Sheet 1, 3 Sheets.

J. Dalton.

Knitting Mach.

No. 77,363. Patented Apr. 28, 1868.

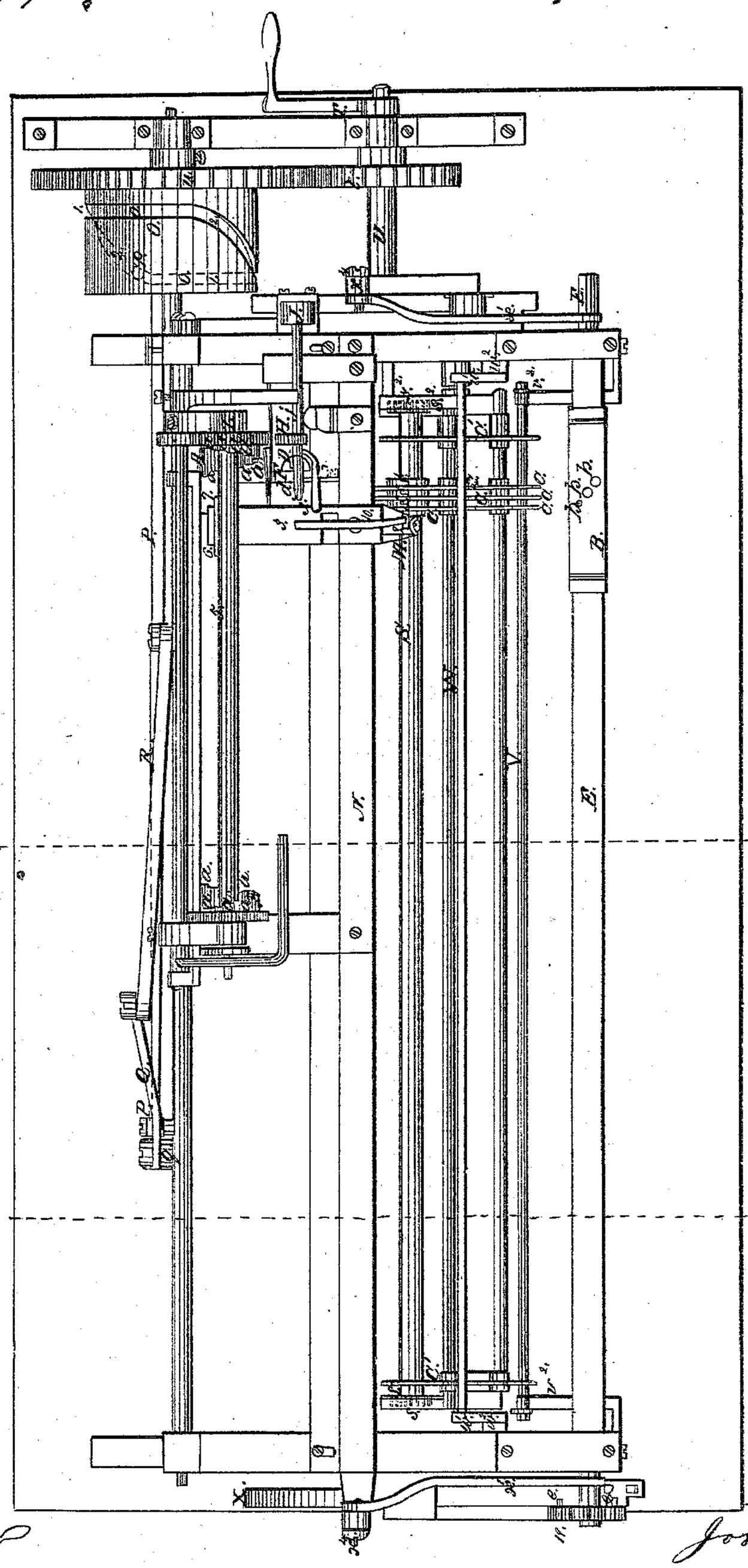

Fig. 1.

Witnesses:
Thos. J. Parker
Ross S Turner

Inventor:
Joseph. Dalton.
J. L. Brown
Atty.

Sheet 2, 3 Sheets.

J. Dalton.

Knitting Mach.

No. 77,303. Patented Apr. 28, 1868.

Fig: 3.

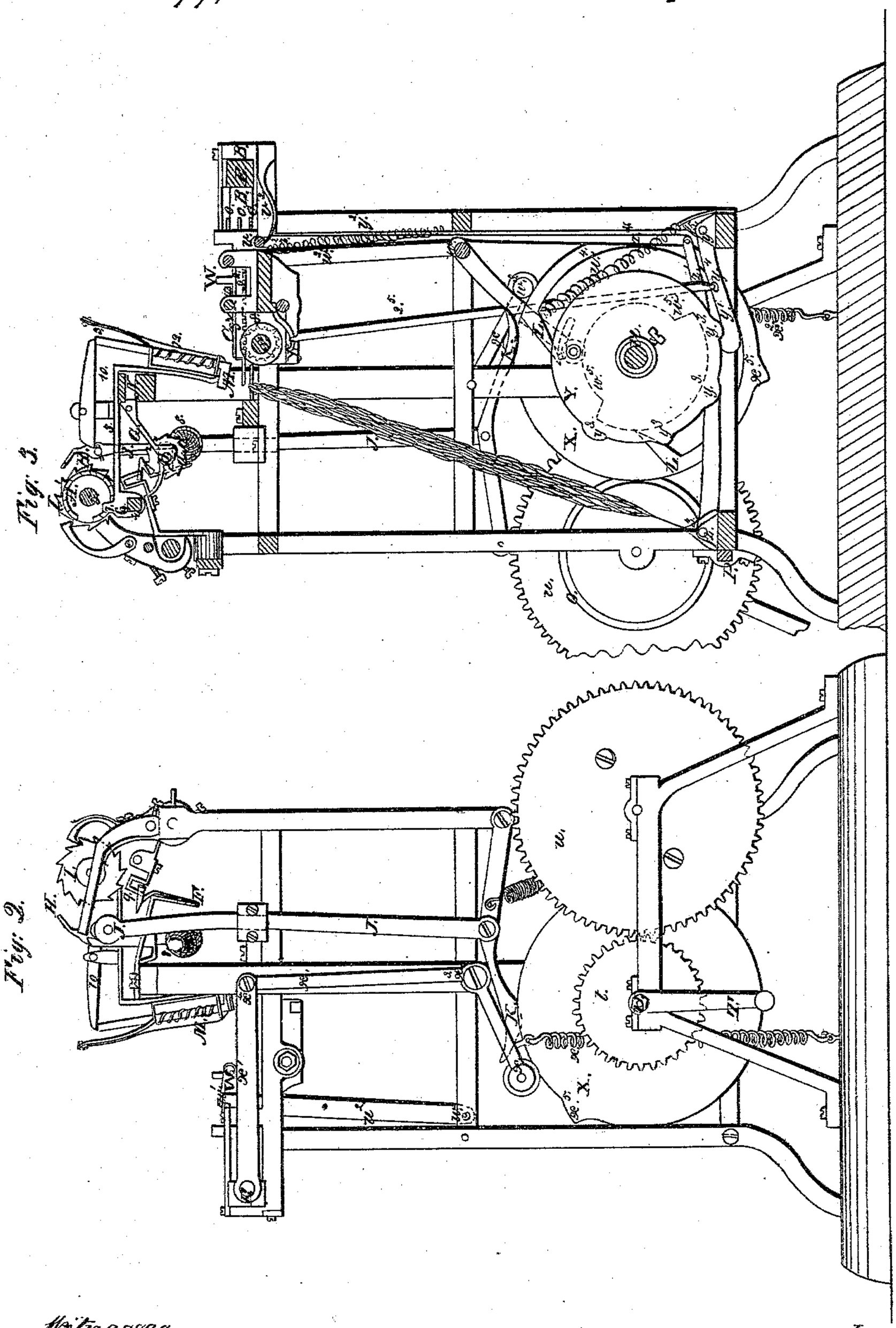

Fig: 2.

Witnesses:
Thos. J. Parker
Ross. S Turner.

Inventor:
Joseph. Dalton
J. L. Brown
Atty.

Sheet 3, 3 Sheets.

J. Dalton.

Knitting Mach.

No. 77,363. Patented Apr. 28, 1868.

Fig. 3.

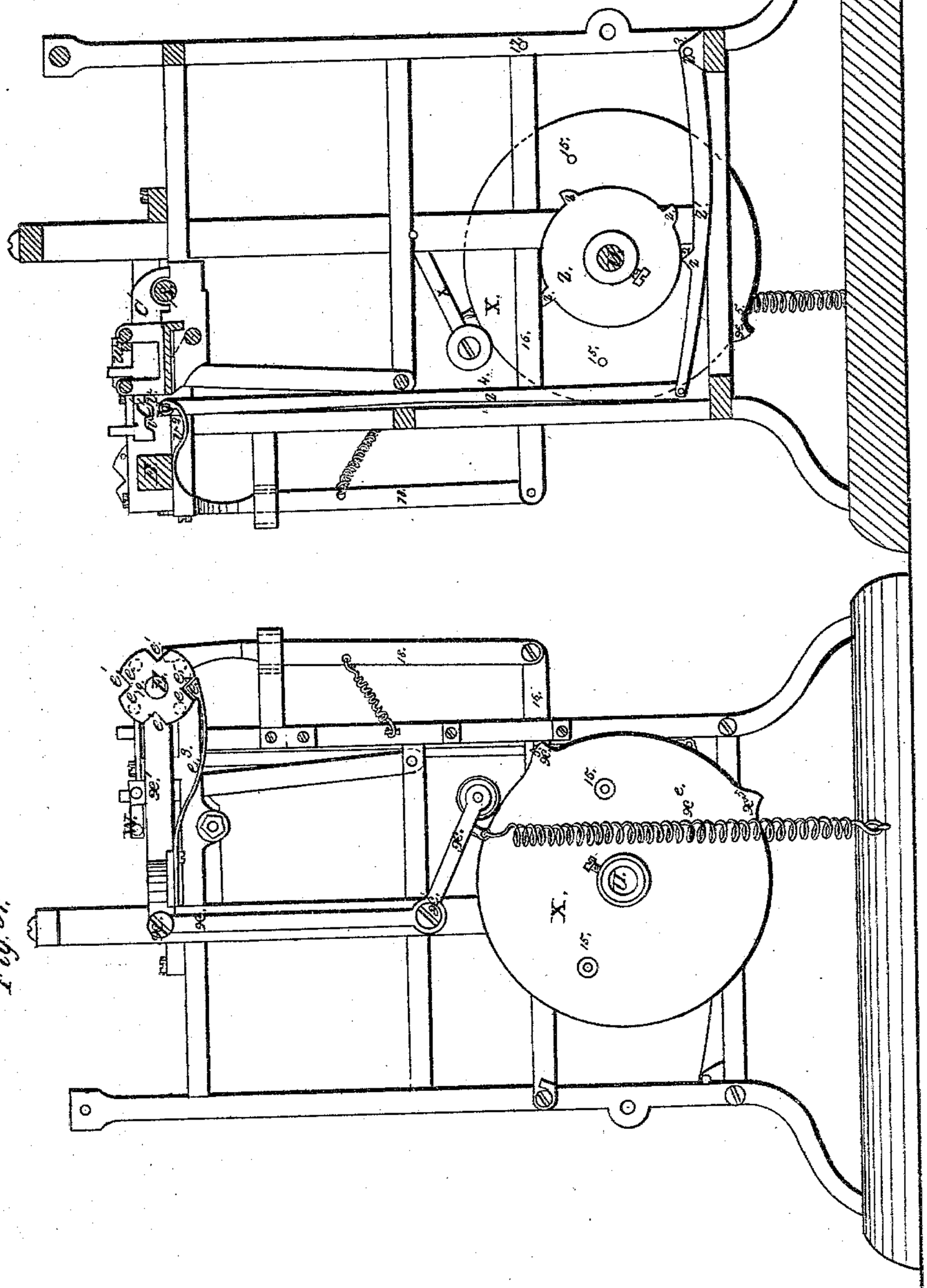

Fig. 4.

Witnesses.
Thos. J. Parker,
Ross S Turner

Inventor.
Joseph. Dalton,
Per J. L. Brown,
Atty.

United States Patent Office.

JOSEPH DALTON, OF BROOKLYN, NEW YORK.

Letters Patent No. 77,363, *dated April* 28, 1868.

IMPROVEMENT IN KNITTING-MACHINE.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOSEPH DALTON, of Brooklyn, in the county of Kings, and State of New York, have invented certain Improvements in Knitting-Machines; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, making part of this specification—

Figure 1 being a top view of a knitting-machine provided with my improvements.

Figure 2, a right-hand end view of the machine.

Figure 3, a transverse vertical section thereof, in a plane indicated by the line * *, fig. 1, and looking toward the right-hand end.

Figure 4, a left-hand end view of the machine.

Figure 5, a transverse vertical section of the same, in a plane indicated by the line *y y*, fig. 1, and looking toward the left-hand end.

Like letters designate corresponding parts in all of the figures.

The main feature of my invention consists in the employment of jacquard-cards or plates, in combination with point-slides and needles in such a manner, that, by the direct action of the jacquard-plates, the point-slides receive a reciprocating motion towards and from the needles, in addition to their tilting and traversing motion, in such a manner that the operation of narrowing knit goods, or of producing open-work knit fabrics is materially facilitated.

The invention also consists in various special improvements of the machine, mostly subservient to carrying out the main feature of the invention, as will be hereinafter specified.

The general construction of the frame and "machine" portion may be as usual, and I shall not here give any description thereof, further than necessary to show the nature and application of my improvements, since any one skilled in the art of knitting by machinery will readily understand the same.

Let T represent a crank, or other means of applying the moving power to the whole machine, secured to the main or driving-shaft U.

I will first describe the device by which the reciprocating or traverse movement is communicated to the thread-guide carrier, in harmony with all the movements of the "machine" portion. A toothed driving-wheel, *t*, on the main shaft U, gears into a cog-wheel, *u*, having twice as many teeth, so that it may revolve half as fast as the wheel *t*. To the wheel *u*, or to its shaft, is attached a cam, O, having a cam-groove, *o*, in its cylindrical periphery. This groove is divided into two straight or exactly transverse portions 1 1, and two oblique portions, 2 2, each two situated on opposite sides of the cam-cylinder. Each straight portion occupies one-third of the entire circumference of the cylinder, and each oblique portion one-sixth of the circumference. Thus the thread-guide carrier, which is moved by this cam, will stand still one-third of the time, at each end of its traverse movement, and occupy one-sixth of the time in traversing each way. The movements are communicated from the cam to the carrier by means of two connecting-rods P R, and an intermediate vibrating-lever, Q. The connecting-rod P has at one end a stud, *p*, which runs in the groove *o* of the cam, being guided or kept therein by a slide-bearing on the frame, near the cam, so that it will slide freely endwise. The other end of this rod is pivoted to the lower end of the upright lever Q, which vibrates on a pivot, *q*; and to its upper end is pivoted one end of the connecting-rod R, while the other end of this rod is pivoted to the carrier, near the middle thereof.

The thread-guide 3 is movable and self-adjusting on its carrier, so that it may be readily slid or moved lengthwise thereon, when it strikes anything which prevents its moving with its carrier, but so that it will stay in any position where it is left until moved again forcibly. For this purpose, it is provided with a sleeve or bearing, 6, fitting around a square bar or rock-shaft, 4, which is mounted in the carrier, the thread-guide sliding thereon and turning therewith. The forward end of the thread-guide simply rests on a bar, N, of the carrier, so that it may be free to be raised therefrom. The extent to which the carrier moves this thread-guide at each movement thereof, determines the width of the web knit. The immediate means by which I narrow the goods consists in a "spiral stop," A, arranged, one at each termination of the movement of the thread-guide on its

carrier. These spiral stops are secured to a shaft, 5, with which they revolve over the carrier. Each stop consists of a cylindrical flange, provided with shoulders or projections *a a*, on its inner end, arranged successively, in regular order, one further advanced than the preceding, a space equal to the distance between the adjacent needles, so that as the stop revolves, the width of one shoulder at a time, each successive shoulder will stop the thread-guide one needle further in at each movement toward the stop, and consequently narrow the web one stitch each time, if the machine is so arranged in connection therewith as to cast off successive stitches or loops from the needles. A bar or projection, 7, on the thread-guide, is so situated as to strike the said shoulders on the stops all around its circumference. The two stops are arranged alike, on the common shaft, so that when one edge of the web is narrowed, the other edge will be correspondingly narrowed; or, if it should be desired to narrow only one edge, there should be only one spiral stop in place, or action.

In order to turn the spiral stops one step or shoulder at a time, a ratchet-wheel, I, is secured on their shaft, having as many notches as there are shoulders or steps *a a* on each stop; and this ratchet-wheel is moved, one notch at a time, by means of a pawl, H, suspended on a horizontal projection, *j*, of a vertical slide-bar, J, which has a reciprocating motion given to it by means of a lever or shoe, *k*, pivoted to the lower end of the slide-bar, and actuated by a cam, L, on the driving-shaft U. As this shaft revolves twice as fast as the cam O, which drives the thread-guide carrier, this pawl is moved at each forward or backward movement of the said carrier. And if the pawl should move the ratchet every time, the narrowing might proceed too rapidly, whereas, generally, it is not required to narrow so fast as one stitch at each course of stitches. I regulate the frequency of the narrowing in the following manner:

The pawl H is suspended freely on the projection *j* of the slide-bar J; and, when left thus free, it does not act on the ratchet-wheel I, so that, ordinarily, the spiral stop is not moved, and no narrowing takes place; and when it is required to narrow, the pawl has to be brought over into gear with the ratchet-wheel. This movement is brought about in the act of bringing the thread-guide forward on its carrier, by a device attached thereto, arranged so as to act on the lower end or bob 8 of the pawl, whereby the said pawl is brought into position for acting either at every forward movement of the thread-guide, or at such regular intervals as it may be arranged to operate. This operating-device consists in what I term a "ratchet-cam," consisting of a cam, D, so shaped as to strike and move the pawl H only when turned on its pivot to a certain position or positions in its revolution. To this cam is attached a ratchet-wheel, *d*, or its equivalent, having a suitable number of teeth around its periphery to move the cam a certain part of a revolution by moving each. This ratchet-wheel, at each forward movement of the thread-guide, is brought against a "spring-guide," F, attached to the frame in a fixed position, and situated obliquely, in such a direction and to such an extent as to turn the ratchet-wheel one tooth or notch, substantially as indicated in the drawings. Hence, as many notches as are required to bring the cam into position for operating the pawl H, so many double rows of stitches will be knit, before the successive narrowings take place; and this number may be varied by adjustment, or by changing the ratchet-cams, or simply changing ratchet-wheels. The ratchet-wheel and cam are held in position by a stationary pawl or detent, G, in the ordinary manner for ratchet-wheels.

In order that the spring-guide F may not interfere with the ratchet-wheel *d*, or disturb its position on the return movement of the thread-guide, its rear end passes into a hook or deflector, 9, on the thread-guide, which deflector, acting on the back side of the oblique-cam, holds and draws forward the whole length thereof, so as to keep it close up to the tooth of the ratchet-wheel, which it has just acted on in the forward movement. It is made elastic, or a spring-guide for this purpose, or any equivalent arrangement, may be employed.

In order to effect the narrowing by the means above described, in connection with the jacquard-cards, it is necessary that the thread should be either raised away from or pressed down below the needles, out of the way of the stitch-loops thereon, and of the action of the point-slides, as the thread-guide is brought over the stitches or loops required to be dropped.

I have represented both methods, the raising and the depressing of the thread-guide, and either may be employed, as preferred.

Thus, to raise the thread, the thread-guide turns on the shaft or bar 4, and the free end is raised by the horizontal arm *j* of the slide-bar J, by passing over the said arm, just before the slide-bar is raised for operating the spiral-stop ratchet-wheel.

Or to depress the thread, there is a smaller extra thread-guide, M, which may slide down and up on the regular thread-guide, and is held up in proper position for guiding the thread by a spiral spring, 12. Upon the upper end of the upright bar of this thread-guide rests one end of a lever, 10, pivoted on the regular thread-guide. By having the regular thread-guide incapable of rising, and having the rear end of this lever 10 pass over the horizontal arm of the slide-bar J, when the latter rises, the extra thread-guide will be depressed, and will force the thread down below the needles.

The above improvements are upon what is termed the "frame" part of the whole machine. The remaining improvements apply directly to what is called the "machine" part thereof.

The leading feature of my invention, the application of the jacquard-cards B B for narrowing, belongs directly to the "machine" part. They act upon the point-slides C C, which take off and transfer the loops on the needles, there being holes *b b* punctured in the cards to receive the ends *c c* of the point-slides, which are not to be pushed forward. Ordinarily, when the stitches are not to be changed, the cards are to be punctured, but when stitches are to be dropped for narrowing, the card is not punctured for the point-slides, which are to take off the loops, and unite them to the adjacent loops. This action is in harmony with the raising or depressing of the thread-guide, as hereinbefore described. The point-slides are secured in a frame, C, to which a tilting motion is imparted by the action of cam Y, tappet-lever y^1, and rod z^5, (see fig. 3.) In addition to their tilting motion, the point-slides receive a reciprocating motion towards and from the needles by the direct action

of the jacquard plates, as will be presently explained, and also a traversing motion, whereby the loops received by said point-slides from one row of needles are transferred to an adjacent row, according to the nature of the work to be produced. The jacquard-cylinder or roller E has as many faces (four shown in the drawings) as necessary for performing the most gradual narrowing. Its side or forward and back movements for pushing the point-slides into position are produced by cams x^5 x^5, on cam-wheels X X, secured to the two ends of the driving-shaft U, bent levers x x, pivoted at x^3 x^3, and connecting-rods x^1 x^1, and the revolving movement is effected by lifting-pins 15 15, on one of the said wheels X X, acting on levers 16 16, which are pivoted at 17 17, and operate pawls 18 18, for turning ratchet-pins e e, that project from a disk, 19, on the said cylinder. A stationary spring-catch, e^2, enters V-shaped notches in the periphery of the disk, to keep the cylinder in position after each movement.

The remaining feature of my improvements in the "machine" consists in the point-slide traverse stay-bar S. This stay-bar has washer-disks s^1 s^1, between which the point-slides rest and move, thus keeping them firm in their proper positions. The stay-bar has bearings in the point-slide frame, so as to turn therein as the frame moves forward and back, and on the ends of the stay-bar there are pinions s s, which work in stationary racks s^3 s^2, so as to cause the stay-bar to revolve as it moves with the point-slide frame. And this revolution is in such a direction that the stay-bar turns in the direction opposite to the slide-motion of the point-slides thereon. The object of this is to prevent those point-slides, which are not designed to be moved, from being pushed forward by friction. It is evident that this device effectually accomplishes the purpose.

When the machine is in operation, each course of stitches is produced as follows: After the thread has been transferred to the needles by the action of the thread-guide, as hereinbefore described, the jacquard-cylinder moves forward, and those point-slides which are opposite to the solid parts of the jacquard-plates are carried forward over the needles. The frame containing the point-slides is then tilted, and the frame-sinkers drive the loops from the needles on the points; then the points rise, and the traverse motion takes place by the mechanism usual for such purpose carrying the stitch to any other needle that is desired; then the point-slides tilt again, and the loops are pushed back on the needles by the frame-sinkers. The point-slides then tip up and return to their original position, when the course is finished.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The point-slides C C, arranged in a tilting-frame, C′, and reciprocated towards and from the needles by the direct action of the jacquard-plates, substantially as and for the purpose described.

2. The spiral stop A, with its ratchet-gear or equivalent, operating with the thread-guide and needles, as described, in combination with jacquard-cards B B and point-slides C C, controlled by said cards for the purpose of narrowing the goods, substantially as herein specified.

3. The ratchet-cam D, in combination with the spring-guide F, stationary pawl G, and pawl H, substantially as and for the purpose herein set forth.

4. The suspended reciprocating pawl H, in combination with the ratchet-cam D and spiral stop A, and its ratchet-wheel, I, substantially as and for the purpose herein described.

5. The perpendicular slide-bar J, operated by the shoe K and cam L, or their equivalents, and acting in combination with the thread-guide M, and moving, by means of its pawl, H, the spiral ratchet, all substantially as herein described.

6. The sliding-thread guide, attached to the regular thread-guide, in combination with the horizontal lever, which acts directly on the upright slide thread-guide, and is operated by the upright shaft that drives the spiral ratchet-gear, substantially as and for the purpose set forth.

7. The point-slide traverse-stay bar S, turning in contact with the point-slides in the direction opposite to its forward movement, substantially as and for the purpose herein set forth.

J. DALTON.

Witnesses:

W. HAUFF,

E. F. KASTENHUBER.