

(No Model.)

2 Sheets—Sheet 1.

G. E. NYE.  
CIRCULAR KNITTING MACHINE.

No. 498,139.

Patented May 23, 1893.

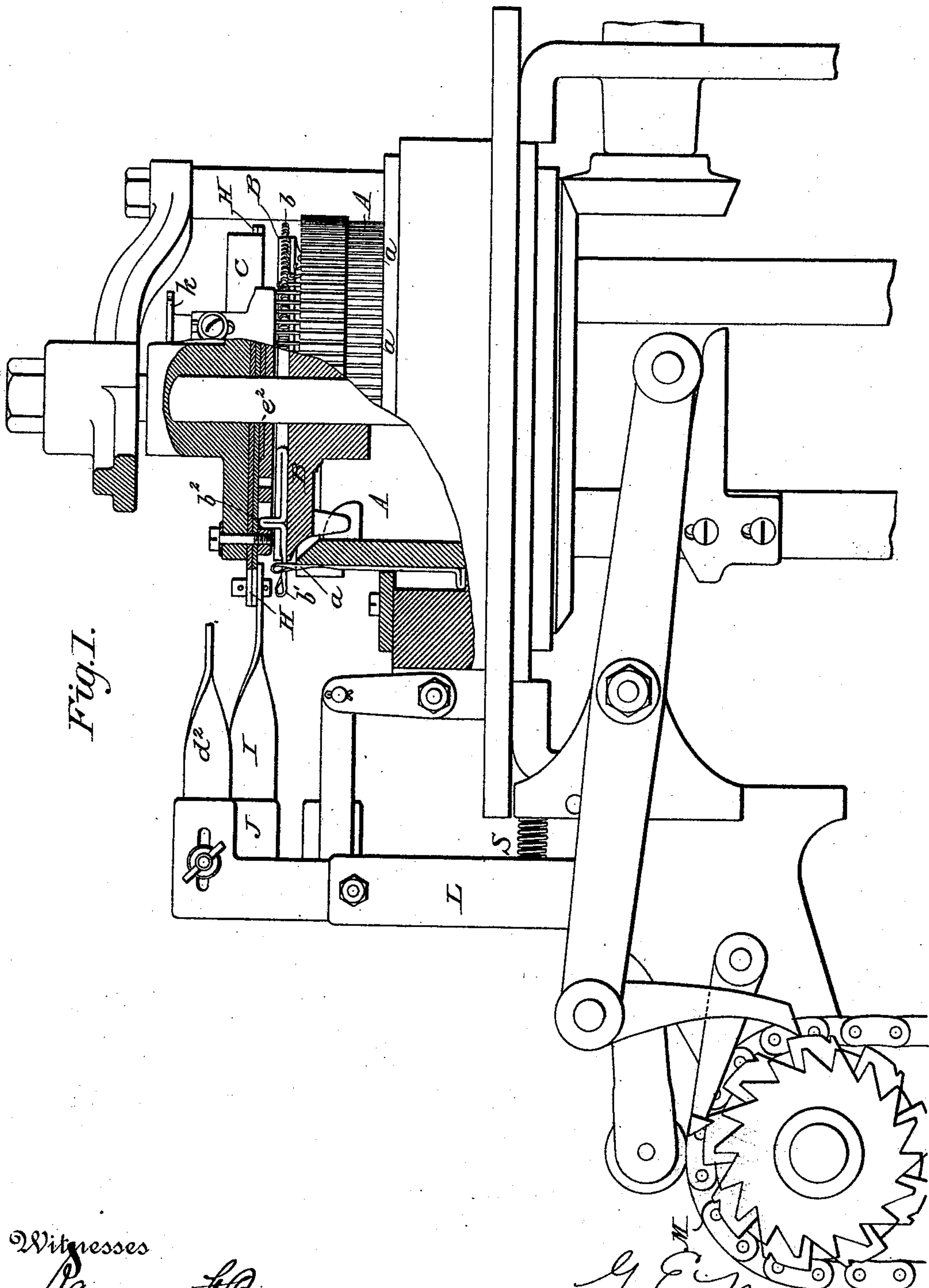


Fig. 1.

Witnesses

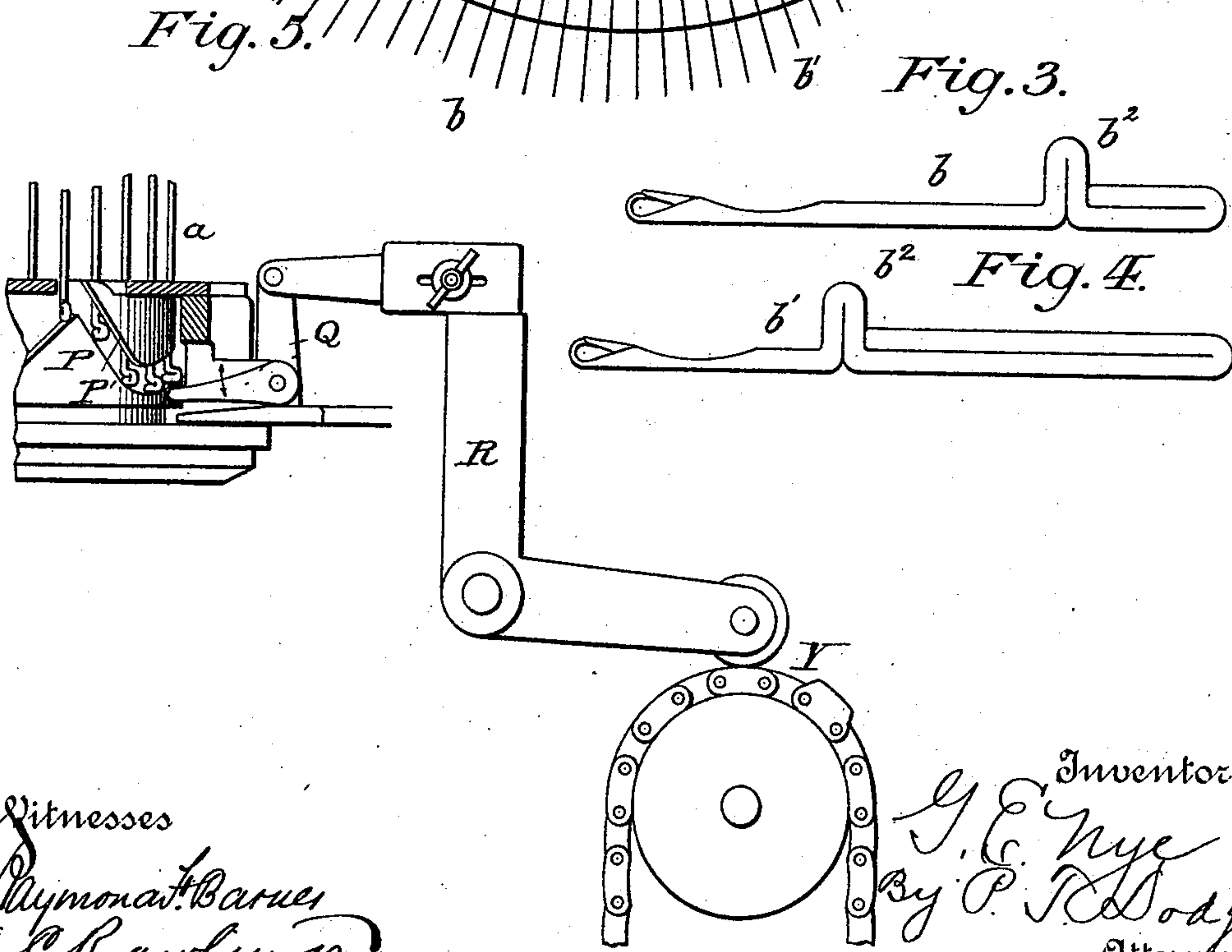
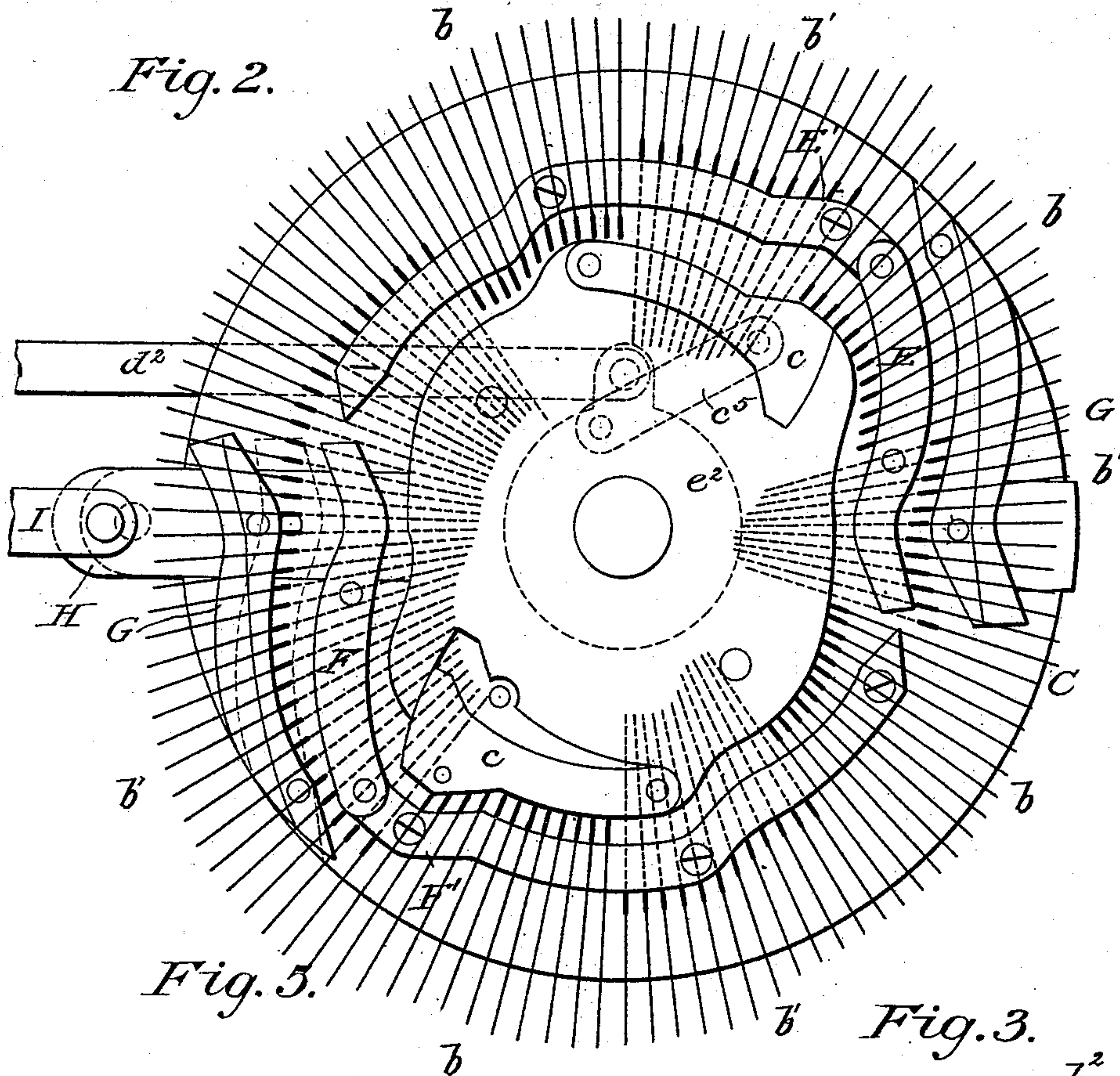
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Raymond A. Barnes  
A. C. Rawlins

Inventor  
G. E. Nye  
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# UNITED STATES PATENT OFFICE.

GEORGE E. NYE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO EDWARD FREDICK, OF SAME PLACE.

## CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 498,139, dated May 23, 1893.

Application filed July 22, 1892. Serial No. 440,915. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE E. NYE, of Philadelphia, county of Philadelphia, and State of Pennsylvania, have invented a new and useful  
5 Improvement in Circular-Knitting Machines, of which the following is a specification.

My invention relates to that class of circular knitting machines in which vertically reciprocating latched needles mounted in a revolving cylinder and actuated by cams, co-  
10 operate with a series of horizontal latched needles mounted radially in a dial plate and reciprocated by cams.

It consists in improvements designed more  
15 particularly for use in connection with the machine patented to me on the 28th day of April, 1885, No. 316,907, the principal object being to produce tuck stitches by any desired number of the dial needles and plain stitches  
20 by the remainder, and thus to produce ornamental fabrics such as could not be produced on the original machine. This result I secure by making use of dial needles of two or more forms, differing as to the location of their  
25 shanks or studs, in combination with separate operating cams for the needles of the respective forms, and a thread guide which delivers the one thread to all the needles in the series without regard to their forms or move-  
30 ment. By this arrangement, under which the dial needles of one form are operated independently of the others, I am enabled to impart different movements to the needles of different forms, and at the same time having  
35 them all act on the one thread so as to produce the required changes in the stitches during the knitting of each round or course automatically, and without changing the fabric from one set of needles to another.

40 While I commonly use my improvement in connection with the dial needles it may be applied in the same manner and with like effect to the cylinder needles.

In the accompanying drawings,—Figure 1  
45 represents in side elevation a machine embodying my improvements, a portion of the cylinder, dial and cam mechanism being shown in vertical section. Fig. 2 is a bottom plan view of the cam mechanism for operating the dial needles. Figs. 3 and 4 are side  
50 views illustrating the dial needles in their

two forms. Fig. 5 is a sectional elevation illustrating the manner of constructing and operating the lifting cam of the cylinder needles.

In the drawings I have represented my improvement applied to a machine which is in most respects identical with that shown in my patent above referred to.

A, represents the tubular rotary cylinder 60 provided with grooves to receive the vertical needles *a*, which are raised and lowered by stationary cams *P P'* engaging their heels.

B, represents a rotary horizontal plate, usually known as "the dial" provided in its upper face with radial grooves containing the horizontal needles *b b'*, which are reciprocated by cams on the under face of the stationary plate C, in essentially the same manner as in other machines known in the art.

In carrying my present invention into effect I provide dial needles of different forms, such as shown at *b* and *b'*, Figs. 3 and 4, having their heels or studs *b<sup>2</sup>* on which the cam operates, at different points in their length. As  
75 these needles differing in form cannot be practically operated by the same cams I provide special or separate cams for each form of needles. As shown in the drawings the needles *b*, are of the usual form with the heels  
80 near their inner ends. They are actuated by the throwout cams *c*, and the drawing-in cams *E* and *F*, as shown in Figs. 1 and 2, these parts being as regards their external form and their actions on the needles substantially identical  
85 in their construction and mode of action with those represented by the same letters in the patent No. 316,907. The needles *b'*, however, instead of being actuated by the above-mentioned cams are moved by the engagement of  
90 their heels with the drawing-in cams *G*, which I now apply to the machine for the first time, and with the outer edges *E' F'* of the cams *E* and *F*, which are now formed on their outer edges for the first time to serve as throw-  
95 out cams. By means of the extra cam surfaces the needles *b'*, are operated independently of the needles *b*.

By forming the draw-in cams as shown, and making them independently adjustable they  
100 may be so set that the needles actuated there- by will only reach the full limit of their in-



ward movement and cast their stitches once in each revolution, as for example, referring to Fig. 2, the cam G at the left is set out farther than that at the right, the latter being so set that the needles  $b'$  actuated thereby will be drawn in far enough to cast their stitches, but will not be drawn in far enough by the left hand cam to cast off. The needles  $b'$  will thus receive two stitches before casting off, and will cast off only once in each round, producing the familiar tuck stitch. By a proper construction of the pattern chains by which the cams are moved any group or series of the needles  $b'$  may be caused to knit either plain or tuck stitches, in any round or course.

I deliver the thread to the needles by the usual fixed guide  $k$ , which lays one and the same thread within the grasp of all the needles. It is to be noted that in my machine the one thread is delivered throughout the entire course or round to all the needles, and that although the different dial needles move different distances and produce different forms of stitch they act on the one thread.

The cams  $c$  and G may be fixed permanently in position, in which case the machine will knit a constant pattern, the figure of which will depend on the manner in which the needles  $b$   $b'$  are grouped or arranged in relation to each other, but I prefer to mount them on pivots that they may be swung inward and outward, and to connect them through intermediate devices with a pattern chain or its equivalent for effecting their automatic adjustment to vary the throw of the needles and thereby the design or pattern of the fabric.

As shown in the drawings one of the cams  $c$  is connected by a link  $e^5$  with a central rotary plate  $e^2$ , connected by a link  $d^2$ , to a lever L, actuated by a pattern chain M, in a manner identical with that described in the original patent.

While the drawings show only one of the cams  $c$  connected with the rotary plate  $e^2$ , it will be understood that both may be connected therewith to be operated simultaneously and in unison, to produce similar stitches at opposite sides of the machine; or one of said cams may be movable and the other stationary; or they may be connected with different actuating devices to be moved and set independently of each other, and in different positions, to produce stitches of different pattern, as may be desired.

One of the new cams, G, is connected at its free end to a slide H, connected by a link I, to an elbow-lever J, which is actuated by a pattern chain, the construction and operation of this pattern chain and lever being essentially the same as those above described. By means of these connections the cam G, may be moved to change the throw and the action of the needles  $b'$ , without in any manner affecting the action of the needles  $b$ . The two cams G, like the cams  $c$ , may be connect-

ed with, and operated by, the same slide H; or they may be operated by different slides and pattern chains; or one of said cams may be movable and the other stationary. It will be observed that in Fig. 1 of the drawings two plates H, are shown though only the lower one is shown connected to an actuating link. By giving the pattern chains which operate the respective cams suitable forms, the needles  $b$  may be caused to knit the plain and the tuck stitch alternately at such intervals as the chain may determine, and in like manner the needles  $b'$ , may be caused to knit the two forms of stitch alternately by means of this pattern chain.

The essence of my invention resides in the combination of dial needles differing in form from each other, and arranged in one row or series, with cams to operate them independently, and with a thread guide which lays one and the same thread to all the said needles, and any equivalent construction which enables the actuating cams to distinguish between the different groups of dial needles is to be regarded as falling within the scope of my invention.

It will be observed that under my construction the needles of the two forms may be grouped or arranged in any desired order of succession, and that any desired number of them may be of one form and the remainder of the other form according to the design of the fabric to be produced.

While I have described herein and prefer to employ the pattern chain and levers such as herein described, it is to be understood that they constitute in themselves no part of the present invention, and that they may be replaced by any equivalent pattern mechanism of which there is at the present time a number familiar to every person skilled in this art. P represents the usual cam located in the frame outside of the cylinder to actuate the vertical cylinder needles. This cam instead of being fixed in position, is arranged to slide vertically and is connected to one end of an elbow lever Q, which is pivoted on the frame and connected as shown, to one end of an elbow-lever R, urged in one direction by a spring S, which tends to lift the cam P. At its rear end this lever bears upon a pattern chain Y, by which it is moved at certain intervals to depress the cam P and thus prevent the cylinder needles from rising to their highest point. The pattern chain is mounted upon and actuated by the roll which carries the other pattern chain.

There being two sets of operating cams diametrically opposite each other, the dial needles will be moved through two reciprocations in each revolution of the machine, corresponding movements occurring at diametrically opposite points. While I have stated above that a single thread guide is used to lay the thread to all the needles in each course, it is to be understood that two guides, located diametrically opposite each other, are employed, and



that each guide lays its thread to all the needles, so that two courses may be knitted simultaneously at each complete revolution of the machine.

5 I am aware that it is old to arrange in one series needles differing in the form of their shank and operated by different cams, and this I do not broadly claim. I am not, however, aware that any one has heretofore combined with a series of needles constructed and operated as above a guide by which one thread was laid to all the needles.

Having thus described my invention, what I claim is—

15 1. In a circular knitting machine, the cylinder, its needles and actuating cams, in combination with the dial, its needles *b b'*, part of which have their studs or heels in different positions from those of the remainder, the  
20 throw-out cam *c*, acting on the needles of one

form, the draw-in cam *G*, acting on the needles of the other form, and the intermediate cam acting as a draw-in cam for the needles of one form, and as a throw-out cam for those of the other form, said cams being adjustable 25 to move the different needles different distances, and a thread guide, whereby one and the same thread is laid to all the needles.

2. In combination with the needles differing in the form of their shank, the cam *F* and 30 the cams *c* and *G*, and means for independently adjusting the cams *c* and *G*.

In testimony whereof I hereunto set my hand, this 26th day of March, 1892, in the presence of two attesting witnesses.

GEORGE E. NYE.

Attest:

H. KENNEDY,  
WM. K. SHYROCK.

It is hereby certified that the name of the assignee in Letters Patent No. 498,139, granted May 23, 1893, upon the application of George E. Nye, of Philadelphia, Pennsylvania, for an improvement in "Circular Knitting Machines," was erroneously written and printed "Edward Fredick," whereas said name should have been written and printed *Edward Tredick*, and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 13th day of June, A. D. 1893.

[SEAL.]

JNO. M. REYNOLDS,

*Assistant Secretary of the Interior.*

Countersigned:

JOHN S. SEYMOUR,

*Commissioner of Patents.*