

C. H. YOUNG.
Straight Knitting-Machine.

No. 222,619.

Patented Dec. 16, 1879.

Fig. 1.

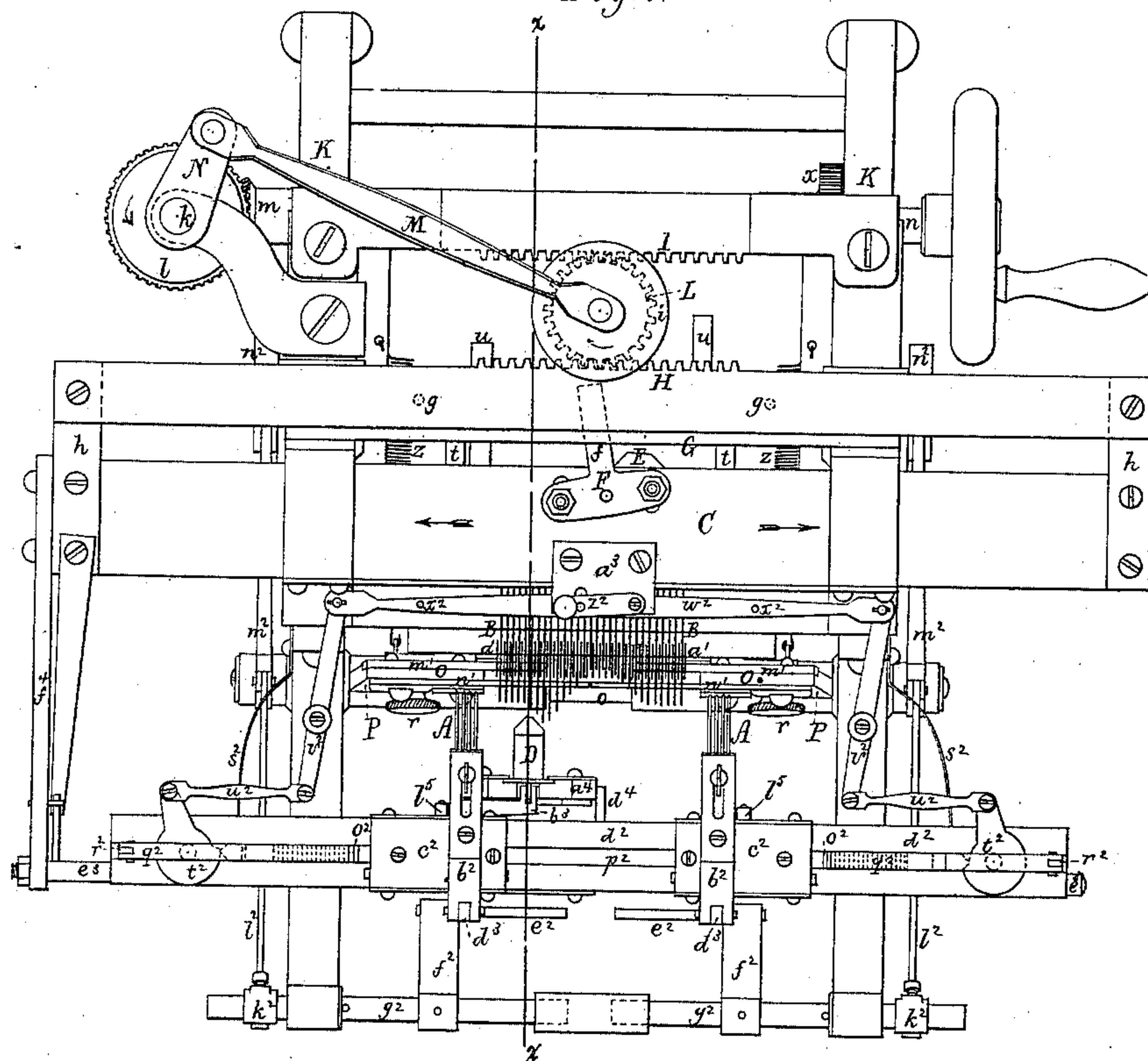
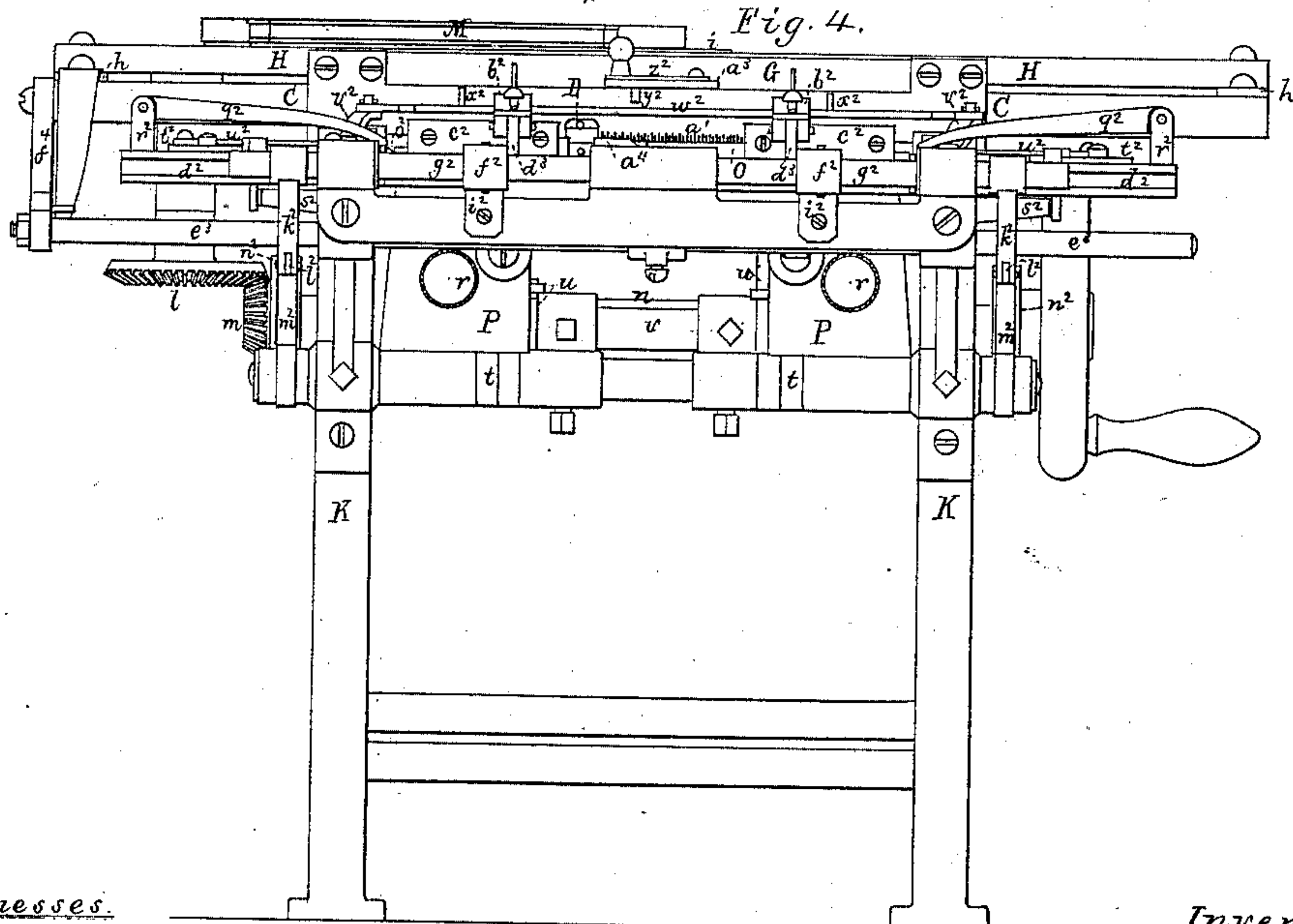


Fig. 4.



Witnesses.

S. N. Piper
M. W. Lind

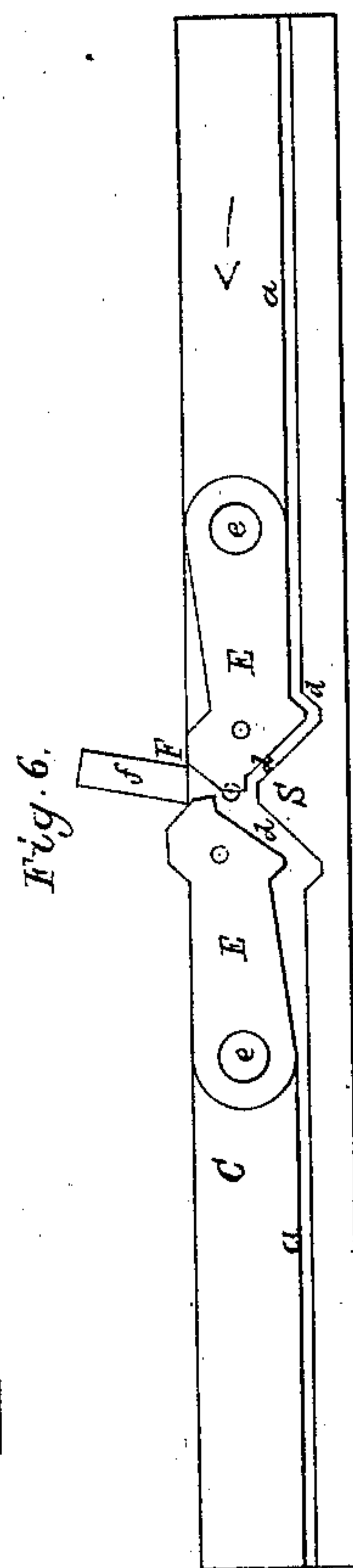
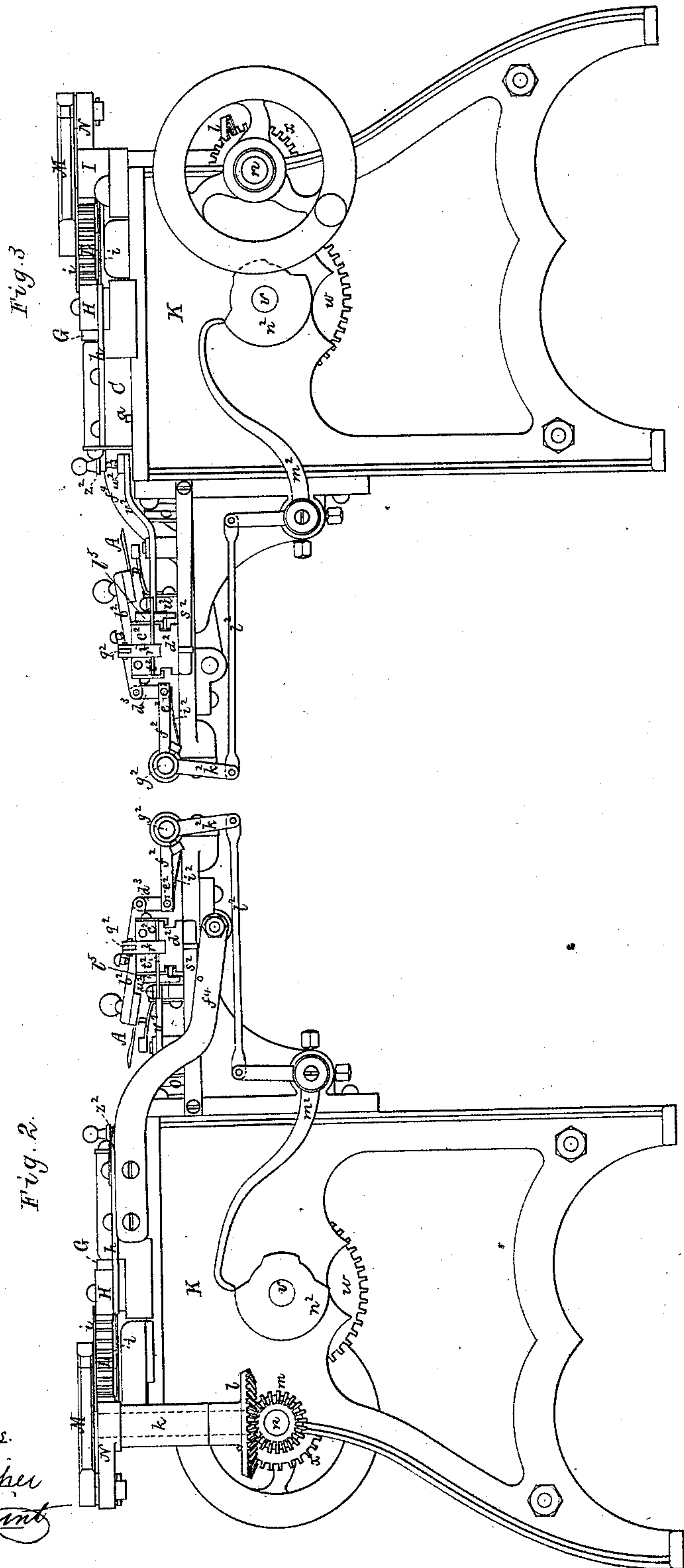
Inventor.

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Fig. 5

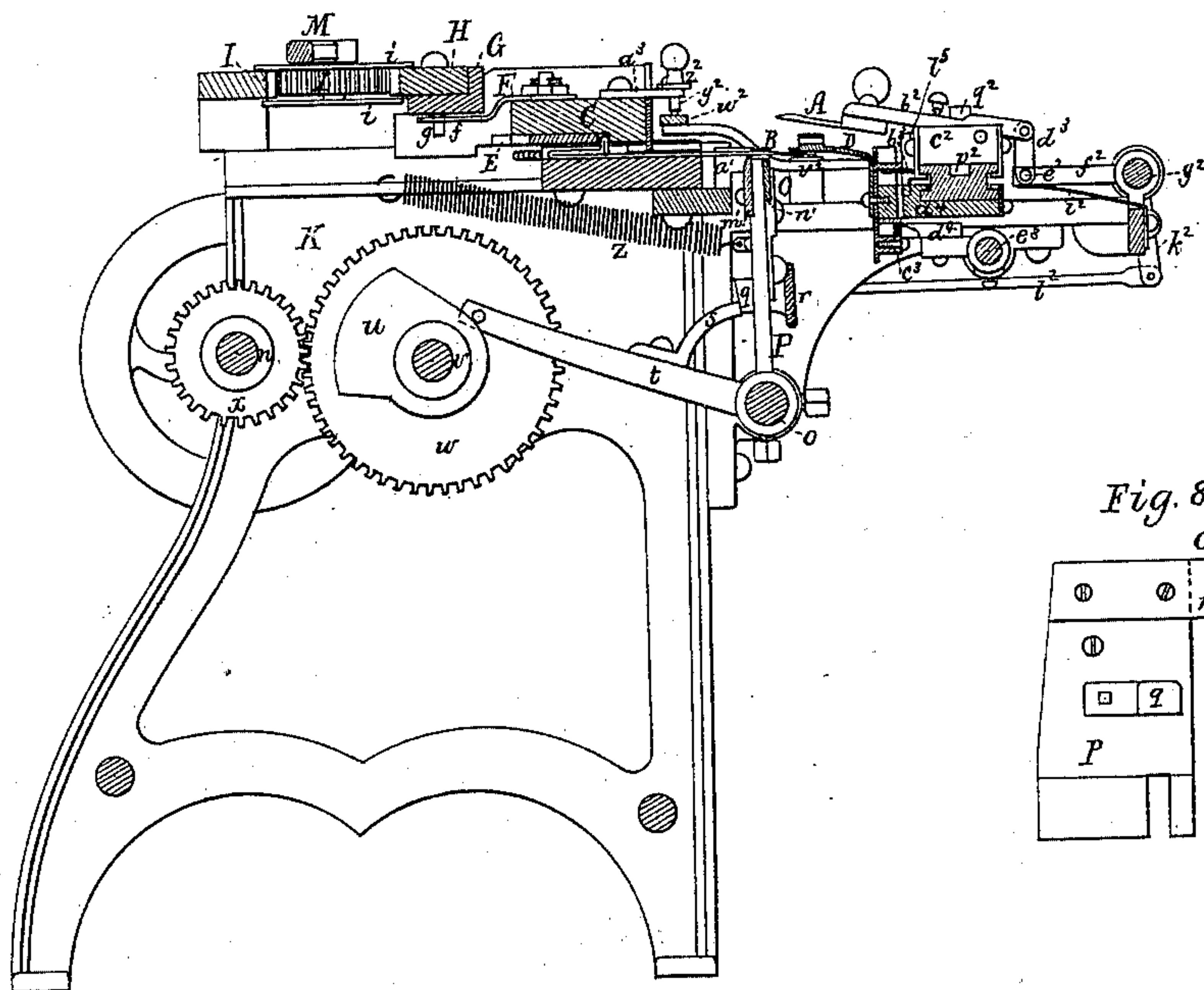


Fig. 8.

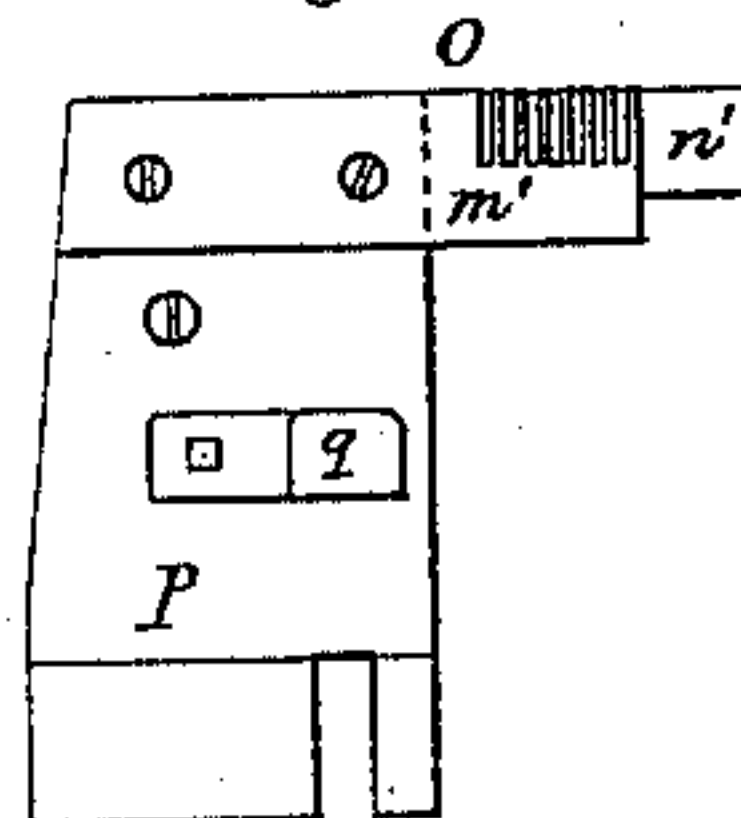


Fig. 9.

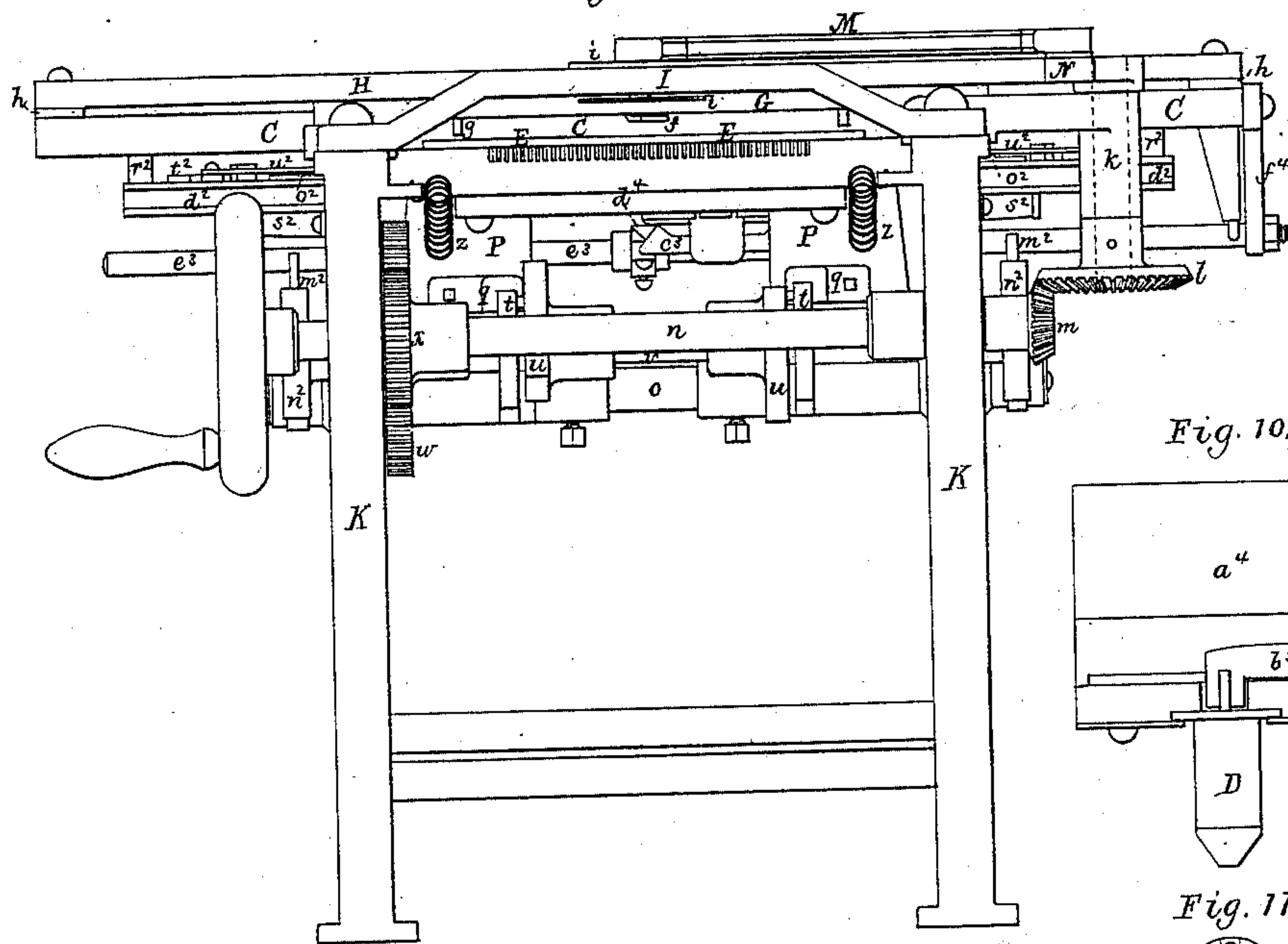


Fig. 10.

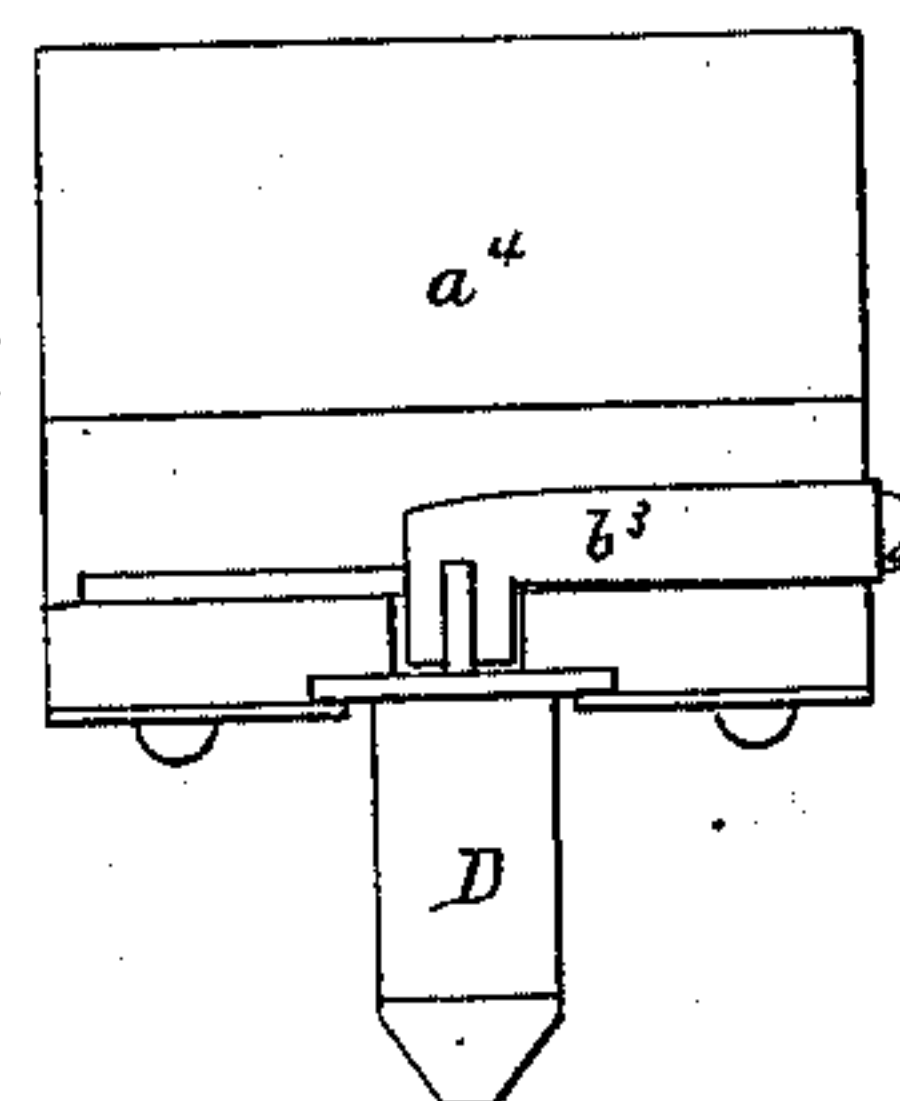


Fig. 11.

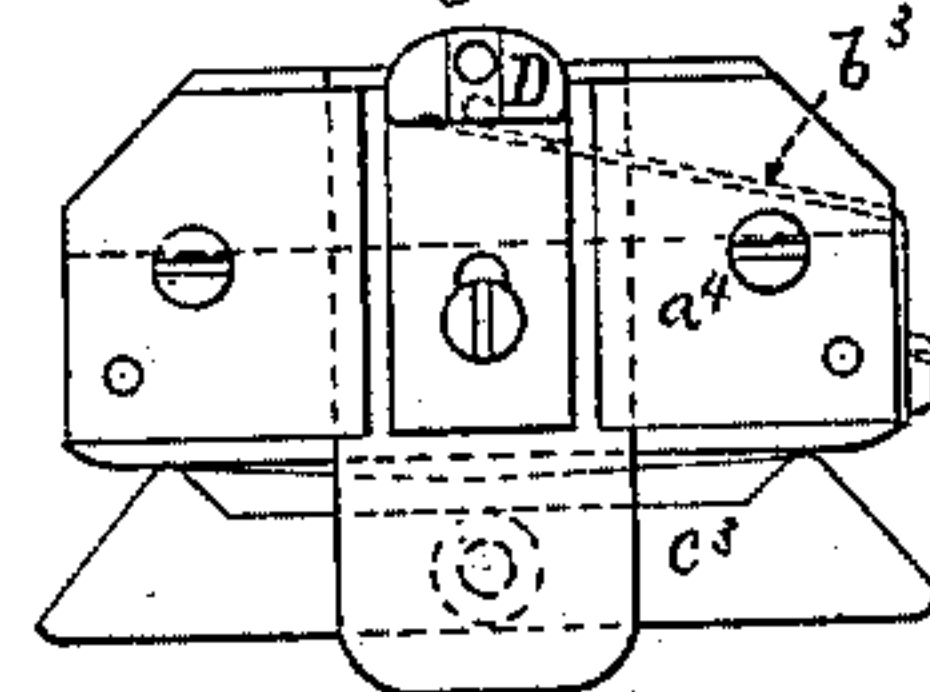


Fig. 7.



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES H. YOUNG, OF LACONIA, ASSIGNOR TO WALTER AIKEN, OF FRANKLIN, NEW HAMPSHIRE.

IMPROVEMENT IN STRAIGHT-KNITTING MACHINES.

Specification forming part of Letters Patent No. 222,619, dated December 16, 1879; application filed June 11, 1879.

To all whom it may concern:

Be it known that I, CHARLES H. YOUNG, of Laconia, of the county of Belknap and State of New Hampshire, have invented a new and useful Improvement in Straight-Knitting Machines; and I do hereby declare the same to be described in the following specification and represented in the accompanying drawings, of which—

Figure 1 is a top view, Figs. 2 and 3 opposite end elevations, Fig. 4 a front view, and Fig. 5 a vertical central transverse section on line *x x* of Fig. 1, of a machine embodying my invention. Fig. 6 is an under-side view of its needle-cam bar.

Such other figures as may be necessary to illustrate my improvement are hereinafter mentioned and referred to.

My invention consists in the improvements in straight-knitting machines hereinafter described, having for their principal object to enable the machine to perform the operations of narrowing and knitting simultaneously.

It further consists in various improvements in details of construction, all as hereinafter fully set forth.

In carrying out my invention I use with the needles two separate push-bars, which operate alternately, they being to push the stitches on and off the narrowing-points.

In the ordinary mode of operating each of the needles, it is first moved forward and next backward; but with my method of operation each needle, after having been drawn in between the knocking-over points to cause the stitch on the needle to be cast off or knocked off, is moved forward into position such as it should have for receiving the narrowing-point, which is next depressed upon the needle, from which it is to receive a stitch. Next, the push-bar is moved forward and frees the stitch of the needle therefrom to and upon the narrowing-point. Next, the said point rises and is moved inward to and over the next needle, and descends thereupon, after which the push-bar retreats and forces the stitch off the narrowing-point and upon the needle or the latch thereof, which is then open. Next, the needle is moved forward a distance for the stitch to pass off and back

of the latch, after which the needle is moved back between the knocking-over points to cause the stitch to be knocked off.

To produce the above-described movement of the needles, I have a cam-bar of peculiar construction, it having one main cam, which is stationary, and two auxiliary cams, which are movable, all being formed and arranged with the straight grooves of the bar substantially in manner as represented, and hereinafter described.

In the drawings, *A A* denote the two series of narrowing-points; *B*, the set of latched needles; *C*, their cam-bar; and *D* is the yarn-carrier. The said cam-bar has in its lower face or side two straight grooves, *a a*, arranged in a right line with each other, and having between them one stationary cam, *S*, and two movable cams, *E E*, the grooves being continued around the cams in manner as represented at *d d*, all being as shown in Fig. 6. The cams *E E* are movable flat arms, which formed as shown, are pivoted to the cam-bar, their pivots being represented at *e e*. These arms are also pivoted to a tri-armed lever, *F*, which is pivoted to the opposite side of the cam-bar.

The medial arm, *f*, of the tri-armed lever is moved in opposite directions alternately by being moved against two stationary studs, *g g*, projecting down from a stationary bar, *G*, an edge view of which with its studs is shown in Fig. 7. Over and upon the said bar *G* is a slide-rack, *H*, which is attached to the cam-bar by two arms, *h h*, arranged as shown, and connected to the rack and cam-bar by screws. Parallel to the said rack, and back of it, is another but stationary rack, *I*, which is fastened to the frame *K* of the machine. Between the two racks, and engaging with their teeth, is a pinion, *L*, which is pivoted to a connecting-rod, *M*, and held in engagement with the racks by two disks, *i i*, arranged as represented. The connecting-rod is pivoted to the wrist of a crank, *N*, fixed on a vertical shaft, *K*, which is provided with a bevel-gear, *l*, that engages with a bevel-pinion, *m*, fixed on the driving-shaft *n* of the machine. While the crank is revolved not only is the pinion *L* moved along its rack *I*, but it causes the rack

H, and the cam-bar of course, to have a greater degree of rectilinear motion, or, in other words, to move twice the distance rectilinearly that the pinion moves in a given time.

The two separate push-bars are represented at O O, each being composed of two parallel plates, $m' n'$, projecting from one of two arms, P P, that, arranged as shown, are pivoted upon a stationary rod, o . Each arm P has on its back a short auxiliary arm, q , that is pivoted to the arm P, and provided with a milled head, r , applied to the pivot.

Fig. 8 is a rear view of arm P and its arm q .

When narrowing of the work is not to be carried on, the arm q is to be turned up out of the way of an arm, s , that extends, as shown, from a lever, t , which, pivoted on the rod o , bears upon a cam, u , fixed on a shaft, v , which engages with the driving-shaft by two gears, $w x$, arranged as represented. There is to each of the arms P an arm, q , and an operative arm, s , lever t , and cam u , they being as shown in Figs. 5 and 9, the latter being a rear elevation of the machine. Furthermore, to each arm P is a spring, z , for retracting it, such spring being fastened to the arm and to the frame.

The cams $u u$ project in opposite directions from their shaft, so as to cause the push-bars to be alternately moved, one of them being at rest while the other is in movement. The knit fabric extends down between the plates $m' n'$ of the said push-bars, the rear plates being slotted, in order for the knocking-over points a' to pass through them in course of the retraction of the push-bars.

The two sets A A of narrowing-points project from adjustable slides fixed to two levers, b^2 , that are pivoted to separate slides or carriages c^2 , adapted to slide rectilinearly upon a stationary bar, d^2 , arranged as represented. These levers have short links d^3 projecting down from them at their rear ends.

Rods e^2 , extending from arms f^2 , and arranged as shown, go loosely through the links d^3 , the arms f^2 being projected from two separate rock-shafts, g^2 , arranged as represented. Underneath each arm f^2 is a spring, i^2 , for forcing the arm upward. Each of the shafts g^2 has an arm, k^2 , extending down from it, such arm being pivoted to a rod, l^2 , which in turn is pivoted to the shorter arm of a bent lever, m^2 , whose longer arm rests on the periphery of a cam, n^2 , fixed on the cam-shaft v .

By means of the cam n^2 , lever m^2 , rod l^2 , arm k^2 , shaft g^2 , arm f^2 , rod e^2 , link d^3 , and lever b^2 , applied to each set of narrowing-points, each set derives its proper vertical motions and intervals of rest.

The mechanism for moving the sets of narrowing-points in directions lengthwise of their carriages c^2 may be thus described: From each carriage c^2 serrated rack o^2 extends, as shown, in a straight groove, p^2 , made in the bar d^2 . A long pawl, q^2 , engages with each rack o^2 , and projects from and is pivoted to a slider, r^2 , that slides lengthwise in the bar d^2 ,

and is moved back by a spring, s^2 , and forward by a cam, t^2 , pivoted to the bar d^2 , and connected to a lever, v^2 , by a connecting-rod, w^2 . The two levers $v^2 v^2$ are joined by a single bar, w^2 , pivoted to them, all being arranged as represented. This bar w^2 has two studs, x^2 , projecting up from it. Between these studs is a third stud, y^2 , that extends down from a crank, z^2 , pivoted to a plate, a^3 , projecting from the cam-bar. By pushing back the crank z^2 its stud will be thrown out of action with the studs $x^2 x^2$, while the cam-bar may be in movement.

From the above it will be seen that both cams t^2 will be turned simultaneously in each movement of the cam-bar when it may be desirable to effect the narrowing of the fabric, one cam causing one of the pawls to advance its rack, and the other cam allowing the other pawl to be moved back in its rack by the spring for operating the point-slide. Thus the sets of narrowing-points are alternately moved laterally of the machine and operated to effect the narrowing of the fabric.

The yarn-carrier D slides longitudinally on the bar d^2 , being driven by an arm, d^4 , attached to rod e^3 , fixed to arm f^4 , which is attached to the end of cam-bar C and moves with it. Besides the longitudinal movements to lay the yarn upon the needles, it is depressed at proper times, so as not to lay it upon those needles from which the loops may have been transferred.

The yarn-carrier is supported in a movable carriage, a^4 , so as to be capable of sliding vertically, it being forced upward by a spring, b^3 , suitably applied to it and the carriage.

Fig. 10 is a top view, and Fig. 11 a front elevation, of the carriage.

There is pivoted to the lower part of the yarn-carrier a cammed lever, c^3 , (see Fig. 11,) with which an arm, d^4 , projecting from a slide-rod, e^3 , operates first to slide and then to depress the carrier, such slide-rod being supported in suitable boxes or guides and fixed to an arm, f^4 , extended from the cam-bar.

From the above it will be seen that in each traverse of the cam-bar the arm d^4 will be caused to enter between the cammed lever c^3 and the carriage a^4 , and will not only move the carriage along, but in passing out cause the yarn-carrier to be depressed for the purpose of preventing it from laying yarn on the needles from which the loops may have been transferred.

The lateral movements of the yarn-carrier are properly co-ordinated with the movements of the carriages of the narrowing-points by means of adjustable stops l^3 , attached to the carriage c^2 , which arrest the movement of the carrier-carriage at any predetermined point where the narrowing is designed to take place.

The arm d^4 does not depress the carrier till the carrier-carriage has been arrested by the stop at either end of its course. While either of the movable cams E E of the cam-bar is being moved forward the other is correspond

ingly moved backward. During the greater part of each traverse of the cam-bar one of the movable cams will be forward, or in parallelism with the stationary cam, and the other movable cam will be back, or out of parallelism with the stationary cam. The cam thus back acts on the needles to force them out far enough for them to receive the narrowing-points. On completion of each traverse of the cam-bar all the needles are out, with the work hanging on their latches, the needles then being in position for the narrowing to be effected. The needles are next successively forced out sufficiently to carry the loops back of the latches, such being accomplished by the cam E, that may be forward at the time.

From the foregoing it will be observed that, owing to the peculiar construction of this machine, the knitting of the foot or sole of a stocking onto the side or selvage edge of a stocking-heel is facilitated, since by the peculiar movement of the cams the needles do not move in until after they have moved out and taken yarn to form new loops; hence the selvage-stitches, which are short, are not drawn in between the sinkers, as they would be if the first movement of the needles after receiving them were inward.

It will also be observed that the transferring-points through the mechanism described are narrowing at one edge of the fabric while the yarn-carrier is feeding the yarn into the needles and knitting upon the other edge of the fabric; also, that the needles, through the intervention of the mechanism described, are not dropped down after the transferring-points have taken the loops from them; also, that by means of the cams and their operative mechanism no latch-opener is necessary, owing to the fact that the yarn is laid across the needle-hooks before the needles are moved out far enough to have the old loops thrown behind the latches; also, that through the intervention of the described mechanism the yarn-carrier is so operated as to feed the yarn into the exact number of needles that is required to make loops; also, that through the mechanism described the narrowing is effected during one forward and one backward movement of the movable cams; also, that the yarn-carrier is dropped to determine the width of the work, the time of said dropping being determined by the position of the transferring-points and the described connecting and operating mechanism.

Having thus fully described my improve-

ments, what I claim as new and of my invention is—

1. In combination with the series of needles and knock-over points, the sliding cam-bar C, having the fixed cam S, the straight grooves *a a*, the two movable cams E E, the tri-branched lever F, and bar G, provided with studs *g g* and mechanism for sliding the cam-bar, all constructed and operating as described, for the purpose set forth.

2. The combination, with the sliding cam-bar C, operated as described, and provided with plate *a*³, crank *z*², and the narrowing-points A A, of the mechanism for operating the said narrowing-points, the same consisting of the bar *w*², studs *x*², levers *v*², links *u*², cams *t*², slides *r*², pawls *q*², racks *g*², and carriages *c*², all constructed and operating substantially as set forth.

3. The combination, with the sliding cam-bar C and mechanism for operating the same, of the arm *f*⁴, sliding rod *e*³, arm *d*⁴, cammed lever *c*³, carriage *a*⁴, and yarn-carrier D, all constructed and operating substantially as described.

4. The combination, with the shaft *v* and cams *n*² on the ends thereof, of the bent levers *m*², rods *l*², arms *k*², rock-shafts *g*², spring-arms *f*², rods *e*², links *d*³, levers *b*², and narrowing-points A, all constructed and operating substantially as specified.

5. The combination, with the push-bars O, arms P, and shaft *o*, of the auxiliary arm *q*, levers *t t*, cams *u u*, and milled head *r*, as and for the purpose set forth.

6. The push-bars O O, composed of plates *m' n'*, and divided from each other in the middle of their length, in combination with the cams *u u* and intermediate mechanism between such cams and push-bars, whereby the said push-bars are operated alternately, one being at rest while the other is in action, as and for the purpose described.

7. The combination, with the series of latch-needles, the thread-guide, push-bars, and mechanism for operating the same, of the two sets of transferring-points and mechanism for operating the same, the said parts being timed as described, whereby the narrowing is alternately carried on at opposite sides of the machine simultaneously with the operation of knitting, substantially as described.

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Witnesses:

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