

(No Model.)

3 Sheets—Sheet 1.

J. M. MERROW.
KNITTING MACHINE.

No. 291,377.

Patented Jan. 1, 1884.

Fig. 1.

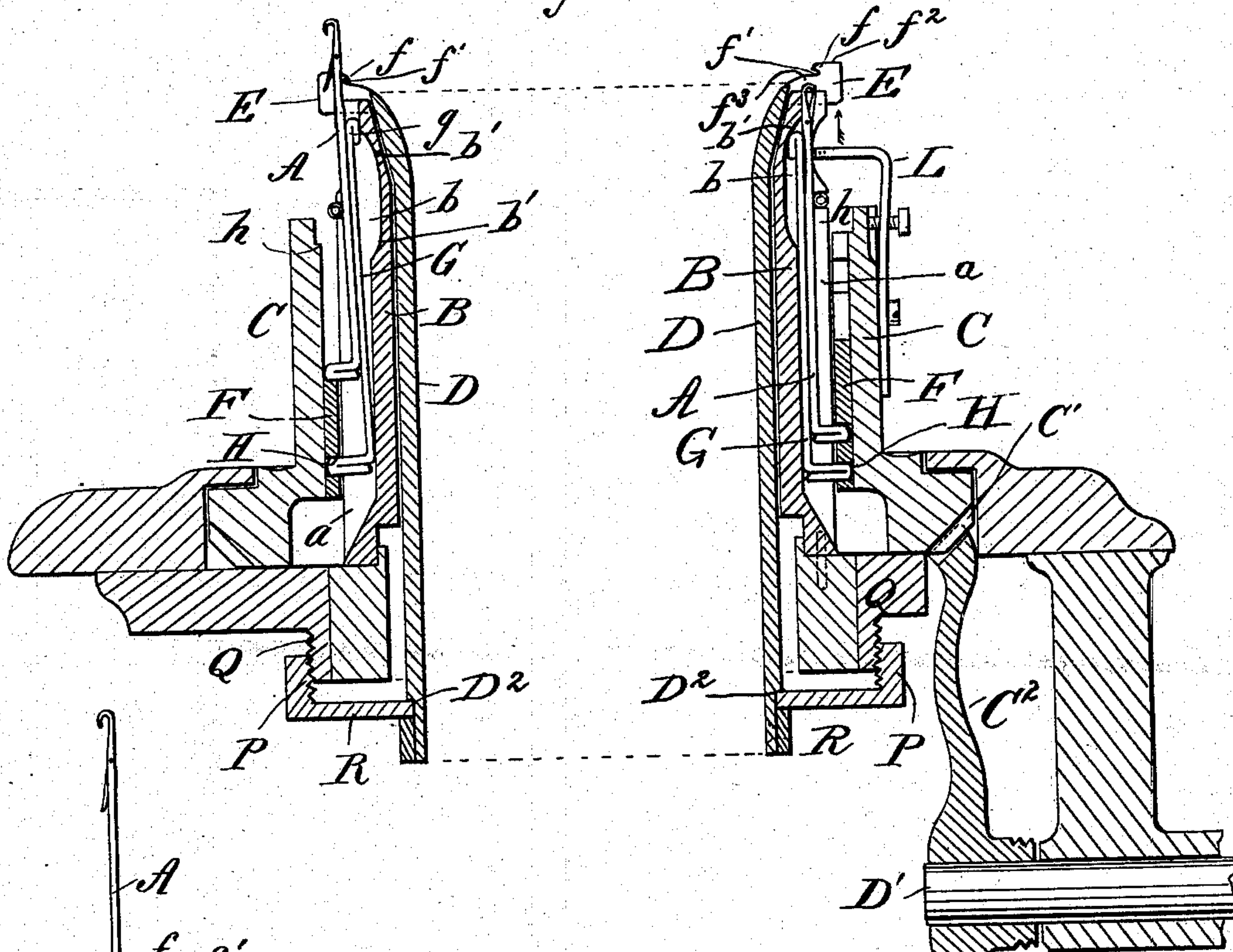


Fig. 2.

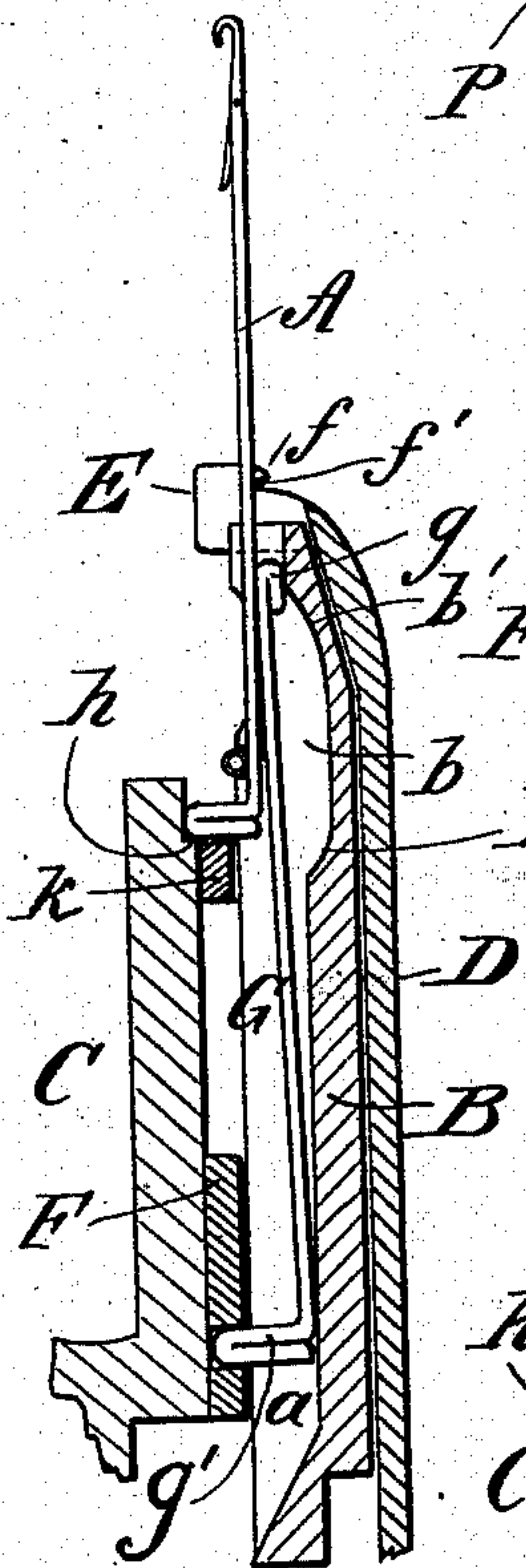


Fig. 4.

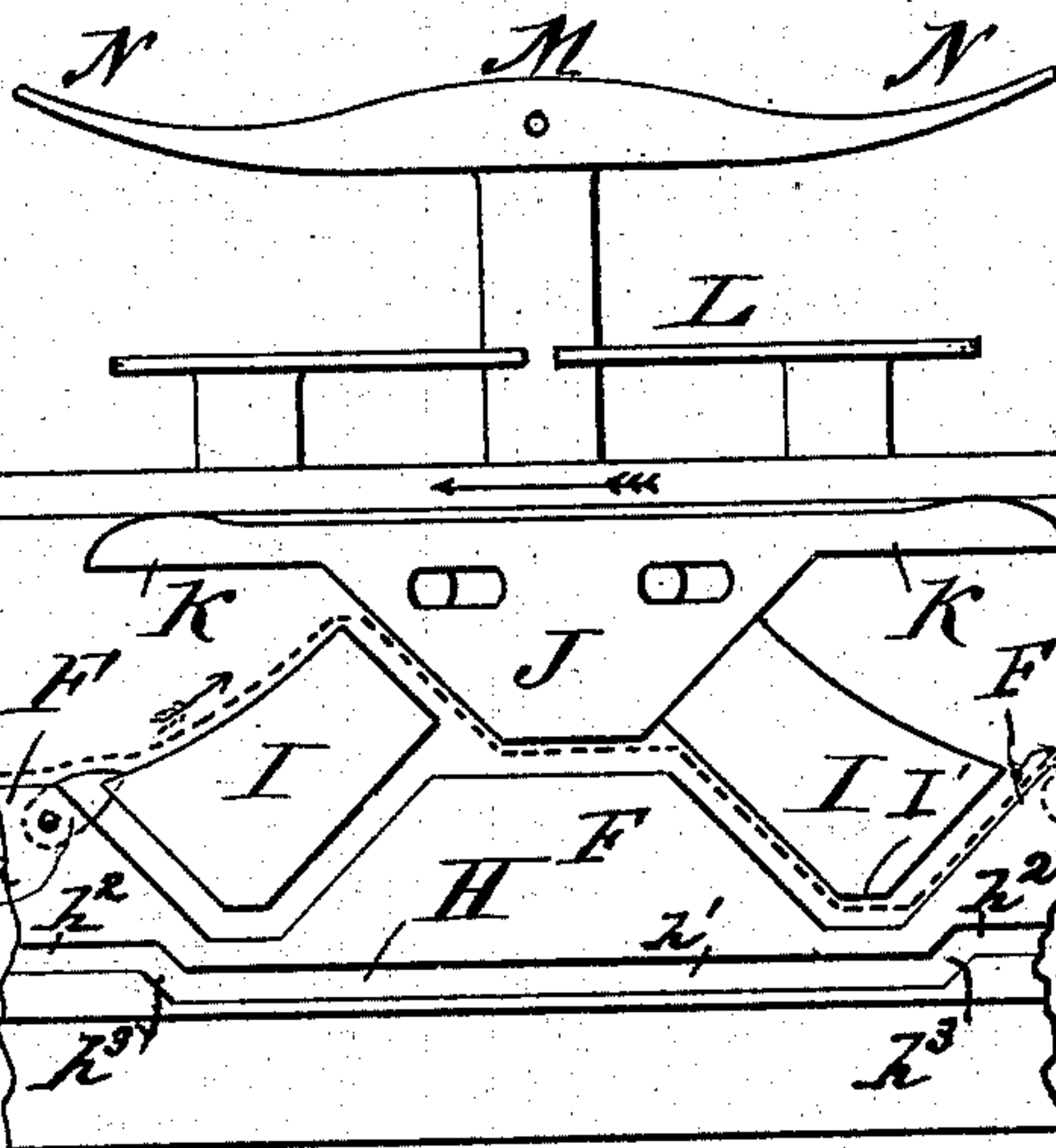
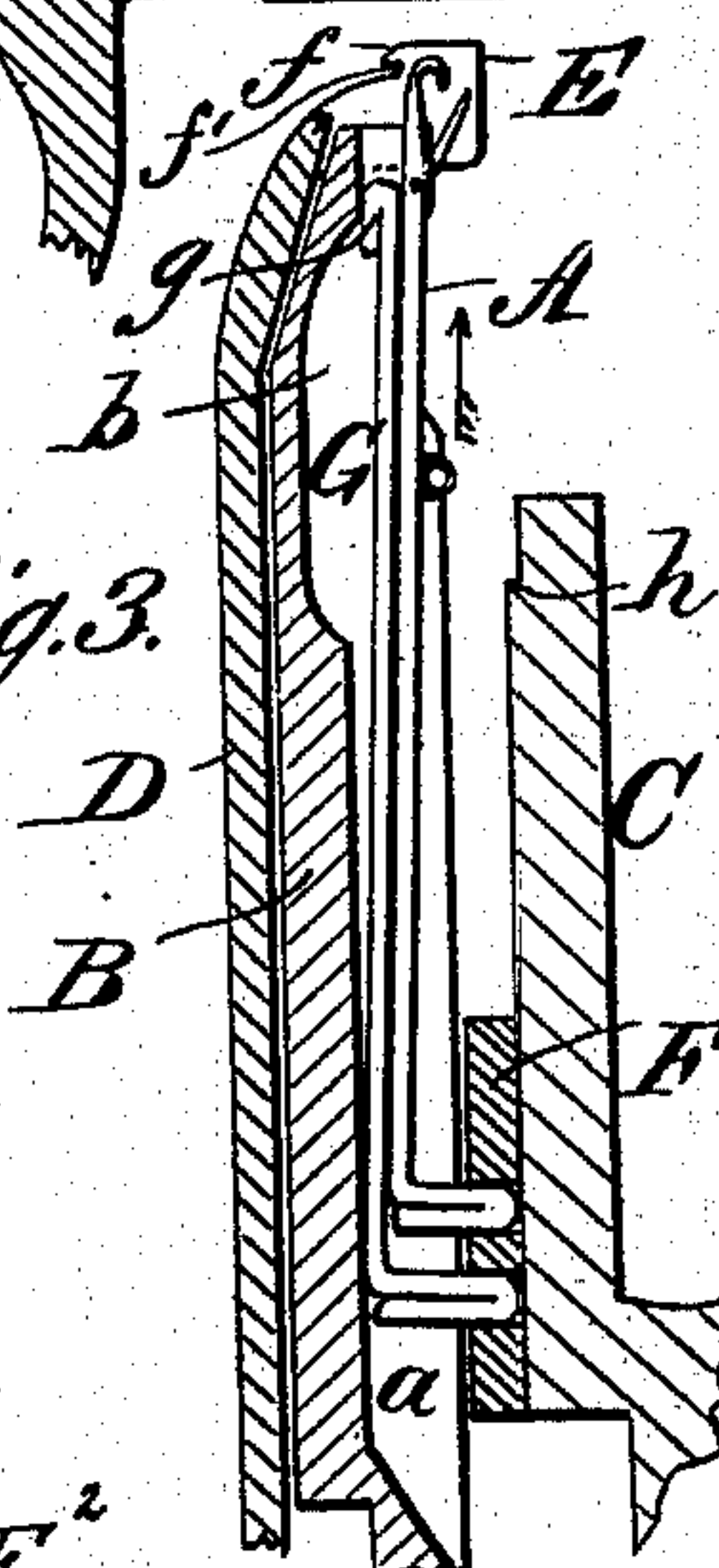


Fig. 3.



WITNESSES:

Norm Twitchell
C. Sedgwick

INVENTOR:

J. M. Merrow
Mum & Co
ATTORNEYS.

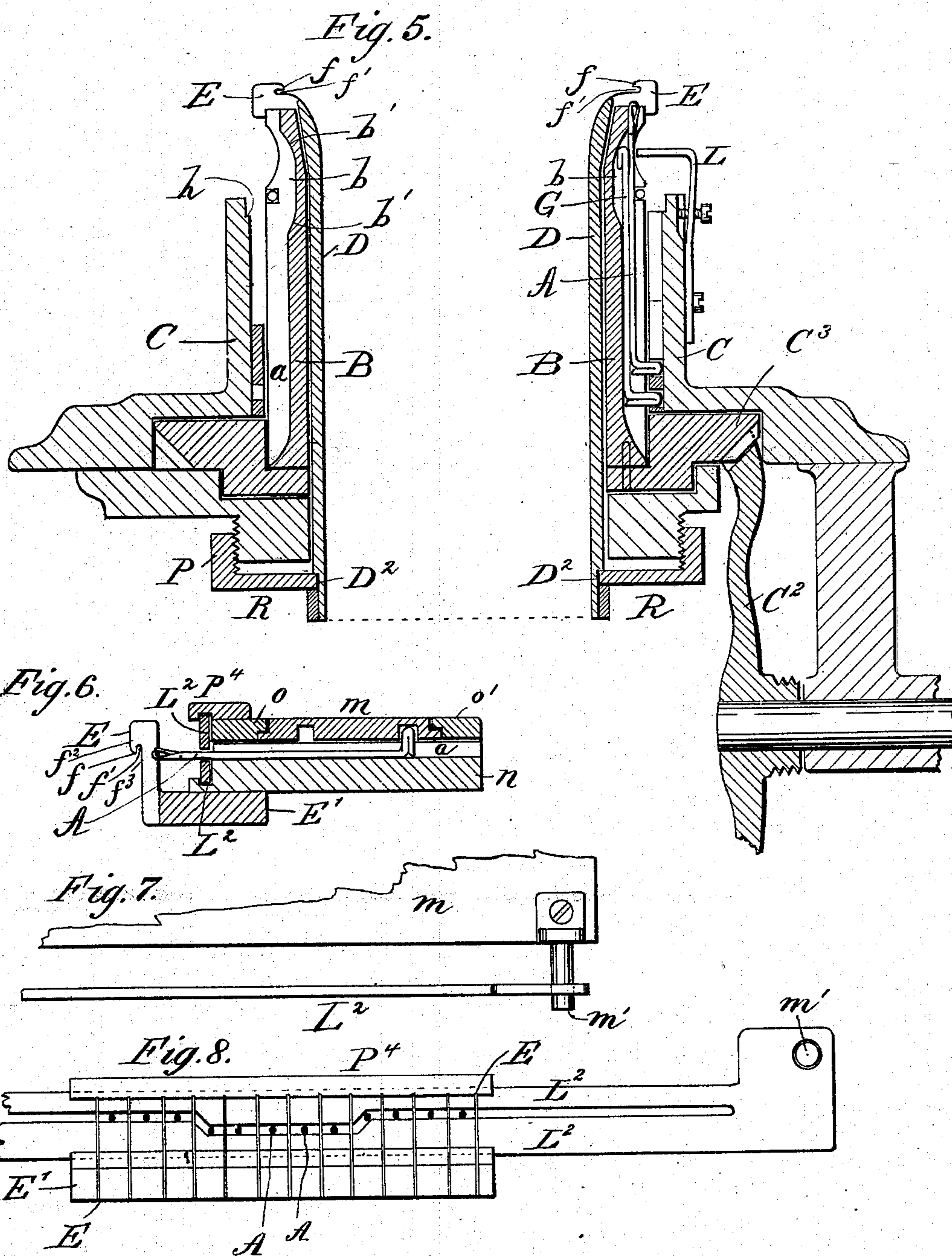
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3 Sheets—Sheet 2.

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WITNESSES:

Donn Twitchell.
C. Sedgwick.

INVENTOR:

J. M. Merrow
BY Munn & Co
ATTORNEYS.

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3 Sheets—Sheet 3.

J. M. MERROW.
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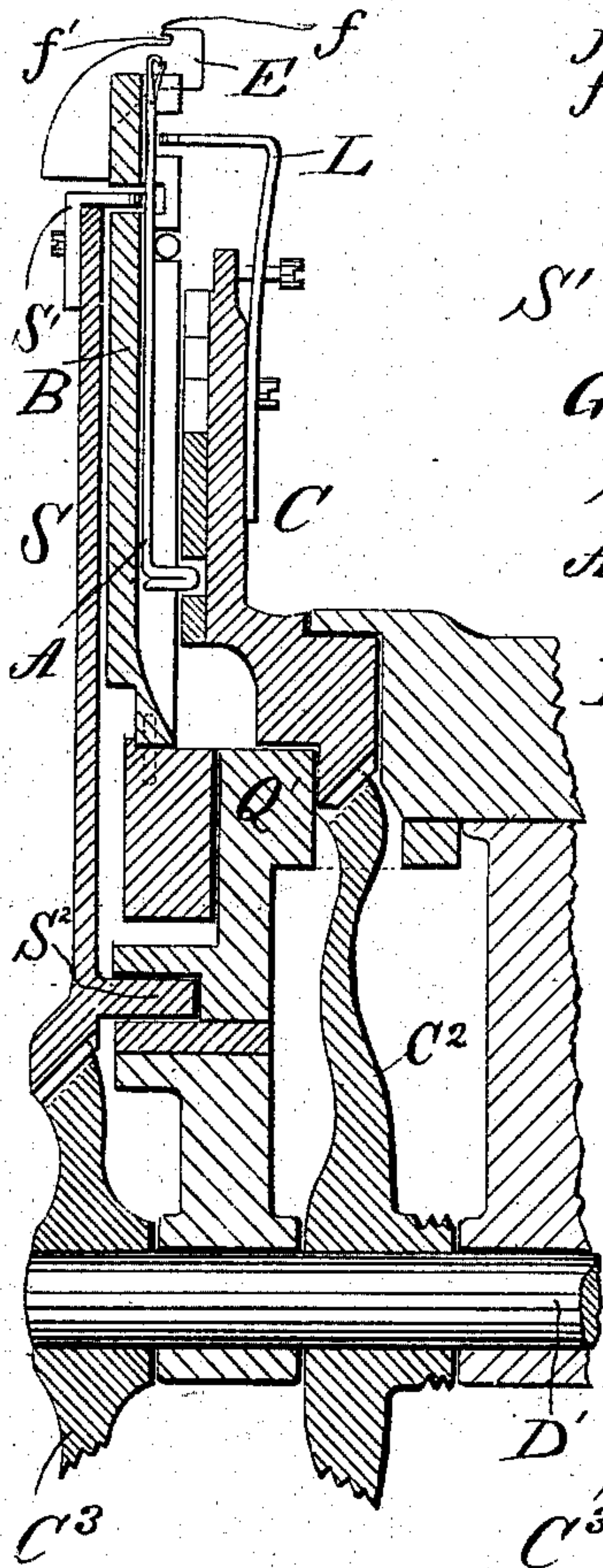


Fig. 9.

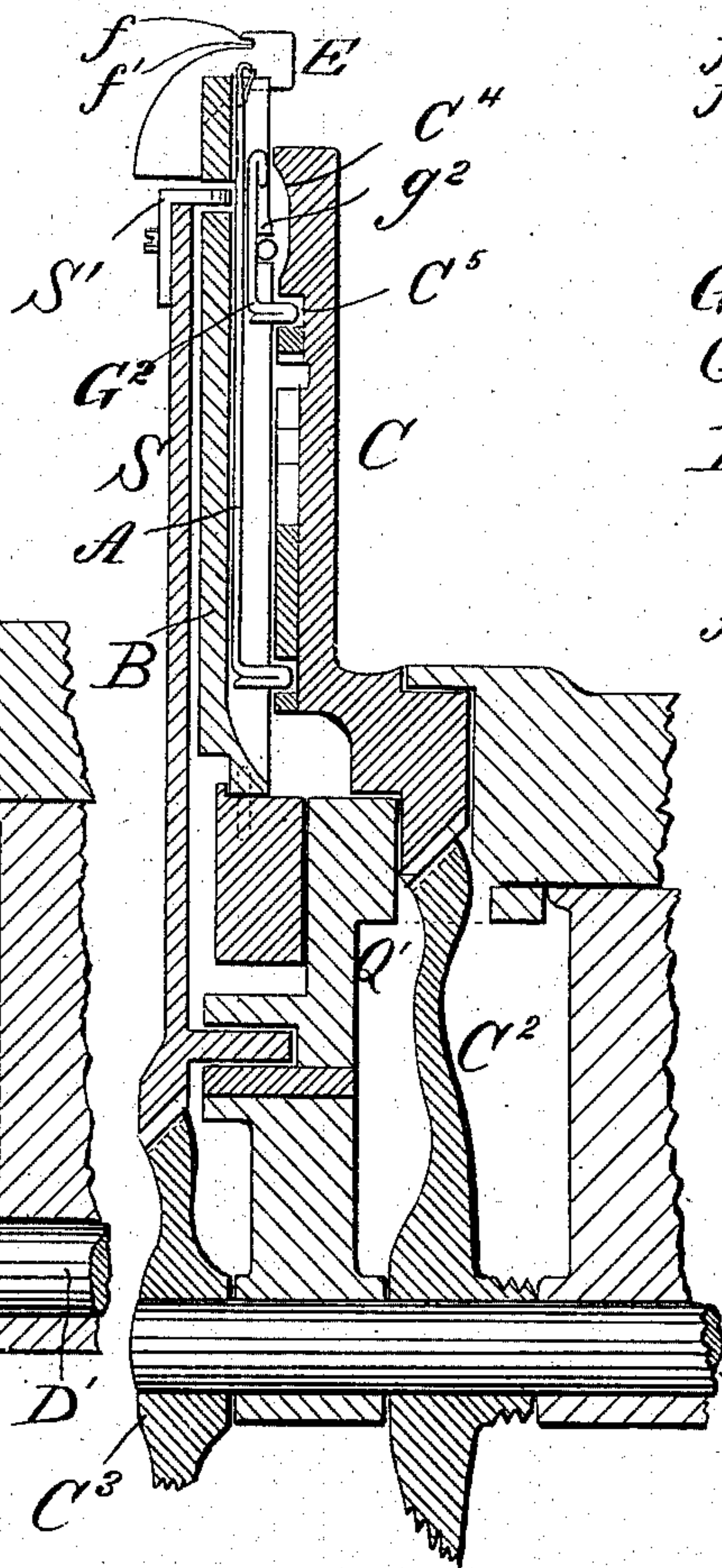


Fig. 10.

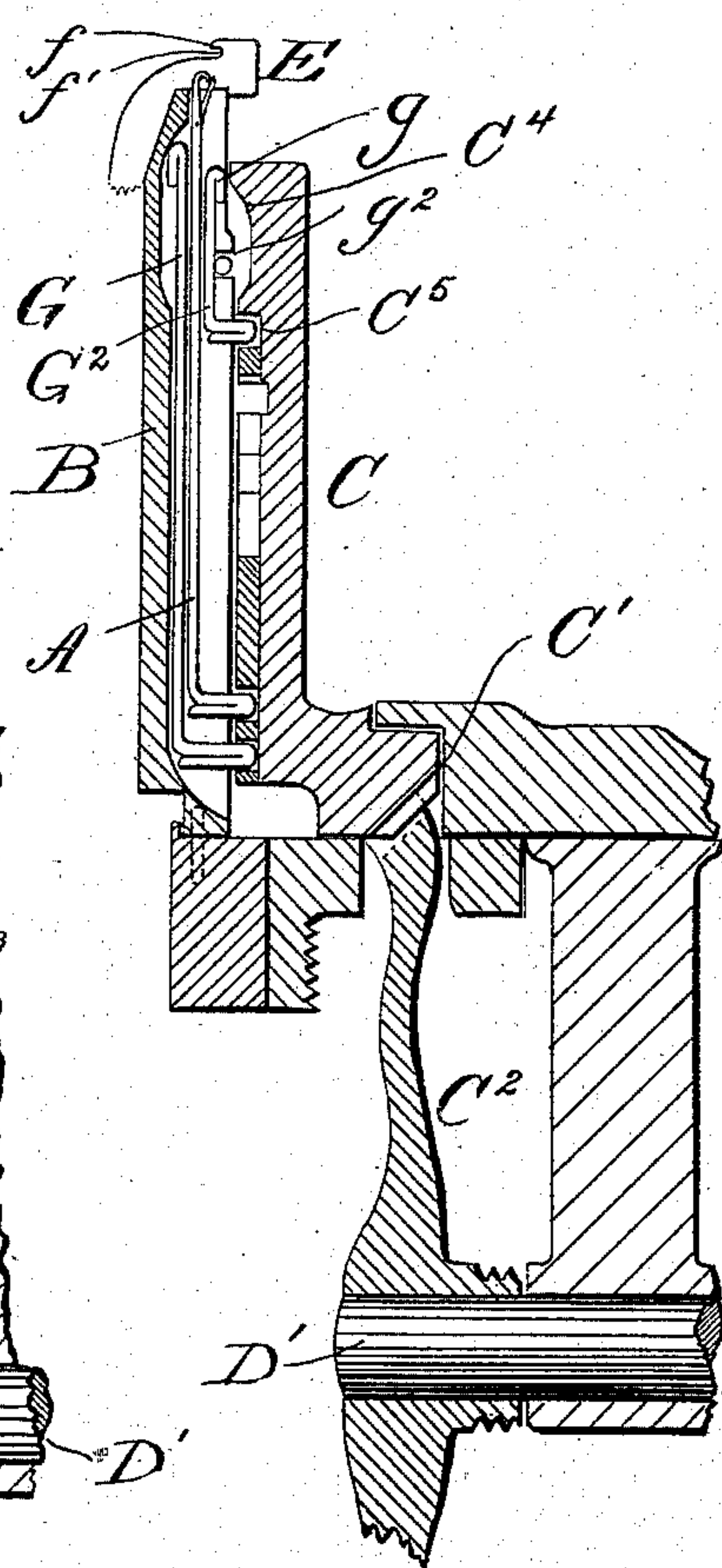


Fig. 11.

WITNESSES:

Donn Twitchell
C. Sedgwick

INVENTOR:

J. M. Merrow
BY Munn & Co
ATTORNEYS.

UNITED STATES PATENT OFFICE.

JOSEPH M. MERROW, OF MERROW, CONNECTICUT.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 291,377, dated January 1, 1884.

Application filed March 5, 1883. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH M. MERROW, of Merrow, in the county of Tolland and State of Connecticut, have invented a new and useful Improvement in Knitting-Machines, of which the following is a full, clear, and exact description.

The object of my invention is to provide certain new and useful improvements whereby the fabric will be kept from being carried by the needles in the direction of the reciprocations of said needles.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical central sectional elevation of a circular knitting-machine provided with my improvements, the needle-cylinder being stationary and the cam-cylinder rotating. Fig. 2 is a like sectional elevation of a part of the machine, showing a needle raised above its operating-cams and out of use. Fig. 3 is a like sectional elevation, showing a needle slightly raised from its lowest position. Fig. 4 is an inside view of a portion of the cam-cylinder, showing the arrangement of the cams for operating the needles and blanks. Fig. 5 is a cross-sectional elevation of a knitting-machine, in which the needle-support is revolved by the gear-wheel and the cam-cylinder is held stationary. Fig. 6 is a cross-sectional elevation of a portion of a straight machine having my improvements applied thereto. Fig. 7 is a view showing the connection of the pressing-cam to the bar, which causes the former to reciprocate with the latter on straight machines. Fig. 8 is a face view of the pressing-cam of a straight machine, the pin which drives said pressing-cam, and the web-holders. Fig. 9 is a cross-sectional elevation of one side of a circular machine, in which cams are used on the inside and the outside for pressing the needles laterally. Fig. 10 is a like sectional view, in which cams are used on the inside and blanks on the outside for pressing the needles laterally. Fig. 11 is a like view, showing blanks as used on both sides of the needles for pressing them laterally.

In the machine shown in Figs. 1, 9, 10, and 11 latch-needles A, which are of the usual con-

struction, are held in grooves *a*, in the outer surface of the needle cylinder or support B, which is to remain stationary, and is surrounded by revolving cam-cylinders C, provided with a beveled-cog wheel, C', engaging with the beveled-cog wheel C², mounted on a shaft, D', provided with a suitable handle for turning it, or with pulleys, or with other suitable known devices for applying power. The needle cylinder or support B contains a cylinder, D, to the upper or knitting edge of which a series of hooks or web-holders, E, are attached, which project between the needles and outwardly over the upper or knitting edge of the needle cylinder or support B, the prongs *f* of the said hooks forming recesses *f'*, and projecting toward the center of the needle cylinder or support B, as shown in Figs. 1, 2, 3, and 5.

There is to be one web-holder or jack E in each space between two needles. The hooks or web-holders E can be attached to the cylinder D, or they can be made integral with the same, or they may be attached to or integral with the needle-support or cylinder. The needle-holding grooves *a* of the needle cylinder or support B are each provided with a depression, recess, or cavity *b*, the ends of which recesses or cavities are beveled, as shown at *b' b'*. The needles A are reciprocated in the grooves *a* by means of needle-operating cams I J and of cams constructed of the plate F and the tumbler F', coming in contact with the bent ends or butts of said needles. In each groove *a*, as shown in Figs. 1, 2, and 3, a blank, G, is placed, which has one end, *g'*, bent to form a butt in the same manner as the needles, and has a head, *g*, formed at its other extremity, the end of which head is preferably rounded or beveled. The head *g* is formed by bending over the wire forming the blank, but can be made in any other equivalent manner. The function of the blanks is to press the hooked ends of the needles laterally at the proper times, for the purpose of carrying the yarn or thread connecting the loops or stitches which are upon said needles into the recesses *f'*, formed by the projections *f*. The blanks G are caused to perform their before-mentioned function by means of the irregular groove H acting upon the butts of

said blanks. The butts g' of the blanks G extend into the groove H , which groove runs around the inside of the cam-cylinder on a continuous horizontal line, h^2 , except below the needle-cams $I J$, at points h^2 , where it is slightly lowered to the plane of h' , and forms inclined portions h^3 , which inclined portions h^3 are located below the point at which the needles begin to rise after having been drawn down through the old loop to its lowest limit. When the cam-cylinder is rotated in the direction of the arrow in Fig. 4, the butts g' of the blanks G in the part h^2 of the groove H , at the left side of said figure, will pass down the incline h^3 to the portion h' of the groove H at the same time that the needles rise to receive the yarn, and as the rotation of the cylinder continues the butts of the blanks will slide along the part h' of the said groove H , and up the incline h^3 at the right in Fig. 4. This last-mentioned movement of the butts of the blanks up the incline h^3 to the portion h^2 of the groove H , as before mentioned, occurs just after the needles have been drawn down to their lowest positions to complete their stitches. When the blanks are thus raised, their heads g , sliding upon the upper inclined surfaces, b' , force the needles laterally outward. When the blanks were lowered in the manner previously described, the needles were left free to be pressed inwardly. This lateral movement inward of the needles is accomplished by cams L , which are shown at the right side of Fig. 1, which cams come into contact with the needles immediately after the blanks are drawn down, and cease to act upon the said needles just as the said blanks begin to rise and the needles begin their ascent through the newly-formed loops or stitches. The cam or presser L , as shown in Fig. 1, is by preference adjustably connected to the cam-cylinder. A plate, F , extends entirely around the interior of the cam-cylinder, and is secured to the same near the lower part thereof. The upper edge of this plate below the needle-operating cams $I J$ co-operate with said cams to cause the reciprocations of the needles in the usual well-known manner. At other points than below the cams $I J$ the upper edge of the plate F forms a shoulder or ledge for the butts of the needles to rest or slide upon when in what may be termed their "normal position." The lower edge of the said plate forms the upper surface of the irregular groove H , into which the butts of the blanks G extend. The lower surface of said groove H is formed by the upper edge of a ring secured to the inner lower edge of the cam-cylinder.

Fig. 4 shows the position that the needle-operating cams will assume when the cam-cylinder is moving in the direction of the arrow. The irregular dotted line indicates the path or the different positions of the butts of the needles when they perform the operation of knitting. When the cam-cylinder is rotated in

the direction of the arrow, the butts of the needles pass from the upper edge of the plate F over the tumbler or pivoted bridge F^2 , up along the inclined top of one cam, I , and over the top thereof, by which the needles are raised to receive the yarn or thread from the thread-guide. The butts of the needles encountering the switch-cam J , of common construction, pass down along the lower edge of said cam, and of the other cam, I , to the point I' of the cam I , by which the stitches in the hooks of the needles are drawn through the old loops to their complete length, and the old loops which were on the shanks of the needles below the latches are cast off. As the movement of the cam-cylinder proceeds, the butts of the needles encounter the inclined surface F' of the plate F , by which they are raised to the position shown at the left of Fig. 1. Before, however, the butts of the needles are permitted to slide upon the upper horizontal edge of the plate F , they slide upon and over the tumbler F^2 . This last-mentioned movement of the needles is sufficient to carry the latches of the needles through the newly-formed stitches or loops.

The width of the plate F may be varied, and if it is made wider in proportion to the other parts there will be less pressure upon the tumblers F^2 by the butts of the needles, and if the plate F is made narrower the cams I might then be extended or made wider, so as to cause the needles to advance earlier in relation to the action of the blanks G while the web is yet held by the web-holders.

In place of making the groove H lower under the cams $I J$, the said groove H may be made higher under the said cams than at other parts of the said groove H , in which case the blanks will move in directions opposite to the ones described, and the head g of said blanks will slide upon the lower part of the recess b' , forcing the needles laterally, and it is obvious that the result will be the same in either case.

The proportions of the cams and the plate F , as shown and described, are convenient in practice, and I consider preferable. When the butts of the needles are upon the plate F at a point away from the cams and tumblers, the needles and blanks will be in the approximate position shown at the left side of Fig. 1. If from such a position after the latches have passed through the stitches the needles are pressed inward and advanced farther, the web may be carried along somewhat by the longitudinal motion of the needles; but such action would not interfere with the operation of knitting.

While knitting the heel of a stocking some of the needles may be raised so as to be inoperative, and to hold the said needles raised and prevent them from falling I have provided the cam-cylinder C with an annular shoulder, h , in its inner surface, on which the butt-ends of the needles can rest. When the needles are thus raised out of action, as shown in Fig.

2, the blanks G, when also raised, rest against the lower part of the said needles and hold their butts on the shoulder *h*; but at the needle-operating cams the blanks G are lowered 5 by the groove H, and the cam J is provided with extensions K, to prevent the needles from dropping.

The thread-guide M is provided with two curved arms, N, the edges of which rest quite 10 closely against the hooks of the needles, when the latter advance, for the purpose of keeping the latches open, and of opening any latches which might by accident have been closed.

The cylinder D is provided with an annular 15 groove, D², in its outer surface, into which groove a flange, R, of the screw-ring P projects, which ring P is screwed on a screw-threaded collar, Q, projecting from the base of the machine. By turning the screw-ring P 20 the cylinder D can be moved in the direction of its longitudinal axis, for the purpose of adjusting the length of the stitches. If the cylinder D is moved in a line with its axis in one direction by the screw-ring P, the web-holders 25 E will be carried to a greater distance from the hooks of the needles when the latter are forming the loops, and the knitted stitches will be made longer, while if the cylinder D is moved in an opposite direction by the ring 30 P the web-holders E will be at a less distance from the hooks of the needles when the stitches are formed, and the said stitches will consequently be shorter. The axial motion of the cylinder D is made independently of the cylinder B, so that the latter will not be thrown 35 out of adjustment in relation to the blanks G.

The machine described is adapted to knit in both directions. Supposing a stitch or loop to be upon each needle of the series of needles, the operation of knitting is as follows, viz: Commencing with the needles A in the position shown at the right side of Fig. 1, loops being upon their hooks, the needles are successively moved longitudinally by the action of their operating-cams in the direction 45 of the arrow in Fig. 1, and at the same time the hooked ends of the needles are moved laterally to a position shown in Fig. 3, so that the yarn or thread which is between two of the needles, or, in other words, the yarn or thread connecting two stitches or loops together and resting against the part *f*³ of the web-holders E, will be carried into the recesses *f*¹, and prevent the loops which are upon the hooks 55 of the needles from slipping from the said hooks, and when the longitudinal motion of the needles is continued the loops will remain at rest, and if the needles are moved sufficiently their latches will pass through the loops. If the needles A are then moved longitudinally in the opposite direction to the one last described, and yarn or thread is supplied to their hooks, such yarn or thread will be carried by the hooks of the needles. If such 65 motion is continued sufficiently, the yarn or thread will be drawn through the loops or

stitches which are upon the needles, the latches of the needles being closed by the loops or yarn as the needles are moved. Said loops pass over the hooks of the needles, and new loops 70 or stitches will be formed. Before the stitches are formed the needles A move laterally, so that the yarn or thread will not be drawn on the part *f*² of the web-holders E, but on the part *f*³ of said web-holders. (See Fig. 1.) 75 This last-mentioned lateral motion of the hooked ends of the needles also carries the yarn or thread which was in the recesses *f*¹ out of said recesses, so that the next yarn in course of knitting may pass into the said recesses. 80

By the employment of the web-holders E the use of weights or other tension devices is dispensed with, the fabric being held by the web-holders while the needles pass through 85 the loops.

The machine has been described as being circular, and as constructed with a rotating or reciprocating cam-cylinder and a stationary needle cylinder or support, having blanks 90 back of the needle and cams in front of the needles for pressing the said needles laterally at the proper times. Instead of such an arrangement, the cam-cylinder may be constructed to remain stationary, and the needle-cylinder 95 arranged to rotate or reciprocate, or a straight machine may be made in the same general manner described.

I have shown my improvements applied to latched knitting-needles, though obviously the 100 improvement may be applied to other knitting-needles. Cams may be used for pressing the needles laterally in either or both directions, or blanks may be used similarly for the same purpose, as shown in the drawings. The 105 general arrangement shown in Figs. 1, 2, 3, and 4, I consider preferable; but I have shown in Figs. 5, 6, 7, 8, 9, 10, and 11 modifications of the same. In Fig. 8 a cam-bar is arranged to move in a straight line in a straight machine, causing an irregular groove to move the needles laterally in both directions at the proper times, supplanting the blanks and operating in the same manner as the cams S' and L in the circular machine. (Shown in Fig. 9.) 115 In Fig. 5 the cam-cylinder C is made a part of the bed of the machine, and the needle cylinder or support B is attached by means of suitable pins to the ring C³, which is provided with cog-teeth on its edge, into which the cog-teeth of the gear-wheel C² engage, and by means of which the ring C³ and the needle-cylinder B may be revolved together, while the cam-cylinder C remains stationary. The inner cylinder, D, is carried by the cylinder B as 125 the web-holders E pass into the radial grooves in the edge of the needle-cylinder, and the annular groove D² extends entirely around the cylinder D, which allows the latter to revolve independently of the ring R. In Fig. 6 the 130 cam-bar *m* is adapted to slide upon the needle-support in a straight machine. The cam-

bar *m* slides in guides formed upon the bars *o o'*. The cams *L*², for pressing the needles laterally, slide in guides formed upon the needle-support *n* and upon the bar *P*⁴. The cams *L*² are actuated by means of the pin *m'*, which is connected to the cam-bar *m*, as shown in Figs. 7 and 8, and the cams *L*² are reciprocated with the bar *m*, which carries the needle-operating cams. The web-holders *E* are attached to the bar *E'*, which is connected to the needle-support. In Fig. 9 the cam-cylinder is rotated as in Fig. 1; but there are cams shown to move the needles laterally in both directions at the proper times. The cam *S'* is moved simultaneously with the cam *L* in the following manner, viz: The cam *S'* is attached to the cylinder *S*, which is revolved by the gear-wheel *C*³ in the same time that the cam-cylinder *C* is revolved by the gear-wheel *C*². The cylinder *S* is supported by its flange *S*², which runs in an annular groove in the part *Q*¹.

In Fig. 11 blanks are used, instead of cams, to press the needles laterally in both directions at the proper times. The blanks in front of the needles are made shorter than the ones at the backs of the needles. The butts of the blanks in front of the needles are acted upon by an irregular groove, *C*⁵, in the same general manner as the blanks at the back of the needles are operated. The heads of the blanks in front of the needles slide upon the inclined surface *C*⁴ of the cam-cylinder *C* and force the needles laterally. In Fig. 10 blanks are used in front of the needles and cams upon the other side, each being operated as has been described in Figs. 5, 9, and 11.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, with a needle-support and a series of web-holders arranged at the knitting-edge of said needle-support, of a series of needles and means, substantially as described, for imparting a reciprocating and lateral movement to said needles, substantially as shown and described.

2. The combination, with a needle-support having fixed web-holders, of needles held in said support, devices for pressing the needles into the grooves in the support, and devices for pressing the needles outward at suitable times, substantially as set forth.

3. The combination, with a cam-cylinder, *C*, of the needle-support *B*, provided with needle-grooves *a*, having a bevel surface, the needles *A*, the blanks *G*, held in the needle-grooves, needle-operating cams, a cam or cams adapted to operate the blanks, web holders *E* at the knitting-edge of the needle-support, and devices for operating the machine, substantially as shown and described.

4. The combination, with the needle-support and cam-cylinder *C*, provided with needle-operating cams, plate *F*, a cam-groove, *H*, having a lower and upper part on the inner surface of the cam-cylinder, of the needle-cylinder *B*, the needles *A*, the blanks *G*, web-holders *E*, and devices for operating the cam-cylinder, substantially as herein shown and described, and for the purpose set forth.

5. The combination, with a needle-support provided with grooves having beveled surface *b'*, of blanks *G*, needles *A*, and means for reciprocating said blanks and needles, whereby a lateral movement is imparted to the hooked ends of the needles, and also a reciprocating movement to the same, substantially as shown and described.

6. The combination, with the cam-cylinder *C*, having an annular shoulder, *h*, at the upper edge of its inner surface, of the cam *J*, provided with arms *k* at its ends, the needle cylinder *B*, needles *A*, blanks *G*, cams for operating the needles, and blanks and devices for operating the cam-cylinder, substantially as herein shown and described, and for the purpose set forth.

7. The combination, with the base of the machine, provided with a collar having a screw-threaded neck, *Q*, and the needle-cylinder *B*, of the cylinder *D*, contained in said cylinder *B*, and provided with a groove, *D*², on the lower part thereof, the web-holders *E* on the cylinder *D*, the ring *P*, screwed on said neck *Q*, and provided with a flange, *R*, projecting into said annular groove *D*², substantially as shown and described, whereby the cylinder *D* may be adjusted axially, independently of the needle-cylinder *B*, as set forth.

JOSEPH M. MERROW.

Witnesses:

OSCAR F. GUNZ,
EDWD. M. CLARK.