(No Model.) 2 Sheets—Sheet 1.

W. ESTY.

KNITTING MACHINE.

No. 322,361. Patented July 14, 1885.

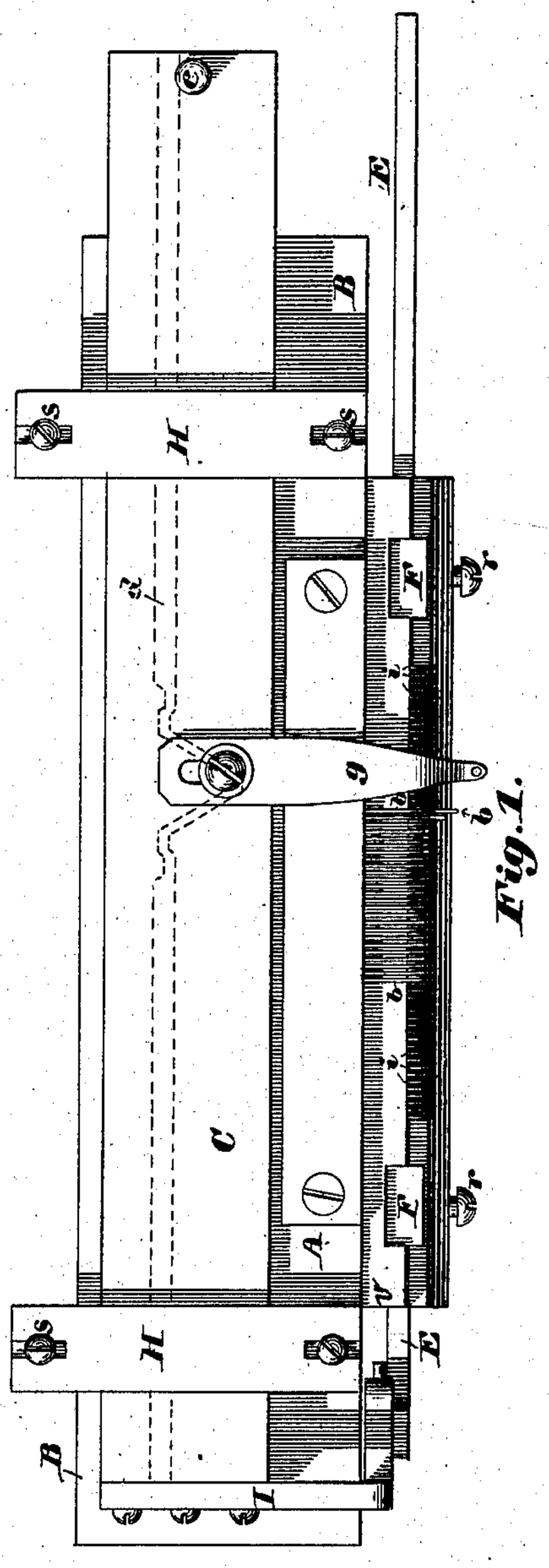

Fig. 1.

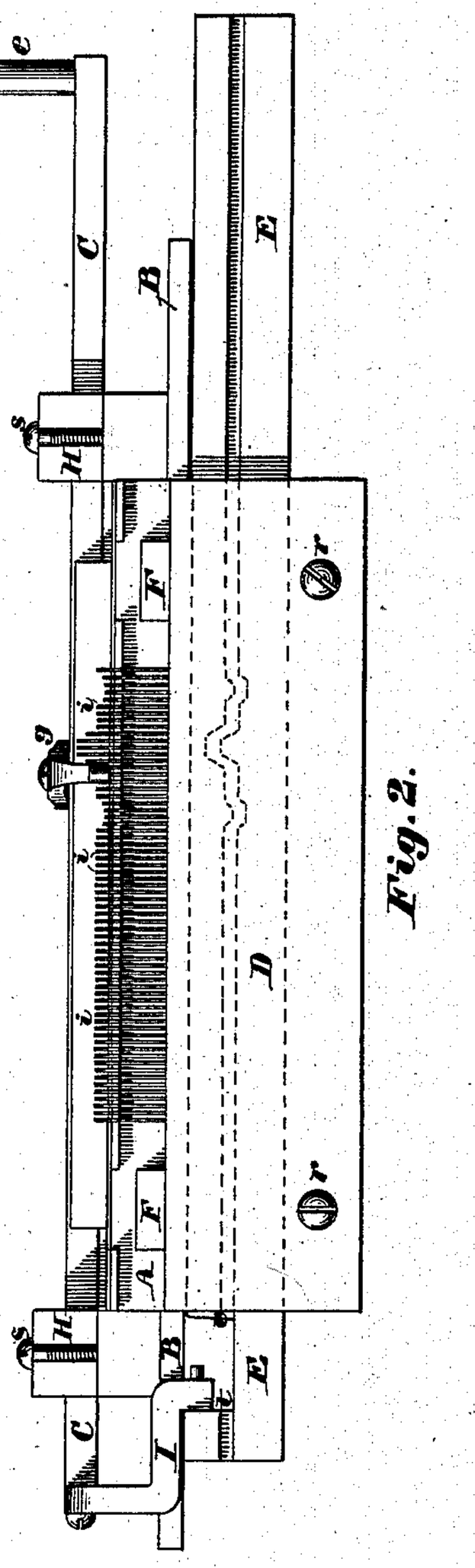

Fig. 2.

Witnesses:

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Frank Edgerly

Inventor:

William Esty

(No Model.) 2 Sheets—Sheet 2.

W. ESTY.

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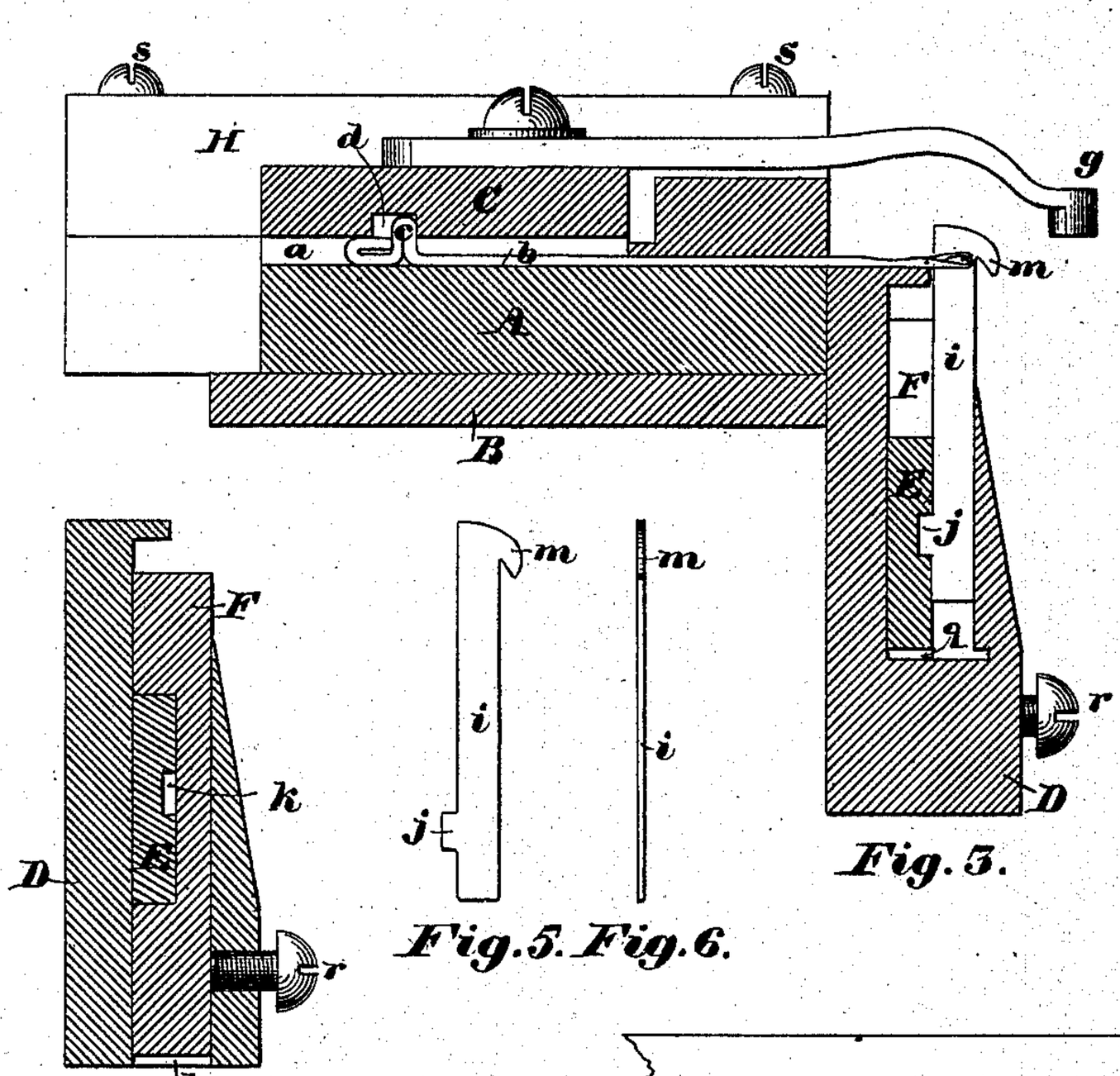

Fig. 3.

Fig. 4.

Fig. 5. Fig. 6.

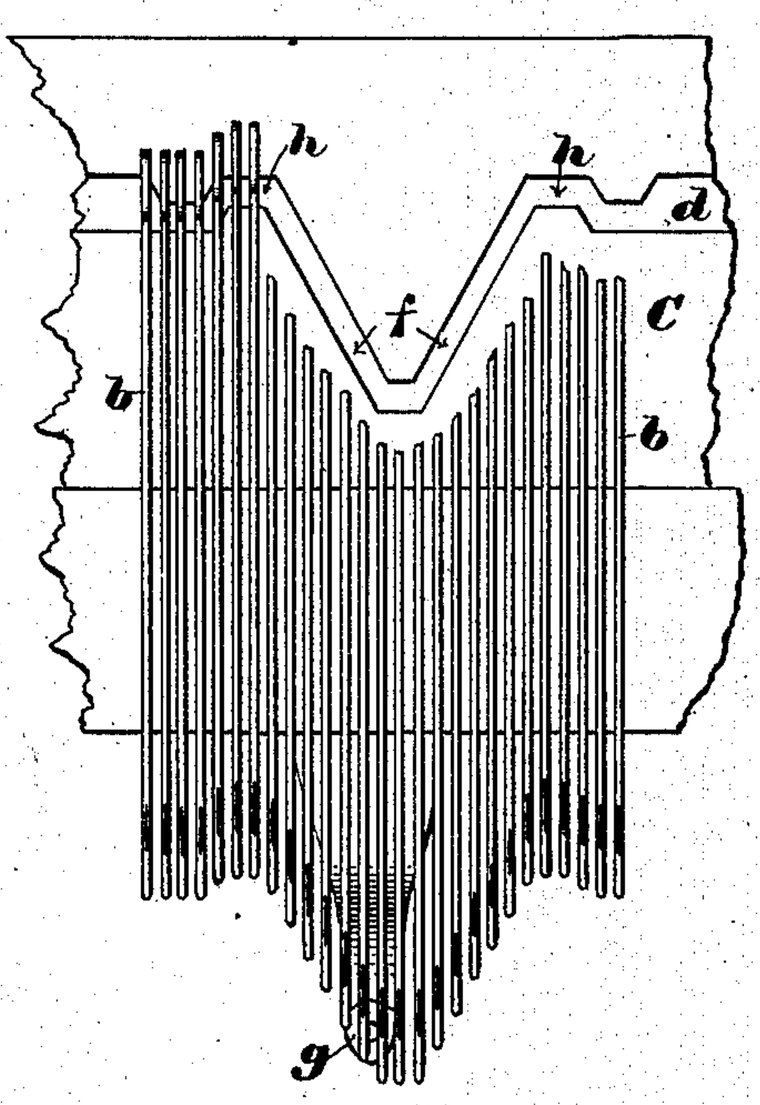

Fig. 7.

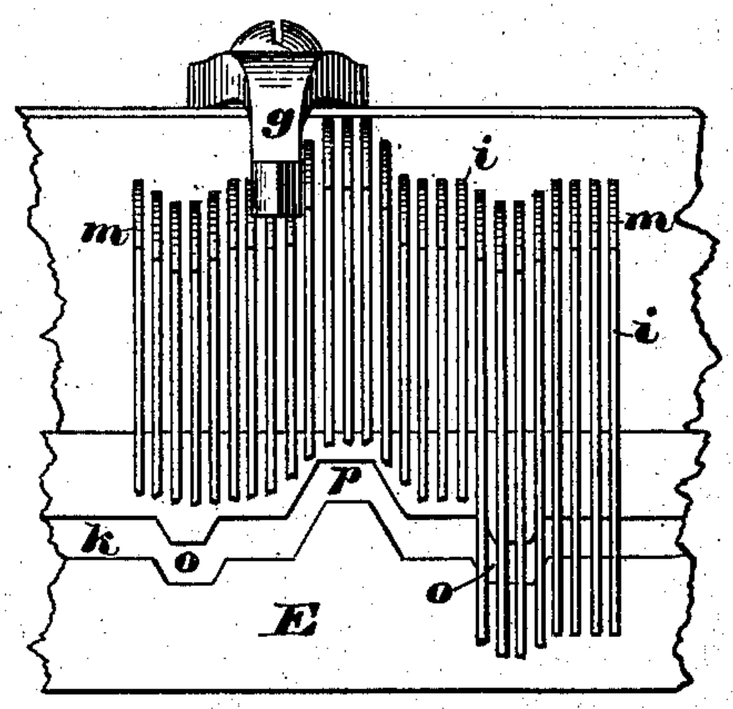

Fig. 8.

Witnesses:

Merrill A. Berry.
Frank Edgerly

Inventor:

William Esty

UNITED STATES PATENT OFFICE.

WILLIAM ESTY, OF LACONIA, NEW HAMPSHIRE, ASSIGNOR OF THREE-SIXTHS TO JOHN T. BUSIEL, CHARLES A. BUSIEL, AND FRANK E. BUSIEL, ALL OF SAME PLACE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 322,361, dated July 14, 1885.

Application filed August 10, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM ESTY, of Laconia, in the county of Belknap and State of New Hampshire, have invented certain new and useful Improvements in Knitting-Machines, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to that class of knitting-machines known as "straight-row" knitting-machines; and it has for its object the simplification of the sinkers and mechanism for operating the needles and sinkers, whereby many parts are dispensed with, thereby greatly diminishing the cost, while the work performed is done in a much more effectual manner, as will be more fully understood by reference to the description of the drawings and the claims to be hereinafter given.

In the drawings, Figure 1 is a plan of so much of a knitting-machine as is necessary to show my invention. Fig. 2 is a front elevation of same. Fig. 3 is a transverse vertical section of same. Fig. 4 is a transverse vertical section of the adjustable bearing for the sinker-cam. Figs. 5 and 6 are respectively a side and front elevation of the sinker. Fig. 7 is an inverted plan of the needle cam-bar, showing the relation of the needles thereto; and Fig. 8 is a front elevation of the sinker-cam, showing the relation of the sinkers thereto. Figs. 1 and 2 are drawn to a smaller scale than the other figures.

A is the needle-bar, firmly secured to the frame B of the machine, and provided in its upper surface with a series of transverse grooves, *a*, in which the latch-needles *b* are reciprocated by the action upon the projection or lug *c* of the needles of the cam-path *d*, formed in the bar C, which is reciprocated lengthwise of the machine by means of any known mechanism acting upon the pin *e*, which is firmly secured at one end of said bar C. The cam-path *d* is provided with the central throw, *f*, of a shape adapted to move the needles *b* outward beyond their normal positions at the proper time to catch on their hooks the yarn as it is delivered by the yarn-carrier *g*, which is adjustably secured to the upper surface of the needle cam-bar C, said throw *f* of the cam-path *d* being of such a shape and length in the direction of the length of the bar C that only two or three of the needles can be extended to the extreme outward position at the same time, thus rendering it possible for the majority of the needles to occupy their normal positions, where they are retained by the straight portions of the cam-path *d* until the inclined or angular portions of said cam-path, acting upon the lugs *c* of the needles, move them inward or outward.

Upon each side of the throw *f* in the cam-path *d* is formed a reverse throw, *h*, adapted to retract the needles beyond their normal positions, which is an important feature of my invention, its object being to make all the loops, as the knitting progresses, of the required length, and draw the yarn tight around the sinkers, and then give a slight forward movement to the needles to relieve the strain on the yarn.

The operation of this part of my invention is as follows: The needles being in their normal positions, as shown in Fig. 3, with their front ends even with the breasts of the sinkers *i*, if the bar C be moved endwise, the reverse throw *h*, coming in contact with the lugs *c* of the needles *b*, moves said needles slightly to the rear, when the throw *f*, coming into action, moves the needles forward through the loops already formed, thereby opening the latches, so that the hooks, when in the position shown in Fig. 7, may catch the yarn as it comes from its carrier before the needles return to their normal positions, where the yarn, coming in contact with the breast of the sinkers *i*, is held, while the needles are drawn back beyond their normal positions by the other incline of the throw *f*, sufficiently far to draw the yarn taut around the sinkers and definitely determine the length of the loops, when the throw *h* of the cam-path *d*, acting upon the lugs *c*, returns the needles to their normal positions.

The object or office of the reverse throw *h*, when it acts upon the needles after the needles have been drawn back to form the loop by the throw *f*, is to relieve the strain on the yarn, and is useless when its action upon the needles precedes the action of the throw *f*;

but as the needles are to be operated by the cam-bar C when it moves in either direction, it follows that, in order to relieve the strain on the yarn after the formation of each loop, the throw *h* must be formed upon each side of the throw *f*, as shown.

The sinkers *i* are made of thin sheet metal, and are adapted to slide midway between the needles in slots cut in the front frame, D, by the action upon the lugs *j* thereof of the path-cam *k*, formed in the bar E, which is provided with bearings in the slides F, adapted to be adjusted in the slots *l*, formed in the frame D.

The sinkers *i* are provided at their upper ends with hooks *m*, the rear or lower edges of which are inclined at an acute angle to the front vertical edges of the shanks or bodies of said sinkers, and are adapted, when said sinkers are depressed to their normal positions, to press the yarn down close upon the needles, and to hold it from being carried forward or back by the needles, thus causing the loops to be shed when the needles are drawn back, and also doing away with the necessity for using a weight or tension-rollers on the fabric being knit.

The normal position of the sinker is with the point of its hook on a level with the under side of the needle, and all of the sinkers occupy this position at all times, except when the lugs *j* of said sinkers are being acted upon by the throws in the cam-path *k* of the bar E, to lift or depress said sinkers, and as the extent of the throw *p* of the path *k* in the direction of the length of the bar E is such that only three or four of the sinkers are in the highest position at the same time, it follows that the greater part of the sinkers are in said normal position at all times, and pressing the yarn and holding it firmly on the needles. The movement of the bar E should be so timed that when the needles *b* are moved forward by the action of the throw *f* of the cam-path *d* upon the lugs *c* the sinkers contiguous to those needles that are just commencing to move forward should be acted upon by the throw *o* of the cam-path *k* to depress the sinkers below their normal positions, and thus effectually prevent the fabric from being pushed forward with the forward movement of the needles. As the needles are returning, the contiguous sinkers are acted upon by the throw *p* of the cam-path *k*, thereby being lifted to allow the needles to bring yarn which they have just secured beneath the hooks *m*, and against the breasts of the sinkers, which are then drawn down by the throw *p* to a point slightly below their normal positions, to insure the drawing of the loop into the angle formed by the hook of the sinker with its breast, and also to prevent the needles, in their advance movement, coming in contact with and breaking the loop, as is often the case when the extra downward movement is not given to the sinkers, owing to the spring or elasticity of the yarn, which often causes the loops to spring upward in front of the ends of the needles, and after the needles have been moved forward through the loops the sinkers are returned to their normal positions, to relieve the strain on the yarn, in which position they firmly hold the yarn against the needles until the backward movement of the bar E takes place, when the operation is repeated.

It will be seen by reference to Fig. 8 that the path *k*, formed in the bar E, has a throw, *p*, which acts upon the lugs *j* of the sinkers to raise them from their normal positions, and upon each side of the throw *p*, but somewhat removed therefrom, a throw, *o*, which acts upon the sinkers to depress them below said normal positions just as the needles commence to move outward, thereby effectually preventing the yarn from being carried outward by the needles. This is a great advantage in insuring the proper formation of the stitch and the production of smooth and even work.

The frame D is provided with a groove, *q*, extending its whole length, in which the bar E is adapted to be vertically adjusted by means of the adjustable slides F, which move vertically in the slots *l* in the frame D, and are secured in any desired position by the screws *r*, as shown in Fig. 4. The bar C may also be adjusted by means of the slotted bearings H and the screws *s*.

To one end of the bar C is secured the bent arm I, one end of which extends into a notch cut in the upper side of the bar E, from *t* to *u*, the object of which is to cause one bar to move the other.

As shown in the drawings, with the arm I in contact with the shoulder *t*, if the bar C is moved to the left the bar E will be moved in unison therewith until they have reached the extreme limit of their movement in that direction, when if the motion of the bar C is reversed it will move alone toward the right until the arm I comes in contact with the shoulder *v* on the bar E, when both bars will move in unison till they have reached the limit of their motion in that direction. This loss of motion in the bar E is necessary, in order that the forward movement of the needles may precede the upward movement of the contiguous sinkers at all times.

Any known or equivalent mechanism for producing the same result may be used instead of the arm I and the notch *t u* without affecting the principles of my invention.

A great advantage is obtained by the combinations and arrangements of the needle and sinker operating mechanisms and the peculiarly-shaped sinker-hook, on account of the greater security with which the work is held during the operation of forming the stitch, due to the extra downward movement of the sinker, the extra backward movement of the needle, and that the peculiar form of the hook permits said sinker to be depressed so that the point of its hook is considerably below the loop of yarn held by its shank without straining the

yarn after the length of the loop has been determined.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. A series of vertical sliding sinkers, in combination with the reciprocating bar E, provided with the path *k*, having throws *o o* and *p*, all arranged and adapted to operate substantially as and for the purposes described.

2. The combination of the bar C, provided with the cam-path *d*, having the throws *h h* and *f*, the needles *b*, provided with the lugs *c*, the bar E, provided with the cam-path *k*, having the throws *o o* and *p*, arranged with respect to each other as set forth, and the sinkers *i*, provided with the lugs *j* and the hooks *m*, substantially as described.

3. In combination with the needles *b b* and the bars C and E, provided, respectively, with the cam-paths *d* and *k* and suitable supports for said bars, a series of sinkers, *i i*, each provided at its upper end with a hook, the back or under side of which presents a straight edge and forms an acute angle with the breast or front vertical edge of the body of the sinker, all arranged and adapted to operate to form the loop upon the body of the sinker in front of or below said hook and draw said loop into the angle of and above the point of said hook without straining the yarn or changing the length of the loop after it has been once determined, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 7th day of August, A. D. 1883.

WILLIAM ESTY.

Witnesses:
FRANK EDGERLY,
FRANK W. REEVES.