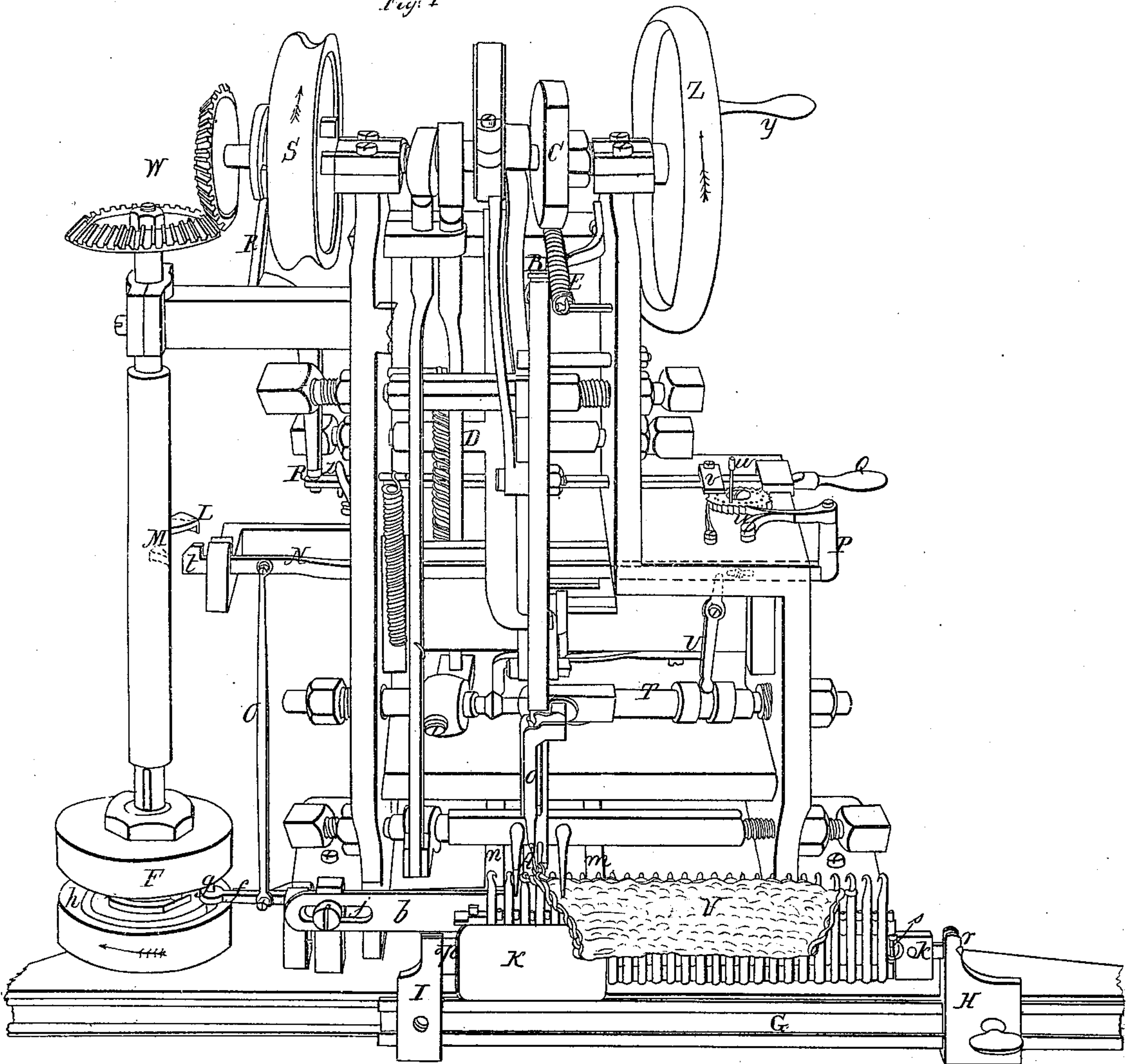


J. H. Doolittle.
Knitting Mach.

N^o 13,693.

Patented Oct. 16, 1855.

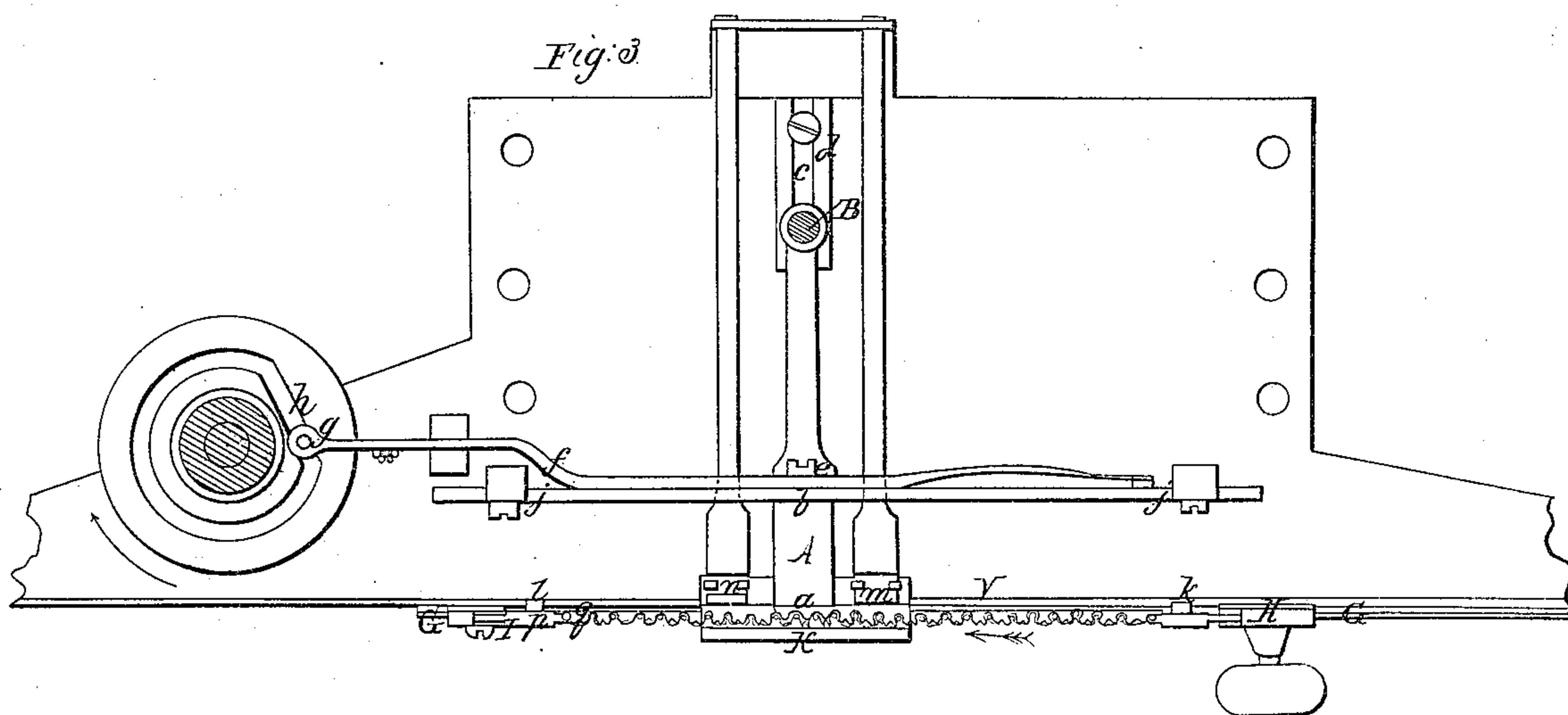
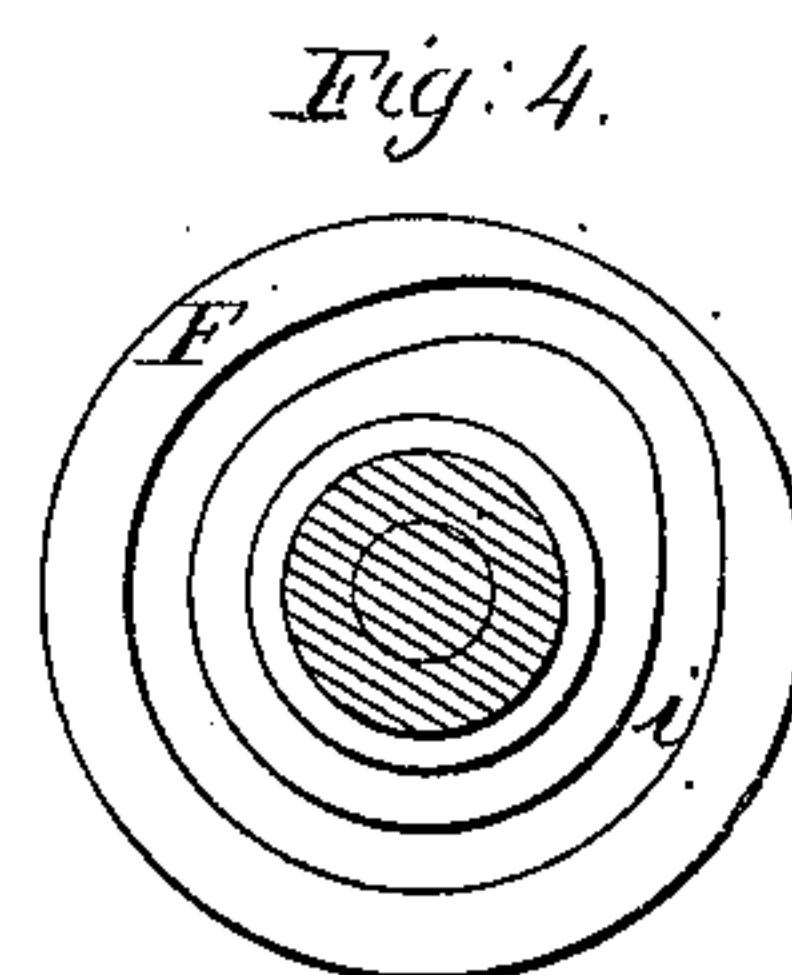
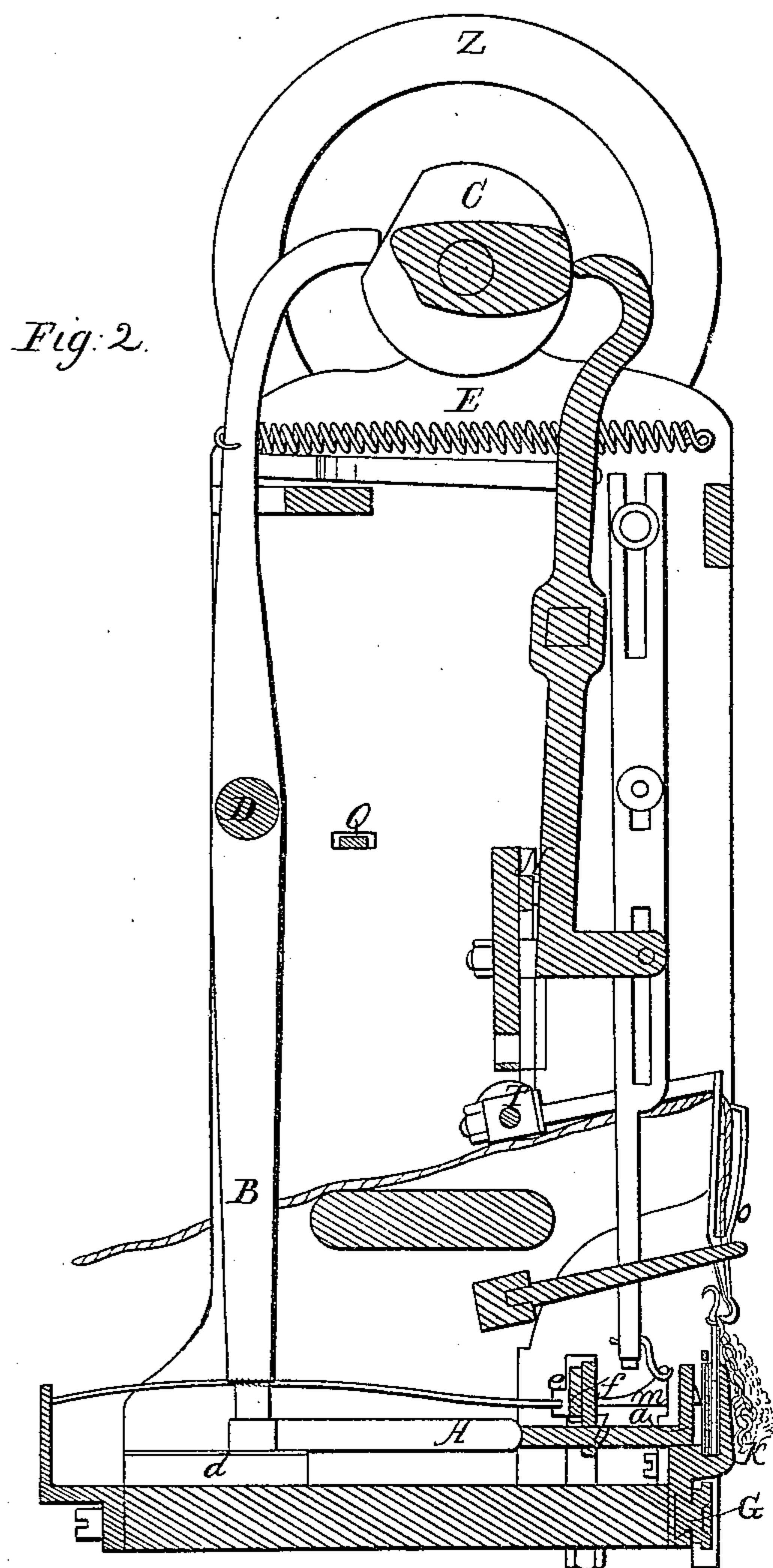
Fig. 1



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Knitting Mach.

N^o 13,093.

Patented Oct. 16, 1855.



UNITED STATES PATENT OFFICE.

JNO. H. DOOLITTLE, OF WATERBURY, CONNECTICUT, ASSIGNOR TO AMERICAN
HOSIERY CO.

KNITTING-MACHINE.

Specification of Letters Patent No. 13,693, dated October 16, 1855.

To all whom it may concern:

Be it known that I, JOHN H. DOOLITTLE, of the city of Waterbury, in the county of New Haven and State of Connecticut, have
5 invented a new and useful Improvement on Rufus Ellis' Knitting-Machine; and I do hereby declare that the following is a full, clear, and exact description of the construction, character, and operation of the same,
10 reference being had to the accompanying drawings, which make a part of this specification, in which—

Figure 1, is a perspective view of the machine taken from the front. Fig. 2, is a vertical section of the same, cut through from front to rear, at right angles to Fig. 1. Fig. 3, is a plan of a section cut horizontally from front to rear, near the bottom. Fig. 4, is a plan of the under side of the grooved
20 cam F, Fig. 1.

My improvement consists in the method of operating the feed motion, so as to hold the needles perfectly steady, or rigid, while forming the stitch, and in the method of reversing the feed by the action of the spring
25 levers, operated by the inclined planes attached to the needle holders, which spring levers change the use of the two cam-grooves, so as to feed, alternately, in opposite directions:—And in the method of attaching the series of needles to the needle
30 bar G, so as to be readily adjustable to the number of needles desired, and tightening or straining them there, and in the method
35 of working the apparatus for counting the courses, and for throwing the machine out of gear, when the heel is long enough; (as the improvement applies more particularly to the knitting of the heels of stockings,) and
40 in the use of the spring yarn guide, to prevent breaking the yarn when knots or inequalities occur.

I make the frame, cams on the driving shaft, levers, rock-shafts, and all other parts,
45 (except those claimed as improvements,) substantially, as described in the patent issued to Rufus Ellis of Northampton in the State of Massachusetts, on the 17th day of June 1851, No. 8163, and as represented in
50 Fig. 1.

I construct the feed motion with a bar, A, Figs. 1, 2, and 3, having projecting teeth, on the front end, which fit into the spaces between the needles, as represented in section,
55 at *a*, Fig. 3. This bar, A, slides backward

and forward, horizontally, in a guide in the bar, *b*, Figs. 1, 2, and 3, as shown in section in Fig. 2, in which direction it is moved by the lower end of the back lever, B, Figs. 2 and 3. This lever, B, is worked by the cam, C, Figs. 1 and 2, and is supported by the fulcrum, D, and held up to the cam by the spiral spring, E, Figs. 1, and 2, and its lower end works in a slot, *c*, Fig. 3, in the block, *d*, Figs. 2, and 3. While the upper end of the
60 lever, B, rests on the circular part of the cam, C, (as indicated in Fig. 1,) the teeth, *a*, on the front end of the bar, A, will be pressed into the spaces between the needles, as represented in Fig. 3, so as to hold the
70 needles, perfectly rigid, against the front plate, H, Figs. 1, 2, and 3, but when the upper end rests on the plane part of the cam, C, as seen in Fig. 2, the bar, A, will be drawn back so as to be entirely disengaged
75 from the needles, as shown in Fig. 2. The front end of this bar, A, also, receives a lateral motion by means of the bar, *b*, which is attached by a joint screw, *e*, Figs. 2, and 3, to the small bar, *f*, Figs. 1, 2, and 3. This
80 small bar, *f*, receives a longitudinal reciprocating motion, from right to left, and vice versa, by means of the double projecting pin, *g*, working in the cam groove, *h*, Figs. 1, and 3, or *i*, Fig. 4, as the needles are being
85 fed to the right or left; and the bar, *b*, is allowed to move freely with the bar, *f*, by means of a slot in each end, one of which slots is shown at *j*, Fig. 1, (the other is concealed, as at *j*', Fig. 3.)
90

To reverse the feed motion, I use an inclined plane attached to the needle tighteners, at each end, as shown at *k*, and *l*, Fig. 3, (and indicate at *k*, Fig. 1,) so that when the needle bar, G, is passing in the direction indicated by the dart in Fig. 3, the inclined plane, *k*, will pass under the end of the spring bar, *m*, Figs. 3, and 2, and raise it to the position shown in Fig. 2, which will raise the right hand end of the small
100 bar, *f*, and thereby depress the other end, and force the projecting pin, *g*, into the cam groove, *h*, as shown in Fig. 1, and when the projecting pin, *g*, comes to the straight part of the cam groove, *h*, it will
105 draw the front end of the bar, A, to the left the distance of one needle; this will take place at the time the lever, B, Fig. 2, has drawn the lever, A, back to the position shown in Fig. 2, when its teeth are entirely
110

disengaged from the needles; and the lever, B, will immediately force forward the bar, A, so that its teeth, *a*, will take hold of the needles, as shown in Fig. 3, so that, as the
 5 projecting pin, *g*, approaches the curved part of the cam groove, *h*, it will move the needle bar the distance of one needle to the right, (or in the direction opposite to that indicated by the dart,) ready to knit the
 10 next stitch, and when the needle bar, G, has passed so far to the right as to bring the inclined plane, *l*, under the end of the spring bar, *n*, that bar will raise the left hand end of the small bar, *f*, and force the projecting
 15 pin, *g*, into the cam groove, *i*, Fig. 4, which cam groove, *i*, (being of a different shape, as shown,) will give the longitudinal motions to the bar, *f*, at the opposite times of the cam groove, *h*, (as regards the backward and forward motion of the bar, A,) and so feed the
 20 needle bar in the opposite direction, so that no time is lost in reversing the feed, the cams *h*, and *i*, being so arranged that the change of the bar, *f*, from one cam to the
 25 other is always made so as to let the pin *g*, pass readily into its place in either cam. These cams for feeding, and reversing, are revolved by means of the bevel wheels, W, worked by the driving shaft, as shown in
 30 Fig. 1.

I make the yarn guide, *o*, Figs. 1, and 2, with a spring, as seen in Fig. 2, to allow knots, or other inequalities, to pass through without breaking the yarn.

35 I attach the ends of the series of needles to two studs, or upright pieces, on the needle bar, G, as seen at H and I, Figs. 1 and 2. This needle bar, G, slides in a dove-tail groove, as shown in section in Fig. 2. I attach the upright, I, immovably to the needle
 40 bar, G, and attach the piece, *p*, to it by means of a joint pin, as seen near *p*, in Fig. 1. In the right hand edge of this piece, *p*, I have two loops, or eyes, (one of which is
 45 seen at *g*, Fig. 3,) through which I pass a joint pin, which also passes through sockets on the side of the needle, so as to connect needles with the upright. I attach the upright, H, to the needle bar, G, by means of
 50 a binding screw, as seen in Figs. 1, and 3, so as to be movable at pleasure, and have a slot in the top, into which I pass the piece, *k*, Fig. 1, so that it will be seen in the slot and recess, as seen at *v*, Fig. 1. In the left
 55 hand edge of this piece, *k*, I also have two loops, or eyes, which serve to hold the joint pin which attaches the needles to the piece, as seen at *s*, Fig. 1. By this means I am
 60 able to attach any desired number of needles, and tighten them, with the greatest ease and expedition; and to increase, or lessen, their number, as may at any time be required, as for narrowing or widening.

I work the apparatus for counting the
 65 number of courses that are to be knit, (as

for the heel of a stocking,) by the means of two cams L, and M, (on the upright shaft of the cams which give the feed motion,) working on the horizontal sliding bar, N,
 Fig. 1. When the small feeding bar, *f*, is
 70 raised so as to be worked by the groove in the upper cam, F, the rod, O, will raise the bar, N, so that the cam, L, will take hold of the catch part, *t*, and draw it to the left,
 75 nearly against the cam shaft, which will cause the upright, P, (at the right hand end,) to force forward the dog, or hand, *u*, and revolve the count wheel one notch, and when the left hand end of the feed bar, *f*,
 80 is depressed, (to the position for the pin, *g*, to work in the lower groove, *h*,) the left hand end of the bar, N, will be depressed so as to be acted on by the cam, M, which
 will force it back to the position shown in Fig. 1, and thus draw back the dog, or hand,
 85 *u*, one notch; so that the count wheel will be revolved one notch for every two courses knit across the heel. When it is determined how many courses are to be knit across, (as
 90 for a heel,) I count off half that number of holes, on the count wheel, from the end of the block, *v*, and there insert a pin, as *w*, so that when the count wheel is revolved
 sufficiently to bring the pin, *w*, against the
 95 end of the block, *v*, it will force back the end of the bar, Q, so as to release its catch, when a spring, (as *z*, Fig. 1,) will force the
 bar, Q, longitudinally to the right. This bar, Q, at the left hand end, is connected
 100 with the clutch lever, R, R, which throws the pulley, S, out of gear and stops the machine; thus when the number of courses is finished the knitting will stop. The longitudinal motion of the bar, N, also gives a
 longitudinal motion to the rock shaft, T,
 105 (which works the yarn guide, *o*,) through the medium of the connecting lever, U, so as to cause the yarn guide to bring the yarn across the needle in the desired direction,
 110 whichever way the feed motion is working. Having made and arranged the several parts of the machine, as before described, I attach the needles to the needle bar, G, in a
 plane, (or straight line,) and put on the
 115 stitches, (or take them from the other machine, [Ellis'] and use so many of the needles as are necessary for the heel,) as seen at N, Figs. 1, and 3, and the yarn on the
 yarn guide, *o*. I then apply the power, by a band on the pulley, S, (or use the crank
 120 pin, Y, on the ply wheel, Z, by hand,) and revolve the driving shaft in the direction indicated by the dart on the pulley, S, when the machine will operate, substantially, as
 set forth in Rufus Ellis' patent, (before
 125 named,) except that the feed motion will be given by the combined operation of the back lever, B, worked by the cam, C, and the small horizontal bar, *f*, worked by the cam
 groove, *h*, or *i*, both acting on the bar, A, at
 130

right angles to each other, as before described, and the inclined planes, *l*, and *k*, and the spring bars, *m*, and *n*, with the bar, *f*, and cam grooves, *h*, and *i*, will reverse the feed, as before described, and, by the revolving of the shaft, the cams, *L*, and *M*, will work the apparatus for counting, and throwing the machine out of gear, and also reversing the yarn guide, *o*, as described.

10 The feed motion, before described, is equally applicable for knitting in continuous circles, (as the leg, or foot, of a stocking,) when all the other parts of Ellis' machine are used, and the method of reversing, and counting, are equally applicable, when needed, (as in knitting heels,) when all other parts of Ellis' patent are used, so that in making new machines, otherwise according to Ellis' patent, either, or all three, of these improvements may be made in them to great advantage.

The advantages of my improvement, apply principally to the knitting of the heels of stockings, and consist in the manner of feeding, by which the needle is held perfectly rigid while the stitch is being made, and in the very ready, and easy, method of reversing the feed motion, and in the very convenient method of attaching the needles, of any desired number, to the needle bar, and, in the simplicity, and certainty, of the count apparatus, by which the machine is thrown out of gear, at the exact time de-

sired, and in the use of the spring yarn guide to prevent breaking the yarn. 35

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

1. The method of producing the feed motion by means of a feed bar with teeth formed upon it of proper shape to engage with, and move, or feed, the series of needles, substantially as herein described. 40

2. I claim the method of reversing the feed motions, by means of the inclined planes, *k*, and *l*, spring bars, *m*, and *n*, swinging bar, *p*, and the cam grooves, *h*, and *i*, when constructed, arranged, connected, and made to operate, in the manner, substantially, as herein described. 45

3. I claim attaching the blocks, or inclined planes, *l*, and *m*, to the needles in such a manner that they will always operate at the end of the course without reference to the number of needles used, substantially as herein described. 50

4. I claim the method of working the counting apparatus in combination with the method of throwing the machine out of gear, when the parts are arranged, connected, and made to operate, substantially, as herein described. 55 60

JOHN H. DOOLITTLE.

Witnesses:

AUGUSTUS SMITH,
R. FITZGERALD.