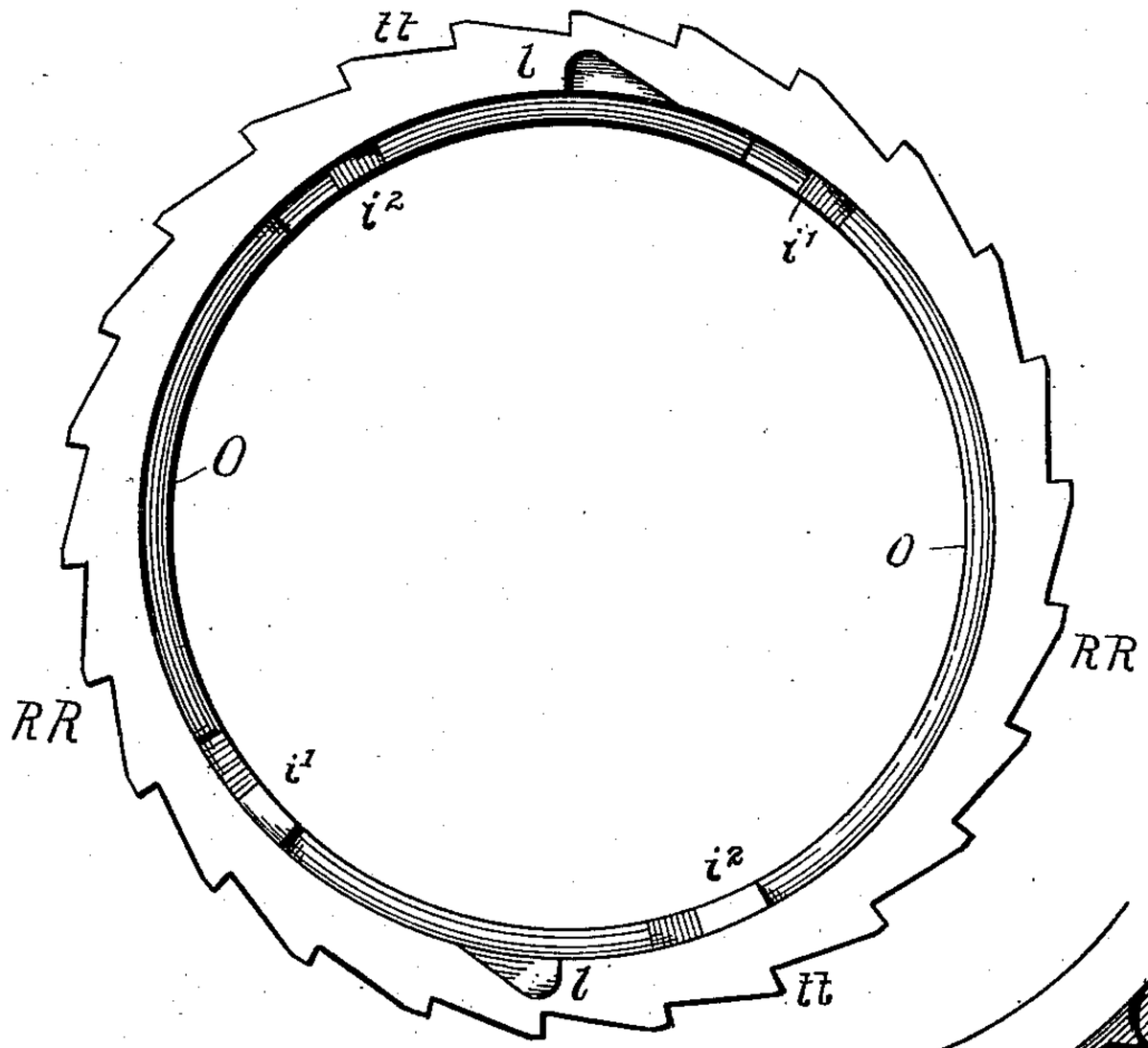


Fig. 12.

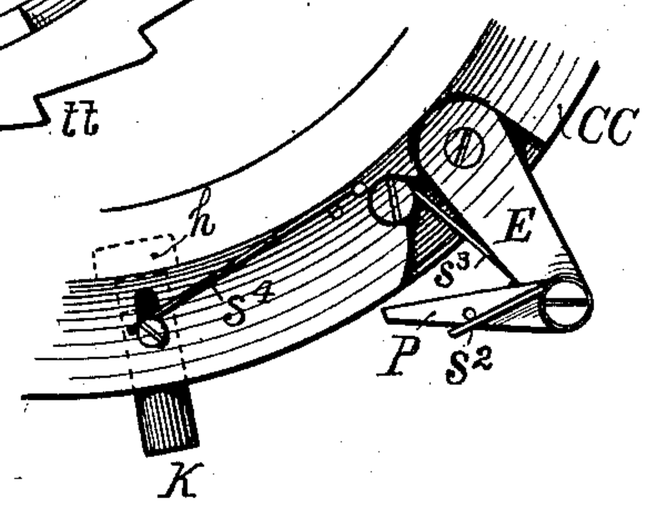
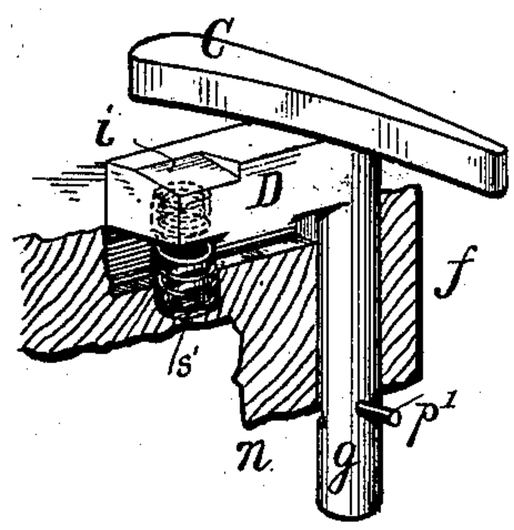


Fig. 13.



WITNESSES:

A. H. Culver

John Nolan

INVENTOR

James L. Branson,

per Joshua Pusey, atty

UNITED STATES PATENT OFFICE.

JAMES L. BRANSON, OF PHILADELPHIA, PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 334,338, dated January 12, 1886.

Application filed October 20, 1883. Serial No. 109,547. (No model.)

To all whom it may concern:

Be it known that I, JAMES L. BRANSON, a citizen of the United States, residing at the city and county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Knitting-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention relates to the class of circular-knitting machines known as "ribbers" or "rib-knitting" machines; and its object, is by the combination of certain novel mechanism, hereinafter fully described, to knit a continuous connected series of rib-tops for hose, which tops are designed and adapted when separated, to be transferred onto the needles of ordinary plain knitters, (such, for example, as have been patented to me in several Letters Patent of the United States, and now well known as "Branson's Knitters," dated March 31, 1874, and numbered 149,192,) the remainder of the stocking being added to such tops by completing the same on the latter machine, which is not adapted for doing rib-work. Each of these tops, separately considered, as usually made, and as also made by my present improved mechanism, is composed of the following parts or divisions, in succession, to wit: The welt at the top, the main body of plain rib work, a loose course of stitches, several courses of plain rib, and, finally, a second loose course. In the connected series or running web (W, Figure 1 of the annexed drawings) they are separated on the loose course nearest the welt. The purpose of that loose course is to constitute a guide or line of demarkation to aid the eye in cutting with the scissors. There is also a plain rib course between the welt and this loose course, that is made in order to prevent some liability of cutting through the welt-stitches in separating one top from another.

The purpose of the first-mentioned loose course of stitches is to aid in transferring the top onto the needles of the Branson or other similar plain knitter, as shown in the patent dated March 21, 1874, and numbered 149,192, and the object of the few rounds of plain ribbing next to this loose course is to serve as a hold for the hand in casting the loose-course stitches onto the needles of the machine.

Further particular description of such stocking-tops is unnecessary, as they are not my invention and are well known, my improvements relating only to the mechanism for producing the same. This mechanism I shall now proceed to describe, referring to the accompanying six sheets of drawings, in which there is uniformity in the use of the reference-marks.

Fig. 1, Sheet 1, is a general perspective view of a ribbing-machine in which my improvements are embodied. Fig. 2, Sheet 2, is a top or plan view of the head of the machine and outlying parts of the invention. This view represents the like parts as in the same position as of Fig. 1—that is, just as the machine has begun on the plain rib-works of the main body of the stocking-top. Fig. 3, Sheet 2, is a side elevation of Fig. 2. Fig. 4, Sheet 3, is a horizontal section just above the ratchet-ring R R, representing the positions of the several parts shown therein as the machine is about to knit the first loose course of stitches, the ratchet-ring having been moved one tooth. Fig. 5, Sheet 3, is a section as on the line *a a*, Fig. 4, looking in the direction of the arrow in the latter figure. Fig. 6, Sheet 4, is an elevation of a cylinder-head, in which part of the ratchet-ring R R is broken away, revealing the stitch-cam pin in the act of being drawn down by one of the inclines on the under side of the annular inside flange of the ratchet-ring, thus causing the lengthening of the stitches to make the loose course. Fig. 7, Sheet 5, is a plan or top view of the cylinder-head, showing the position of the visible parts when the pivoted lever L, that controls the dial-needle cam, has moved out into a recess, r', in the top of the ratchet-ring preparatory to making the first round of the welt. Fig. 8, Sheet 5, is a similar top view showing the pivoted lever L advanced from the position of Fig. 7, so as to project out its farthest extent—that is, into the opening r^2 in the side of the ratchet-ring. Fig. 9, Sheet 4, is a plan view of the upper side of the ratchet-ring detached. Fig. 10, Sheet 4, is a section thereof on the line *b b*, Fig. 9. Fig. 11, Sheet 6, is a view of the under side of the ratchet-ring detached. Fig. 12, Sheet 6, is a detail of cam-cylinder, showing top view of

the "knockdown-pin," ratchet-pawl, and controlling-springs, the ratchet-ring having been removed. Fig. 13, Sheet 6, is a detail showing the cam-pieces *g* C D, with its elevating-spring.

Save in Fig. 1, the usual yarn-carrier, *x*, is not shown.

The operation of the machine in knitting the main body of the fabric of the stocking-top—that is, the part marked 1 in Fig. 1, between the welt 5 and the first loose course, 2—is as in ordinary rib-machines. The several changes in this usual action of the machine requisite to cause it with ease and certainty to make the two loose courses and the welt in proper relation to each other and the plain rib-work I effect, in the main, by means of a peculiarly-constructed ring, R R, fitting loosely around the cam-cylinder C C, which I term the "ratchet-ring," in combination with certain mechanism.

The construction and operation of these I shall now proceed to set forth in detail, and in order to assist to a clear understanding of the construction, as well as the operation of the invention, I shall describe the successive changes of action of the operative parts in the several different stages in knitting one of the connected series of such stocking tops. I shall first explain, however, that the ratchet-ring slips over the cam-cylinder and partakes of its rotation, yet at certain predetermined intervals it is caused to turn back in the opposite direction while the cam-cylinder is still rotating. It is held in place vertically by means of plates *a*, Figs. 1, 2, 7, and 8, screwed to the side of the cam-cylinder, and bears upon the ledge of the latter, as also upon the top of a spring-pushed pin, *b*, Fig. 5, whose frictional contact insures against slipping of the ratchet-ring, yet allowing it to take easily the reverse movements imparted to it, above referred to. The initial movement of this ring, in order to start the required change in the action of the needles in shifting from plain rib-work to the other kinds of stitching above recited, is primarily induced by means of a chain, M, termed the "pattern-chain," which runs over and depends from a sprocket-wheel, S, at the end of a shaft, *b l*, extending beyond the main frame *f*, and having bearings therein, as seen in Fig. 1. Shaft *b l* also carries a wheel, A, whose periphery is studded with numerous curved and pointed pins, *c*, against which the fabric or web W impinges, the latter being kept taut by means of devices (seen in Fig. 1,) so well known in connection with these machines that description thereof is unnecessary. It is obvious that the rotation of the wheel A in the direction which the web gives to it, as indicated by the arrow adjacent to the sprocket-wheel in Fig. 1, is governed by the descent of the web W, as it is gradually formed by the machine, and by sequence the movement of the chain M in the sprocket-wheel S in the direction of the arrow.

Now, bearing in mind that in the description which is about to follow the starting-point is just after the knitting of the main body of the stocking-top has begun, the welt having been just finished, the parts being then in the position seen in Figs. 1, 2, and 3, it will be observed that one of the inclined studs or cams, *m*, with which the pattern-chain M is provided at certain regular intervals, and whose working-faces are inclined in the direction of motion of said chain, has just passed a lug, *d*, at or near the end of an arm of a piece, T, which I term the "trigger," pivoted at *e* to the side of the frame of the machine. The other arm of this trigger has a tooth, *t*, that is engaged with a notch, *n*, in the side of the stem *g* of an important element of the combination of the present invention, and whose construction and functions will appear further on. A spiral spring, *s*, for which a weight may readily be substituted, serves to hold the trigger-tooth engaged with the notch in stem *g*, except when released in the manner and at the fixed times hereinafter explained. By the descent of the web, as it is being gradually added to at the top—the machine now doing ordinary plain ribbing—the pattern-chain M turns over the sprocket-wheels and the machine keeps on doing the plain work until the next cam, *m'*, comes into contact with the lug *d* of the trigger, and finally raises the arm of the latter sufficiently to disengage the tooth *t* from the notch of stem *g*. The latter instantly rises up by the stress of a spiral spring, *s'*, (seen in Fig. 13,) until stopped by a pin, *p'*, striking beneath the circular projecting part of the head of frame *f*.

In order that the description to be given of the consequences following the rising up of stem *g*, as just mentioned, shall be understood, it is necessary here to explain the construction of the important piece which I shall term the "ratchet-pawl cam," of which stem *g* is a part; also its relation to the immediate parts whose action it affects or modifies in accomplishing the purpose of my invention. Looking first particularly at Fig. 13, Sheet 6, and Figs. 2 and 3, Sheet 2, it is seen that the said piece has a cam, C, with a curved face or inner edge bending inwardly toward the direction of rotation of the cam-cylinder and standing out some distance from the latter. It will also be seen that it has a part, D, projecting radially toward and near to the periphery of the cam-cylinder, and that it is provided with an incline, *i*, dipping from the direction of rotation of the cam-cylinder.

The ratchet-pawl consists of a pawl, P, pivoted to the free end of an arm, E, which is also pivoted in a recess in the cam-cylinder C C, just beneath the ratchet-ring, and extends some distance beyond the curved edge of cam C. (See Figs. 2, 3, 4, 7, 8, and 12.) This pawl and arm are retained in their normal or usual positions by means of springs s^2 and s^3, respectively, Fig. 12. In this position the pawl is engaged with one of the teeth *t t* of the ratchet-ring, as seen in several of the figures. Usually pawl P and its arm ride above and

out of contact with cam C. When, however, the latter is elevated, upon its stem *g* being released at the times and in the manner previously described, and the rotation of the cam-cylinder brings the ratchet-pawl around to cam C, the extremity of the arm E rides against the curved face of the latter, thereby inwardly deflecting the arm, and consequently throwing back the pawl a distance equal to the length of the ratchet-ring tooth with which it is engaged, and thus the ring is compelled to rotate around the cam-cylinder this short distance against the direction of movement of the latter. The instant the end of the pawl-arm passes on out of contact with cam C, the springs s^2 and s^3 respectively return the pawl and arm to their original positions, ready for the next repetition of the operation described. The part *y* and swinging push-out cam *sc* are caused to assume the different positions in which they are represented in Figs. 1, 2, 7, and 8 by the action of lever L, as illustrated in Figs. 1, 2, and 4 of the drawings. The effect of this first back-throw of the ratchet-ring is to cause a retraction within the cam-cylinder of a pin, K, termed the "knockdown-pin," which had been projecting a certain distance through the stress of a spring, s^4, Fig. 12, and the under side of which pin, if not thus retracted, would at the next revolution of the machine strike against the incline *i* of piece D, and thereby force down the raised cam C—*i. e.*, from the position seen in Fig. 13 to that shown in some of the other figures. The retraction of this pin is produced as follows: When out to its full extent, as in Figs. 1, 2, and 3, its enlarged head *h* has retreated into a pocket, *l*, Figs. 10 and 11, in the interior surface of the ratchet-ring, said pocket having been brought around into coincidence with the head of the pin by previous movement of the ratchet-ring. Such is the position of pin K in Figs. 1, 2, and 3.

The foregoing first back-throw of the ring R R alters the position of the pocket *l* with relation to the pin. The head of the latter, sliding back over the inclined face of said pocket, draws in the pin, and its head afterward rides against the inner periphery of the ratchet-ring, as in Figs. 4, 6, 7, and 8, until it is again caused to drop into the pocket, or, rather, into a similar one, as will be hereinafter mentioned. This movement of the ratchet-ring, which causes the retraction of pin K, also produces the requisite adjustment vertically of the stitch-cam U, Figs. 5 and 6, for making the first course of loose stitches, 2, Fig. 1, on the succeeding revolution of the machine. This is done as follows: As the ratchet-ring is thrown back, as before explained, an inclined lug or cam, *i'*, Figs. 10 and 11, engages a pin, *q*, Figs. 5 and 6, that projects through a slot in the cam-cylinder and extends beneath an inner annular flange, O, of the ratchet-ring, on the under side of which flange said cam *i'* is fixed. This pin is secured to the stitch-cam, and thus a downward vertical movement of the pin imparts a like movement to the cam U. Excepting when the loose courses of stitches are being made, the end of pin *q* rides up against the even part of the under surface of flange O by the stress of the needles; but when on the cam *i'* the stitch-cam is pulled down, thereby drawing down the cylinder needles successively—*i. e.*, lengthening their downward path, and thus causing the making of the loose course of stitches in the usual manner. The next revolution of the machine, the ratchet-ring being again forced back a tooth by the action of cam C upon pawl P, as before described, carries the ring a sufficient distance to allow the pin *q* of the stitch-cam to again rise up and ride free from the incline *i'*, and the plain rib-work is proceeded with for several revolutions of the machine, (six in the present instance,) each revolution causing a retrograde movement of the ratchet-ring through the action of pawl-arm E, impinging against cam C, as previously described, until said ring is brought around to a position wherein the pin *q* of the stitch-cam rides upon another cam-lug, i^2, the counterpart of the former one, *i'*, and a loose course—*i. e.*, the second loose course, 4—is then made as before. The succeeding revolution of the machine again moving back the ratchet ring, a tooth disengages pin *q* from said cam-lug i^2. During the next turn of the machine a course of plain ribbing is made, and then commences the making of the welt, which is done as follows: Referring to Figs. 1, 2, 7, and 8, particularly Fig. 1, there appears a lever, L, pivoted in a lug, *a'*, at the side of the fixed head of the machine, and whose upper end is pivoted to a horizontal bar, *y*, that rests upon the dial-plate *d p*, and has a pin, p^2, connecting with the usual swinging dial-cam *s c*. (Indicated by the dotted outlines in Figs. 2, 7, and 8.) The lower extremity of lever L extends into a space, *z*, between the flange of the ratchet-ring and the cam-cylinder. This space or groove is annular, except where recessed and cut away at certain points, as hereinafter mentioned. Except when the welt of the stocking-top is being knit, the end of said lever rides within the annular part of this space *z*, against the side or flange of the ratchet-ring, and the dial-needles operate in the usual manner in knitting plain work. When, however, the welt is to be made—that is to say, at the particular period in the movement of the ratchet-ring which the preceding description has brought—the end of this pivoted lever coming opposite a recess, *r'*, in the vertical flange of ring R R, as in Fig. 7, permits the bar *y* to be forced inwardly by the action of the dial-needles. The latter, however, are thus only forced out far enough to catch the yarn on their hooks, yet not far enough to cause the old loops to pass behind their latches. The old loops are thus retained on the hooks of the dial-needles, and, in addition, the yarn necessary to form new loops is retained on the dial-needles with the old loops during one

course or revolution of the cam-cylinder. The next revolution, throwing back the ratchet-ring one tooth releases the end of the lever L from the recess r', and it is allowed to sweep out into the space r^2, formed by cutting away part of the ring, and the swinging dial-cam is then forced back to its full extent and the dial-needles remain back almost stationary, entirely out of the way, with the yet unformed loops on their hooks. The width or length of the cut-away part r^2 of the ratchet-ring is sufficient to allow the end of lever L to extend out into the space during two revolutions of the cam-cylinder, during which two revolutions the cylinder-needles only are operating, thus knitting two courses in excess of those knit by the dial-needles. At the next revolution of the machine—that is, at the next back-throw of the ratchet-ring, caused by the combination of mechanism hereinbefore described—the end of lever L is forced against an inclined face, *j*, of the ring-flange, and slides thereon into the annular groove *z*. This movement of the lever, through its connections, as before explained, draws outward the swinging dial-cam, and the dial-needles are thereby forced out and the knitting of the plain rib-web proceeds in the usual way. This last-mentioned position of the lever and the other parts is that shown in Figs. 1 and 2. The unfinished course on the dial-needles and the two extra courses made on the cylinder-needles, being knit into the web, make the welt 5. The same last-mentioned throw of the ratchet-ring R R that brings the pivoted lever into the annular groove also brings the pocket *l* on the interior of the ring in position to permit the knockdown-pin K to be forced outward by its spring s^4. Said pin then projects far enough beyond the periphery of the cam-cylinder to enable it to strike against the incline *i* of piece D and knock down the latter, and of course cam C, until the tooth of the pivoted trigger T engages with the notch of stem *g*, and the device is thus held down, so that the ratchet-pawl arm will pass over and above the cam until in due course it shall be allowed to rise up again when the next web of plain rib is completed, and the next cam-lug, m^2, of the pattern-chain M unlocks the trigger in the manner before set forth, and the movements requisite for making the succession of loose course, plain rib, loose course, welt, and plain rib are repeated.

It will be readily understood that these various movements and their intervals may be changed with relation to one another, as desired. For example, the number of plain rib-courses between the two loose courses may be governed by the nearness together of the cam-lugs i' i^2 on the under side of the flange of the ratchet-ring; also, that any length of plain rib between welts may be caused to be made by simply adding to or taking from the plain links of the pattern-chain. Thus by lengthening the a full-length lady's hose top can be knit with chain welt and loose courses. By shortening it a similar short top of a sock may be made.

When it is desired to knit what is known as "three and one rib," in which it is impracticable to make the welt, the latter can be omitted, in order to do which I merely draw out the arm *y* to its full extent and insert a locking-pin in a hole, *v*, in said arm and into a corresponding hole in the fixed dial-plate *dp*. It is quite obvious that in this way the lower end of lever L, to which pivoted lever-arm *y* is connected, will be prevented from passing out into the recess r' and space r^2, whereby the dial-cam *s c* will be retained in the proper position to allow the plain ribbing and the slack courses to be done. It will also be observed that the number of teeth of the ratchet-ring is in the present instance twenty-six, and that each half of said ring, vertically bisected, is the duplicate of the other half, so that really the foregoing-described changes of stitch are caused to be made during one-half of a full rotation of the ring around the cam-cylinder. The same operations might be effected during a complete rotation of the ring by providing the same with one-half the number of teeth—say, thirteen in lieu of twenty-six—and suitably disposing the acting parts of the ring and omitting the duplication thereof. This would, however, be objectionable to some extent, as it would require too long a stroke of the ratchet-pawl in order to get the necessary back-throws of the ratchet-ring.

Having thus described my invention so that those skilled in the art to which it appertains can make and use the same, I claim as new and wish to secure by Letters Patent—

1. The combination, with the studded wheel A, adapted to be operated by the web W, the sprocket-wheel S, the pattern-chain M, the shaft *b l*, the trigger T, and the cam-pieces *g c* D, of the cam-cylinder and means to revolve it, the knockdown-pin K, the pawl P, the ratchet-ring having recesses or pockets *l*, the cams i' i^2, and the stitch-cam provided with a pin, *q*, all arranged to operate substantially as specified.

2. The combination, with the cam-cylinder, of the ratchet-ring R R, fitting loosely thereabout and provided with a groove, *z*, a recess, r', and a space, r^2, the mechanism for actuating the said ratchet-ring, and the controlling-lever L, pivoted on said cam-cylinder, all arranged to operate substantially in the manner specified.

In testimony whereof I have hereunto affixed my signature this 11th day of October, A. D. 1883.

JAMES L. BRANSON.

Witnesses:

GEO. H. CHESTERMAN,

J. DANIEL EBY.