

(No Model.)

2 Sheets—Sheet 1.

C. P. HIGGINS.
DIE FOR FORMING POLYGONAL TUBES.

No. 503,962.

Patented Aug. 29, 1893.

Fig. 1.

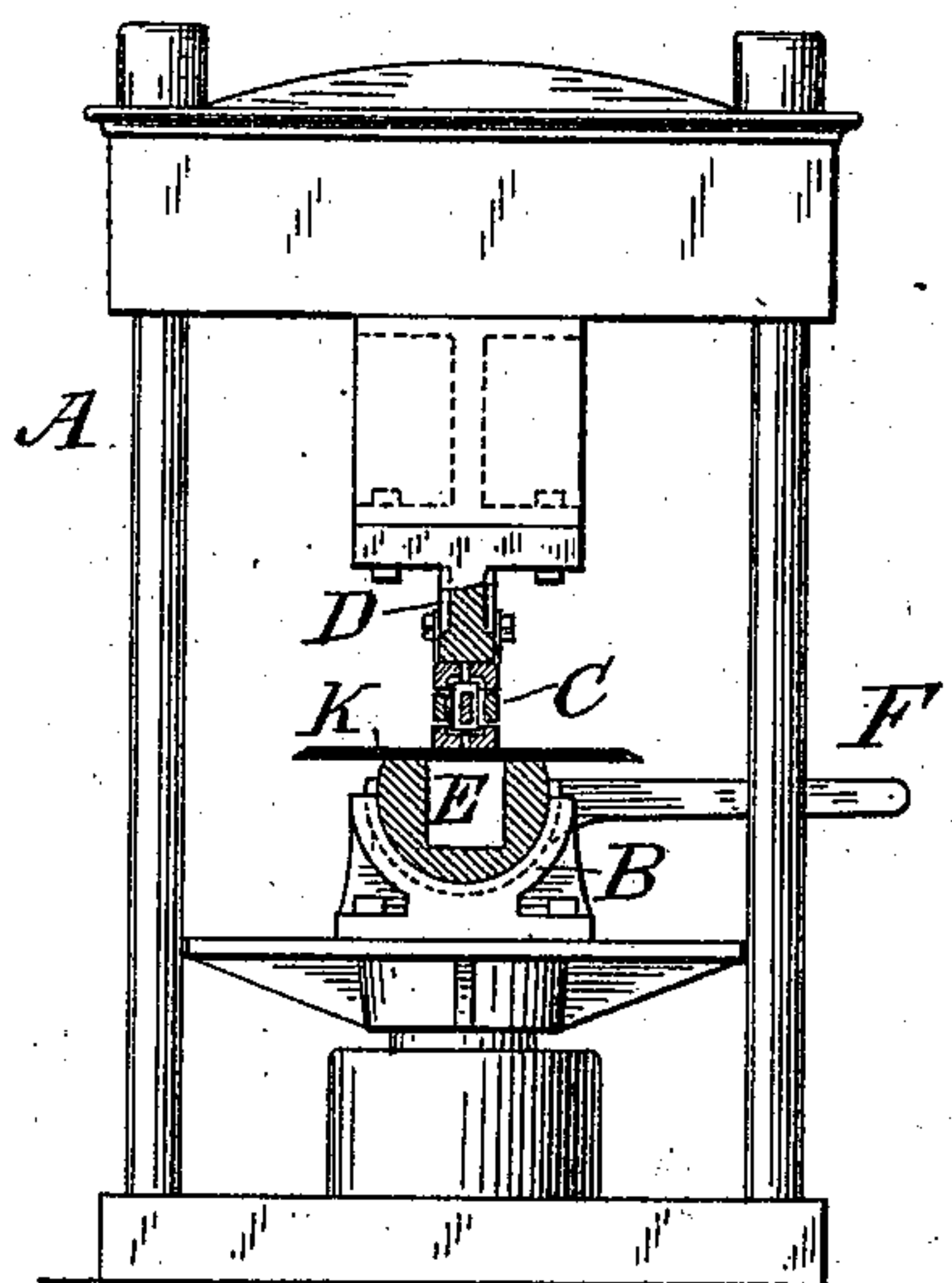


Fig. 2.

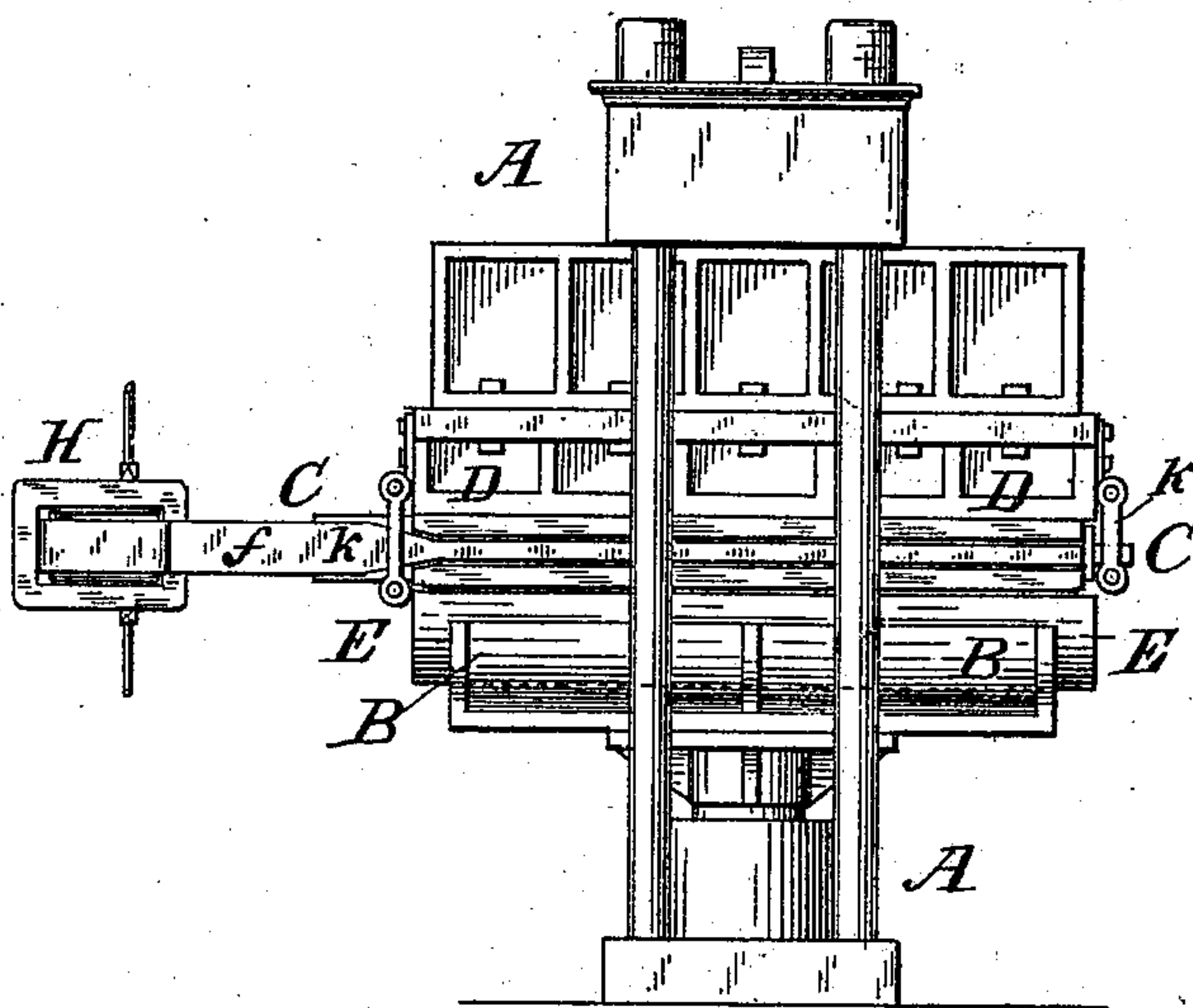


Fig. 3.

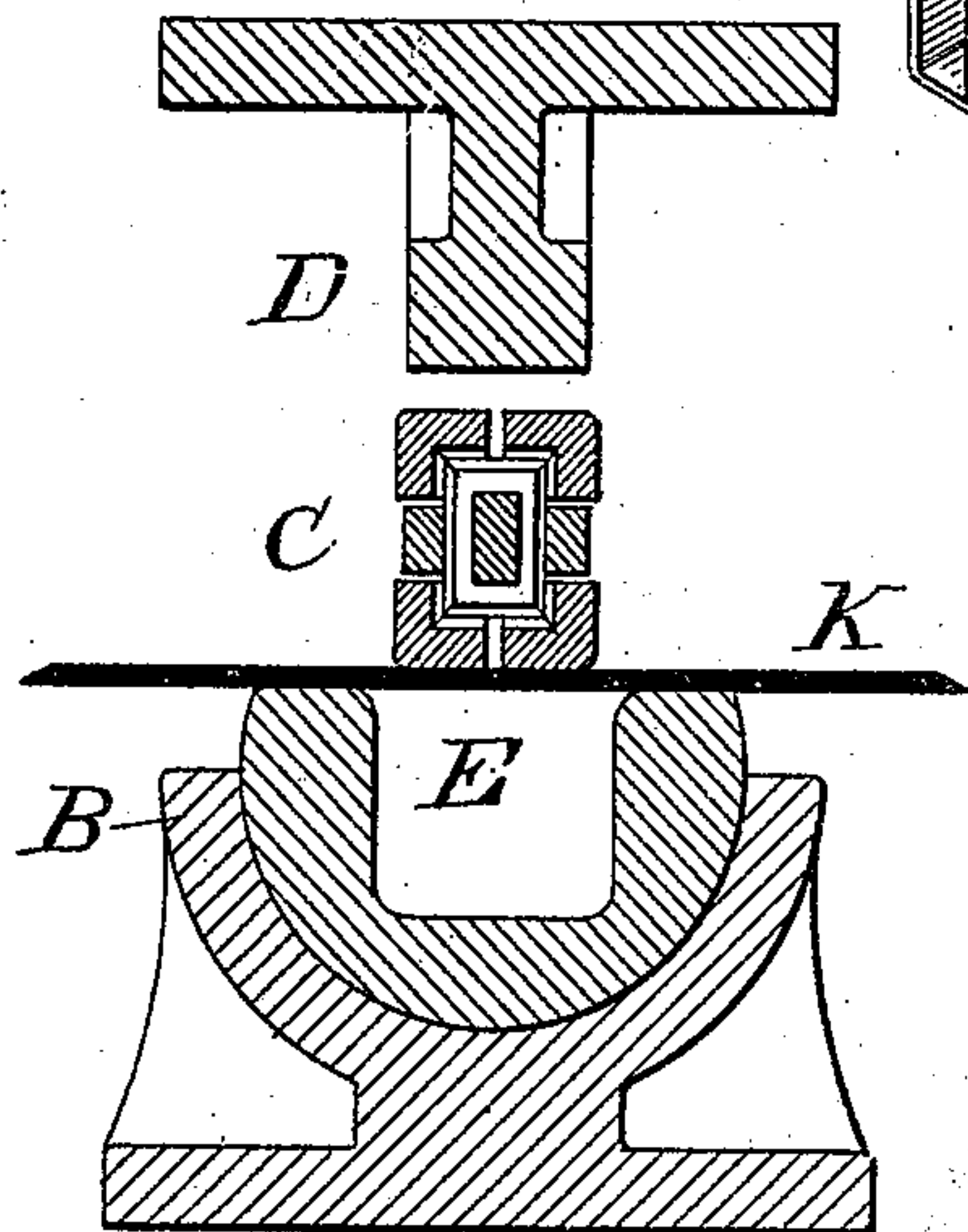


Fig. 5.

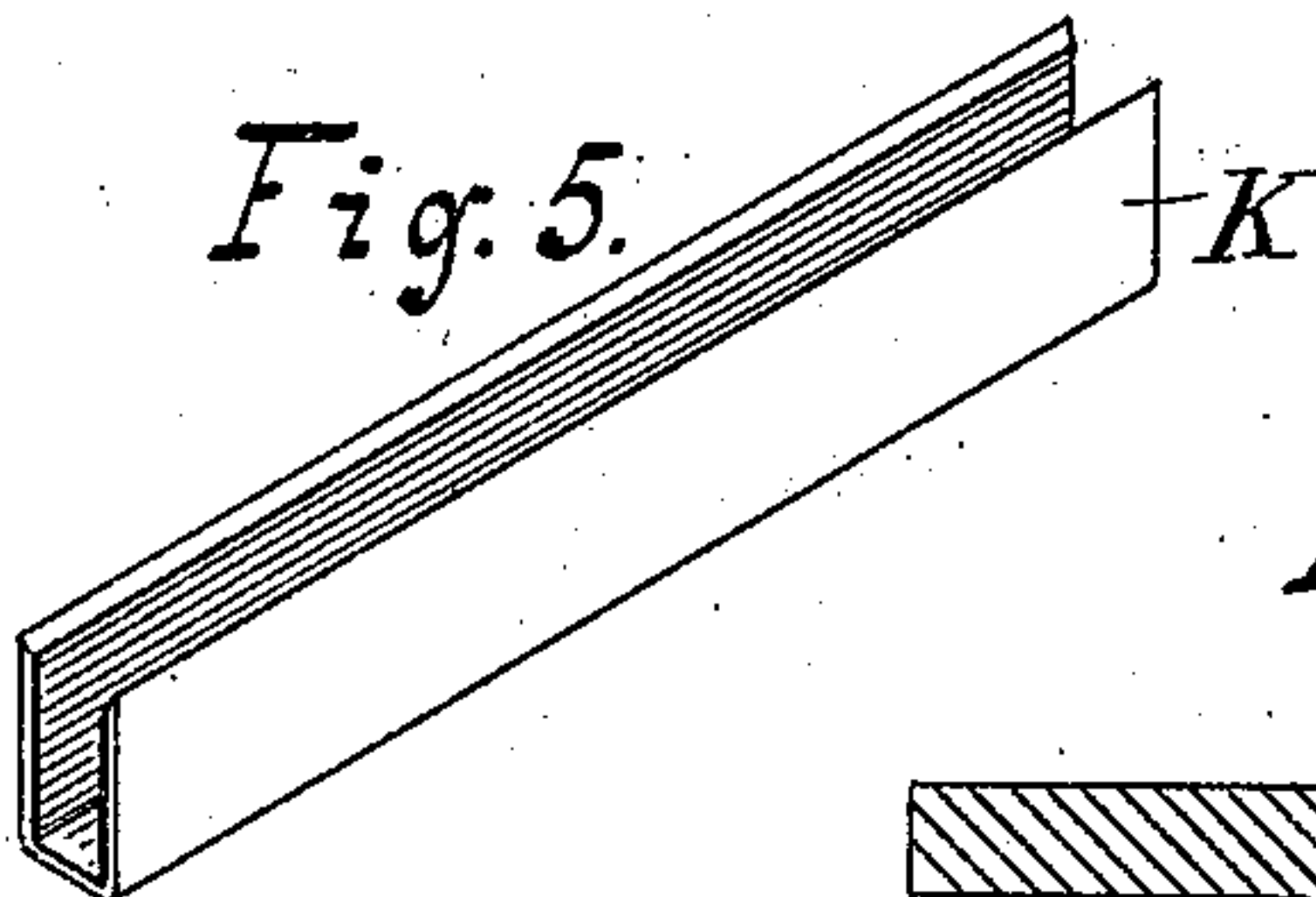
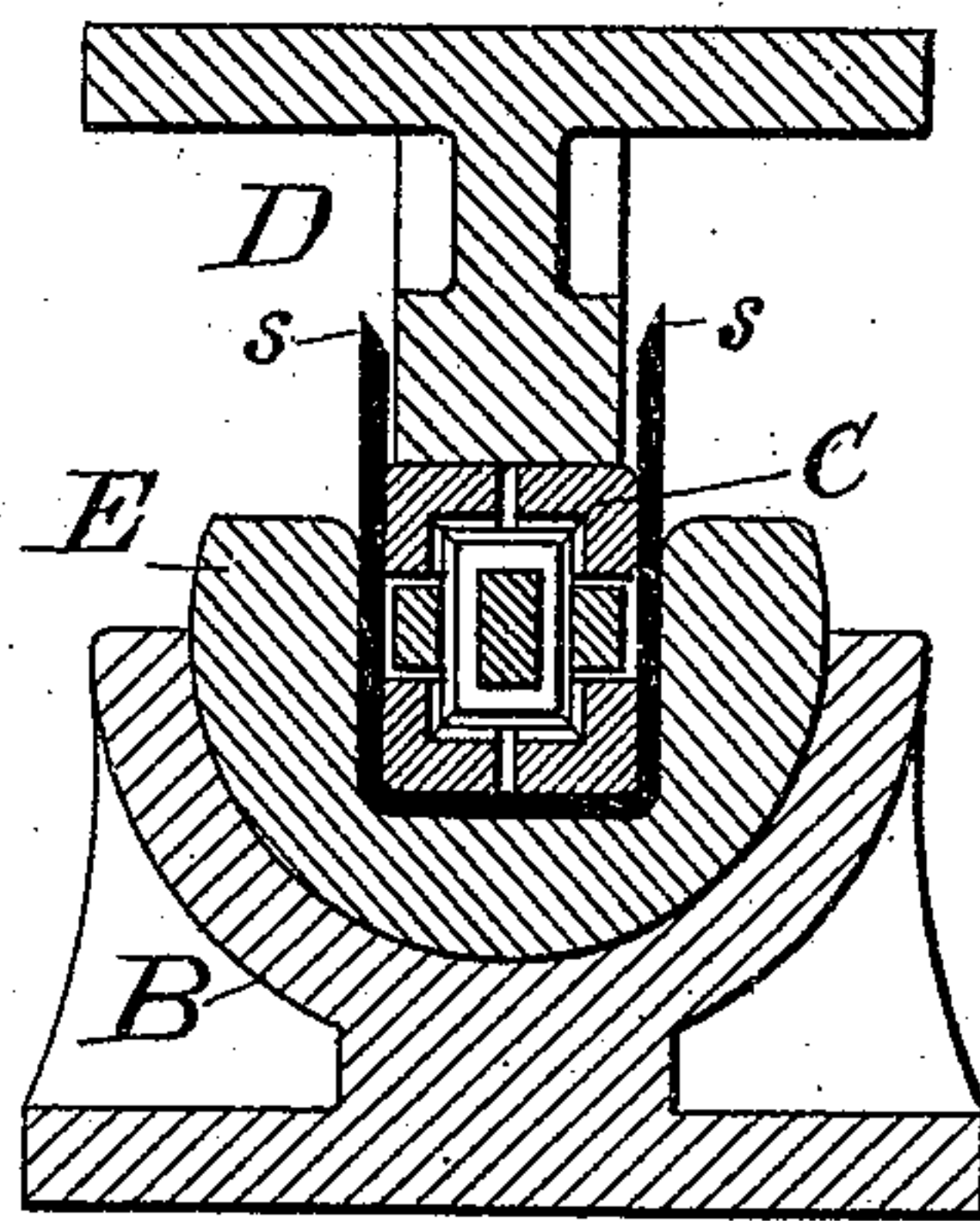


Fig. 4.



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Fig. 6

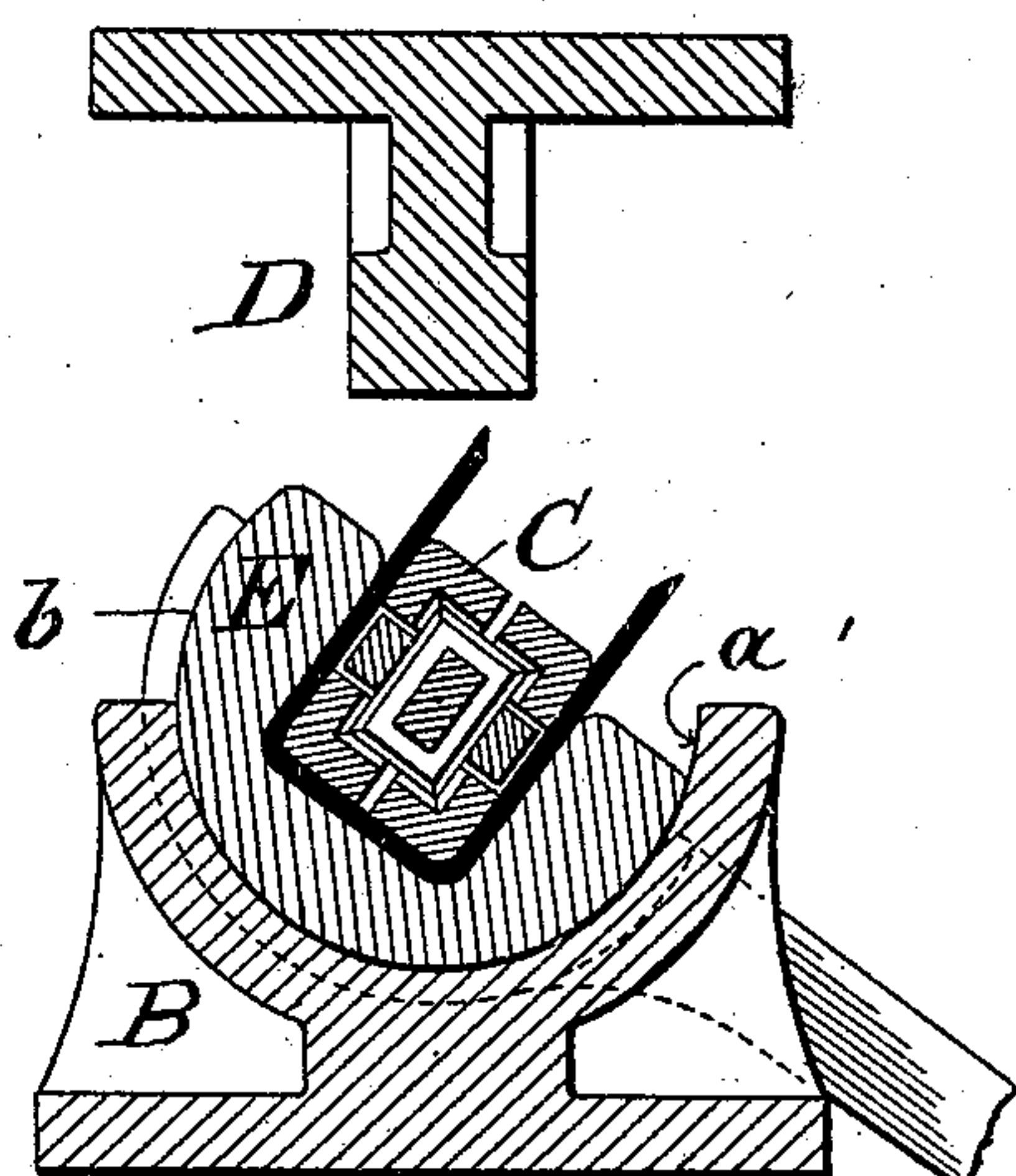


Fig. 7.

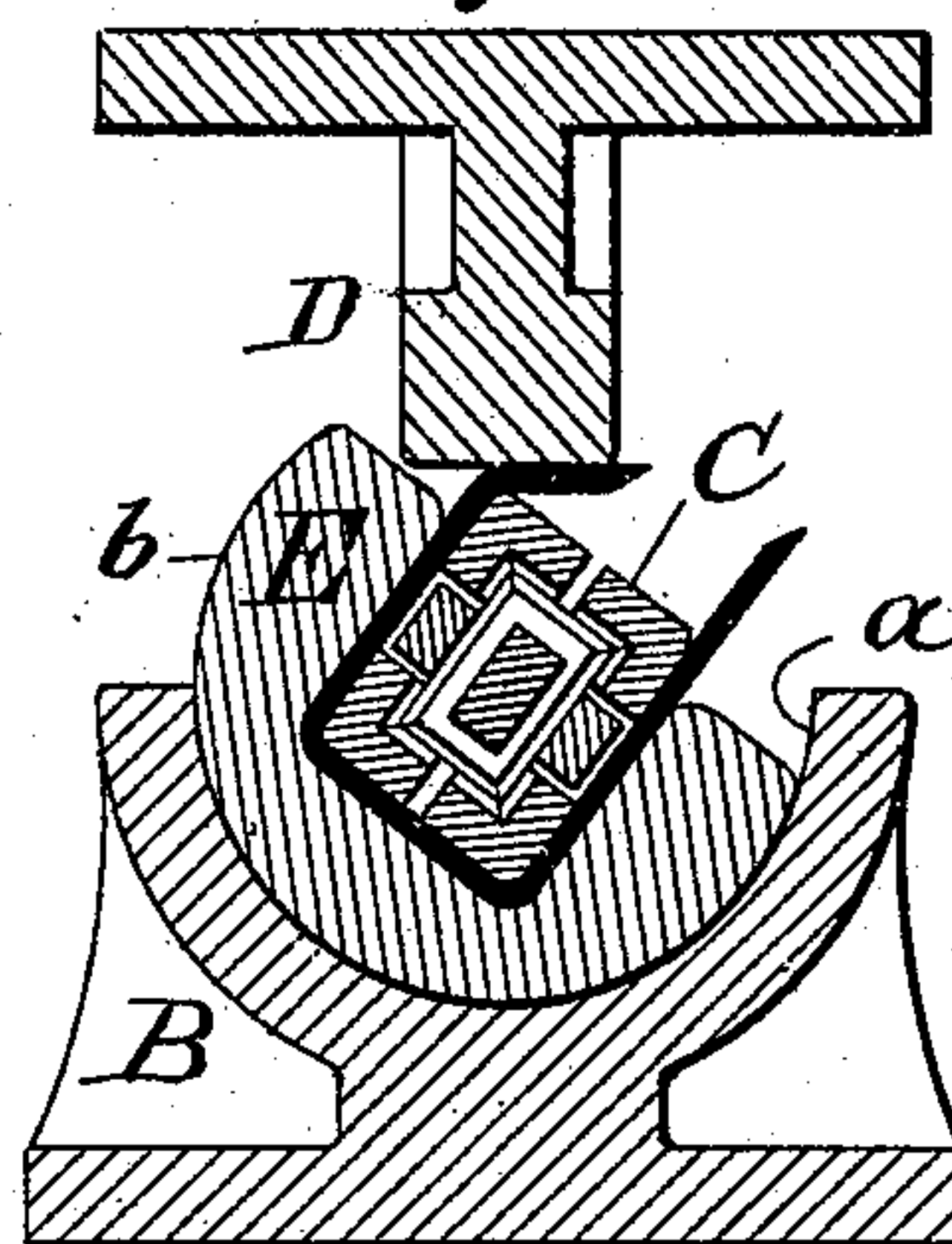


Fig. 8.

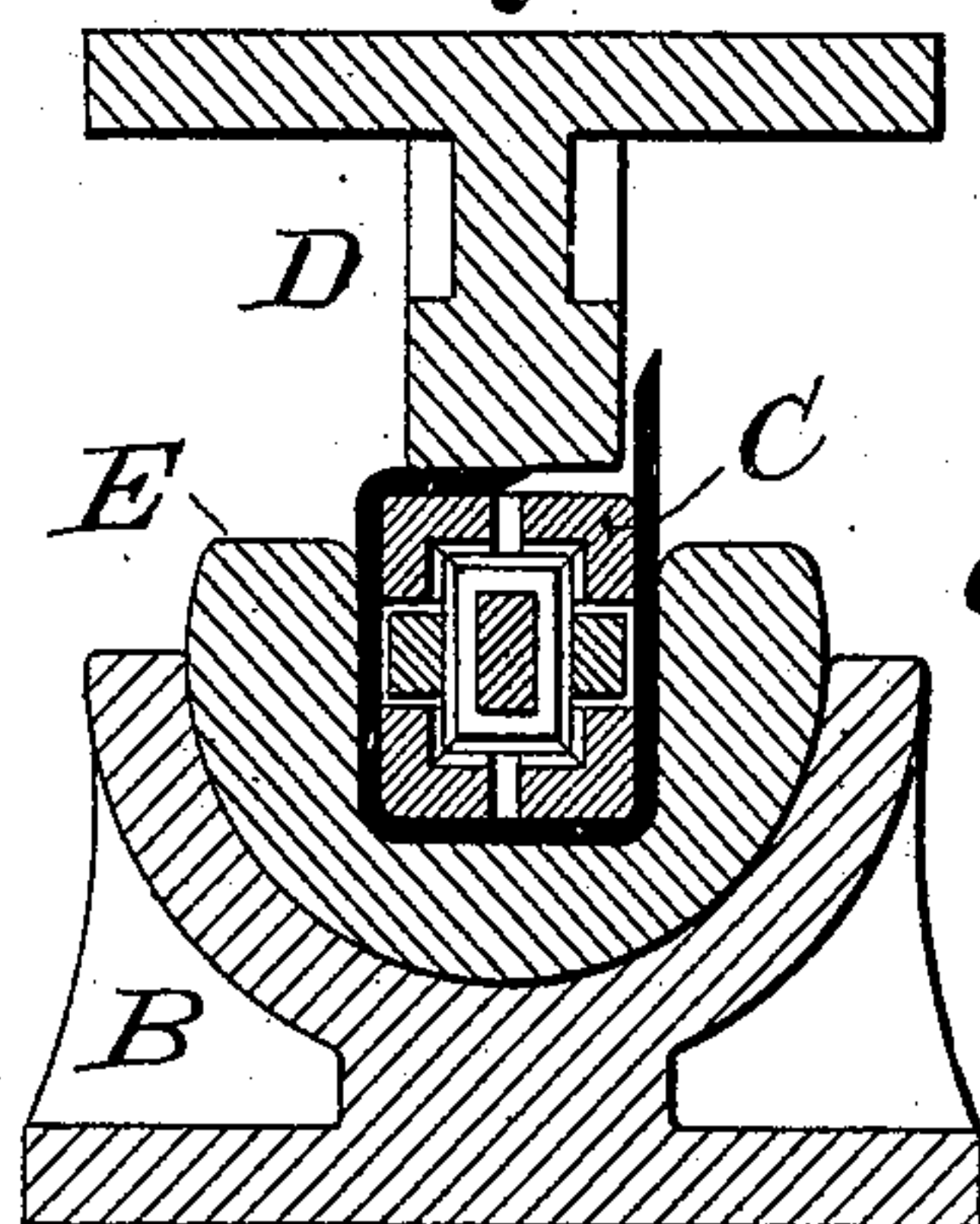


Fig. 9.

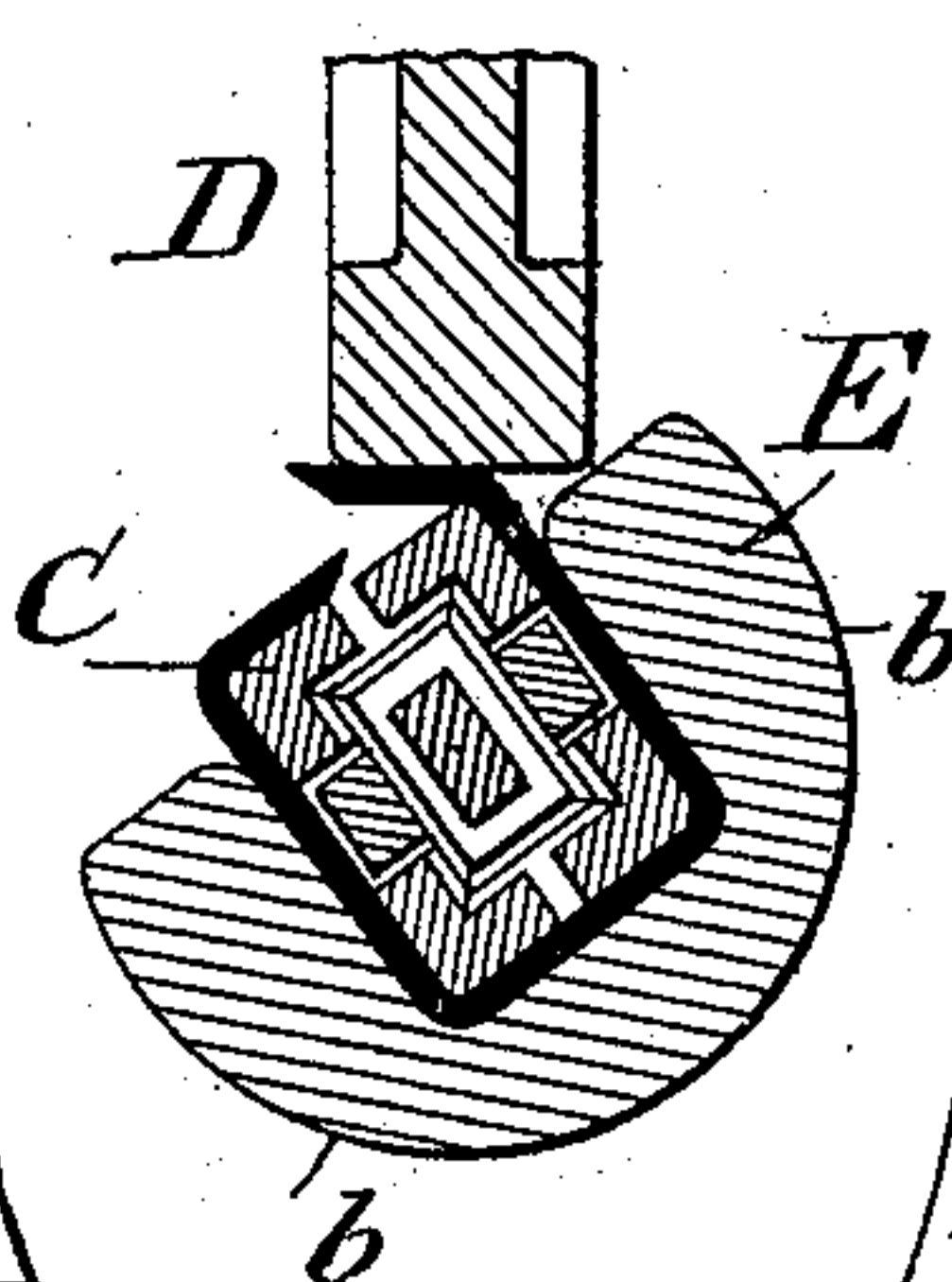


Fig. 10

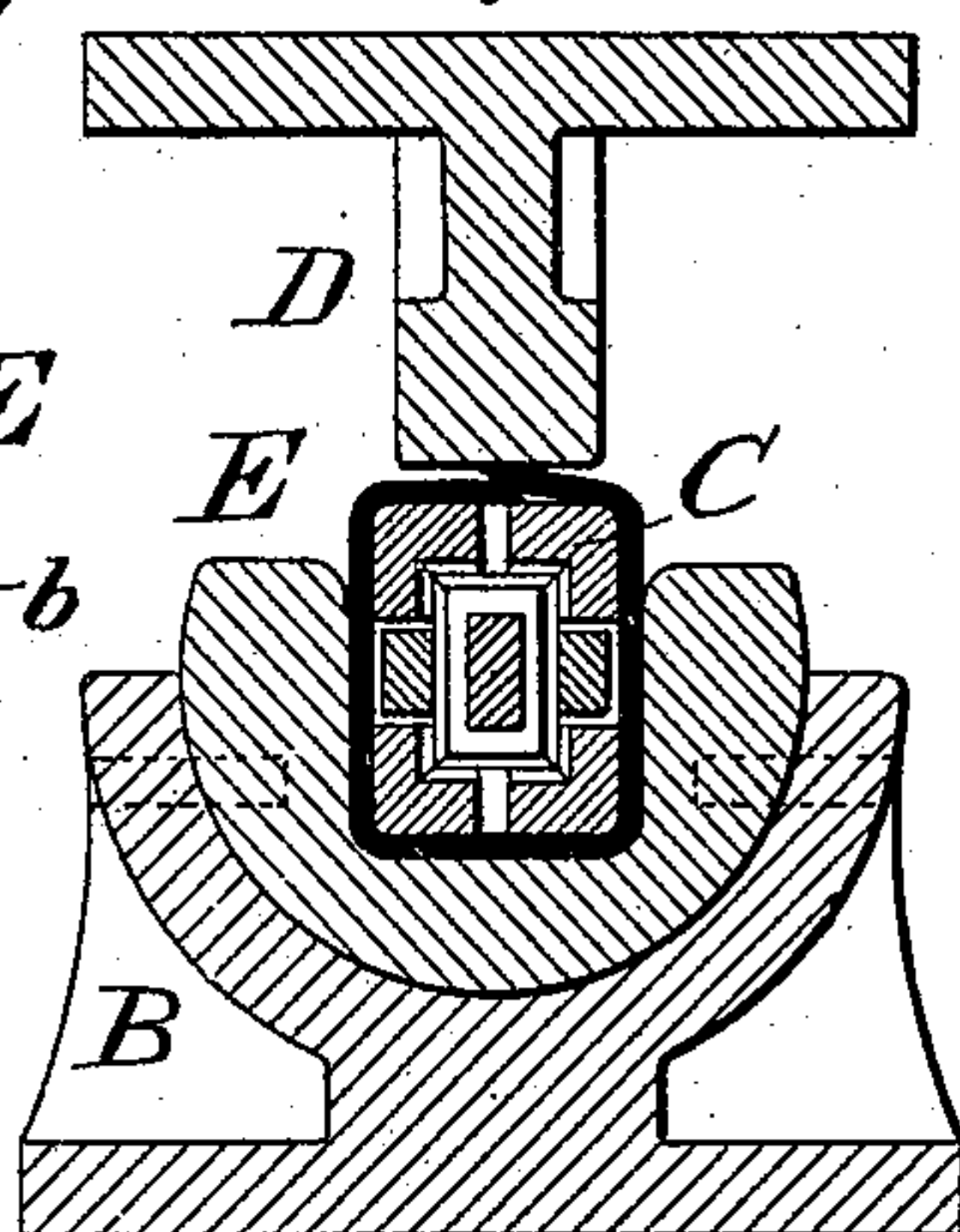


Fig. 11.

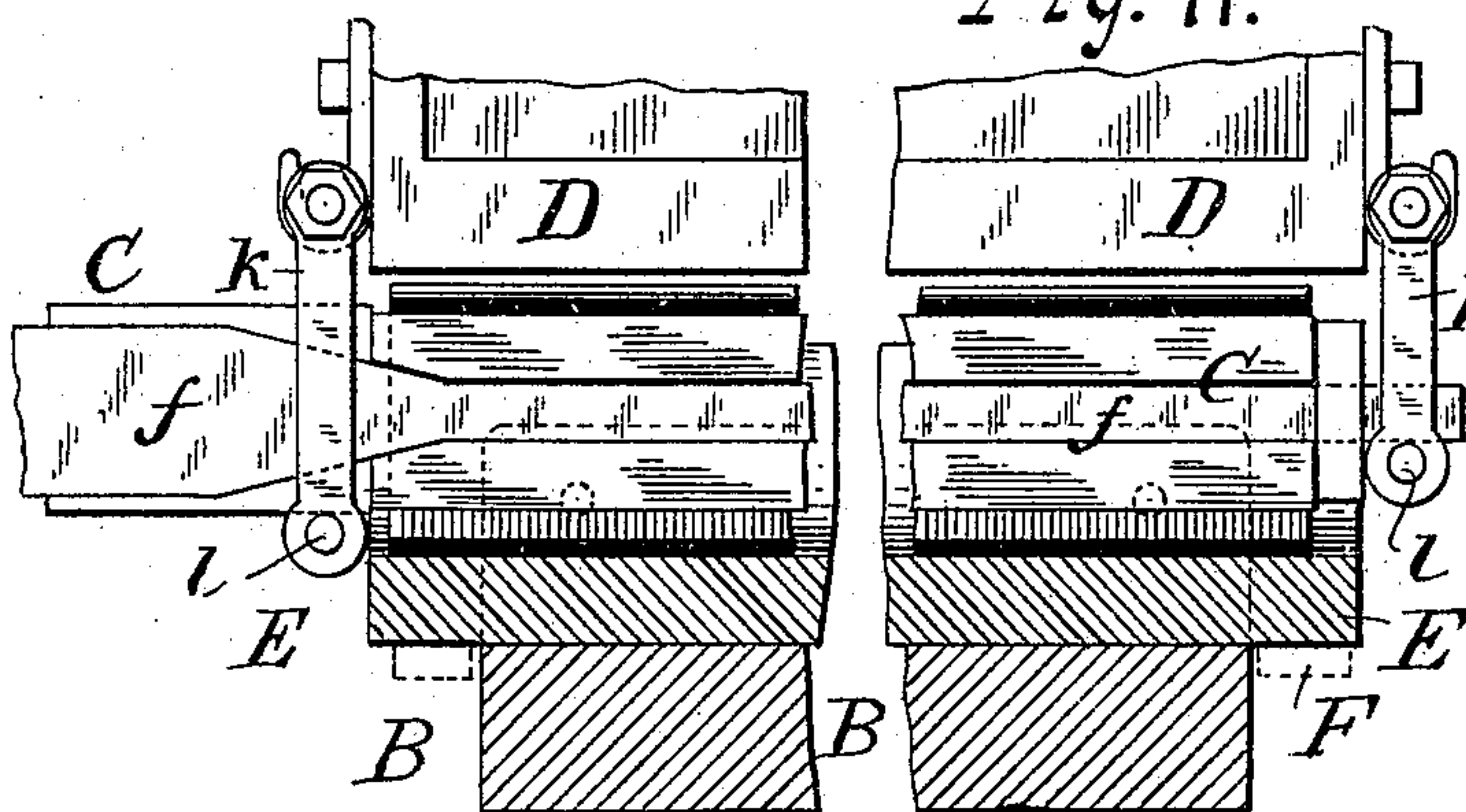
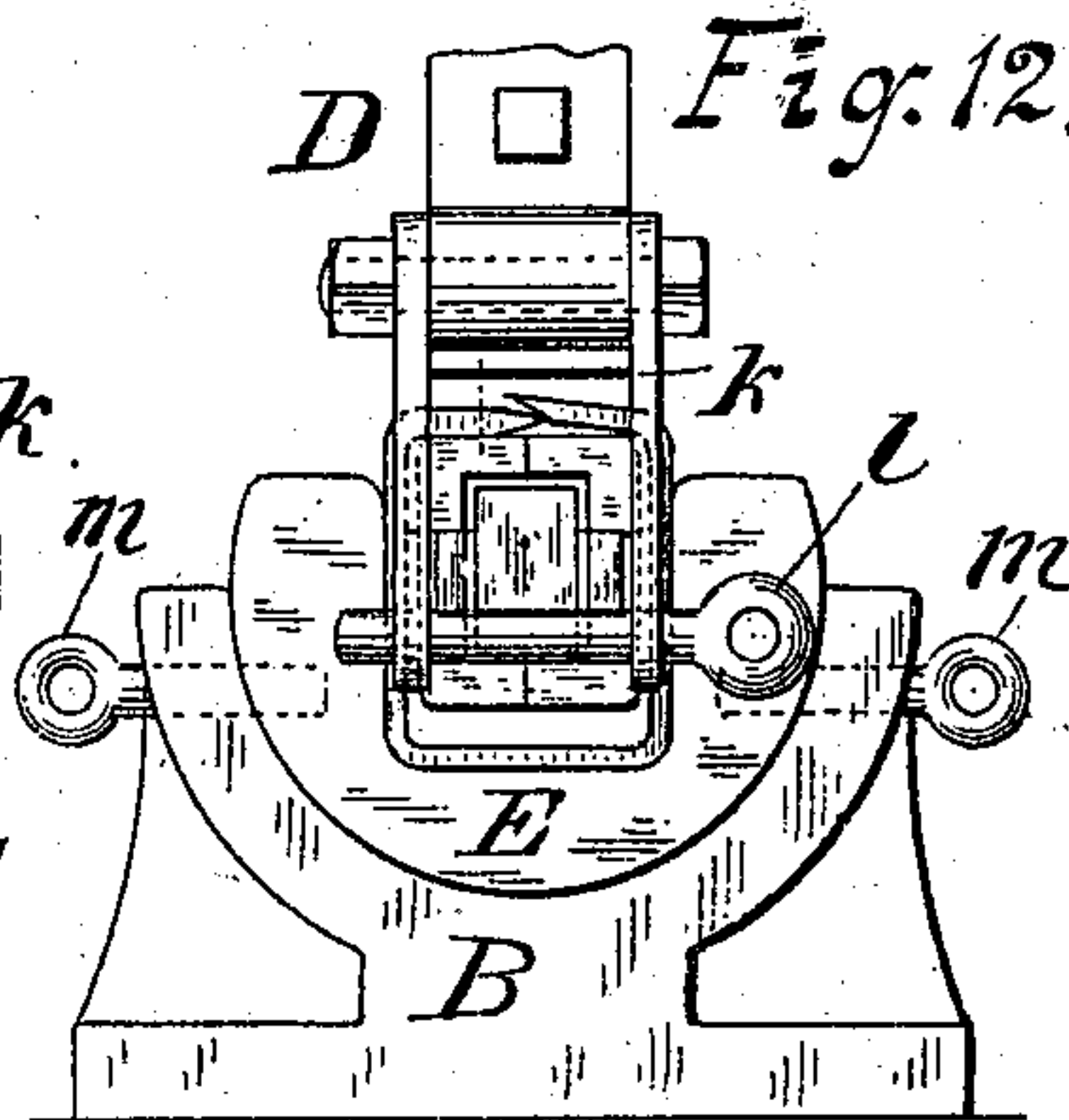


Fig. 12.



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UNITED STATES PATENT OFFICE.

CAMPBELL P. HIGGINS, OF NEW YORK, N. Y.

DIE FOR FORMING POLYGONAL TUBES.

SPECIFICATION forming part of Letters Patent No. 503,962, dated August 29, 1893.

Application filed July 5, 1892, Serial No. 439,061. (No model.)

To all whom it may concern:

Be it known that I, CAMPBELL P. HIGGINS, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Dies for Forming Polygonal Tubes, of which the following is a specification.

The invention relates to forming tubes of rectangular or other polygonal cross-section adapted for use as headers for sectional steam boilers or other purposes; and the object of my invention is to provide for folding all sides of the plate without removing it from the die, and to complete the folding operation by successive strokes of the press in a common direction.

The invention consists in a novel construction of die adapted to form and hold the work and operate at different angular positions to the line of compression, as hereinafter fully described and claimed.

Referring to the accompanying drawings, in which like letters of reference indicate like parts throughout the several views: Figure 1, is an end view partly in section, showing the folding die in operating position in a suitable press; Fig. 2, a side elevation of Fig. 1; Fig. 3, an enlarged cross-section of the die, and a suitable mandrel inserted therein, the position indicated being preparatory to the folding operation; and Fig. 4, a similar view showing the first folding operation. Fig. 5, shows a perspective view of the piece partially folded, as in Fig. 4. Fig. 6, is a cross-sectional view showing the preparatory position for the second folding operation; and Figs. 7, 8, 9, 10, illustrate the remaining steps of the operation hereinafter referred to. Fig. 11, is an enlarged side elevation partly in section showing the press and the devices for holding the mandrel in position; and Fig. 12, an end view of Fig. 11.

A, Figs. 1 and 2, represents the frame-work of a hydraulic or other suitable press adapted for operating the die.

E, is the folding die having a trough shaped interior corresponding to the exterior of the tube to be formed.

B, is the pillow block for supporting the die E, which is provided with a semi-cylindrical,

concave surface *a*, fitting the semi-cylindrical convex surface *b*, of the die E.

At different stages of the operation, the die E, is adapted to be tilted the one way or the other, at different angles to the line of compression, as represented in Figs. 4 to 10 inclusive, and in order to impart such motion any suitable mechanism may be employed. I illustrate a hand lever F, at one end of the press for the purpose. Moreover, in lieu of the semi-cylindric faces between the die E, and support B, suitable trunnions or other equivalents may be substituted to admit of the rotative movement of the die upon its axis substantially at right angles to the line of compression.

D, is the compressing die or head of the press.

C, is the mandrel, which during the working, corresponds in size to the interior size of the tube to be formed. The mandrel illustrated corresponds to one which I have more fully illustrated and claimed in a separate patent application filed simultaneously herewith, Serial No. 439,059. Such a mandrel may, however, to all purposes of my present invention, be composed of a solid bar.

The frame *f, f*, of the mandrel is supported in its proper position (indicated in Figs. 3, 11 and 12) preparatory to the insertion of the plate K, or during the withdrawal of the formed tube therefrom, by means of links *k*, and pins *l*, embracing the extremities thereof, suspended on the ends of the head D. By removal of the pins *l*, the tube may be withdrawn from the die, and mandrel. The pins *m*, which appear in Fig. 12, are designed to hold the die E, in place when the mandrel and tube are lifted therefrom.

In the operation of the invention, the plate K, which has been scarfed or beveled at its edges *s, s*, in the manner described in a separate patent application filed simultaneously herewith, or by other suitable means, is placed in the position upon the die E, shown in Fig. 1; the mandrel C, being suspended over it upon the upper die D. In this relation pressure is applied to the press, forcing the plate K into the die E, and producing the trough shape form, as shown in Fig. 4. The bottom

die E, is then rotated a part of a revolution to the angular position shown in Fig. 6, and one projecting edge of the plate turned over the top of the mandrel C, as at Fig. 7. The die is then leveled and the bent edge pressed down as at Fig. 8. The die E, is then rotated in the opposite direction and the other projecting edge of the plate folded over as at Fig. 9, and the die being again brought into a level position as at Fig. 10, the two edges are squeezed down together, thus forming on the mandrel C, a tube of rectangular cross-section, with the two edges of the plate lapped in position for welding. The die E, when brought to the position shown in Fig. 6, and during the compression of the press may, if desired, be rotated toward its horizontal position simultaneously with the compression movement of the press, so that the edge of the plate is brought from the position in Fig. 6, to the position in Fig. 8, by a continuous motion. Automatic connection may for this

purpose be provided for imparting to the die E, such rotary movement from the movable head of the press.

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

The combination in a press for forming rectangular or other polygonal tubes from a single plate, of a trough shape die corresponding to the exterior of the tube to be formed, having a convex surface fitting into a concave seat or support, a reciprocating compression die or plunger for forcing the plate within the forming die, a mandrel arranged within the trough shaped tube and die, and means for oscillating the forming die into different angular positions to the line of compression.

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Witnesses:

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