

J. BRADLEY.
Circular-Knitting Machine.
No. 227,213. Patented May 4, 1880.

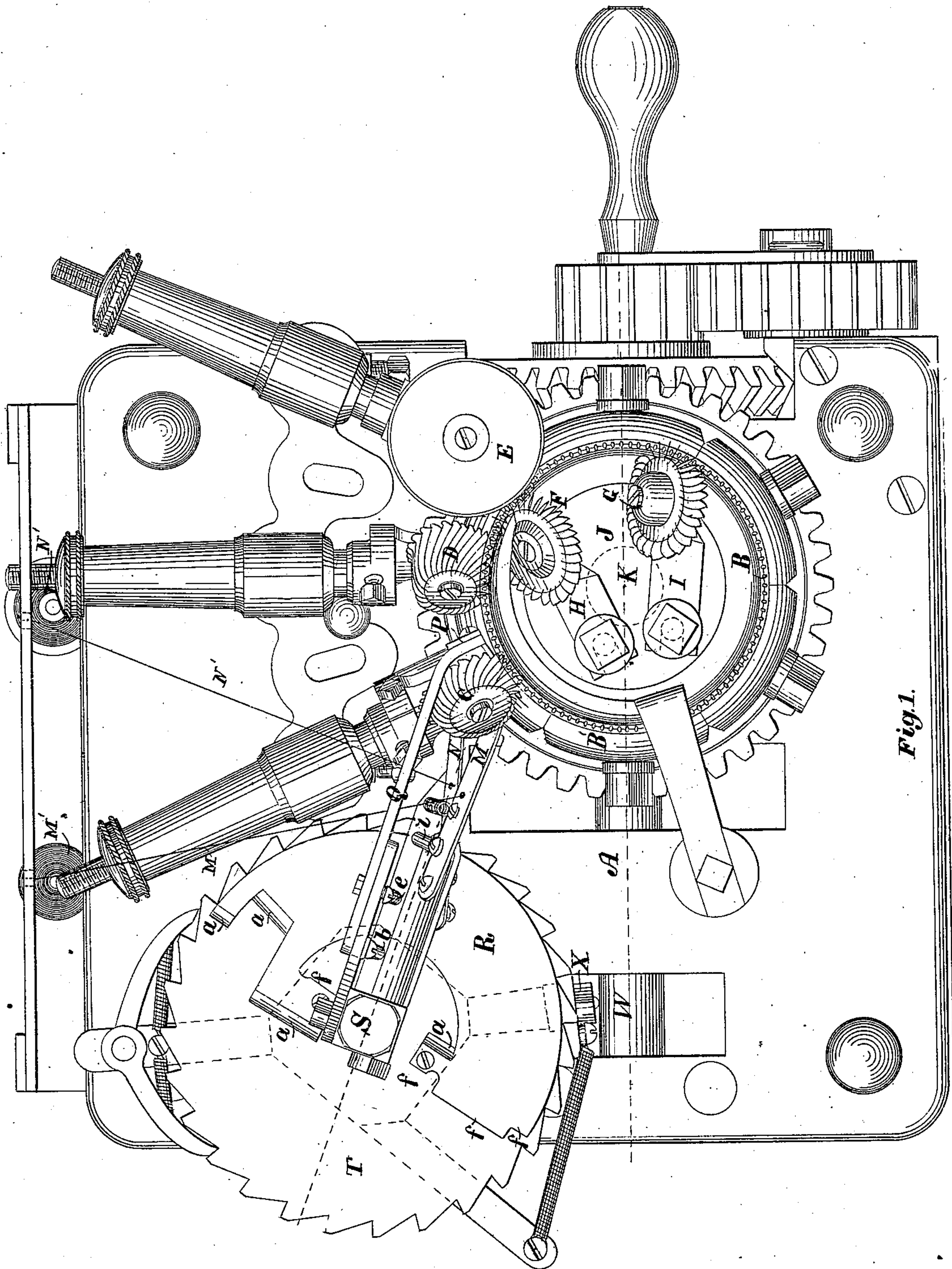


Fig. 1.

Witnesses:

C. H. Dodd.
Wm. C. Hibbard

Inventor:

John Bradley

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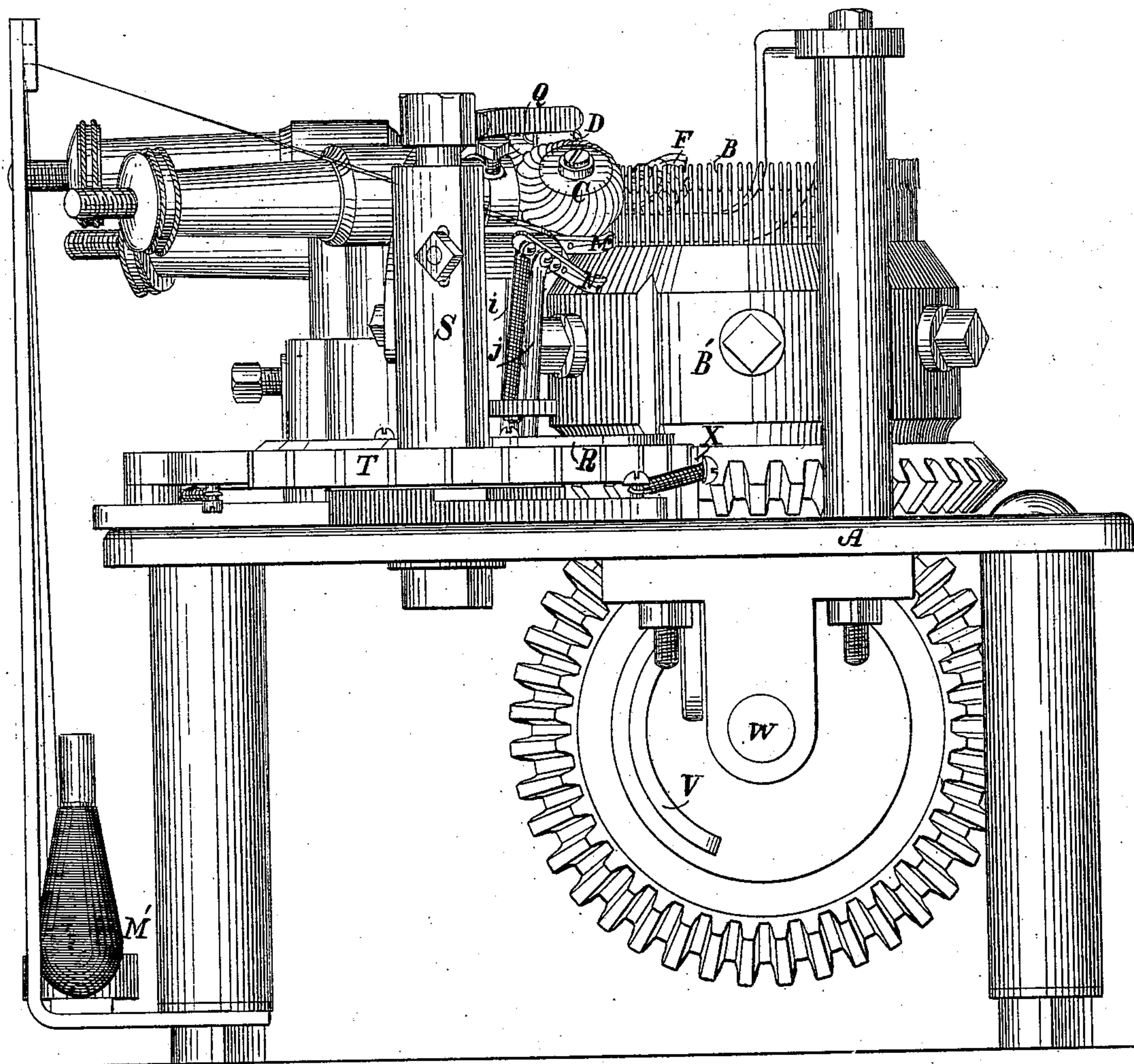


Fig. 2.

Witnesses:

L. H. Dodd.
Wm. C. Hibbard

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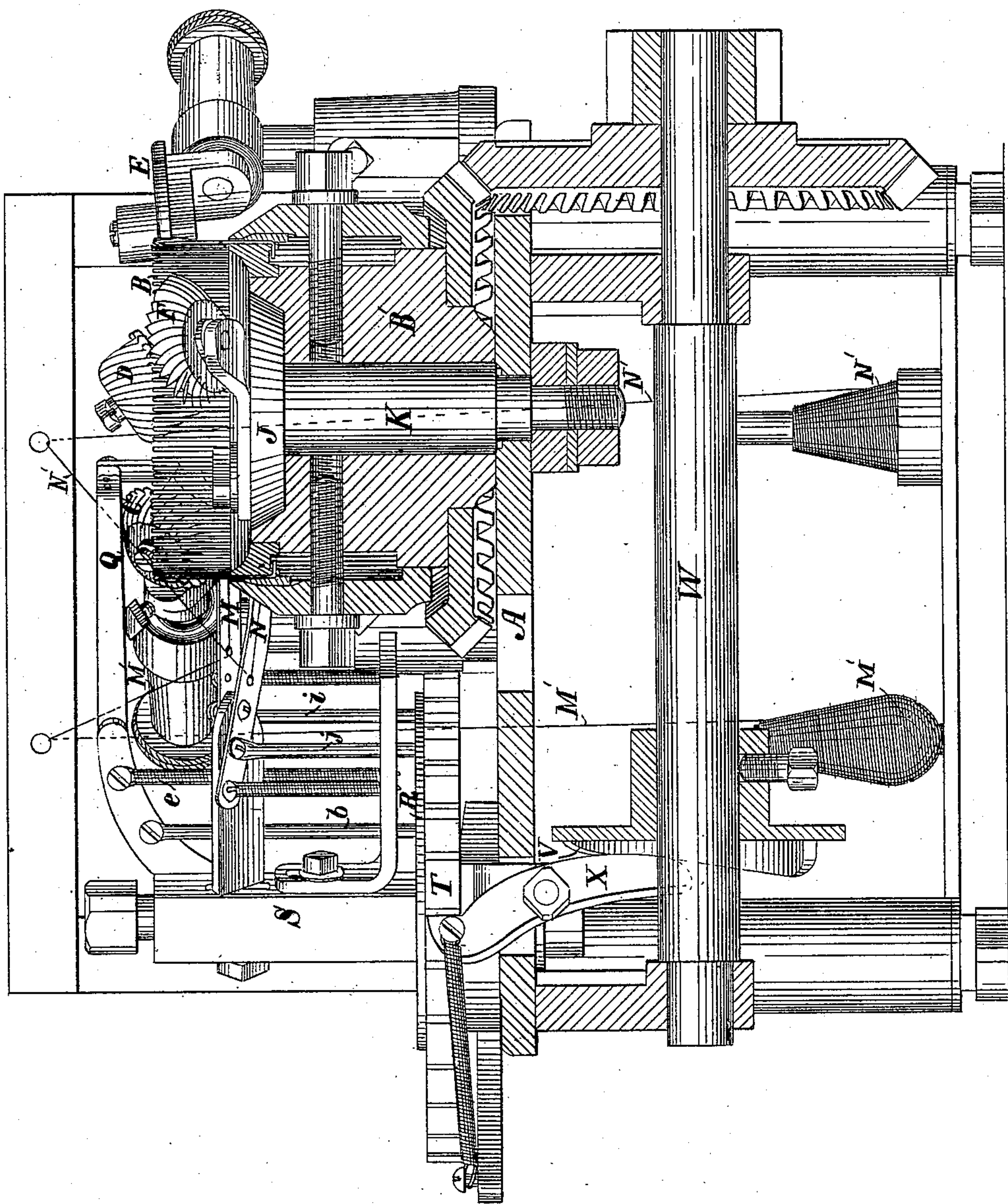


Fig. 3.

Witnesses.

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Wm. C. Hibberd

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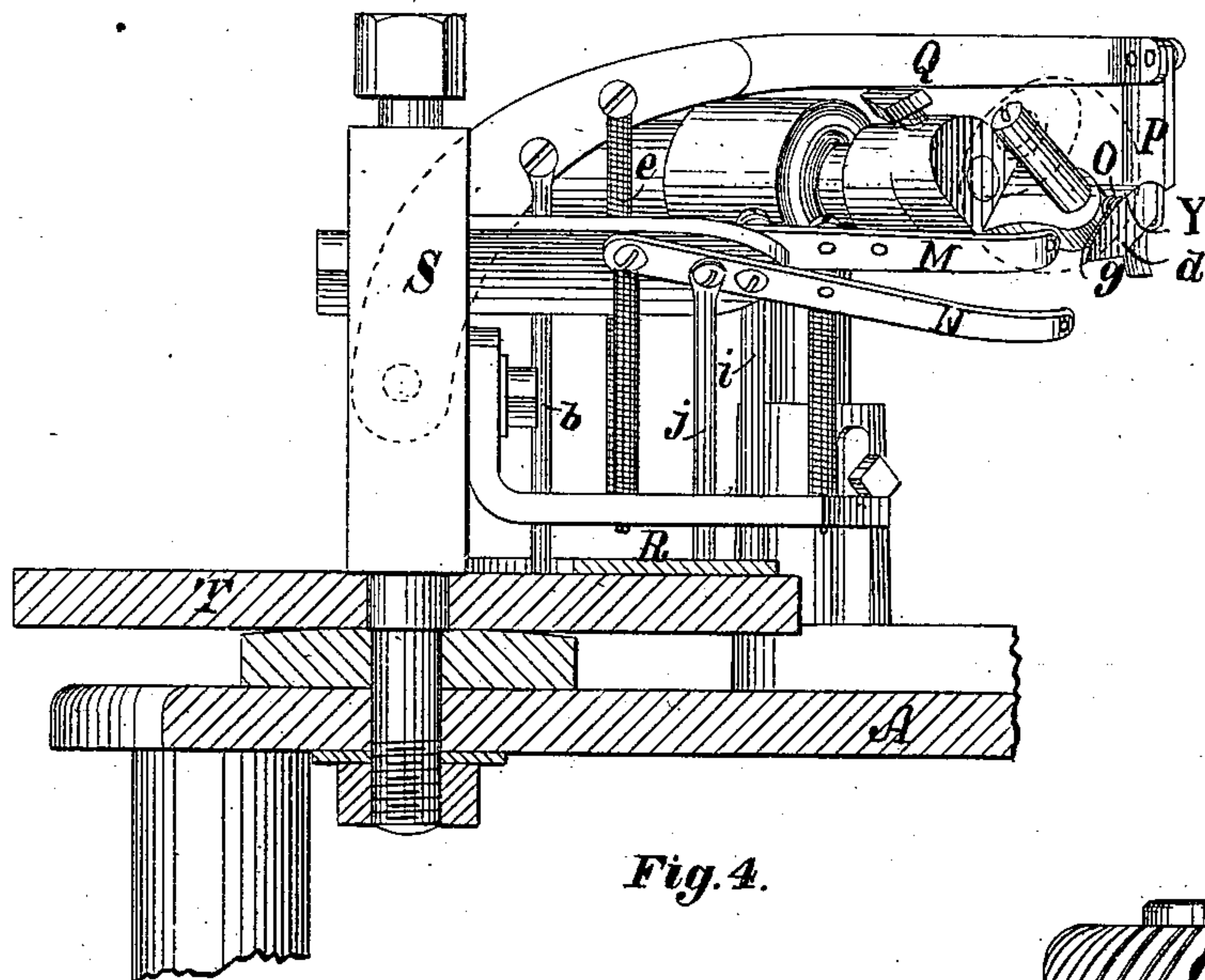


Fig. 4.

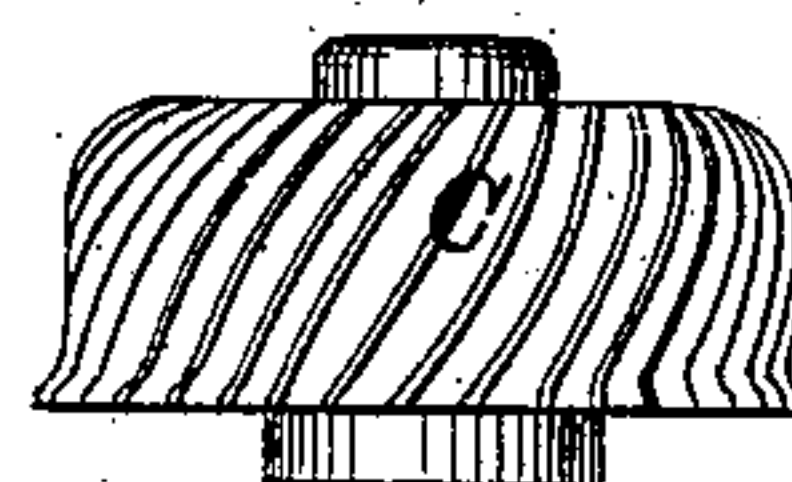


Fig. 10.

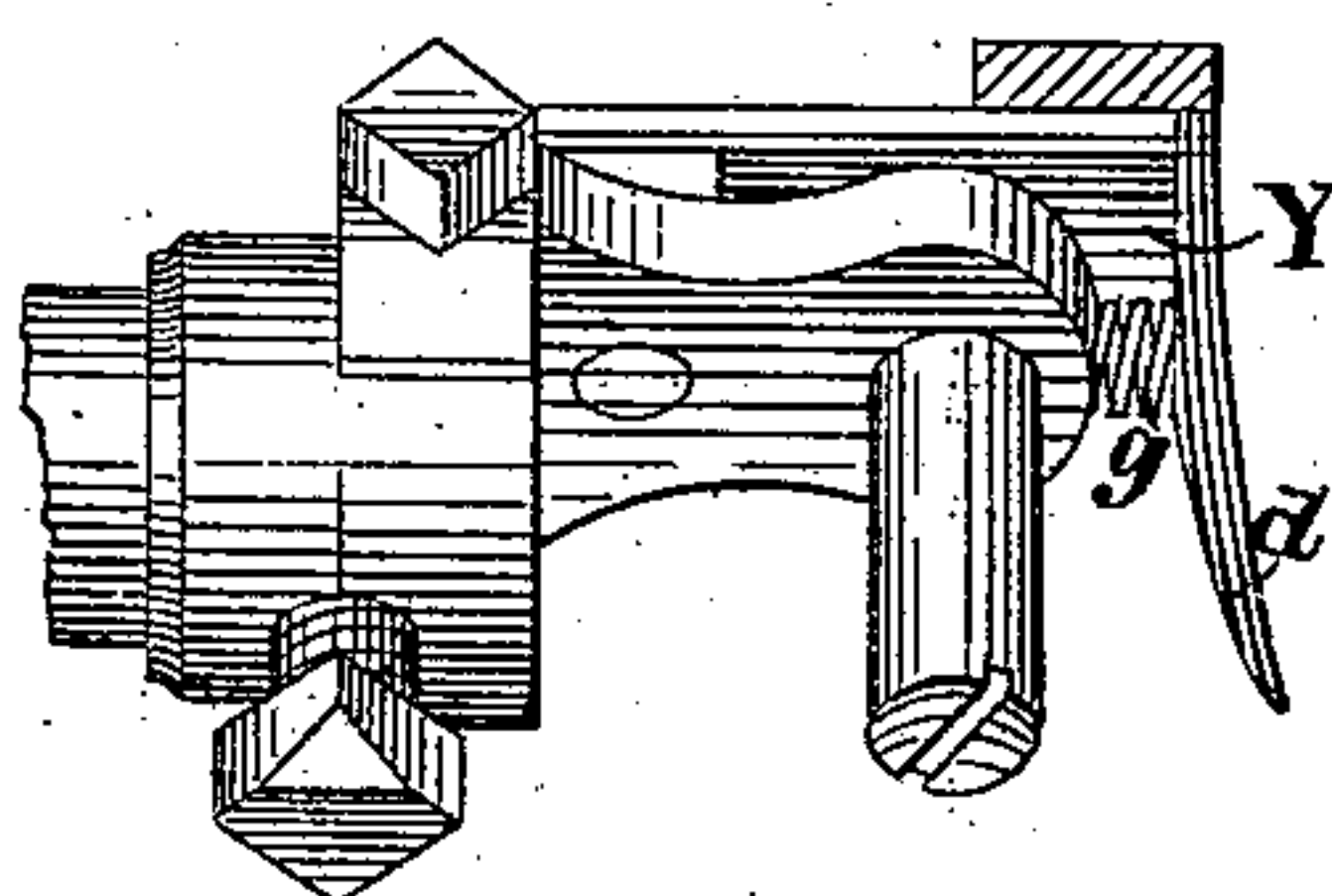


Fig. 5.

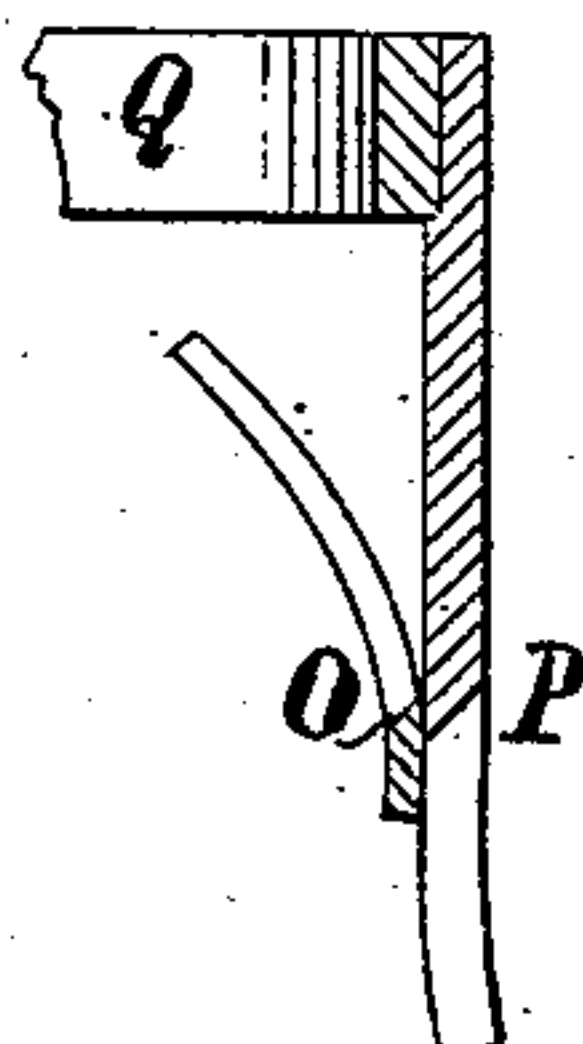


Fig. 7.

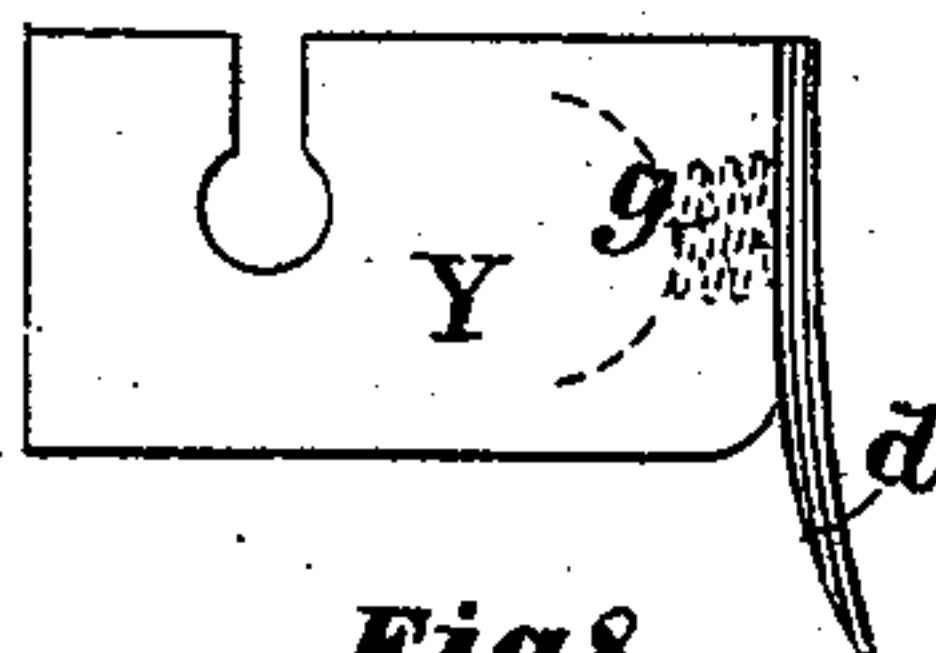


Fig. 8.

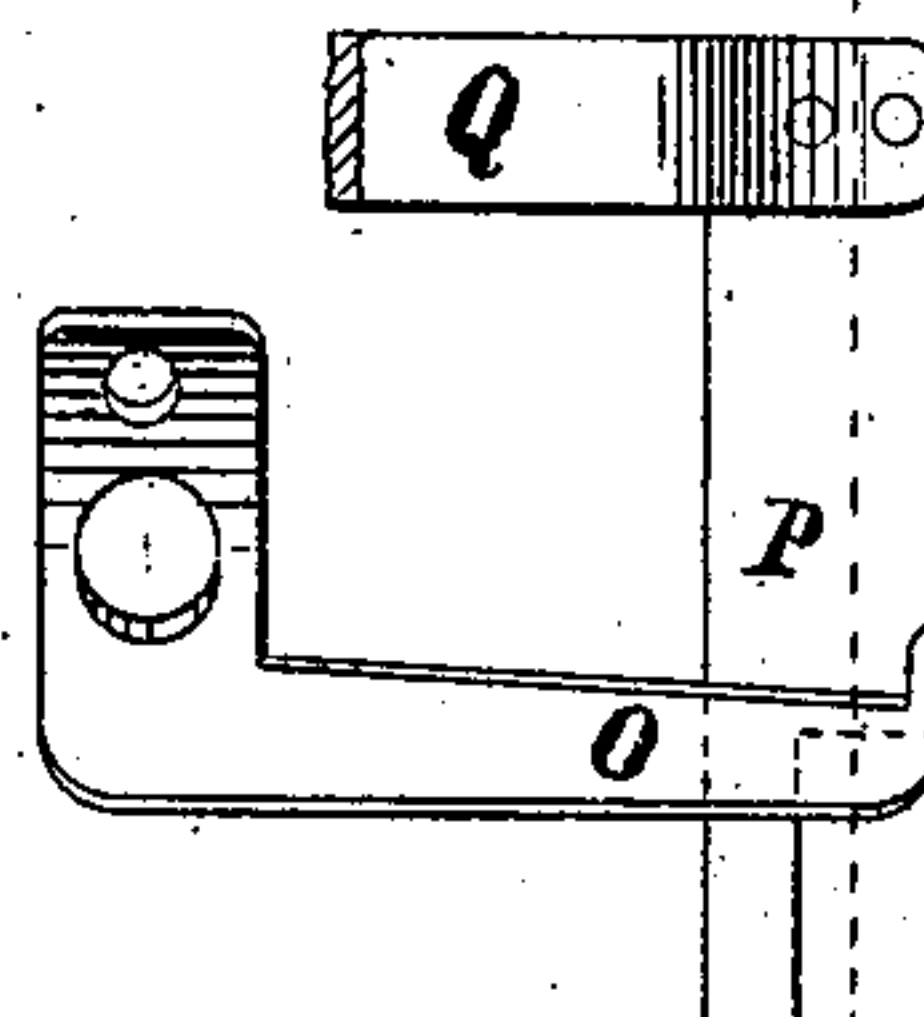


Fig. 6.



Fig. 9.

Witnesses:

C. H. Dodd.
Wm. C. Hibbard

Inventor:

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UNITED STATES PATENT OFFICE.

JOHN BRADLEY, OF LOWELL, MASSACHUSETTS.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 227,213, dated May 4, 1880.

Application filed February 12, 1880.

To all whom it may concern:

Be it known that I, JOHN BRADLEY, a subject of Great Britain, now residing in Lowell, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Circular-Knitting Machines, of which the following is a specification.

This invention is more especially adapted to be used in connection with what are known in the art as "circular-knitting machines," or such machines as have their needles arranged in a circle, and which, in the act of knitting, are moved in a circle, in connection with a series of co-operating wheels the blades or teeth of which engage with the circular series of needles, and by the simple rotation of said series of needles and the co-operating wheels all of the operations of knitting are performed.

The more especial purposes of my improvements are to use two or more yarns of different colors in knitting the same tissue, and to automatically change said yarns in such order as may be desired.

By the means hereinafter described circumferential stripes of different colors may be produced in the work, and of such width and in such order as may be desired, by automatically severing one of the yarns at the finishing of the stripe, and by uniting the other yarn with it automatically, so as to uninterruptedly continue the knitting until a determined number of rounds or courses are completed, when the other yarn is brought into action and the yarn just used is automatically severed. A succession of these operations produces a series of stripes circumferentially in the work without arresting the operation of knitting to unite the two yarns by tying.

In the accompanying drawings, Figure 1 is a plan of a circular-knitting machine with my improvements attached to it. Fig. 2 is an elevation of one side of the machine. Fig. 3 is a longitudinal sectional elevation. Figs. 4 to 10 indicate the thread-plate in various views, the stitch-wheel, and the cutting device attached to the thread-plate.

In the drawings, A is the bed-piece of the machine, upon which the several parts of mechanism are arranged, as is shown. B is the circular series of knitting-needles, which

are of the kind known in the trade as "spring-needles." These are fixed at their lower ends in a circular stock, B', called the "head," to which all the needles are firmly fixed, the heads of the needles projecting vertically upward therefrom to carry the several stitches being formed. This circle of needles is rotated about a vertical axis to perform the operations of knitting by means of the bevel-gearing shown, either by hand, as shown, or by power. Around this series of needles are placed circumferentially several wheels, which I term "working wheels," the circumferences of which are provided with radial blades or teeth set in various positions, which work between the several needles and serve to manipulate the yarns in connection with them, and perform upon the yarn all of the operations of knitting, some of them operating outside of the series of needles, and some of them within the series, but all of them rotating with the needles.

In the drawings, C represents the "stitch-wheel," so called, by which the yarn is looped partly around the needles, and is the wheel by which the yarn is first received in the operation of knitting.

D is called the "dividing-wheel," which places the loops of yarn more accurately upon the bodies of the needles.

E is the presser-wheel, by which the beards of the needles are depressed to allow the stitches to pass over them, and its circumference therefore is not provided with teeth or blades, like the other wheels.

F is the landing-wheel, by which the stitches are carried outside of the points of the beards of the needles. G is the knocking-over wheel, by which the work is discharged from the needles. These two last-named wheels are located within the series of needles, and all the others are located outside of the needles; but they all revolve with the needles and operate upon the yarn and upon the needles to perform the knitting in the order that they are mentioned above.

The two wheels last mentioned are mounted upon fixed axes borne upon the brackets H I, which are secured to the interior fixed plate, J, which plate is fast upon the interior shaft, K, about which the revolving needle-head B'

revolves. The lower end of the shaft Kis fixed in the bed-piece A of the machine, and therefore does not revolve with the needle-head B'. The revolutions of the needles and of the several working wheels co-operating with them, as before mentioned, perform continuously the operations of plain knitting, excepting as will be hereinafter described.

In making the stripes with this machine it is to be remembered that each stripe is composed only of plain knitting with one yarn only, that the stripes run parallel with the courses of the stitches, and that the width of the stripe depends upon the number of courses thus knit before changing the color of the yarn, which is done automatically by the machine after a determined number of courses of knitting, which determines the width of the stripe to be produced. By thus changing the yarns of different colors and uniting each yarn at the commencement of each stripe by the automatic action of the machine alternate stripes of different colors may be produced, according to any determined pattern, and continued without stopping the machine.

I will now proceed to describe that part of the mechanism which changes and severs the yarn automatically.

The yarns, of different colors, are mounted upon the bobbins M' and N', and are led, respectively, as shown in the drawings, Figs. 1 and 2. The uppermost yarn, M', is the one that is in action in knitting. The lower yarn, N', by its guide N, is carried below the stitch-wheel C and down upon the "thread-plate" Y, so called, so that it will rest upon the lower knife, O, (shown separately in Fig. 6,) and in the proper position to sever the yarn when the stripe is finished. The lower cutter-blade, O, is fixed to the lower part of the thread-plate, which, in turn, is attached to the "star-box," so called, which carries the stitch-wheel C. The several "star-boxes," so called, carry the several working wheels, as shown in Figs. 1 and 2.

In order to explain more clearly the mode of operation of the yarns in changing them to make stripes of different colors and to remove the yarn from use when the stripe is finished, I will endeavor to explain the nature of the operations that are produced by the machine.

We may premise that the yarn that is in action in knitting is the one that is led through the yarn-guide M and is shown as the upper one. The other yarn-guide, N, is meantime, of necessity, the lower one. When the yarns of different colors are to be changed, this lower yarn or yarn-guide N is first raised by automatic action to its proper position on the stitch-wheel to be carried into the proper position in the work or knitting, which unites this yarn to the yarn or yarn-guide M already knitting, so that they both together are knit into the work being produced. By this means both yarns are securely spliced to the work and also to each other. The operation of knit-

ting then continues for a few—say three or four—stitches, which thus unites the two yarns together for that number of stitches. Immediately after this the other yarn-guide, M, moves downward, which carries the yarn M' downward below the blades of the stitch-wheel C, and the yarn is carried down onto the blade O and to the proper position to be severed.

The movable cutter-blade P, which works with the lower cutter-blade, O, to sever the yarn, is attached to the lever Q, which turns upon an axis fixed in the post S, which also carries the arm for the axes of the vibrating yarn-guides M N. The lever Q, with its movable cutter-blade P, is raised a short distance by the face-cam R, which is fixed upon the counting-wheel T and rotates with it.

The counting-wheel T is provided around its periphery with twenty-eight teeth, and is turned one tooth at each revolution of the needles by means of the vibrating pawl X, which is vibrated by the face-cam V, which is fast upon the driving-shaft W beneath the bed of the machine, (seen in Fig. 3 of the drawings,) and thus the wheel T is turned one notch at each revolution of the needles.

Upon the face of the counting-wheel T is secured the face-cam R, which, by its inclines *a* and offsets *f*, actuates the yarn-guides M and N, and also the lever Q, which actuates the movable cutter-blade P, in connection with stationary cutter-blade O, to sever the yarn.

The cutter P is raised by its lever Q by means of the rod *b*, which rides upon the face of the cam R, to the offset *f*, from which the rod *b* drops when the counting-wheel brings the cam R round to the proper offset *f*. The lever Q is drawn downward by the helical spring *e*, so that as the rod *b* falls off from the face of the cam R it carries the cutter-blade P downward to meet the lower cutter-blade, O, and sever the yarn held between them. The blade P descends a little past the edge of the lower blade, O, and thus severs the yarn close to the thread-plate and its splice with the other yarn.

When the yarn is in the proper position to be severed it is, by the action of the yarn-guide and the draft upon the yarn, drawn beneath the small helical spring *g*, or from between the coils thereof, which is attached to the "thread-plate," so called, which is shown more clearly in Figs. 5 and 8. This spring holds that part of the severed yarn which is between the cutter-blade P and the yarn-guide from which it led, and retains it until the severed yarn is again brought into use to begin another stripe, which is done by raising and guiding the severed yarn onto the stitch-wheel by its appropriate yarn-guide to the proper height to be knit, when it unites with the other yarn, and with it is carried into the work, and knit in with it for a few stitches, as has been already described. The yarn-guides M and N, as they lower the yarns, bring them within the horn *d*

on the thread-plate, Figs. 5 and 8, and precisely over the lower cutter-blade, O, by which the yarns are severed by the movable cutter P.

Figs. 5, 8, and 9 are different views of the thread-plate and its horn *d*.

By the continuous action of the counting-wheel T the face-cam R vibrates the yarn-guides M and N in both directions—that is, both upward and downward—and each yarn, when it is carried downward, is carried onto the lower cutter, O, and by the movable cutter P is severed, leaving the yarn thus severed held fast by the small spring *g*, which is upon the thread-plate. The lever Q, which actuates the movable cutter P, is jointed to the post S, and is raised a short distance by the inclines *a a* upon opposite sides of its axis, (of the face-cam R,) and is held raised a short time while the rod *b* rides upon the face of the cam R. When the cam R has turned until the rod *b* has arrived at the limit of the cam-face it (rod *b*) falls at the point *f* of the cam, which allows the cutter-blade P to fall and sever the yarn beneath it.

The cam R is of a semicircular form, and embraces such proportion of the circle as will correspond to the number of courses of knitting that are desired in the stripe in width, or the number of courses that are desired to be made in the stripes of different colors, both of them produced in plain knitting.

The yarn-guides M and N are made to vibrate in opposite directions by inclines *a* of the face-cam R, which, by the act of raising the rods *i* and *j*, which act upon opposite arms of the yarn-guides, cause one of them to vibrate the yarn upward a little before the other vibrates its yarn downward, and the inclines of the face-cam R are so timed as to produce this action.

It may be observed of the yarns in action

and to be brought into action that the yarn that is to be brought into action in knitting is to be raised and carried to the knitting position on the stitch-wheel, while the yarn that is to go out of action and be severed is carried downward onto the thread-plate and onto the cutter-blade O.

It may also be stated that when two colors only are used to make the stripes they must be alternately brought into action, and after the joint of the yarn is made the other yarn is severed, and is held by the spring *g* on the thread-plate until another stripe is commenced, and so on until the work is done.

The face-cam R is cut to form to adapt it to the pattern of work to be produced, changing the cam with each style of stripe desired.

What I claim is—

1. In a circular-knitting machine, the combination, with a series of barbed needles, the stitch-wheel, and a pattern mechanism, of two yarn-guides, a cutting device for severing the yarns and a device for holding the end of the severed yarn, both located in rear of the stitch-wheel, and connecting mechanism between said pattern mechanism and the yarn-guides and the cutting devices, substantially as described.

2. The combination, with the stitch-wheel support, of the cutting-blade O, the movable cutter-blade P, means for operating said movable cutter-blade, and the thread-plate Y, provided with the retaining-spring *g* and horn *d*, as and for the purpose set forth.

3. The thread-plate Y, provided with a horn, *d*, and spring *g*, to retain the yarn after it is severed, substantially as described.

JOHN BRADLEY.

Witnesses:

C. H. DODD,
WM. C. HIBBARD.