

No. 749,933.

PATENTED JAN. 19, 1904.

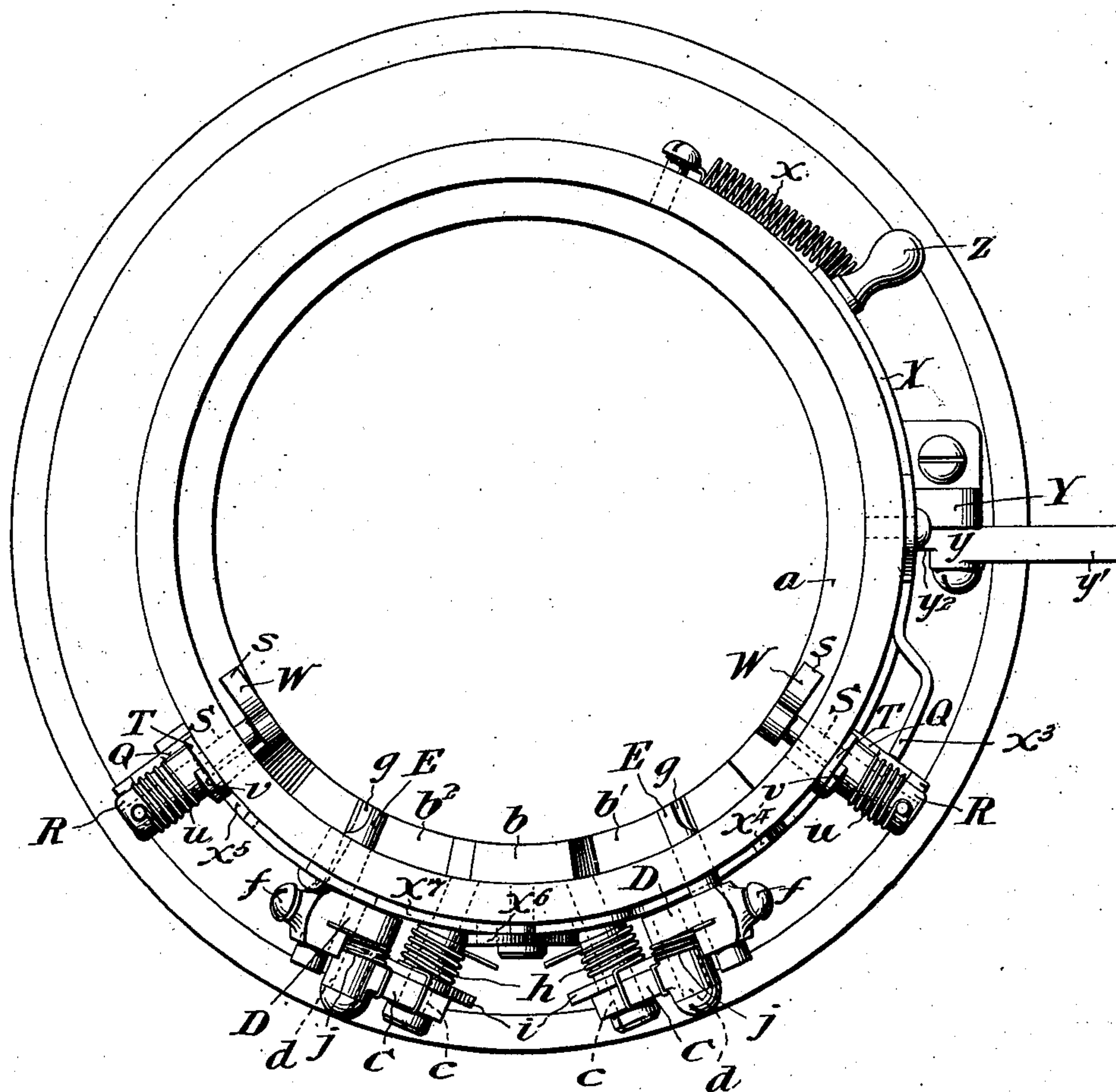
J. B. HIPWELL.  
AUTOMATIC CIRCULAR KNITTING MACHINE.

APPLICATION FILED JULY 25, 1903.

NO MODEL.

3 SHEETS—SHEET 1.

FIG. 1.



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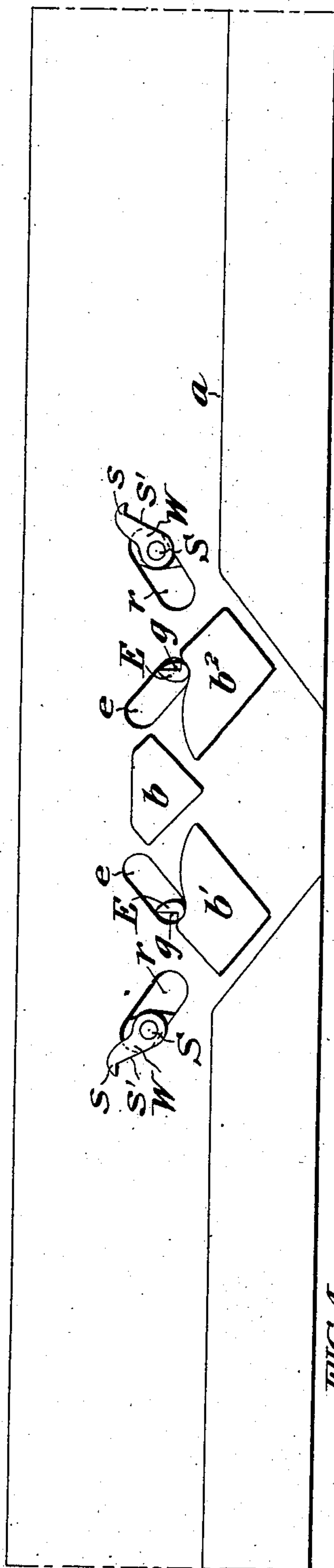
J. B. HIPWELL.

# AUTOMATIC CIRCULAR KNITTING MACHINE.

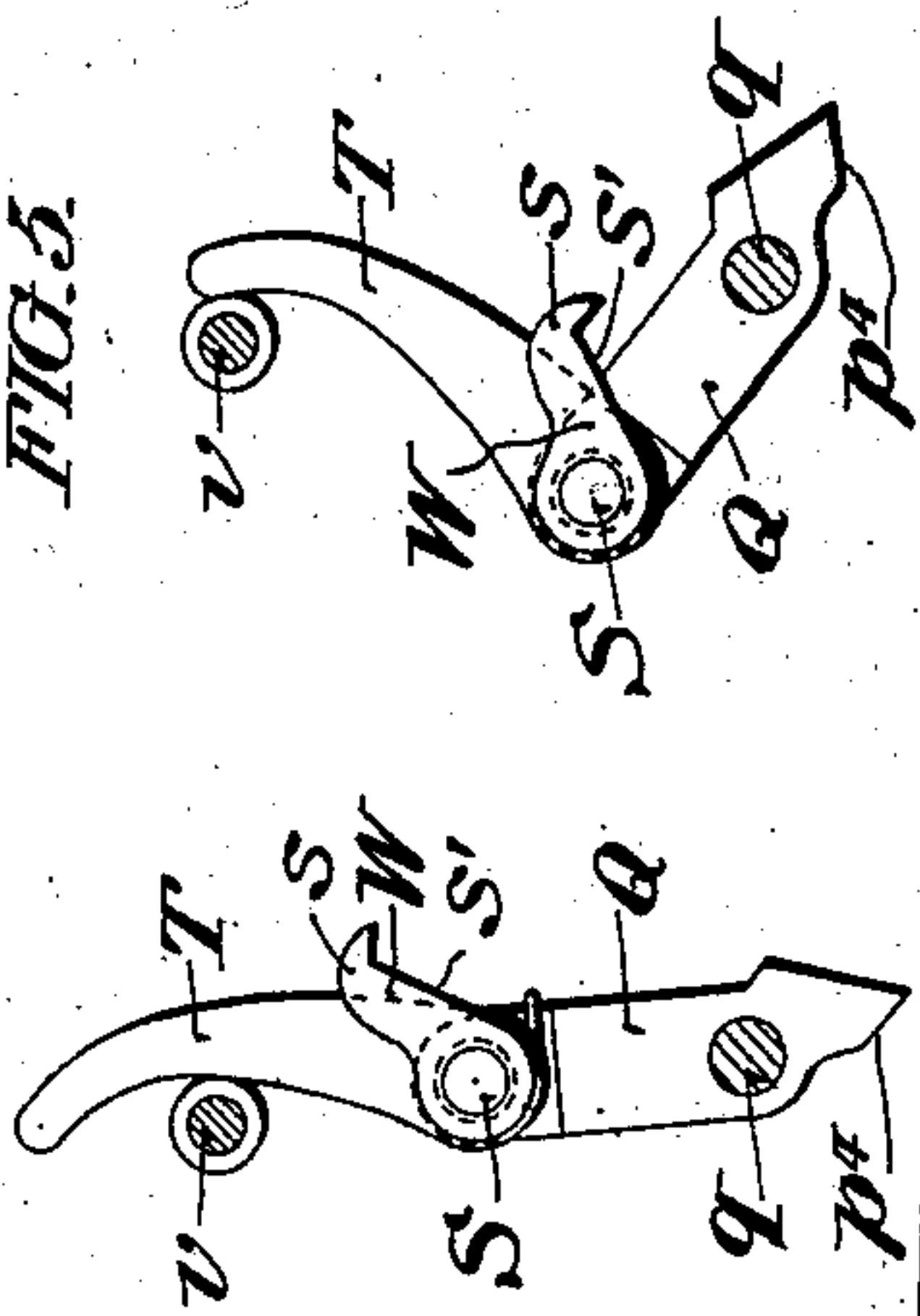
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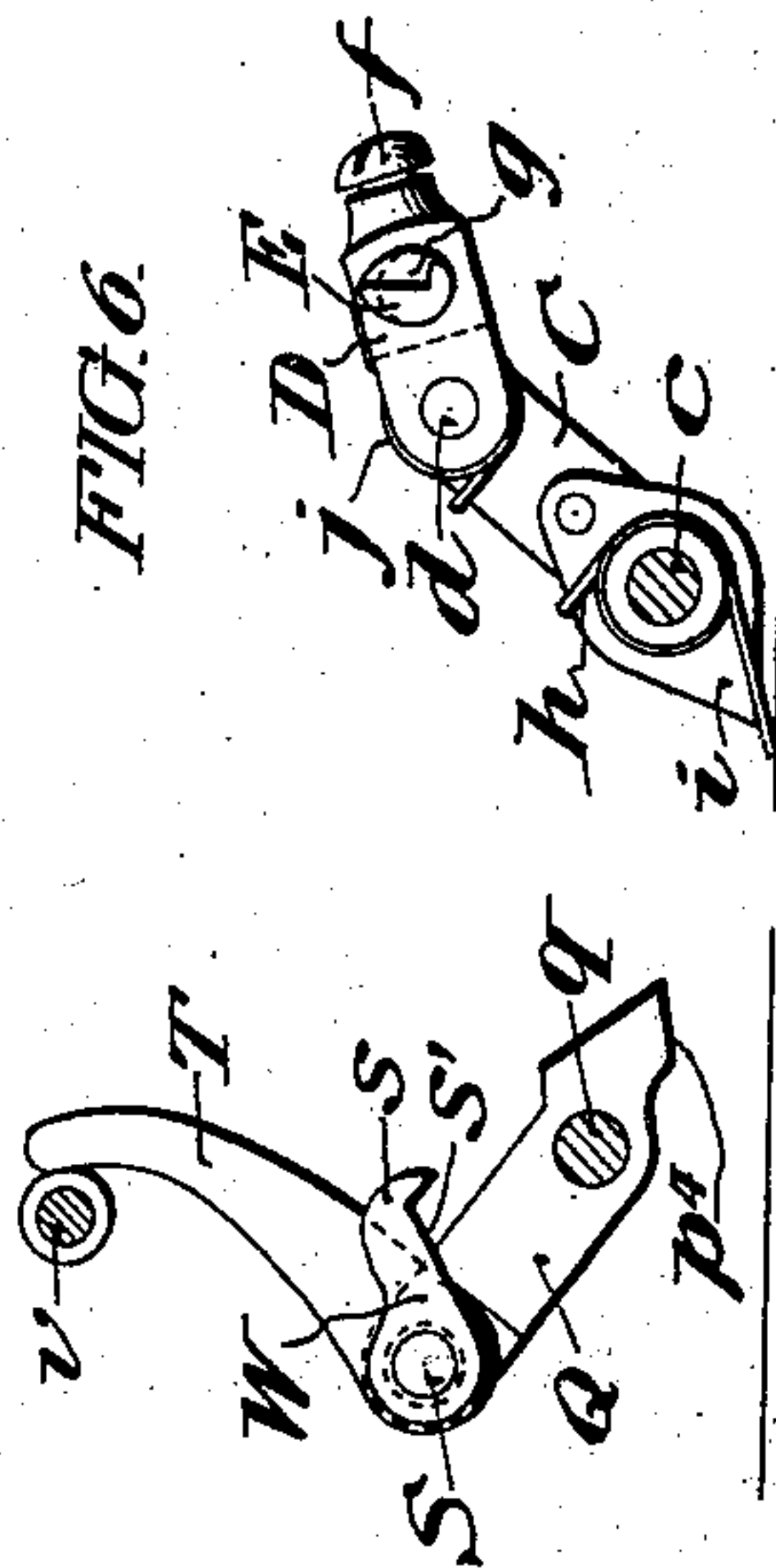
3 SHEETS—SHEET 3.



**FIG. 4**



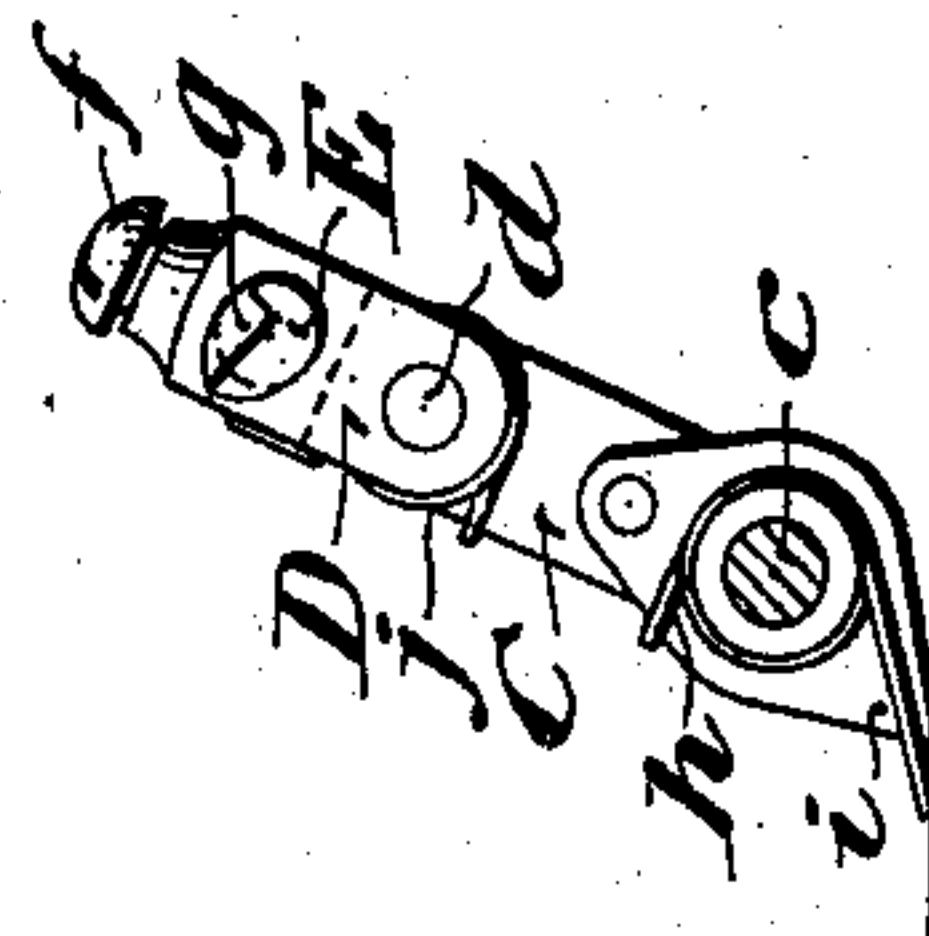
**FIG. 5.**



**FIG. 6**



FIG 7



**FIG. 8.**

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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 749,933, dated January 19, 1904.

Application filed July 25, 1903. Serial No. 166,929. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN B. HIPWELL, a citizen of the United States, residing at No. 2454 North Twenty-ninth street, in the city and county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Circular-Knitting Machines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to circular-knitting machines adapted for stocking-knitting; and it consists in certain improvements in the needle-picking mechanism whereby during the fashioning operation the narrowing and widening operations are performed.

The automatic pickers, of which two forms are to be described, one being employed for the lifters and the other for the droppers, are novel in their construction and mode of operation.

In the accompanying drawings, Figure 1 is a plan view of a cam-cylinder of a knitting-machine embodying my improvements. Fig. 2 is an elevation of a part of the exterior of the same developed upon a plane. Fig. 3 is an elevation of the interior of the cam-cylinder developed upon a plane. Figs. 4 and 5 are detail views of one of the drop-pickers or "droppers," showing it in two different positions. Figs. 6, 7, and 8 are detailed views of one of the lifting-pickers or "lifters," showing it in three different positions.

Referring to Fig. 3, it will be observed that I have shown a cam-cylinder provided with the usual needle-ledge *a*, which is interrupted by a set of reciprocary knitting-cams consisting of the top center cam *b* and the two stitch-cams *b'* *b''*.

For convenience of describing the relations of some of the parts I will use the term "center line" to indicate the vertical line which symmetrically bisects the center cam *b*.

As usual, the lifters are paired, one being placed in the upper edge of each stitch-cam in position to engage the first needle of the active series which approaches in the proper direction and to deliver it at the idle level.

Likewise the drop-pickers are similarly paired, each being set a short distance in front of the respective stitch-cams and arranged so as to depress the first of two needles of the idle series approaching in the proper direction and deliver them within the range of action of the top center cam.

It will be understood that lifters constructed in accordance with my invention can be used with other forms of droppers, and, vice versa, that droppers constructed in accordance with my invention can be used with other forms of lifters.

I will first describe one of the lifters, it being understood that its fellow is similar in construction except that it faces in the opposite direction. Each lifter consists of a main arm *C*, pivoted on the outside of the cam-cylinder upon a pivot *c*. To the free end of this arm there is pivoted a secondary arm *D*, the pivot *d* thereof being substantially parallel to the pivot *c*. The free end of the secondary arm *D* carries a needle-engaging finger *E*, which projects into the path of the needles through a suitable opening *e* in the wall of the cam-cylinder. This inwardly-projecting finger may conveniently take the form of a pin adjustably secured in the free end of the secondary arm *D* by means of the set-screw *f*. The inner end of this finger has a needle-engaging notch *g*. Both of the pivoted members of the lifter are provided with springs, by which they are spring-pressed in one direction. The spring *h*, coiled around the pivot of the main arm *C*, constantly tends to throw the free end of this arm *C* in the direction away from the center line. The motion of the arm *C* upon its pivot in the direction opposed to this spring-pressure is limited by a toe *i*, fastened to or formed upon the lower end of the arm, which comes into contact with the base-flange of the cam-cylinder when the arm is thrown toward the center line. The coiled spring *j* surrounds the second pivoted joint (between the arms *C* and *D*) and constantly tends to throw the secondary arm *D* in the direction away from the center line. Its motion in this direction, however, is limited by



the contact of a face upon the arm D with an edge *h* upon the upper portion of the arm C.

The operation of the lifter thus described is as follows: In its initial position, as shown in Fig. 6, both arms C and D of the lifter are normally retained (under the influence of their respective springs) in the inclined position there shown, further movement away from the center line being limited by the contact of the finger E with the lower edge of the opening in the wall of the cam-cylinder through which it projects. Upon the engagement of the notch *g* of said finger with the butt of an approaching needle the lifter as a whole first yields at the pivot *c* of the main arm C and is turned toward a vertical position without any relative movement of the secondary arm D upon its own pivot *d*. This action continues until about one-half of the total throw of the lifter has been completed, when the toe *i* comes in to contact with the base-flange of the cam-cylinder and prevents further movement of the main arm C. This intermediate position is illustrated at Fig. 7. Thereafter the lifter yields at the pivot *d* of the secondary arm D, and the relative movement of this secondary arm continues until the throw is completed, at which time the lifter has assumed the position shown in Fig. 8. In this position the needle, which has been carried up by the lifter, is freely delivered from the notch *g* in the finger E to the idle level over the center cam *b*. As soon as the needle has been thus raised the lifter as a whole springs backward toward its initial position, the finger riding on top of the remaining needle-hubs until the end of the active series is reached, when it resumes its initial position and is again ready to raise another needle approaching in the proper direction.

A lifter thus constructed is characterized by great ease and smoothness of action. The first part of the throw of such a radially-pivoted lifter effects the greater part of the actual vertical movement of the needle, and it is desirable that this initial lifting movement should occur upon a relatively long radius. On the other hand, the last part of the throw is chiefly effective for turning the lifter to a position where its notch will readily disengage from the needle-hub, and for this action the shorter the radius of rotation the more easily is it performed. If the several positions of the longer edge of the notch *g* be noted in Figs. 6, 7, and 8, it will be observed that during the relative movement of the secondary arm D the long or vertical edge of the notch *g* turns through an arc of considerable extent and finally attains a comparatively slight inclination to the horizontal, as seen in Fig. 8, and thus the needle is easily delivered.

I will now describe one of the droppers. Each dropper consists of a main arm Q, pivoted on the outside of the cam-cylinder upon a pivot *q*. At the upper or free end of this

arm is an outwardly-projecting hub R, within which a shaft S, substantially parallel to the pivot *q*, is journaled. Said shaft projects into the cylinder through a suitable opening *r* in the wall thereof. Upon the inner end of the shaft is rigidly secured a secondary arm W, provided with an overhanging notch or hook *s* for engaging the hubs of the needles from above and having a lower edge adapted to form a cam-surface *s'*, which can deflect the needle-hubs downward at the completion of the throw. In the present instance the extent of the overhanging notch *s* is sufficient to engage the hubs of two needles at once, and the dropper therefore works upon the well-known "two-and-one" principle—that is to say, the dropper carries down two needles, one of which is thereafter raised by the lifter. This, however, is a detail which depends upon the relation between the extent of the notch and the spacing of the needles, and it may of course readily be varied, so that the dropper shall only carry down one needle, the lifters in that case being placed, as usual, in an inoperative position during the period of widening, as is well understood. Upon the outside of the cam-cylinder the shaft S carries a rigidly-attached curved guiding-arm T. A coiled spring *u* is secured to the shaft S near its outer end and is attached at its other end to the main arm Q of the picker in such relation as to constantly tend to turn the secondary arm W and guiding-arm T toward the center line of the cam *b*. A lug *v*, mounted on the outer wall of the cylinder, affords a point of resistance to this turning movement of the guiding-arm T, so that by the influence of the spring-pressure the main arm of the dropper is normally thrown in the direction away from the center line.

The operation of the dropper thus described is as follows: The initial position is shown in Fig. 4. In this position the hubs of the end two needles of the idle series approaching in the proper direction come into contact with and engage beneath the hook *s* of the secondary arm W. The inclination of the cam portion *s'* of the finger is at this time too great for the needle-hubs to ride down it. Consequently the further movement turns the dropper toward the center line, causing it to assume the position shown in Fig. 5, where its further motion is limited by contact of the shaft S with the end of the slotted aperture in the cylinder through which it passes. When this position has been attained, the needle-hubs readily ride down the cam-surface *s'* of the secondary arm W and are thereby delivered into the range of the knitting-cam. It will be observed that in this form of dropper the depression of the needles is effected by two simultaneous actions—that is to say, the rotation of the main arm of the dropper upon its pivot tends to effect depression of the needles, while at the same time the rotation of



the shaft S (which is positively effected by the sliding contact of the guiding-arm T with the lug  $v$ ) turns the secondary arm W downward, thus enhancing the depressing action. Furthermore, this same motion of the secondary arm W helps to rapidly diminish the angle of the cam-surface  $s'$  to the horizontal, so that by the time the end of the throw is reached said surface has assumed an inclination sufficiently slight to readily deliver the needles then in engagement with the dropper. As soon as the dropper disengages itself from the needle-hubs it springs back toward an upright position, yielding, however, at the upper joint formed by the shaft S sufficiently to allow the remainder of the idle series of needles to ride freely over it during the residue of that movement. When this has been completed, the gap in the idle series of needles allows the secondary arm to resume the position of Fig. 4, and during the return movement it again yields downward at the upper joint to allow the idle needles to freely pass over it without disturbance, resuming its initial position after they have passed. When, however, the needles again approach it in the direction proper for engagement, it again depresses the first two needles of the series and repeats the operations which have been described. As before stated, the lifters on either side raise one of the two needles which have thus been depressed, so that the widening operation progresses in the well-known manner characteristic of the two-and-one method.

I will now describe the picker-controlling slide. Fitted upon the outside of the cylinder-wall is a curved horizontally-sliding plate X, containing numerous projections which engage different parts of the picker mechanism. A spring  $x$ , attached to one end of this plate, constantly tends to shift that end away from the center line or toward the right-hand side of Fig. 2, its motion in that direction being limited to the position there indicated. A slot  $x'$  is cut in the plate X near its end and has two notches  $X^2$  and  $X^3$  formed in its upper edge. A bracket Y, mounted on the wall, projects out beyond the plate X and carries a pivoted latch  $y$ , having an overweighted outer end  $y'$ , which normally presses the inner end  $y''$  upward against the notched edge of the slot  $x'$ . When the plate X is thrown toward the left (and against the tension of the spring) by means of the handle Z, mounted at its extremity, this latch engages successively with the notches  $X^2$  and  $X^3$ , and if stopped at either of these points the latch will hold the plate X against the tension of the spring  $x$ . When, however, the latch is tripped, the plate is immediately returned to its right-hand position, as shown in the figure.

The engagements whereby the control of the pickers is effected are as follows: A wedge-shaped finger  $x^3$ , projecting outwardly from the plate X, engages with a cam-surface  $p^3$ ,

formed upon the upper side of the hub, where the main arm Q of the right-hand dropper is pivoted to the wall. An upwardly-projecting finger  $x^4$  engages the inwardly-projecting finger E of the right-hand lifter. The reduced extreme end  $x^5$  of the plate X engages a cam-surface  $p^4$ , formed on the lower end of the main arm Q of the left-hand dropper below the pivotal point thereof. To control the left-hand lifter, sliding movement in the opposite direction is necessary, and this is effected by means of a lever-arm  $x^6$ , centrally pivoted upon the outer wall of the cam-cylinder and engaging at its lower end with the plate X, while its upper end is pivoted to an auxiliary sliding plate  $x^7$ , which is thus caused to slide in the direction opposite to that of the main plate. A downwardly-projecting finger  $x^8$ , formed upon this secondary plate, engages the inwardly-projecting finger E of the left-hand lifter. The main plate X is of course cut away, as shown, at the regions adjacent to the pivots of the lifters and droppers, so as to clear them during the sliding movement. As a result of these various engagements a single throw of the sliding plate X from the right-hand to the left-hand position can cause all four of the pickers to be thrown out of action. The action, however, occurs by successive steps. The first half of the throw (at the end of which the weighted latch is in engaging relation to the intermediate notch  $X^2$  of the slot  $x'$ ) throws out of action the two droppers without affecting the lifters. The complete movement of the plate effects the other engagements whereby the lifters are also thrown out of operation. It is thus possible to throw the droppers out of operation without affecting the lifters and is also possible to throw both sets of pickers out of operation, and by means of the notches  $X^2$  and  $X^3$  the plate can be held in either of these positions.

Having thus described my invention, I claim—

1. An automatic picker for a circular-knitting machine, consisting of a main arm pivoted to the cam-cylinder and spring-pressed in relation to said cam-cylinder away from the center line; a secondary arm pivoted upon the free end of the main arm, and also independently spring-pressed in relation to said main arm away from the center line; and a needle-engaging finger mounted upon the free end of the secondary arm, extending into the path of the needle-hubs.

2. An automatic picker for a circular-knitting machine, consisting of a main arm pivoted to the cam-cylinder and normally spring-pressed away from the center line; a secondary arm pivoted upon the free end of the main arm and also normally spring-pressed away from the center line; a needle-engaging finger mounted upon the free end of the second arm, and extending into the path of the needle-hubs;



and a stop, whereby the motion of the main arm is arrested before the shifting of the needle is completed.

3. An automatic picker for a circular-knitting machine, consisting of a main arm pivoted to the cam - cylinder and normally spring-pressed away from the center line; a secondary arm pivoted upon the free end of the main arm and also normally spring-pressed away from the center line; a needle-engaging finger mounted upon the free end of the secondary arm, and extending into the path of the needle-hubs; and means for adjusting said needle-engaging finger with relation to the secondary arm.

4. An automatic picker for a circular-knitting machine, consisting of a main arm pivoted to the cam-cylinder; a secondary arm pivotally mounted thereon and arranged in the path of the needle-hubs; and means to positively rotate the secondary arm in a direction opposite to the rotary movement of the main arm, during both the forward and backward movements thereof.

5. A drop-picker for a circular-knitting machine, consisting of a main arm pivoted to the cam-cylinder; a shaft journaled in the free end of said arm and projecting into the cam-cyl-

inder; a needle - engaging secondary arm mounted upon the inwardly-projecting end of said shaft and arranged in the path of the idle needle-hubs; and means whereby, during the motions of the main arm toward and away from the center line, the shaft is rotated in an opposite direction.

6. A drop-picker for a circular-knitting machine, consisting of a main arm pivoted to the cam-cylinder; a shaft journaled in the free end of said arm and projecting into the cam-cylinder; a needle - engaging secondary arm mounted upon the inwardly-projecting end of said shaft; a guiding-arm also mounted upon said shaft; a lug upon the cam-cylinder and engaging with said guiding-arm, whereby the shaft is rotated in one direction when the main arm moves in the opposite direction; and a spring, whereby the secondary arm is normally pressed toward the center line.

In witness whereof I have signed my name to this specification, this 13th day of July, A. D. 1903, in the presence of two subscribing witnesses.

JOHN B. HIPWELL.

Witnesses:

JAMES H. BELL,  
M. K. TRUMBORE.