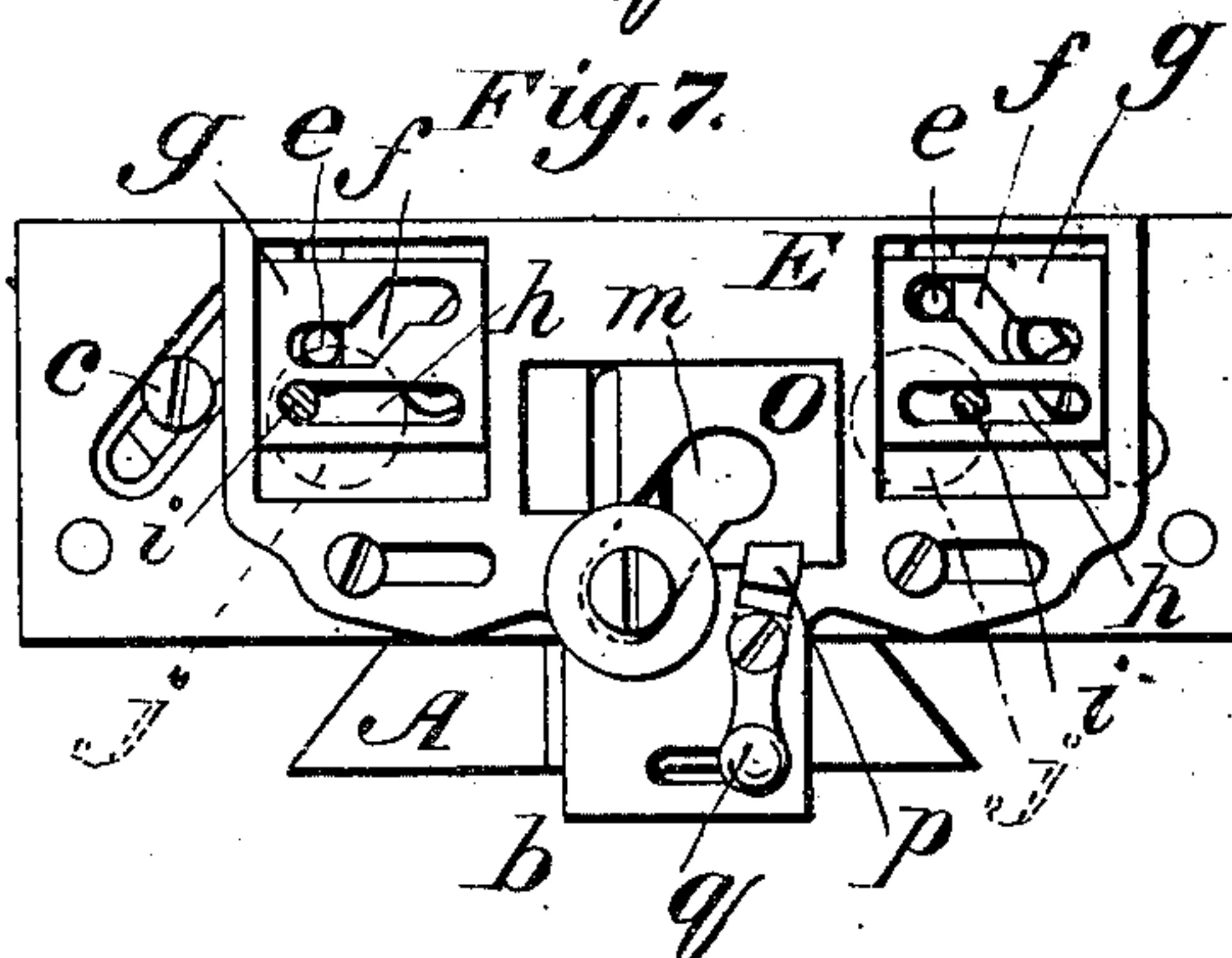
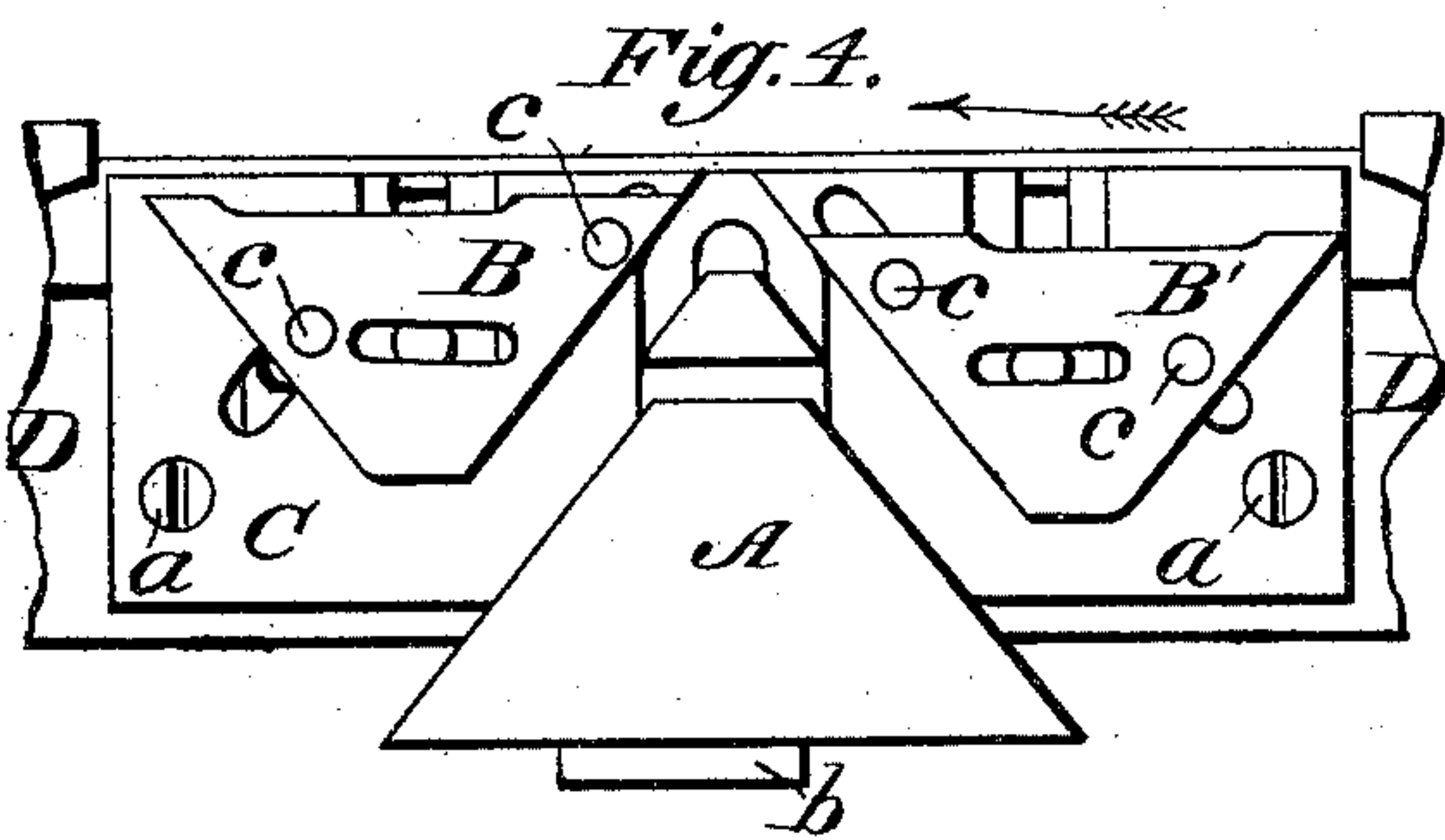
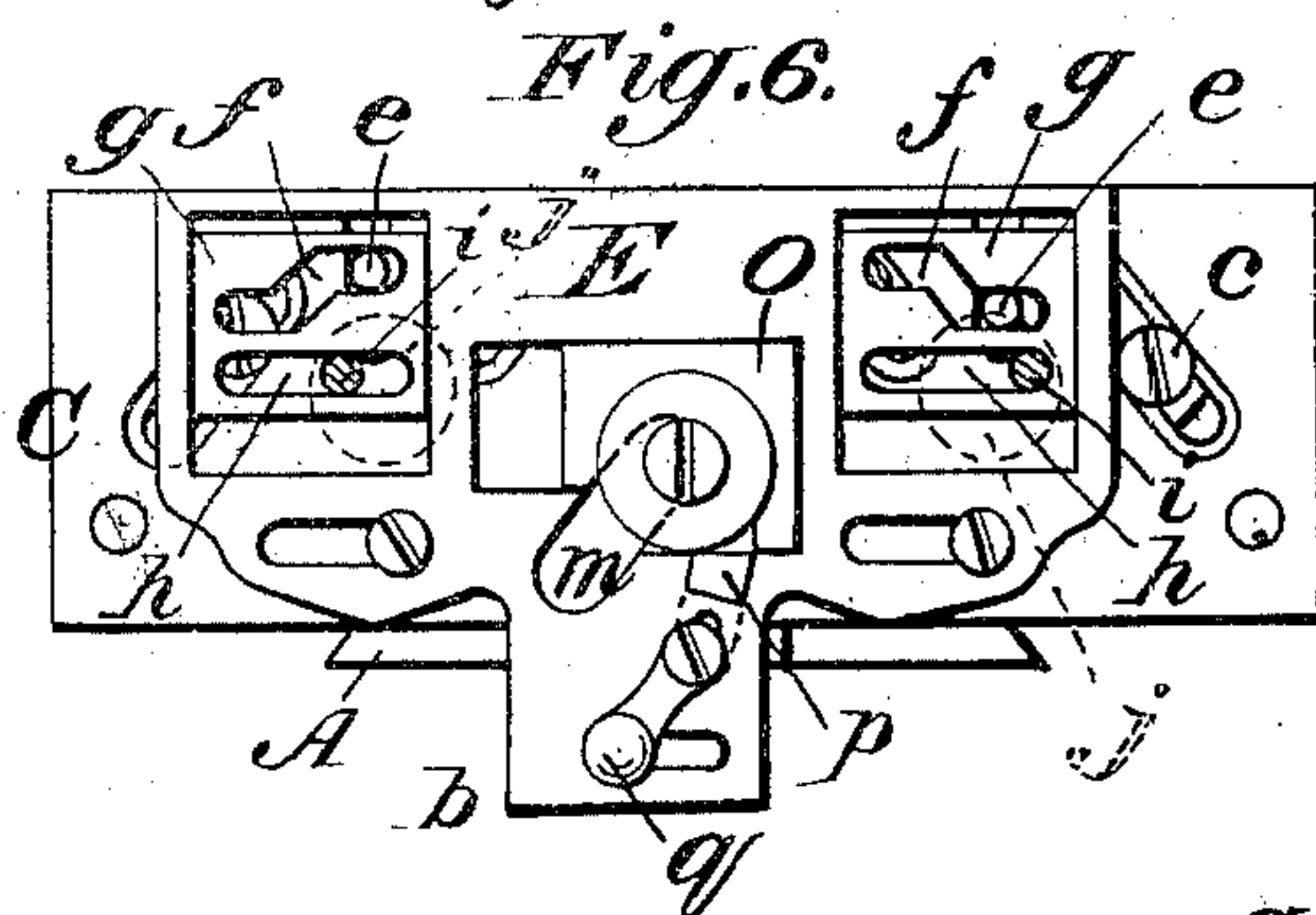
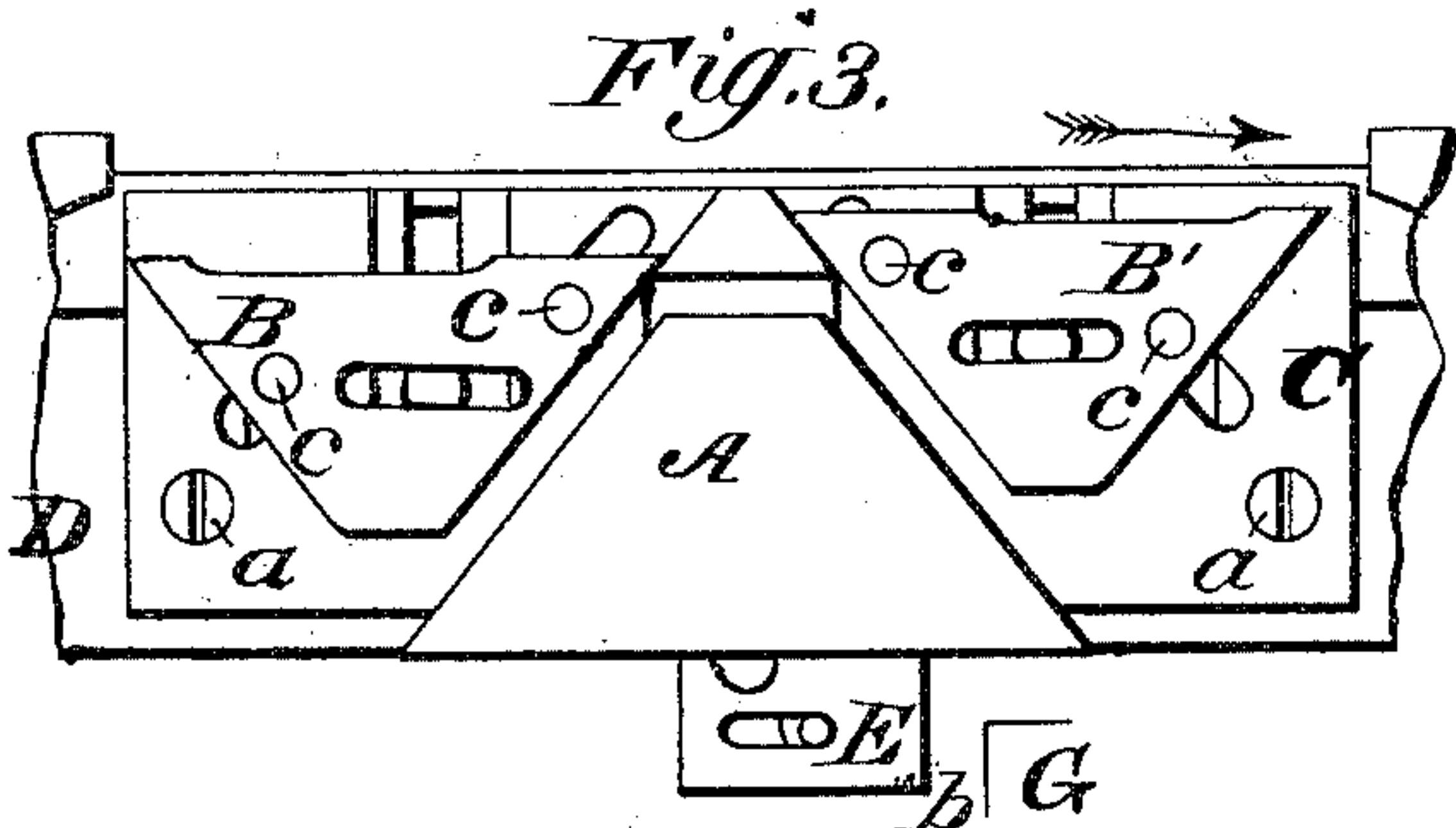
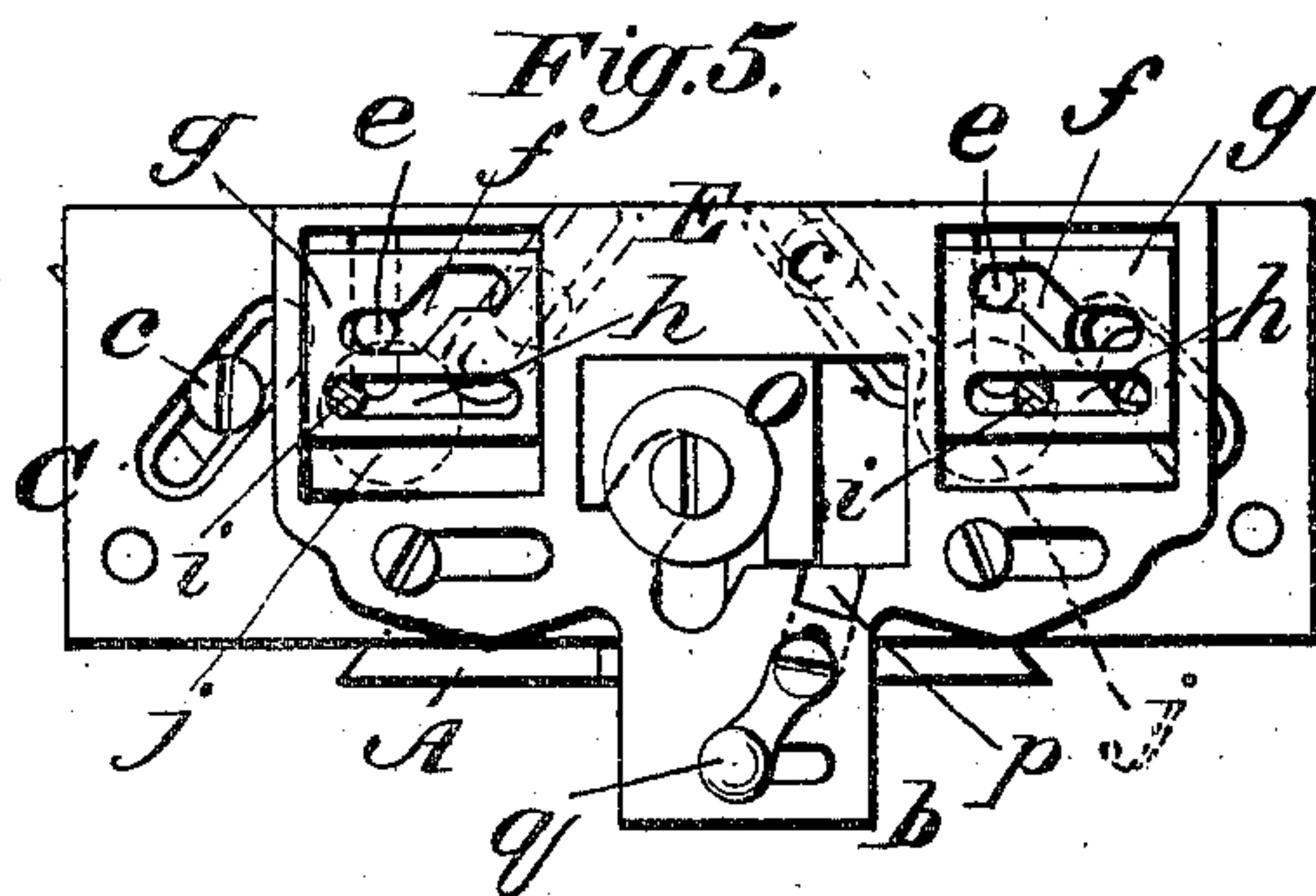
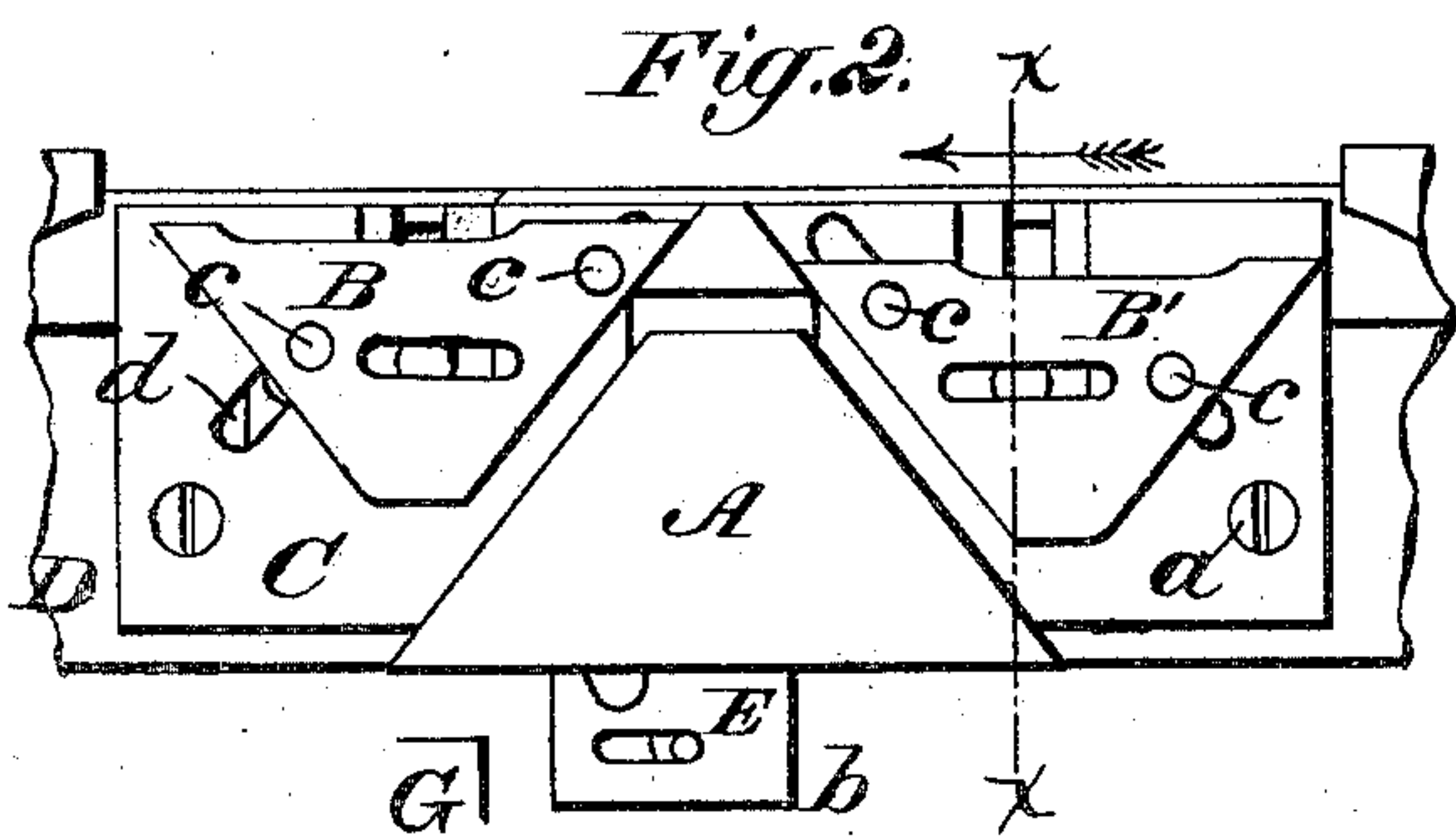
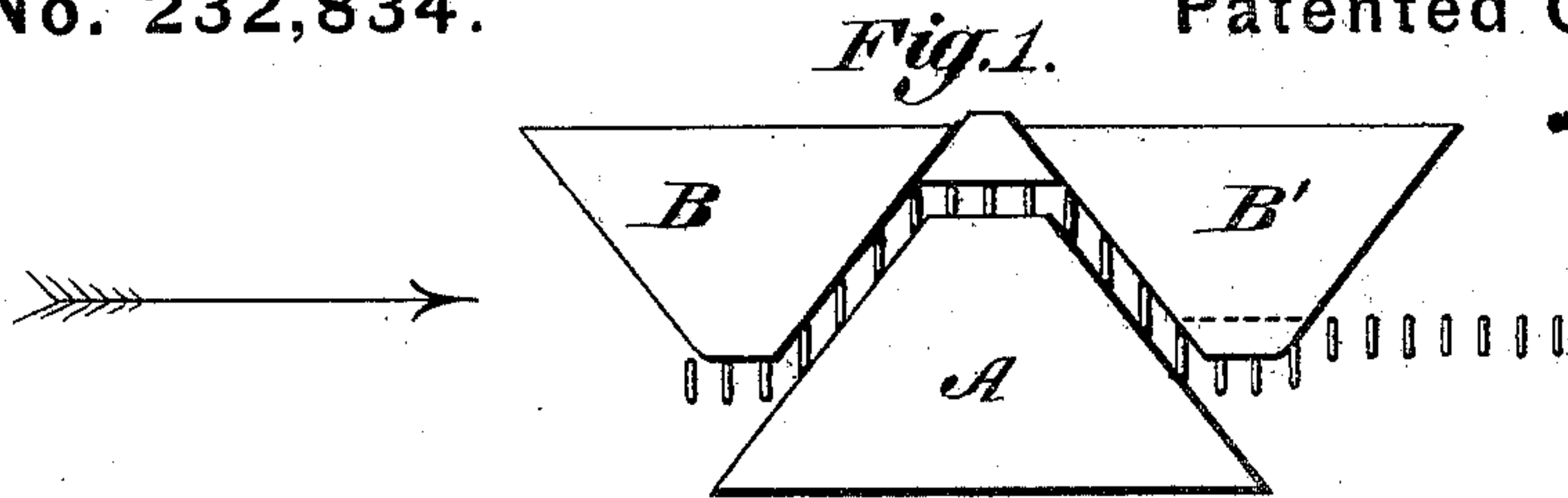


M. MARSHALL.  
Knitting Machine.

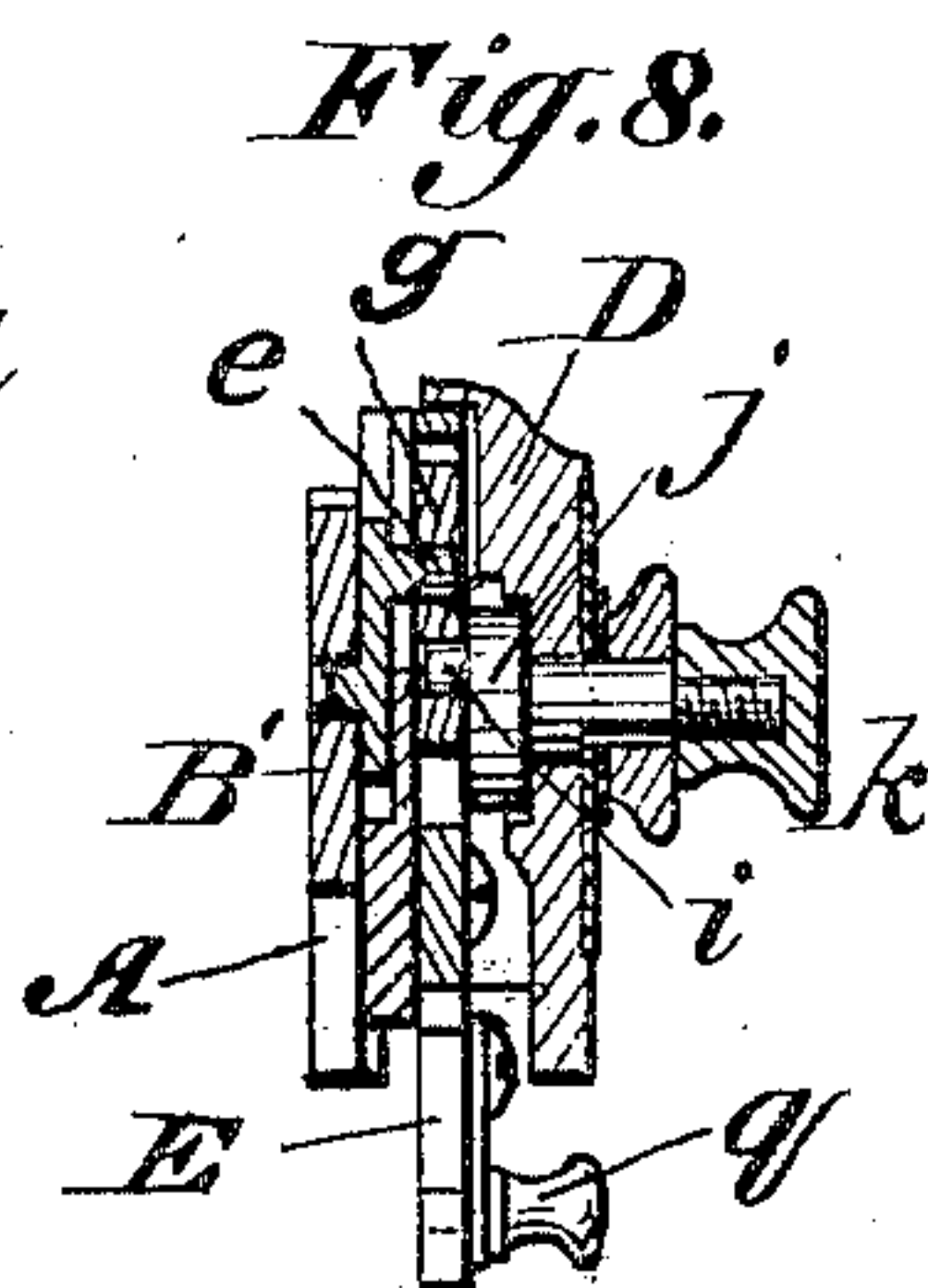
**No. 232,834.**

Patented Oct. 5, 1880.



*Witnesses:*

Donn P. Twitchell.  
William W. Dodge.



*Inventor:*

Moses Marshall  
By his attys.  
Dodge & Son



# UNITED STATES PATENT OFFICE.

MOSES MARSHALL, OF CHICOPEE FALLS, MASSACHUSETTS, ASSIGNOR TO  
THE LAMB KNITTING MACHINE COMPANY, OF SAME PLACE.

## KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 232,834, dated October 5, 1880.

Application filed August 11, 1879.

*To all whom it may concern:*

Be it known that I, MOSES MARSHALL, of Chicopee Falls, in the county of Hampden and State of Massachusetts, have invented certain  
5 Improvements in Knitting-Machines, of which the following is a specification.

This invention relates to the needle-operating cams, particularly the depressing-cams of what are known as "straight-knitting machines;" and its object is to avoid the excessive and needless strain upon the threads and friction upon the parts, caused in the ordinary machine by drawing and holding the needles in advance of the depressing-cam below the  
15 point required for knitting purposes; and to this end the invention consists in mechanism hereinafter described for giving the depressing-cams, which act alternately, an automatic vertical adjustment, so that during each stroke  
20 or action of the cams the forward or idle depressing-cam stands at a higher elevation than the other.

The invention also consists in certain details of construction, and in combining with  
25 the movable depressing-cams devices for shifting the elevating-cam vertically.

In order that the nature and purpose of my invention may be the more readily understood, it is proper to explain that the machine to which  
30 it relates is provided with a series of needles sliding in fixed guides, and with a set of horizontally-reciprocating cams, which act upon the shanks of the needles to slide them up and down in the guides.

35 Figure 1 is a diagram illustrating these cams as constructed and arranged in the ordinary machines hitherto in use. They are three in number, and consist of a central elevating-cam, A, having its small end upward, and two  
40 depressing or wing cams, B B', arranged on opposite sides of the former, with their small ends downward.

The cam A acts at each movement or reciprocation to elevate the needles; but the other  
45 cams act alternately to depress them, the cam B acting when the movement is in the direction of the arrow, and the cam B' acting when the movement is in the opposite direction. During each reciprocation that depressing-

cam which is for the time being in advance, 50 relatively speaking, of the elevating-cam is the idle cam, and the other the active cam. Ordinarily the depressing-cams are fixed in position at the same height, and consequently the needle-shanks are compelled to pass  
55 down under the forward or idle cam to the same extent that the shanks of the needles taking new stitches are depressed by the rear and active cam. Now, the elasticity of the  
60 yarn when strained upon the needles in forming the stitches has a tendency to draw the needle-shanks upward above the lower edges of the cams after the latter have ceased to act, as shown in Fig. 1.

It will be seen that the needle-shanks in  
65 front of the idle cam are a little higher than those which have been pulled down under the advancing edge of said cam. These shanks jumped up or were pulled up the short distance referred to by the strain of the stitches  
70 or loops last put on the needles.

The longer the stitches the greater the tendency of the needles to draw up above the point at which the depressing-cam left them. Now, there is no necessity for having the idle cam  
75 draw these needles down out of this raised position they have assumed, and the doing so causes the useless expenditure of power and strains the yarn uselessly, and in some kinds of stitch, as the Cardigan, breaks the yarn at  
80 times. To remedy this difficulty I so arrange the parts that each cam is raised, when idle, above its operative position, and then returned to said position again before commencing action. By this arrangement the needle-shanks  
85 are permitted to remain in the position to which they are raised by the yarn while passing to and under the idle cam.

Devices for automatically raising and lowering the lifting-cam I do not claim; neither  
90 do I claim devices whereby the depressing-cams may be adjusted vertically and fixed in position according to the length of stitch required, as I am aware that such features are now in  
95 general use.

In the accompanying drawings, which illustrate the needle-cams with my improvements applied, Fig. 2 represents a face view of my



improved arrangement of cams as they appear when moving to the left; Fig. 3, a similar view with the cams in position to move to the right; Fig. 4, a similar view, with the cams in position to move to the left and the elevating-cam depressed; Figs. 5, 6, and 7, rear views, showing the devices for adjusting and holding the cams, the devices being adjusted to correspond with the positions of the cams in Figs. 2, 3, and 4; Fig. 8, a cross-section on the line  $x x$ , Fig. 2.

The cams  $A B B'$  are arranged on the face of a flat plate,  $C$ , which is secured by screws  $a$  to the horizontally-reciprocating frame or carriage  $D$ , a portion only of which is shown, but which will be constructed and arranged as usual.

A flat space is left between plate  $C$  and frame or carriage  $D$  to receive a plate,  $E$ , capable of an independent horizontal reciprocation, for the purpose of giving the vertical adjustment to the cams in the manner hereinafter detailed. This plate is given its independent reciprocation by having a depending arm,  $b$ , which encounters stops at the ends of the machine at the termination of each stroke or reciprocation of the carriage.

Each of the cams  $B B'$  is held and guided by two screws,  $c$ , passing loosely through oblique slots  $d$  in the front plate,  $C$ , whereby each cam is held and guided so that it may slide up and down in an oblique direction, and each cam has on its back a stud,  $e$ , extending into a cam groove or slot,  $f$ , in a plate,  $g$ .

The plates  $g$  are mounted in vertical slots in the ends of the horizontally-reciprocating plate  $E$ , as shown in Figs. 5, 6, 7, and 8.

Each plate  $g$  is provided with a horizontal slot,  $h$ , to receive a stud,  $i$ , fixed eccentrically upon a rotary spindle,  $j$ , which latter is mounted in the frame or carriage  $D$  and provided with an external knob and a binding-nut,  $k$ , similar to those now used for adjusting the wing-cams to fixed positions.

As the plate  $E$  moves to and fro it carries with it the cam-plates  $g$ , which are prevented from moving vertically by the studs engaging in the slots  $h$ , and as the cam-plates move to and fro their grooves  $f$ , acting upon the studs  $e$ , move the depressing-cams up and down, one being raised as the other is lowered. As the frame or carriage moves to the left the parts stand in the positions shown in Figs. 2 and 5, with cam  $B$  elevated, and as the movement is completed the plate  $E$  encounters a stop,  $G$ , and its position is changed to that shown in Figs. 3 and 6, whereby the cam  $B$  is depressed and cam  $B'$  elevated preparatory to a reverse movement of the frame or carriage.

The spindles and their eccentric studs serve to adjust the cam-plates  $g$  vertically, and hold them from moving vertically when in action, so as to determine the vertical positions of the depressing-cams when they are in action, and thereby regulate the depression of the needles

and control the length of the stitches taken. It will thus be seen that by simply turning the spindle  $j$  the length of the stitches may be regulated, as in the machines now in use.

In case a machine is intended for one kind of work only, and the length of the stitches does not require adjustment, the cam-plates  $g$  and spindles  $j$  may be omitted and the cam-grooves made directly in the plate  $E$ , the slotted plates, when fixed, being equivalents of slots formed in the main plate  $E$ .

Passing, now, from the depressing-cams to the elevating-cam  $A$ , I will describe the manner in which it is given the usual vertical movement by means of the same devices, in part, that adjust the depressing-cams.

The cam  $A$  is held by a stud sliding in a vertical slot in plate  $C$ , and extending through the same into an oblique slot,  $m$ , formed partly in the plate  $E$  and partly in a plate,  $O$ , which is mounted in a horizontal slot in said plate  $E$ .

The plate  $O$  is notched in its under edge to receive a locking-bolt,  $p$ , arranged to slide in plate  $E$ , and actuated by means of a thumb-lever,  $q$ , which extends downward within reach of the attendant. When the bolt  $p$  is thrust upward it locks the plate  $O$  firmly to plate  $E$ , and the reciprocation of the latter in the carriage  $D$  causes the cam  $A$  to be raised and lowered at the same time that the depressing-cams are adjusted, the cam  $A$  being shifted from the positions shown in Figs. 2 and 3 to that shown in Fig. 4. When, on the other hand, the bolt  $p$  is drawn down, it releases the plate  $O$ , which remains at rest and holds cam  $A$  in an elevated position, as shown in Figs. 5 and 6, while plate  $E$  moves to and fro.

The object of raising and lowering the elevating-cam, as described, is to cause the knitting action of the needles in one direction only. This adjustment and the result secured thereby are, separately considered, the same as in the machines now in common use.

Having described my invention, what I claim is—

1. In combination with the frame or carriage  $D$ , a reciprocating plate,  $E$ , cams  $B B'$ , slotted plates  $g$ , mounted in and arranged to reciprocate with plate  $E$ , and means, substantially as described, for fixing the vertical position of the plates  $g$ , as set forth.

2. The combination of the cams  $B B'$ , the reciprocating frame or carriage, the plate  $E$ , arranged to be reciprocated upon the carriage, and provided with the oblique cam-operating slots, and the depressing-cams  $B B'$ , as described and shown, whereby the forward or idle cam is automatically raised and maintained above its operative position, as set forth.

3. The combination of the vertically-movable cam  $A$ , reciprocating plate  $E$ , block  $O$ , adjustable laterally in the plate, and means, substantially as described, for locking the plate and block together, as set forth.

4. In combination with the reciprocating



plate E and block O, having the oblique slot formed in them, the cam A, and the sliding bolt, provided with the operating-lever, substantially as described.

- 5 5. The combination of the elevating-cam, the two depressing-cams, and the reciprocating plate E, provided with the three cam-operating slots, and arranged and connected sub-

stantially as described, to elevate and depress all three cams, in the manner described and shown.

MOSES MARSHALL.

Witnesses:

T. C. PAGE,  
H. N. LYON.