

(No Model.)

3 Sheets—Sheet 1.

F. BAILLEY.  
FITTING COMMUTATOR BARS.

No. 400,994.

Patented Apr. 9, 1889.

Figure 1

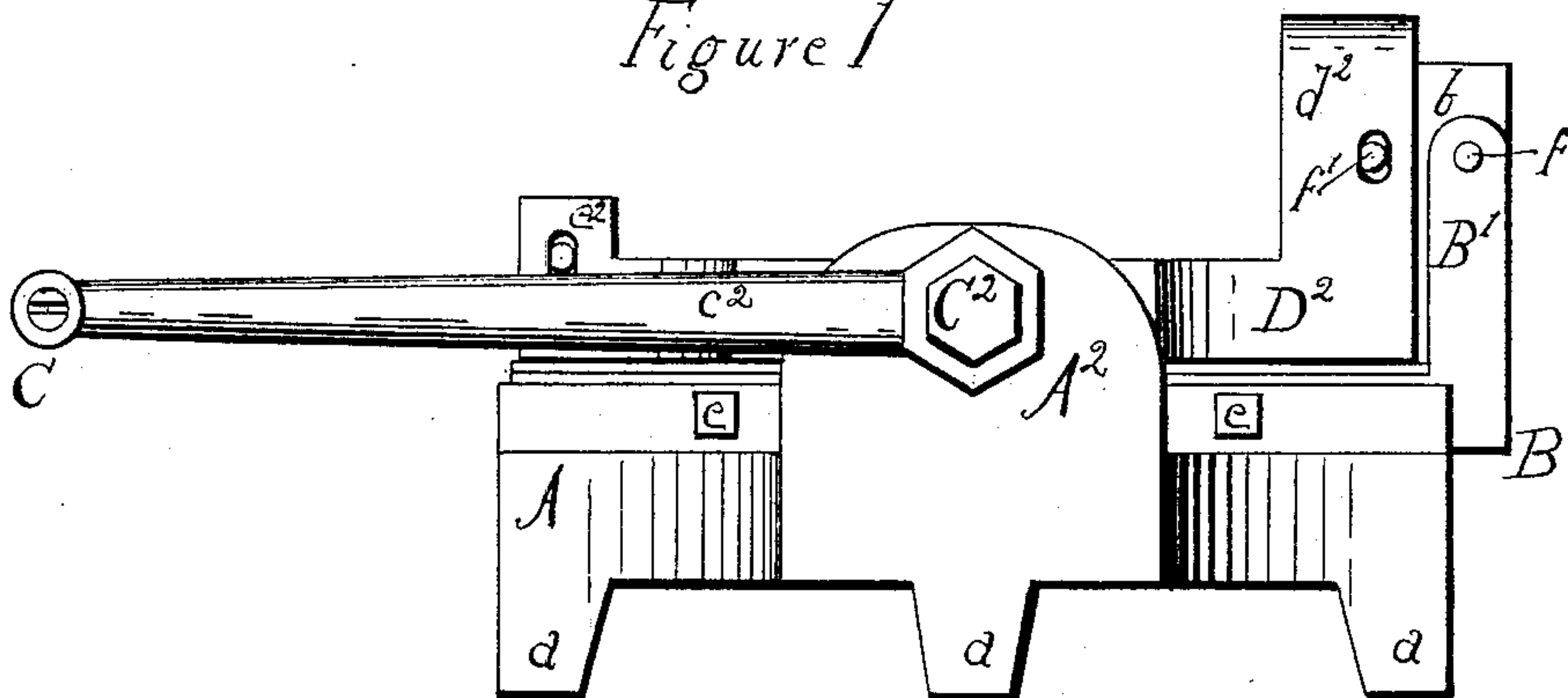


Fig. 2.

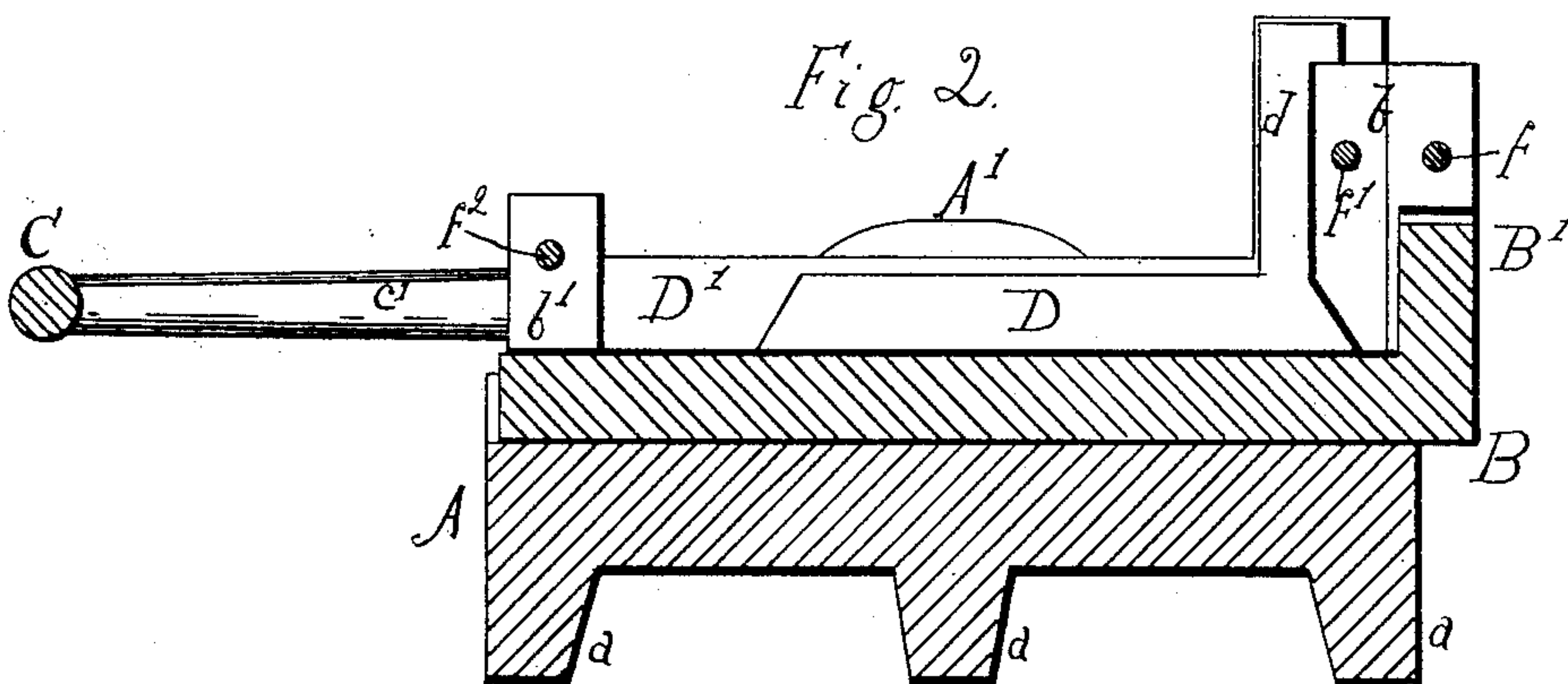
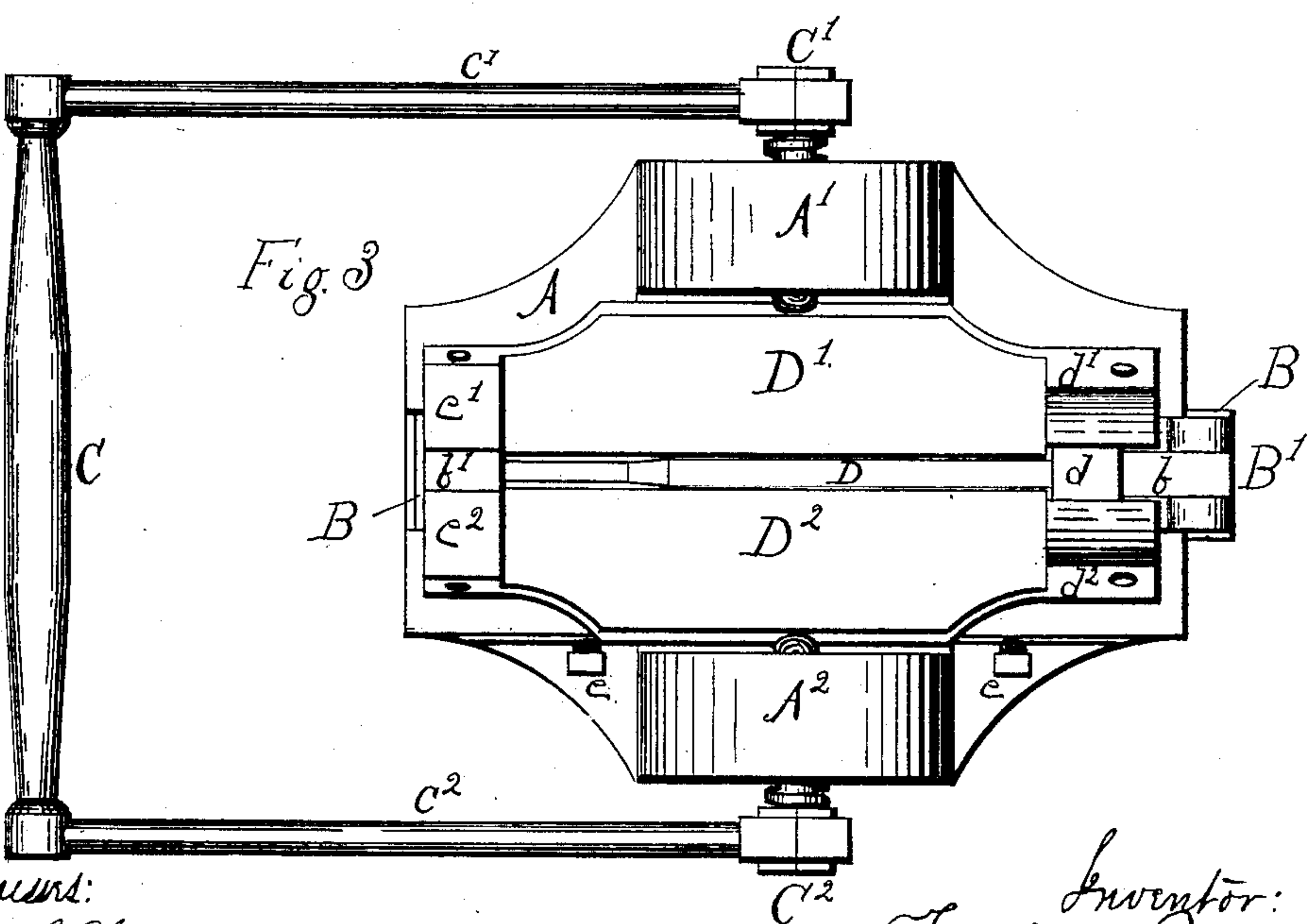



Fig. 3



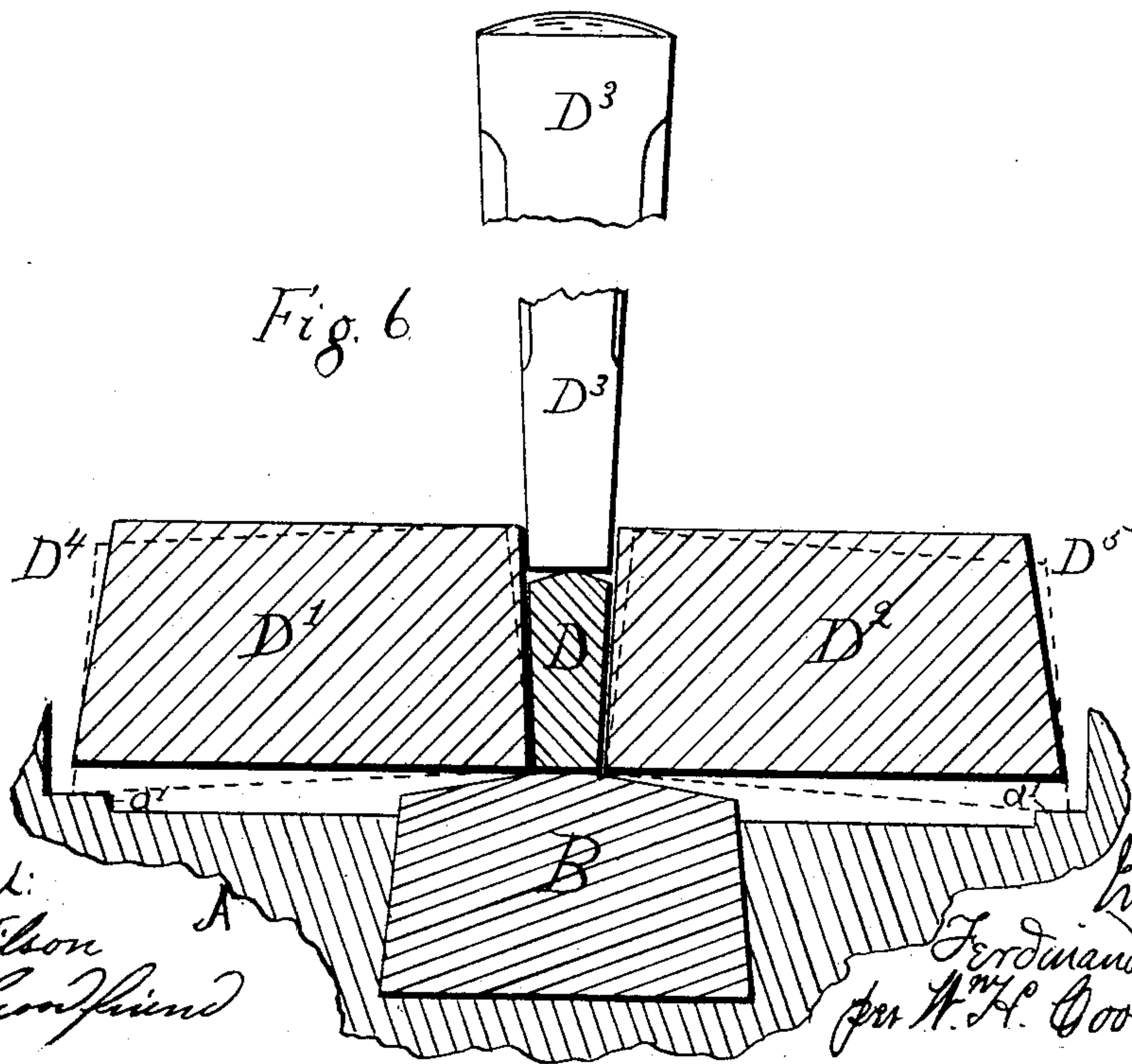
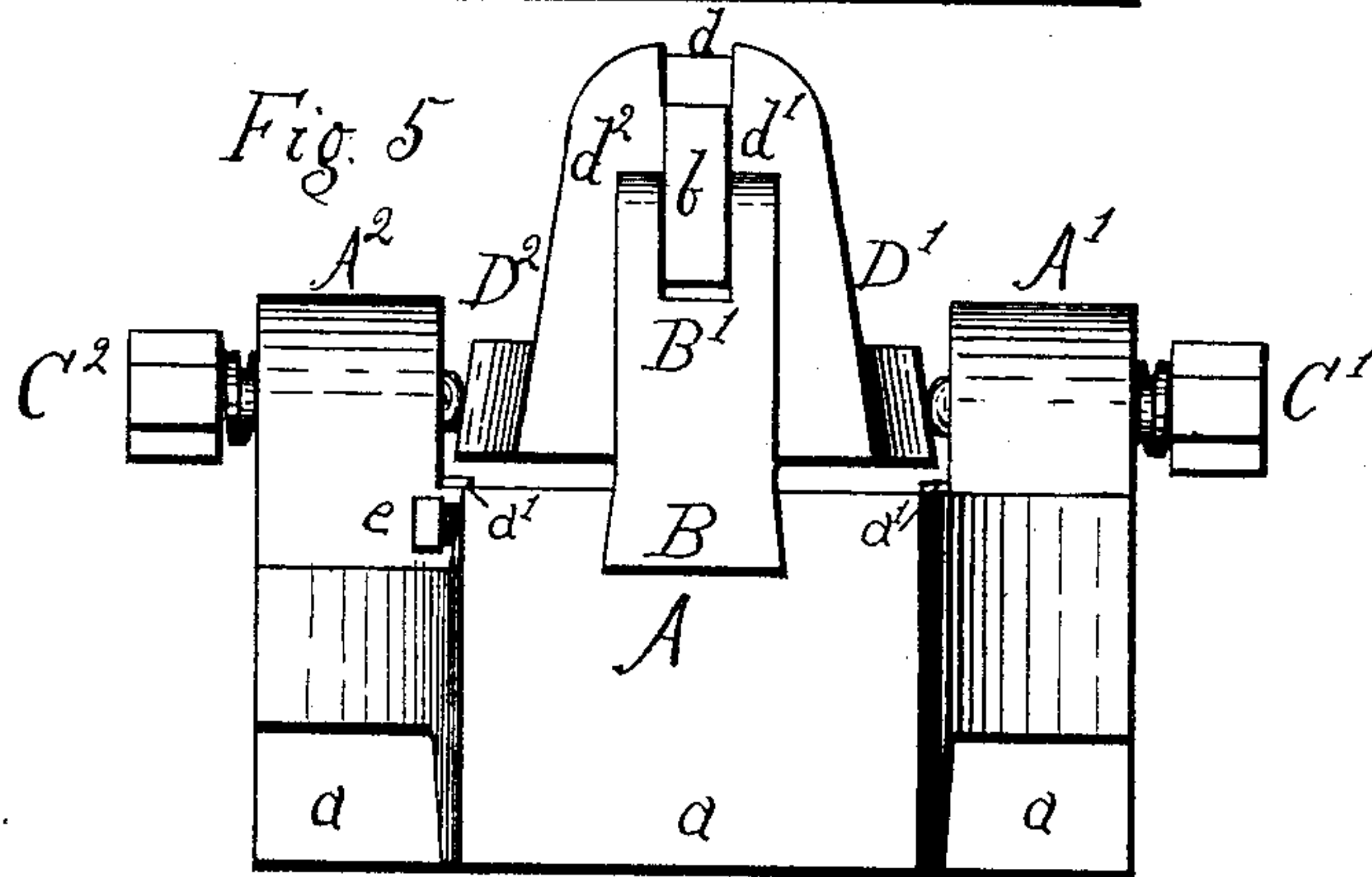
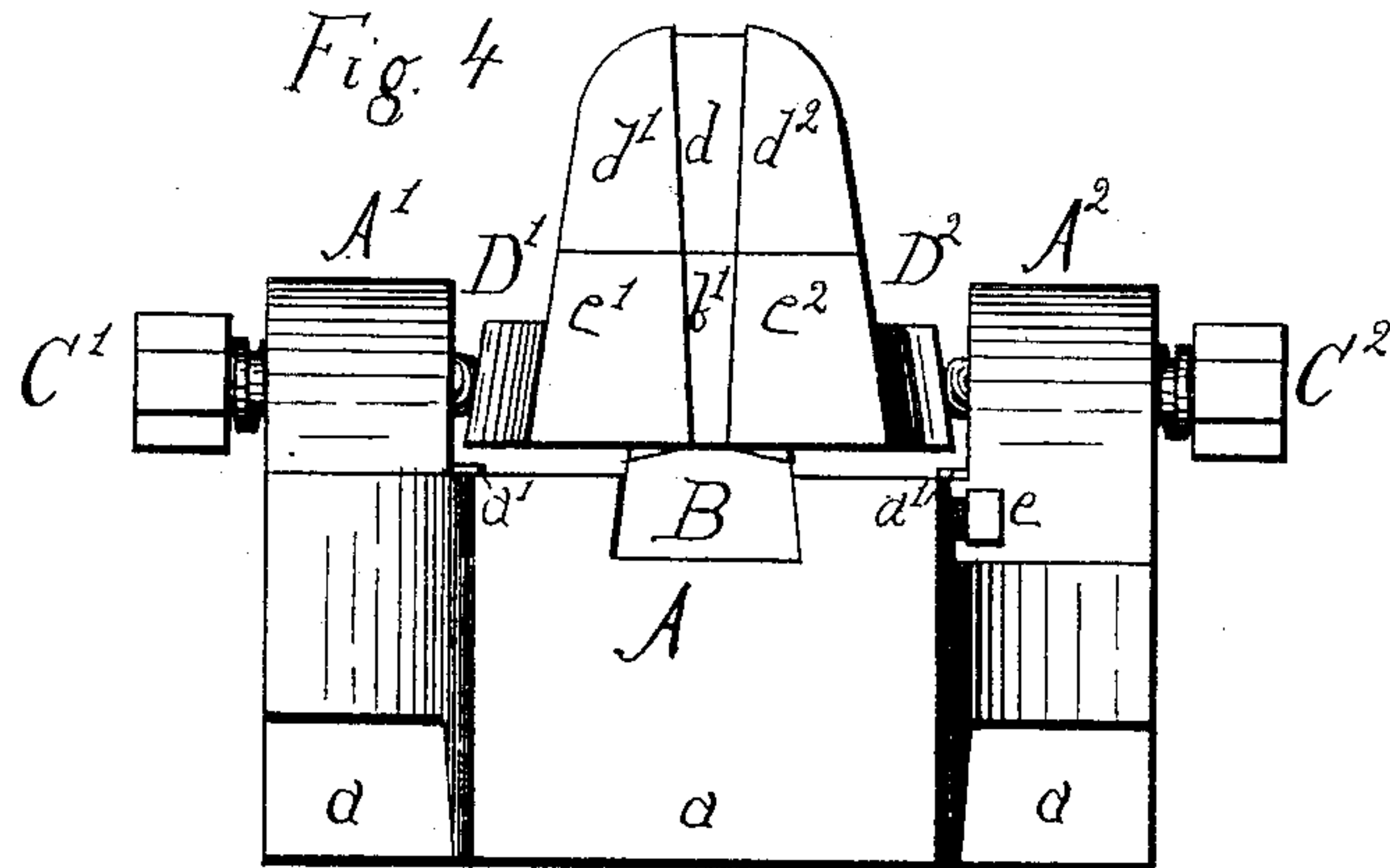
Witness:  
Geo Wilson  
Felix Goodfriend

 C<sup>12</sup> Inventor:  
Ferdinand Bailey  
per W. H. Cooley Atty.

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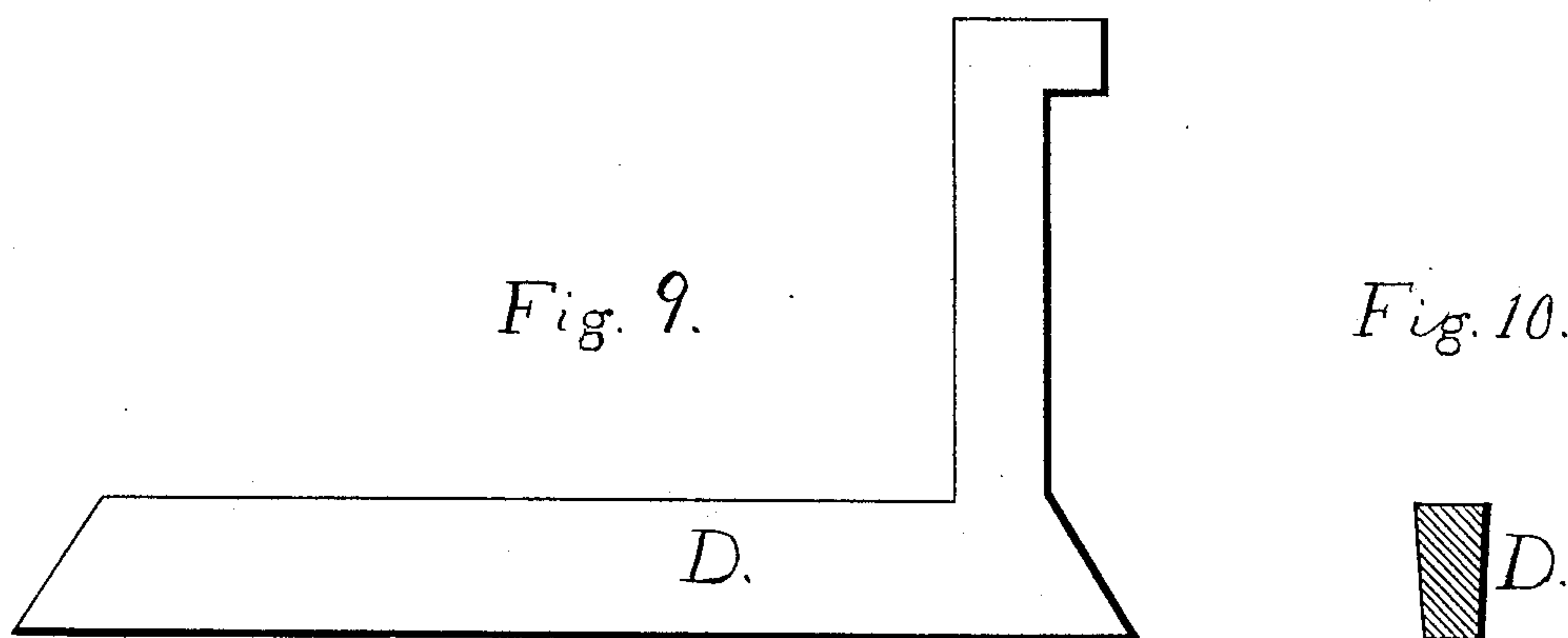
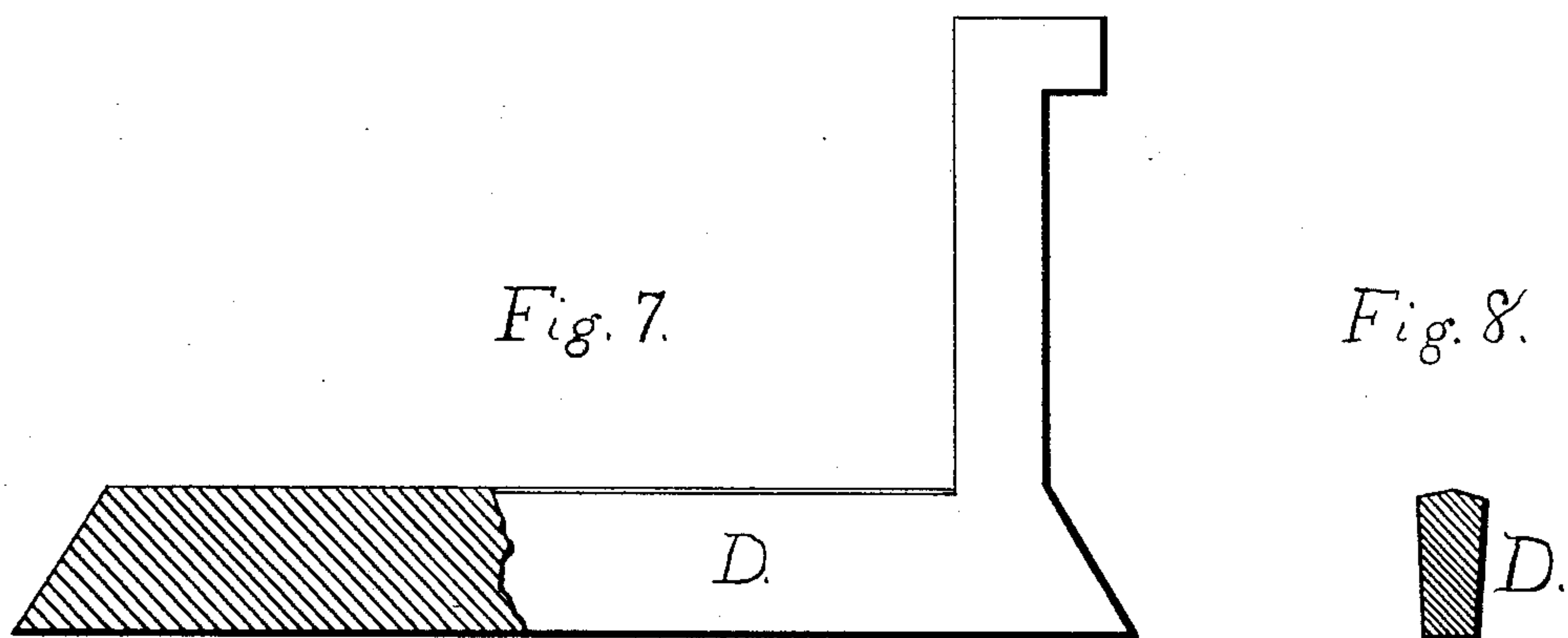
(No Model.)

3 Sheets—Sheet 3.

F. BAILLEY.  
FITTING COMMUTATOR BARS.

No. 400,994.

Patented Apr. 9, 1889.



Witnesses:

B. Frank Cooley.  
Aron Miller

Inventor:

Ferdinand Bailey  
per W. H. Cooley Atty.



# UNITED STATES PATENT OFFICE.

FERDINANT BAILLEY, OF SCHENECTADY, NEW YORK.

## FITTING COMMUTATOR-BARS.

SPECIFICATION forming part of Letters Patent No. 400,994, dated April 9, 1889.

Application filed May 24, 1888. Serial No. 274,933. (No model.)

*To all whom it may concern:*

Be it known that I, FERDINANT BAILLEY, a citizen of the United States, residing at Schenectady, in the county of Schenectady and State of New York, have invented a new and useful improvement in the art of fitting commutator-bars of copper or other similar material for commutators of electrical generators and motors, of which the following is a specification.

The object of my invention is to do away with the tedious process of fitting such commutator-bars so that they shall exactly fit the division-spaces therefor in the commutators to such machines.

With this object in view my invention consists in swaging such bars of copper (as are ordinarily supplied to the trade drop-forged and of approximate form) in hardened-steel molds of the exact form required. I have found that there are no molds yet constructed suitable for carrying out this process of swaging, and have therefore devised such molds. In carrying out my process or method I have found it essential that the molds for swaging the bars in be constructed in separable portions, so that the finished bars can be removed therefrom. For this reason I have found that movable jaws operated by screws or cams and resting upon a common bed-piece and separated by angle-pieces of the exact cross-section it is desired to give the finished bars serve the best purpose.

By my process one man is enabled to perform the work of several working by the old process of fitting with the file. Furthermore, another great advantage results from the employment of my process, in that the bearing or wearing surface of such commutator-bars is greatly increased in durability and hardness.

The accompanying drawings illustrate a machine or device designed to be used in carrying out my invention. This machine, which is also a part of my present invention, consists in jaws forming part of a mold adjustable in size and angles, in which the commutator-bars may be swaged to proper form.

The accompanying drawings, illustrating this machine, are as follows: Figure 1 is a side view of the machine. Fig. 2 is a vertical lon-

gitudinal section; Fig. 3, a top or plan view. Figs. 4 and 5 are left and right hand end views, respectively, with the wrenches  $c'$  and  $c^2$  and their connecting hand-piece C removed. Fig. 6 illustrates in enlarged view a transverse section of jaws  $D'$  and  $D^2$ , bed-piece B, body-piece A, and a commutator-bar, D, between such jaws, taken at or near the center. In this figure there is also illustrated the manner in which such swaging is effected. Fig. 6 is drawn practically to a working scale full size, while Figs. 1 to 5, inclusive, are drawn to a reduced scale. Fig. 7 shows in side view one of such commutator-bars D as are ordinarily supplied to the trade before treatment by my process. The left-hand portion of the body of the bar in this figure is shown in vertical longitudinal section. In Fig. 8 there is shown a vertical transverse section of the body of such bar before treatment. Figs. 9 and 10 show, respectively, a side view and a vertical transverse sectional view of one of such commutator-bars D after treatment by my process. The change in conformation resulting from treatment by my process is oftentimes but slight, yet sufficient to cause them to fit. The whole force exerted in fitting by such process being directed upon the upper edge or bearing-surface of the body of such commutator-bars by means of hammer-blows directed upon the swaging-tool  $D^3$  (seen in Fig. 6) resting thereon, thus hardens and increases the durability of the same.

Similar letters refer to similar parts throughout the several figures.

Referring to the drawings, my machine consists in a substantial body-piece, A, of cast-iron, resting upon the foot-pieces  $a$ , cast integral therewith; and also cast integral with this body-piece A are seen the two heavy up-rights  $A'$  and  $A^2$ , threaded through which are seen the screw-bolts, respectively,  $C'$  and  $C^2$ , operated, respectively, by the wrenches  $c'$  and  $c^2$ , connected at their outer ends, in the manner indicated, by the hand-piece C. These screw-bolts  $C'$  and  $C^2$  are right and left handed, whereby, by means of handle C, which may be moved so as to turn these bolts  $C'$  and  $C^2$  something over half a revolution, these bolts may be caused to approach toward or recede from each other.



Fitting in a dovetailed groove therefor in the body-piece A is seen the hardened steel bed-piece B, having the mortised upright B' at its right-hand end. The upper surface of this bed-piece B is beveled off, as seen, so as to leave a level surface thereon running lengthwise thereof and of a width practically equal to or slightly in excess of that of the narrower edge of the largest commutator-bars which the machine is intended to receive. Resting upon this bed-piece B, and with their inner lower edges just resting on this level surface thereon, are seen the two jaws D' and D<sup>2</sup>. The screw-bolts C' and C<sup>2</sup> bear against the outer edges of these jaws D' and D<sup>2</sup>, respectively; and it is by means of these screw-bolts, operated in the manner indicated and described, that these jaws D' and D<sup>2</sup> are firmly pressed and held together against the steel angle-pieces b and b', which are firmly clamped between such jaws. Angle-piece b, as seen in Figs. 1, 3, and 5, has its right-hand portion of uniform thickness located in the mortise at the upper end of the vertical extension B' of the bed-piece B, and articulates upon a pin or bolt, f, passing therethrough and also through the upper end of this vertical extension B' on bed-piece B. The left-hand portion of this angle-piece b, or, rather, that portion thereof coming between the jaws D' and D<sup>2</sup> and the upward extensions thereon, respectively, d' and d<sup>2</sup>, is tapered in thickness from its upper end downward to the exact taper and thickness that it is desired to give to the finished commutator-bars. Through this tapered portion of the angle-piece b and through its upper end there passes, as seen, the round rod or pin f', fixed in such angle-piece b, but working freely in the holes therefor in the vertical extensions d' and d<sup>2</sup>, respectively, on jaws D' and D<sup>2</sup>. The holes in these vertical extensions d' and d<sup>2</sup> are elongated vertically, so as to permit the jaws D' and D<sup>2</sup> to tip or rock laterally without disturbing their longitudinal alignment. In the same manner also angle-piece b', clamped between the extensions e' and e<sup>2</sup>, respectively, on jaws D' and D<sup>2</sup>, is tapered in thickness from its upper end downward to the exact taper and thickness which it is desired to give to the finished commutator-bars, and has fixed therein the small rod or pin f<sup>2</sup>, also working freely in the vertically-elongated holes therefor in the extensions e' and e<sup>2</sup>, respectively, on jaws D' and D<sup>2</sup>. As seen in Fig. 2, the lower end of the angle-piece b at its lower left-hand corner is beveled off so as to fit the angle at the end of a commutator-bar D, as shown in my machine, in a position to be operated upon in Figs. 2 to 6, inclusive. This angle-piece b has its lower end resting on the level portion of the upper surface of the bed-piece B, and extends upward to such a height that its upper end shall just come under the shoulder or offset formed on the outer extension, d, formed on the commutator-bars D.

In order that the screw-bolts C' and C<sup>2</sup> may

bear, respectively, against the jaws D' and D<sup>2</sup> at points nearly opposite the center of the work between such jaws, the bed-piece B, carrying with it the jaws D' and D<sup>2</sup>, all connected together in the manner described, is capable of longitudinal adjustment in the body-piece A, sliding in the dovetailed groove therein, as described, and secured in any desired position therein by means of the set-screws e e.

It will of course be understood that for each different size or taper that it is desired to give to the finished commutator-bars there must be a corresponding set of angle-pieces, b and b', fitted. These are the only parts of my machine that have to be changed in working different sizes and tapers of commutator-bars.

Referring to Figs. 1, 2, and 3, the hand-piece C is removable from the wrenches c' and c<sup>2</sup> by means of set-screws, one only of which is seen in Fig. 1, whereby either of the wrenches c' and c<sup>2</sup> may be removed and any desired adjustment given to the screw-bolts C' and C<sup>2</sup>.

The operation of this machine and the method of its use are briefly as follows: First, proper angle-pieces, b and b', fitted for the work to be done, are inserted in place. Next the screw-bolts C' and C<sup>2</sup> are so adjusted that when the wrenches c' and c<sup>2</sup>, with the hand-piece C, occupy the position indicated in Figs. 1, 2, and 3 the jaws D' and D<sup>2</sup> shall be firmly screwed together against the angle-pieces b and b'. Then into the space between such jaws there is dropped or inserted a commutator-bar, D, as seen in Figs. 2, 3, 4, 5, and 6. This commutator-bar D is also moved to the right against the angle-piece b, as indicated in Fig. 2. Then, as indicated in Fig. 6 in enlarged view, any suitably-formed upsetting or calking tool, such as D<sup>3</sup>, is inserted between the jaws and upon the bar D. By properly hammering upon this tool D<sup>3</sup> the commutator-bar D is swaged to the exact form or taper and thickness given to the space between the jaws D' and D<sup>2</sup>. After a commutator-bar has been swaged, to remove it from the machine the hand-piece C is turned over to the right, so as to unscrew or withdraw the screw-bolts C' and C<sup>2</sup>, and thus allow the jaws D' and D<sup>2</sup> to rock or tip, so that their outer lower edges shall rest upon ledges a a, formed therefor on body-piece A. This position of the jaws is indicated in Fig. 6 in dotted lines D<sup>4</sup> and D<sup>5</sup>. Thus it will be seen that the jaws D' and D<sup>2</sup> are opened, so as to admit of the ready removal therefrom of the commutator-bars after being swaged. To more readily admit of this rocking motion of the jaws D' and D<sup>2</sup>, and that, too, without too great a movement of the screw-bolts C' and C<sup>2</sup>, the outer edges of these jaws D' and D<sup>2</sup> are beveled, as indicated, and this beveling of the outer edges also serves to keep the inner edges of the jaws D' and D<sup>2</sup> firmly down in bed-piece B. It will very readily be seen that all the bars thus treated must acquire a uniform thick-



ness and taper, so that they shall exactly fit the division-spaces therefor in the commutator for which they are intended. It will also be readily understood that this uniform thickness and taper will be given to such commutator-bars within reasonable limits, whether they are first formed too thick or too thin.

I desire to call attention to the fact that in this process of swaging a greatly-increased durability of wearing-surface is given to the commutator-bars thus treated.

I do not here limit myself in carrying out my invention to the particular style and form of machine herein shown and described, as very obviously different styles and forms of machines or molds may be made and used within the scope of my invention.

I hereby reserve the right to make the mechanism or machine herein described the subject of another separate application.

I claim—

That improvement in the art of finishing commutator-bars that have already been formed approximately, whether by the action of a drop-press or any other means producing substantially similar results, which consists in placing the blanks in a die the bottom and sides of which are constructed of the exact shape and dimensions which the finished bar is to have, and then hammering the upper exposed edge of the bar to reduce said bar to the right breadth, and at the same time to straighten the bar and also secure a hardened surface on the edge (so hammered) of the bar, substantially as described.

FERDINANT BAILLEY.

Witnesses:

T. H. KELLY,  
B. F. ENNIS.