

(No Model.)

4 Sheets—Sheet 1.

B. TOPMILLER.

CUT-OFF VALVE.

No. 305,548.

Patented Sept. 23, 1884.

Fig. 1.

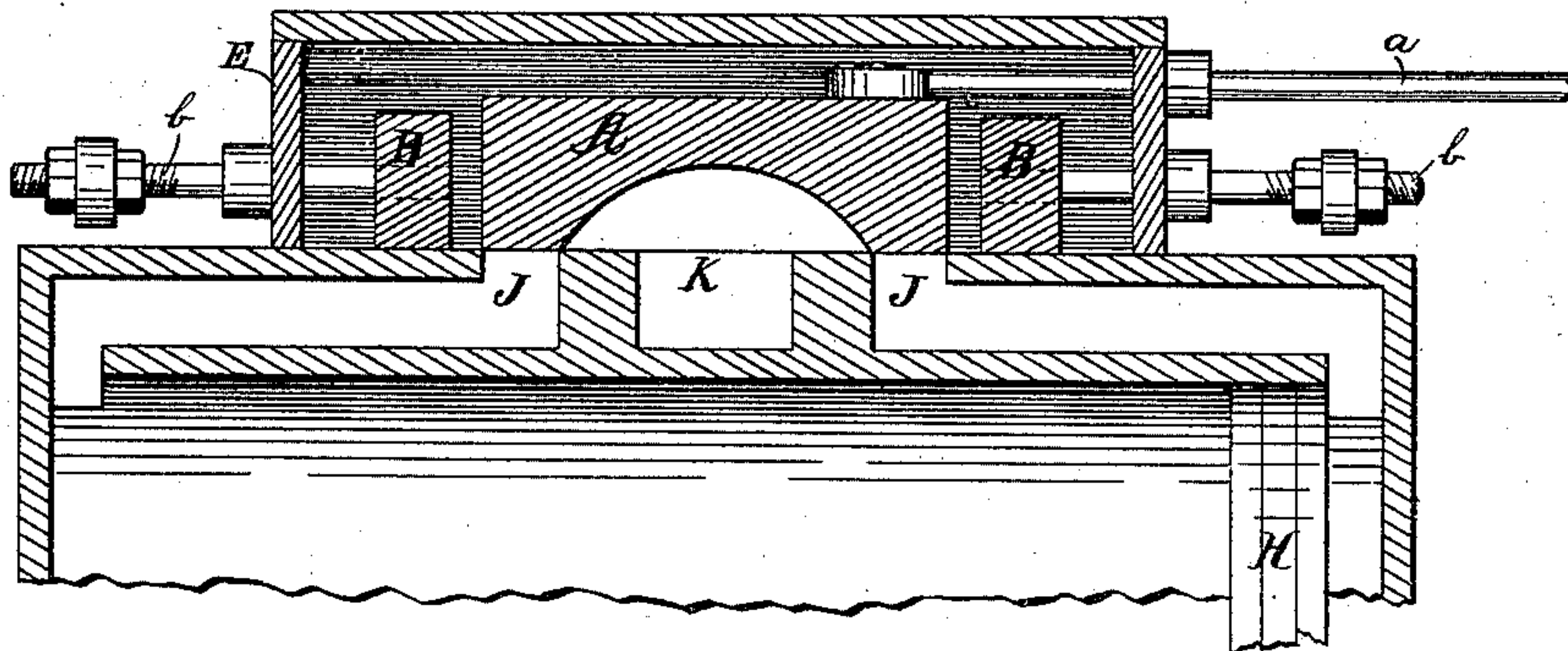
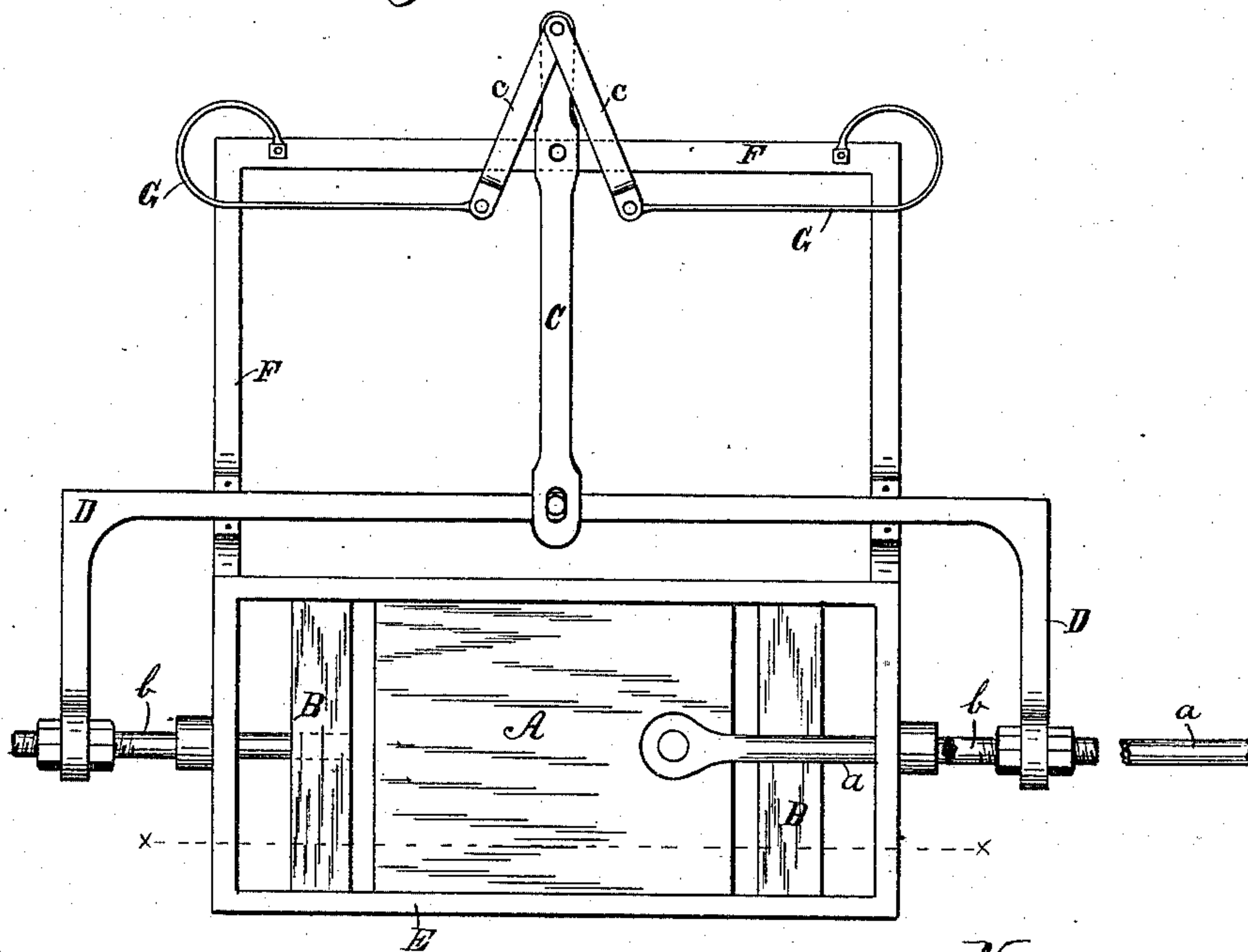


Fig. 2.



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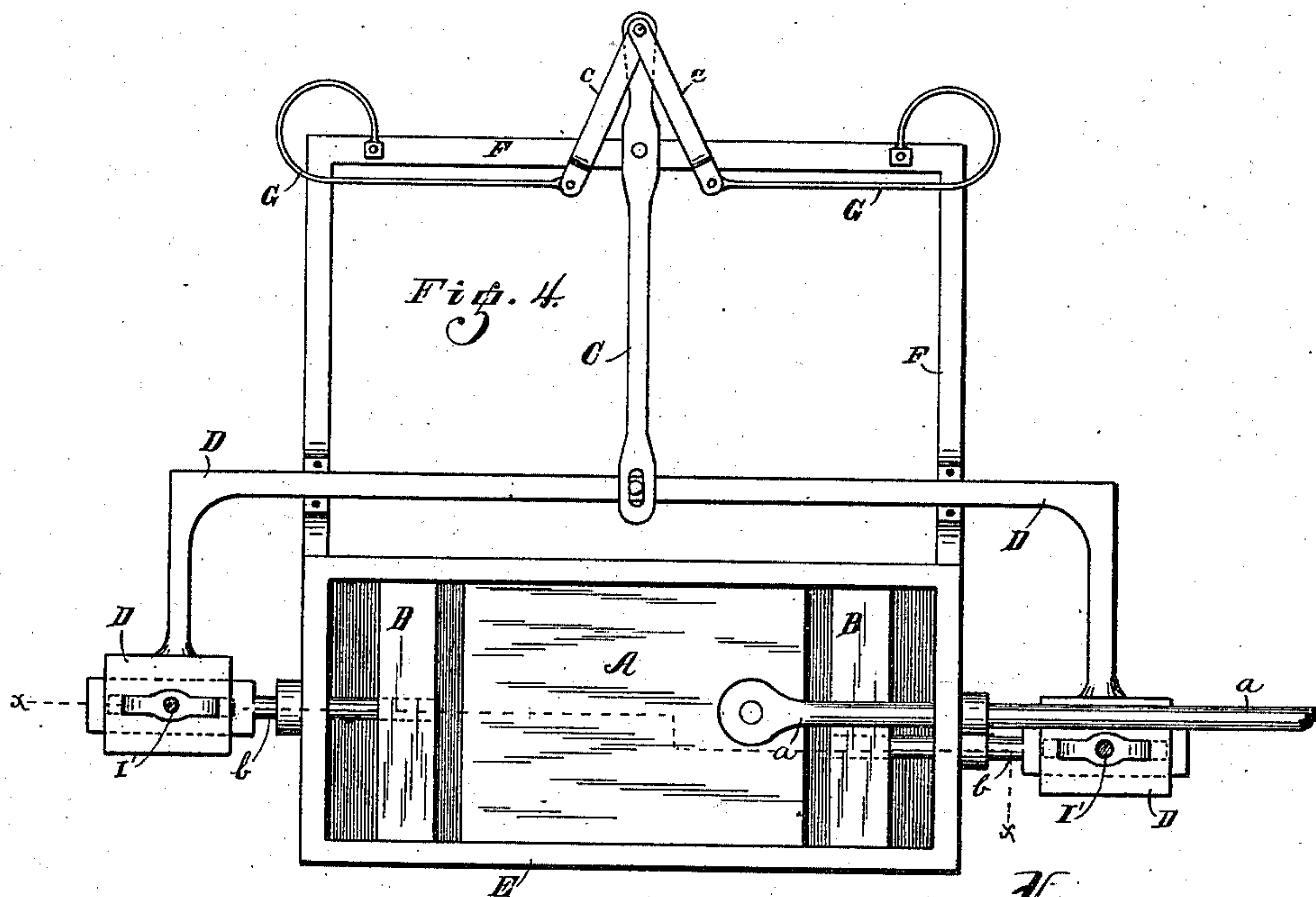
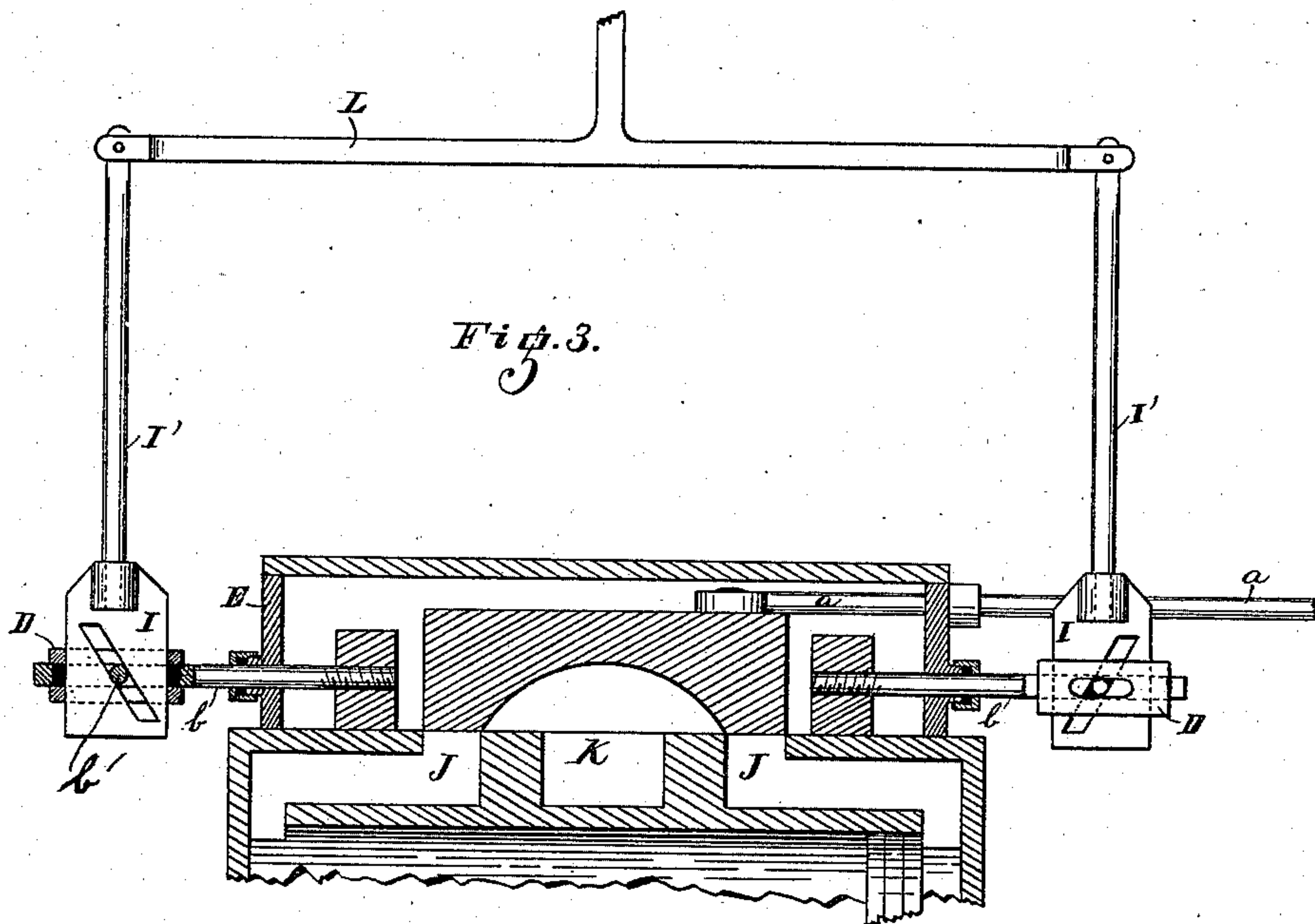
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Fig. 5.

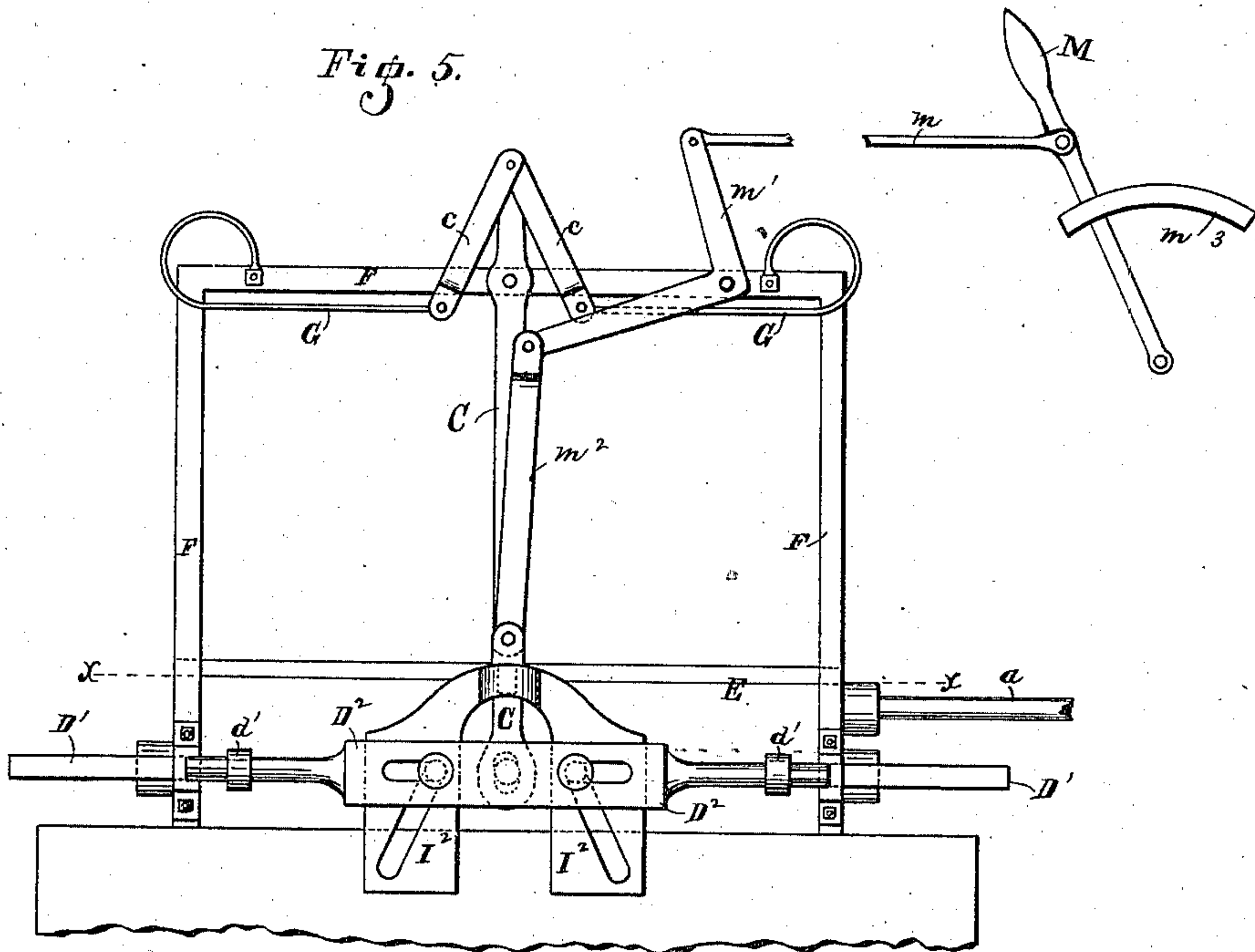
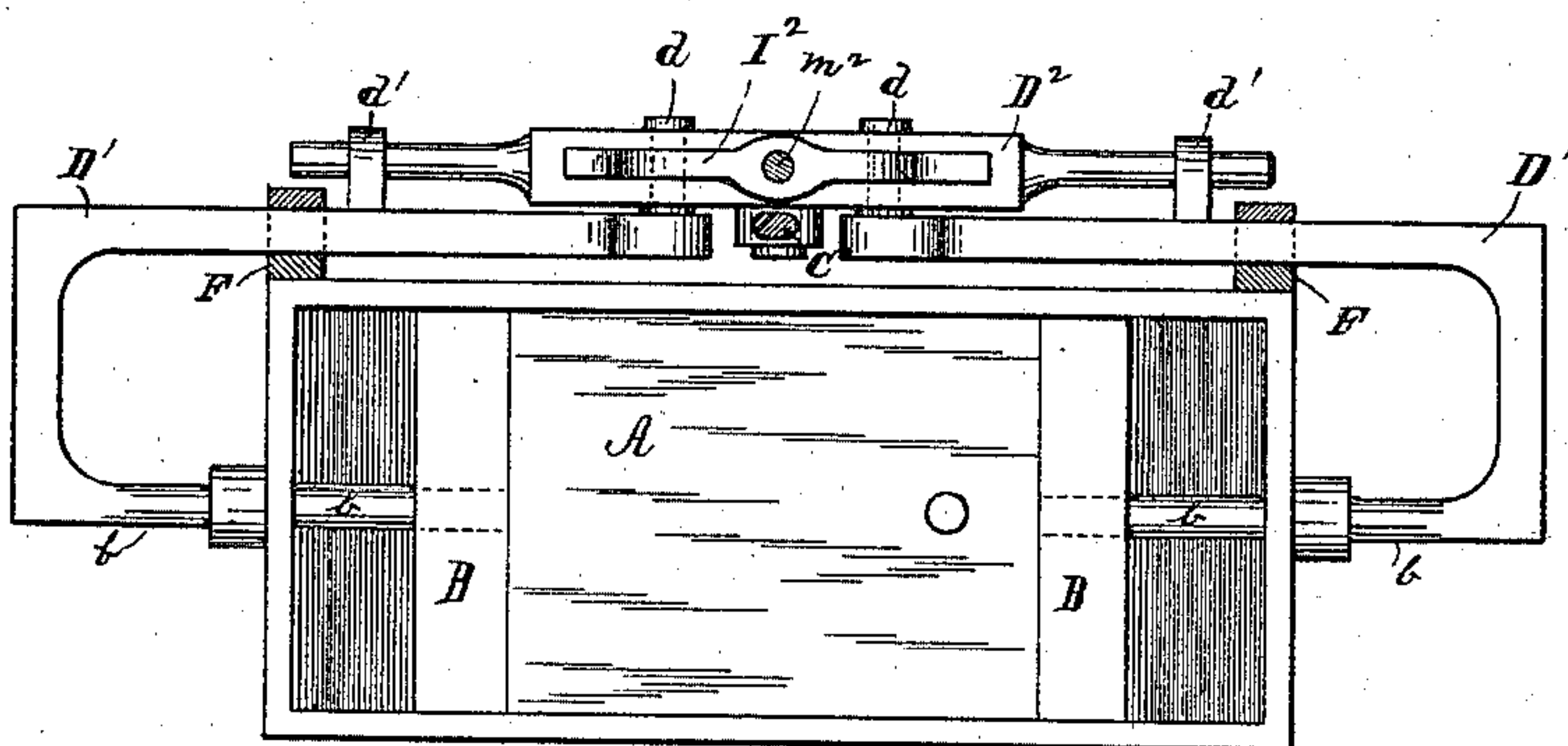


Fig. 6.



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Fig. 7.

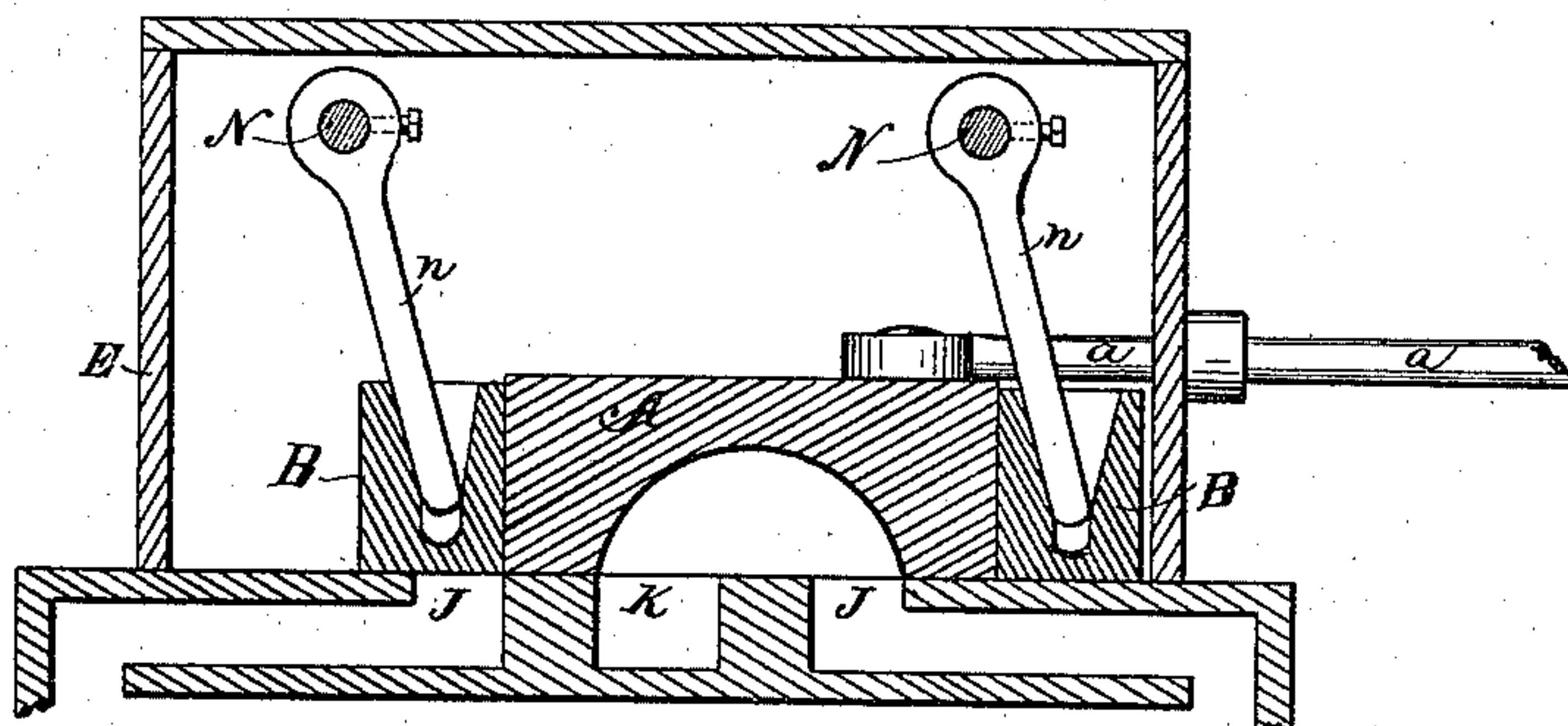


Fig. 8.

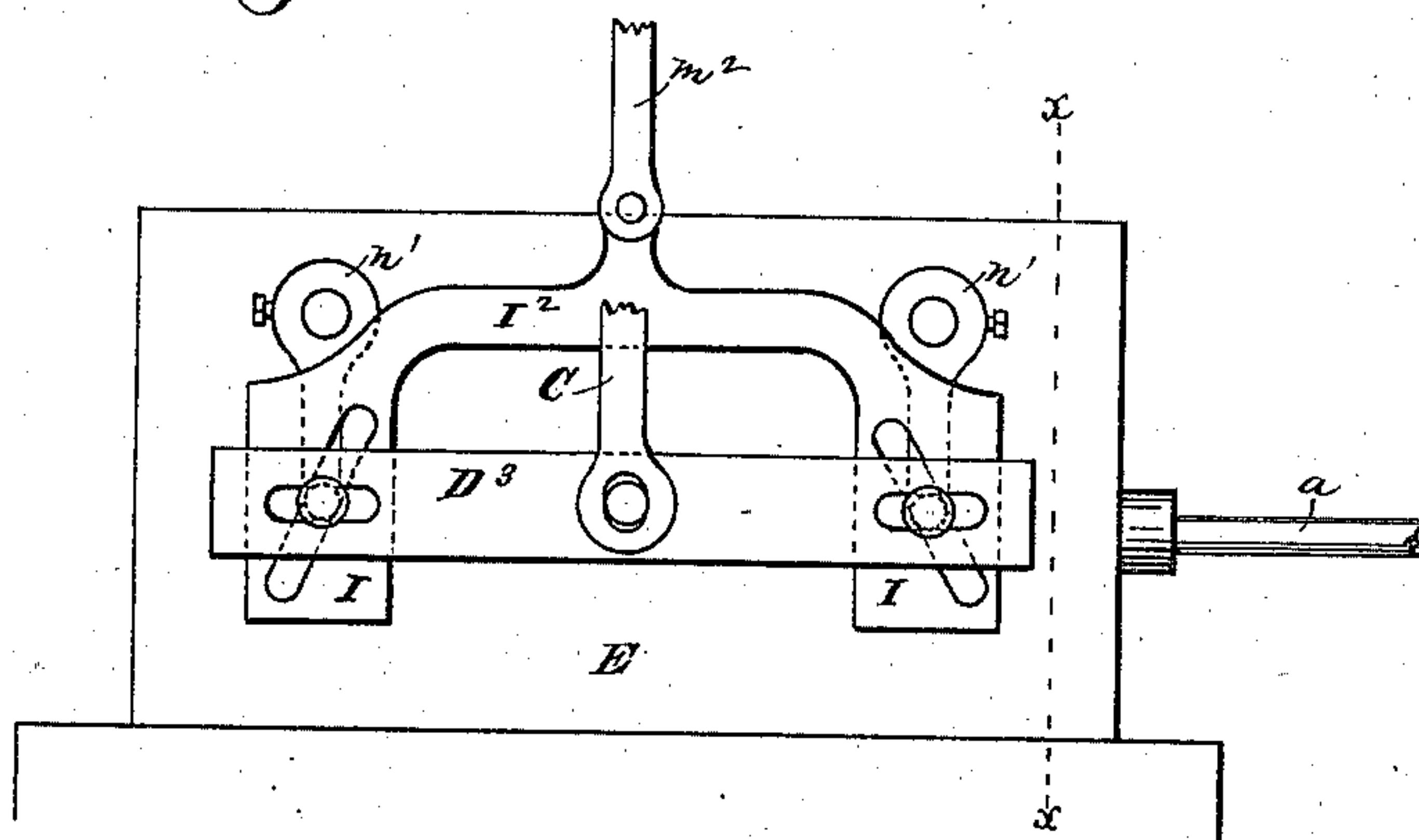
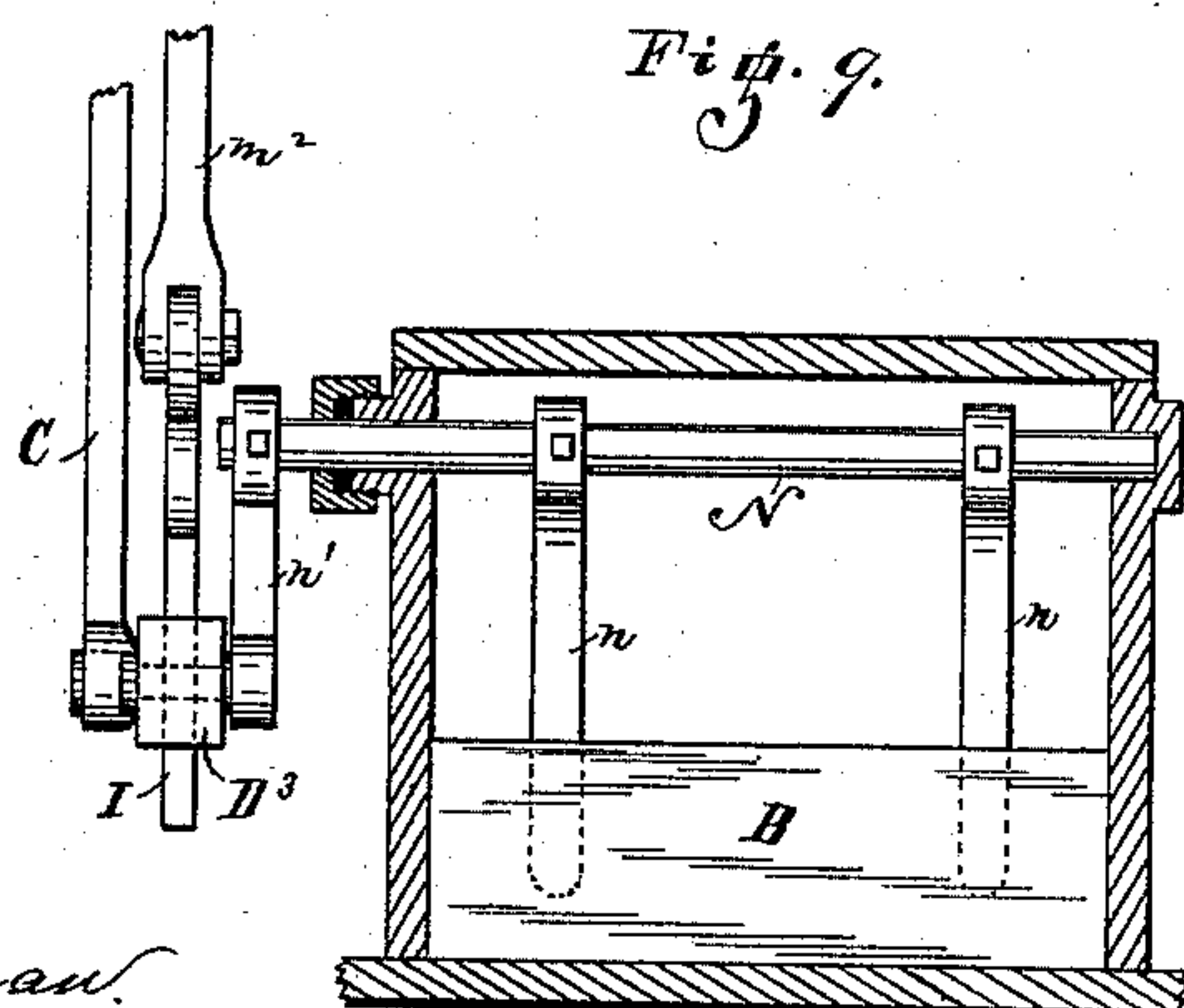


Fig. 9.



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UNITED STATES PATENT OFFICE.

BENNARD TOPMILLER, OF CINCINNATI, OHIO, ASSIGNOR OF TWO-THIRDS TO SIMON OBERMAYER AND JACOB A. HEINSHEIMER, BOTH OF SAME PLACE.

CUT-OFF VALVE.

SPECIFICATION forming part of Letters Patent No. 305,548, dated September 23, 1884.

Application filed August 14, 1883. Renewed April 19, 1884. (No model.)

To all whom it may concern:

Be it known that I, BENNARD TOPMILLER, a citizen of the United States, residing at Cincinnati, county of Hamilton, State of Ohio, have invented certain new and useful Improvements in Cut-Off Valves for Steam-Engines, of which the following is a specification.

My invention relates to that class of engines which have separate valves to control the admission and exhaust ports.

The object of the invention is to provide for the simultaneous opening of the admission and exhaust ports, and to provide an instantaneous cut-off at any point desired. Its object is also to provide for the independent movement of the laps during a portion of the stroke of the slide-valve, so that the "cut-off" may be controlled by the governor or regulator through expansion-gear.

The invention consists in a peculiar arrangement of laps movable independent of the slide-valve within the steam-chest, and peculiar arrangement for working the same to automatically cut off the admission of steam to the cylinder at any point of the stroke, and instantaneously, whether controlled by the regulator or detached from it.

It also consists in certain peculiar details of construction, all of which will be fully understood from the following description of the accompanying drawings, in which—

Figure 1 is a longitudinal section of a steam-chest and part of the cylinder, showing my improvements adapted for use as a variable cut-off in the ordinary steam-engine, the section being taken through line *xx* of Fig. 2, which is a plan view having the top or cap of the valve-box removed. Fig. 3 is a view similar to Fig. 1, but showing a form of expansive gear for controlling the admission-ports by means of the governor. This view is taken through line *xx* of Fig. 4, which, like Fig. 2, is a plan view of the steam-chest with its cap removed. The cut-off mechanism is seen in elevation, except the expansion-gear, which is seen in top plan, the actuating-rods being shown in transverse section. Fig. 5 is a longitudinal elevation of a steam-chest and cylinder, showing my improvements as applied to a locomotive-engine. Fig. 6 is a plan view taken through line *xx* of Fig. 5. The

steam-chest cap in this view is removed. Fig. 7 is a longitudinal section of a steam-chest in which the laps are operated by a crank-arm on the outside through two rock-shafts which have arms inside the chest to engage the laps. Fig. 8 is a longitudinal elevation of the device shown in Fig. 7, and Fig. 9 is a transverse section view taken through line *xx* of Figs. 7 and 8.

Like parts are represented by similar reference-letters wherever they occur throughout the various views.

In Figs. 1 to 4, inclusive, the slide-valve A is shown at the middle of its stroke closing all the ports, and the laps B are shown at each end of the valve A and equidistant from it, being in the position they should occupy when the vibrating lever C is perpendicular to the sliding yoke D, to the ends of which the sliding rods *b* are connected. These rods pass through stuffing-boxes in the ends of the steam-chest E, and are secured to the sliding cut-off valves or laps B. The laps are adjustable nearer to or farther from the slide-valve in Figs. 1 and 2 by means of nuts on the screw-threaded ends of the rods *b*, for the purpose of determining the point of cut-off.

F is a frame rigidly secured to the valve-box.

The lever C is pivoted in its outer cross-bar, and near each corner is secured a spring, G. The free ends of these springs are jointed to links *c*, the opposite ends of the links being jointed to the top of lever C. The lower end of the lever is jointed to the yoke D by a pin which passes through a slot in the lower end of the arm. The yoke D slides in bearings in the frame F. The caps of its bearing or boxes are removed in all the views.

Before entering upon a description of the automatic expansion-gearing by which the admission-ports are controlled through the regulator, I will first describe the variable "cut-off" valves and their actuating devices when in use, as their action is the same whether the admission of steam is controlled by the governor acting upon the throttle, in the usual way, or directly upon the laps to bring them nearer to or force them farther from the slide-valve A.

It should be also understood that I have

shown my improvements as applied to the common slide-valve engines without any change in the internal arrangements of valve-box, valve-seat, or ports.

5 Referring now to Figs. 1 and 2, the valves A B are shown as just "set" or properly adjusted for use, although in use they will never assume this position. Both valves A and B are exactly at the center of their respective
10 strokes. The valve A is driven by the valve-rod a , in the usual manner, and the valves are set so that the cut-off will occur at about quarter-stroke of the piston H. The valve A, moving to the left, simultaneously opens the
15 admission-port J and exhaust-port K. When valve A reaches valve B, all the valves move together for a short distance until the yoke D, which moves with the valves B, throws the lever C out of the perpendicular position
20 shown, when the springs G, pulling down upon the upper end of lever C through links c , sends the yoke D forward with an accelerated movement, bringing the following valve B quickly against the following end of valve A,
25 instantly closing the supply-port and allowing the expansive power of steam to carry the piston H to the end of its stroke. On the return-stroke of the valve A it carries the valve B and yoke D with it against the force of
30 springs G until the valves B assume the position shown, when the force of the springs is taken up by the fulcrum-pins of lever C for an instant, until the yoke is carried past the center, when the force of the springs is again
35 exerted upon the yoke, and the following valve B is forced against the valve A, cutting off the supply of the motive agent to the cylinder, as before.

In Figs. 3 and 4, now to be described, the
40 action of the valves is precisely the same as just described in relation to Figs. 1 and 2, except that the admission of steam to the cylinder is controlled by expanding or contracting the valves B by the governor, while in Figs.
45 1 and 2 the admission of steam to the steam-chest is controlled by the governor acting upon the throttle, while the position of the valves B B, after being set, remains unchanged with relation to valve A. It will then only be
50 necessary, in connection with Figs. 3 and 4, to describe the devices which, actuated automatically by the governor, vary the relation of the valves A and B B to each other, according to the pressure of steam carried or the
55 duty required of the engine.

The valve-rods b terminate at their outer ends in slotted plates, which slide through slots in the ends of yoke D. The ends of yoke D have also vertical slots, which register with
60 the sides of the slots in rods b ; but these slots are shorter than the slots in the valve-rods, being just long enough to receive the diagonally-slotted slides I, which are suspended from the ends of rods I'. These rods are
65 jointed to the ends of a bar, L, the whole forming a suspended yoke, which is connect-

ed in any suitable manner to the governor mechanism, so as to be elevated and depressed by it. The slots in the rods b are crossed by
70 pins b' , which pass through the diagonal slots in the pieces I. Now, it will be seen that when the slides I are drawn up by the yoke I I' L the pins b' , traversing the diagonal slots in slides I, will bring the valves B nearer to-
75 gether, and when the slides I are depressed the valves B will be expanded. The admission of steam to the cylinder is thus automatically controlled by the governor.

In Figs. 5 and 6 I have shown my invention as applied to locomotive-engines. In this case
80 the yoke D is divided, and its opposite ends are but continuations of the valve-rods b . The adjacent ends of the yoke D' have pins d projecting from them, which pass through slots in the bar D², the rounded ends of which pass through
85 perforated lugs d' on the yoke D'. The bar D², it is apparent, is but a part of the yoke D', its office being to permit the expansion or contraction of the yokes, and consequently of
90 the valves B B. The yoke D' and valves B B are expanded or contracted by means of a yoke, I², which slides vertically through a slot in the bar D². The arms of the yoke I² are
95 diagonally slotted, and the pins d , which are secured in the ends of the yoke, pass through these slots. The sliding yoke I² is controlled by a hand-lever, M, through rod m , bell-crank
100 m' , and link m^2 , the lever being in a convenient position to be handled by the engineer. The expansible yoke D' is actuated by the lever C and its springs to cut off precisely as
105 previously described. In these two figures (5 and 6) the yoke I² is shown forced down, and the valves B closed against the valve A. The steam is thus completely cut off from the
110 cylinder. The valves B are expanded to the desired extent by moving the lever M and locking it in the ratchet-quadrant m^3 .

In Figs. 7, 8, and 9 the laps are moved by
115 rock-shafts N, which pass transversely across the valve-box. The arms n , which are secured to the shaft N inside the valve-box by set-screws, enter depressions in the tops of the valves B. The arms n' , which are secured upon
120 the shafts N outside the valve-box, are actuated by the lever C acting upon a bar, D³. This bar is also slotted through the edge and side. The diagonally-slotted yoke I² passes through
125 vertical slot in the bar D³. The pins n^2 of arms n' pass through side slots in bar D³ and the diagonal slots in the yoke I². The valves B are expanded or contracted by elevating or depressing the yoke I², which may be controlled either automatically by the governor or by the engineer, as described in Figs. 5 and 6.

The valve, A, which I have shown is the ordinary D-valve with its laps removed and its
130 stroke of course correspondingly diminished, and I have so shown it, as before stated, because I expect to apply my improvements to engines now in use, which can be done at small expense and without changing the valve-seat

or cylinder; but when constructing new engines embodying my invention the stroke of the valve A may be still further shortened and friction diminished, as the valve-seats between the ports J K may be contracted to fully one-half the size ordinarily used with valves having laps. It is evident that the various forms of expansion-gear may be used in connection with my cut-off valves, and that the laps B B may be operated to advantage by a rod actuated by an eccentric or link motion controlled by the governor.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of a steam-chest, a valve to open the steam-ports, operated directly by the eccentric-rod, and independent cut-off valves at each end of said main valve, and yoked together with suitable mechanism, to alternately close said cut-off valves against the opposite ends of the center valve, substantially as specified.

2. The combination of the steam-chest, valves A B B and yoke D with spring-actuated lever C, to suddenly close the cut-off valves B against the following end of valve A when the lever is thrown from its center by the yoke D.

3. The combination, substantially as specified, of the steam-chest, valves A and B, yoke D, and screw-threaded rods *b*, the said rods passing through the ends of the yoke, and having nuts upon each side to expand or contract the valves B to regulate the cut-off.

4. The steam-chest, the valve A, actuated by rod *a*, the valves B B, connected by yoke D,

and rods *b*, in combination with frame F, lever C, links *c*, and springs G, to operate the said valves B during part of their stroke independent of valve A.

5. The combination of a steam-chest, a slide-valve intermediate two cut-off valves which are yoked together outside of the steam-chest and actuated by mechanism independent of the main valve, with mechanism, such as shown, actuated by the regulator, to automatically expand or contract said cut-off valves for the purpose of controlling the admission-port and cut-off according to the pressure of steam or duty required of the engine.

6. The steam-chest, the valves A B, yoke D, and its actuating mechanism, in combination with yoke I I' L, connected to and controlled by the governor, to automatically control the admission of steam to the cylinder, substantially as described.

7. A steam-chest having a slide-valve within it actuated by the eccentric-rod, and two expansible cut-off valves operated during part of their stroke independent of the main valve, in combination with the yoke connecting said valves, and a vertically-sliding yoke having diagonally-slotted slides I, to engage pins upon the rods of the cut-off valves, said yoke being controlled by the governor or engineer, as shown and described.

BENNARD TOPMILLER.

Witnesses:

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GEO. J. MURRAY.