

(No Model.)

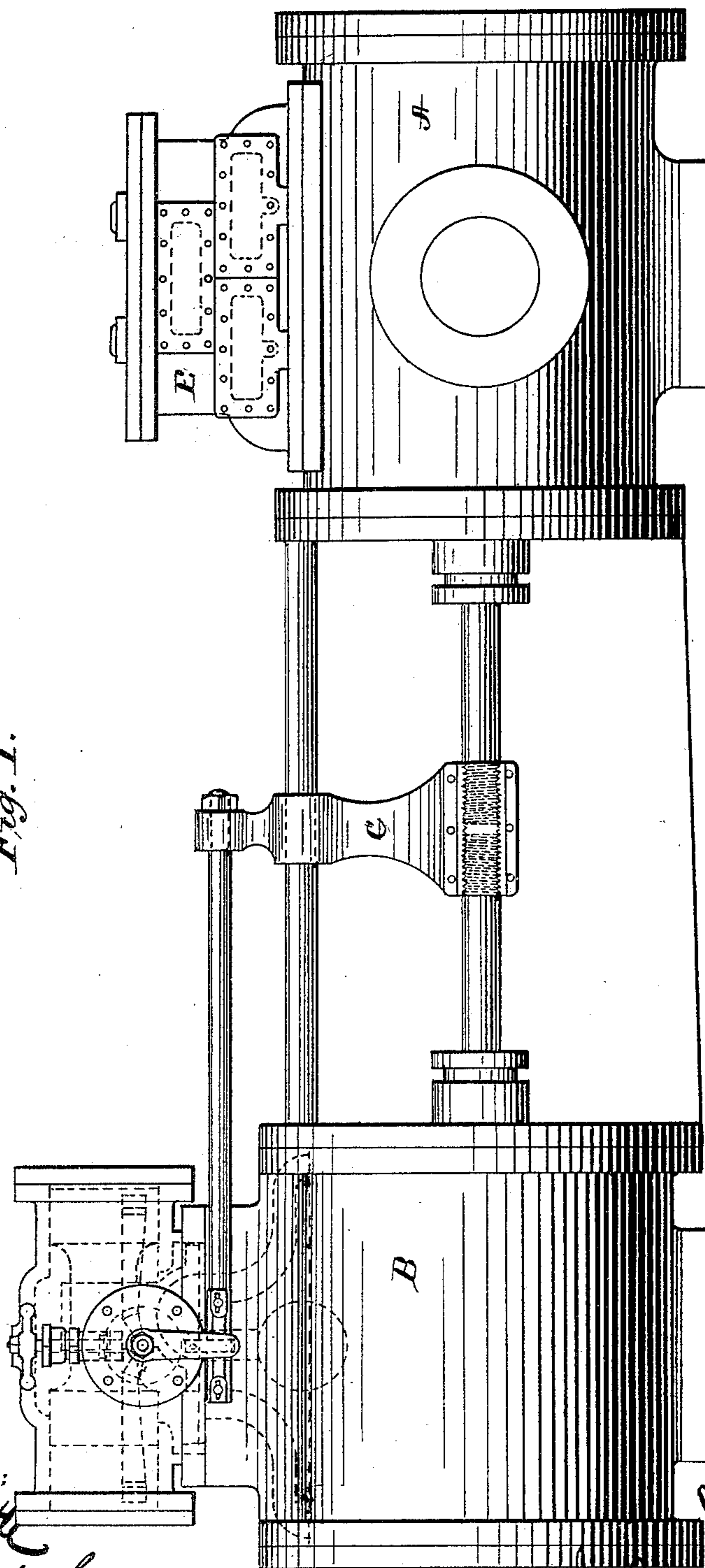
2 Sheets—Sheet 1.

D. EVANS.
MINING PUMP.

No. 442,311.

Patented Dec. 9, 1890.

Fig. 1.



Witnesses:
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Inventor:
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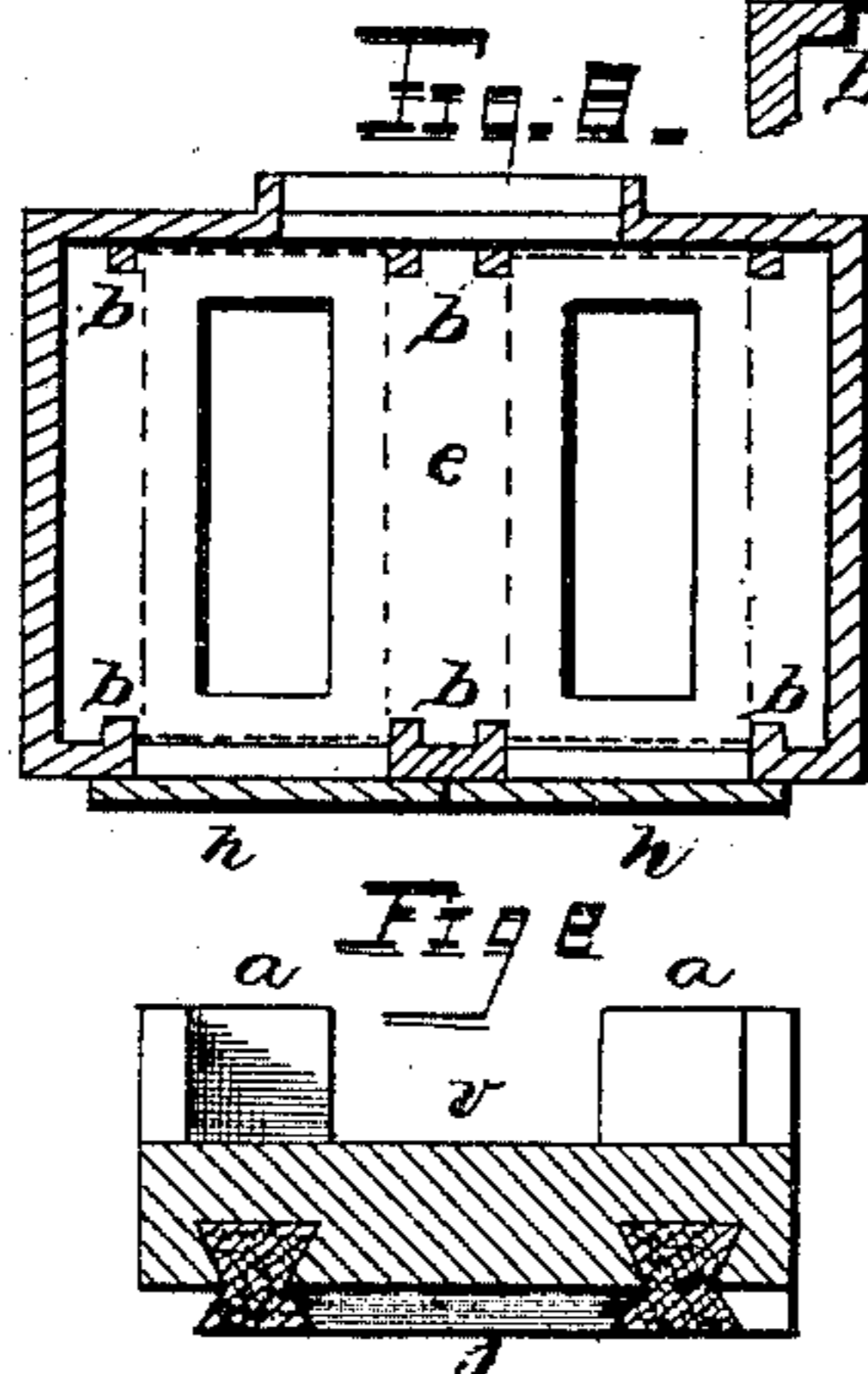
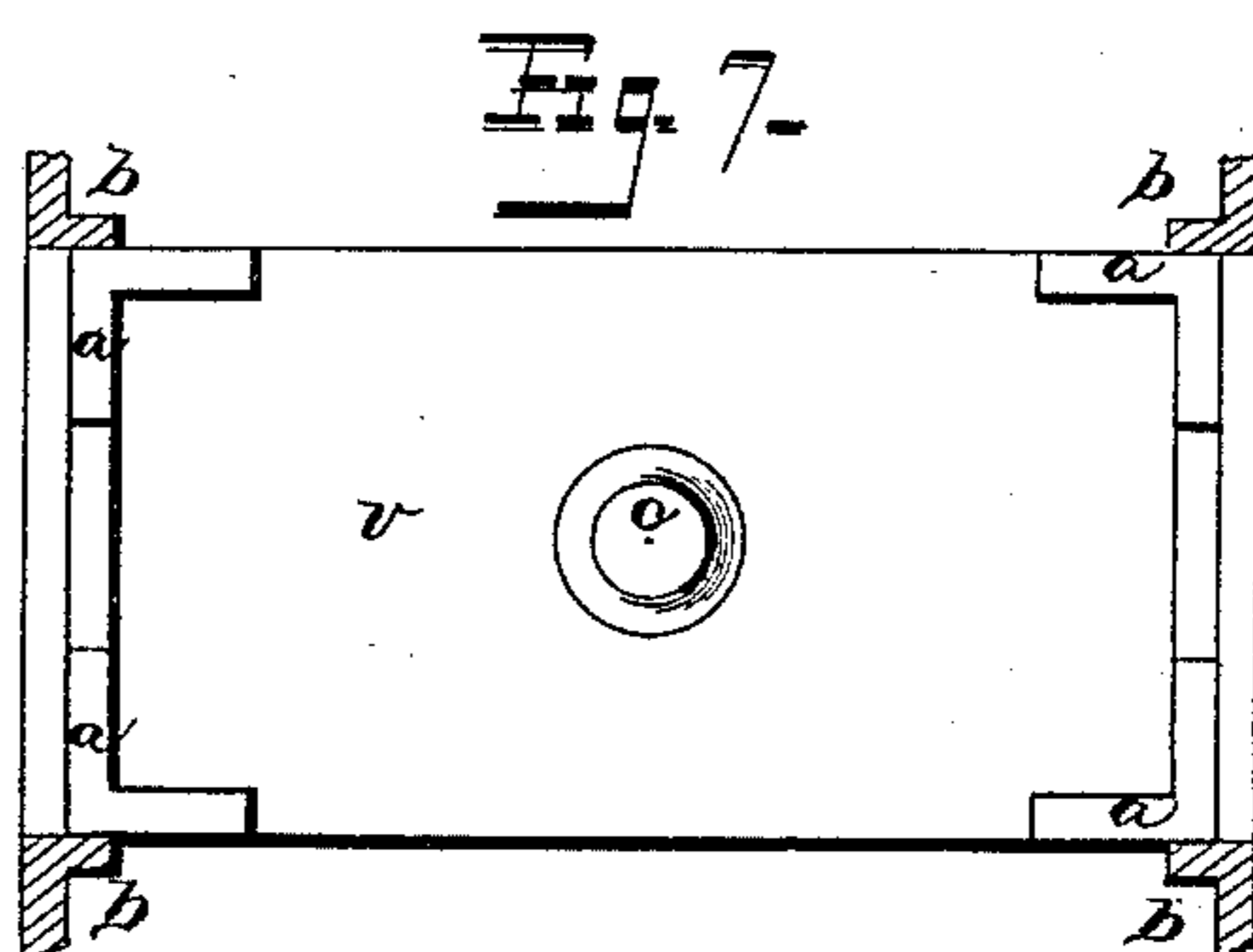
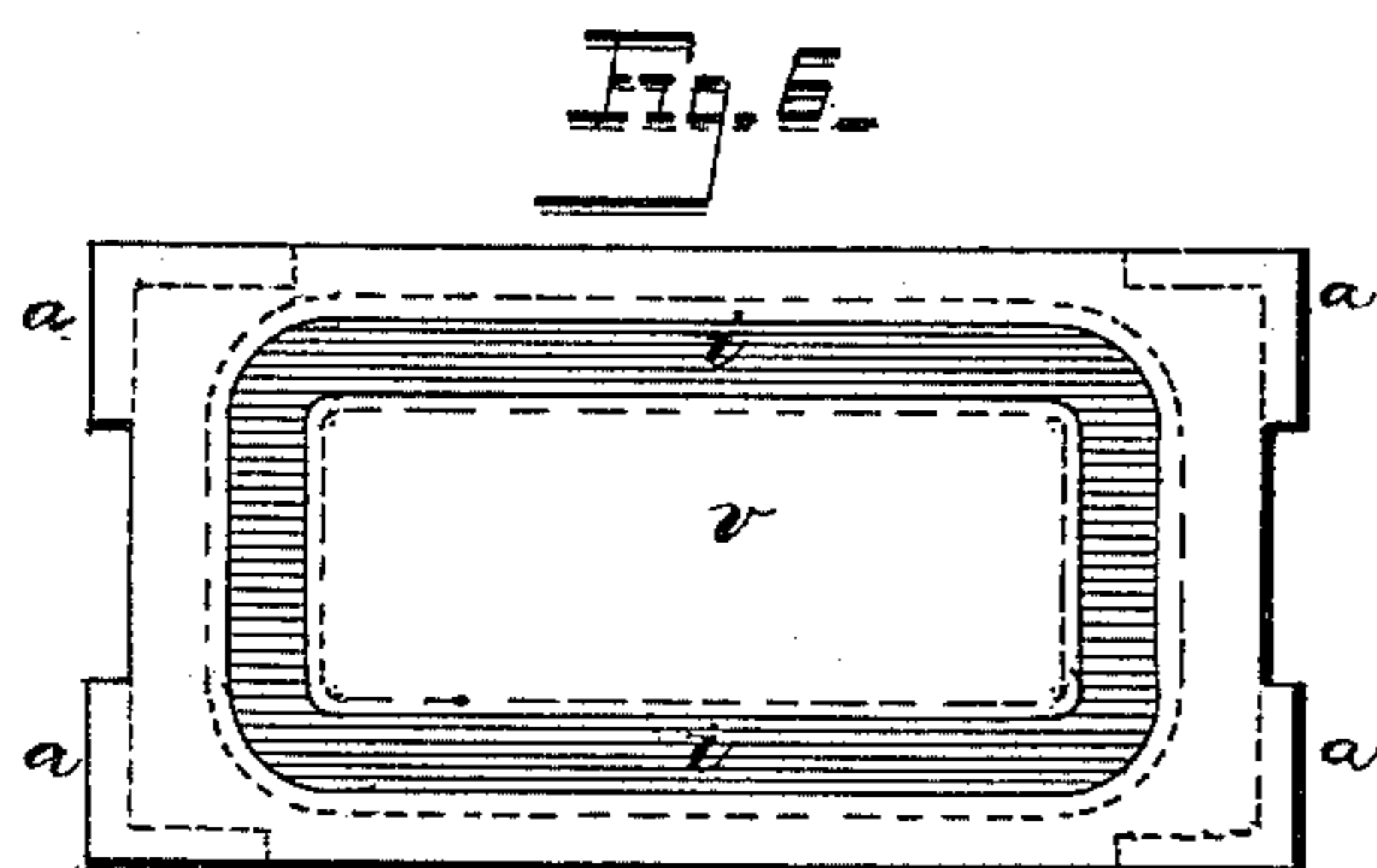
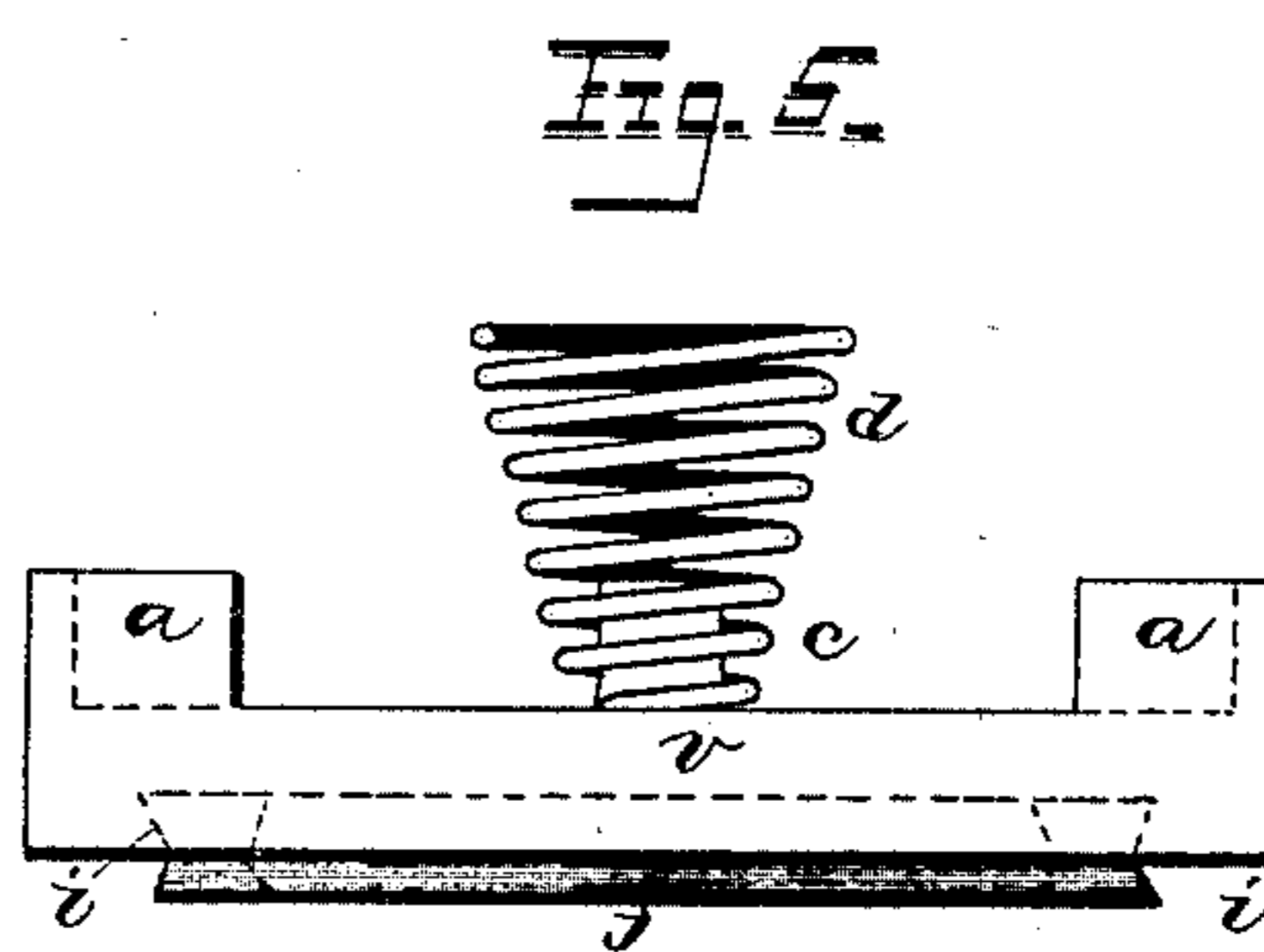
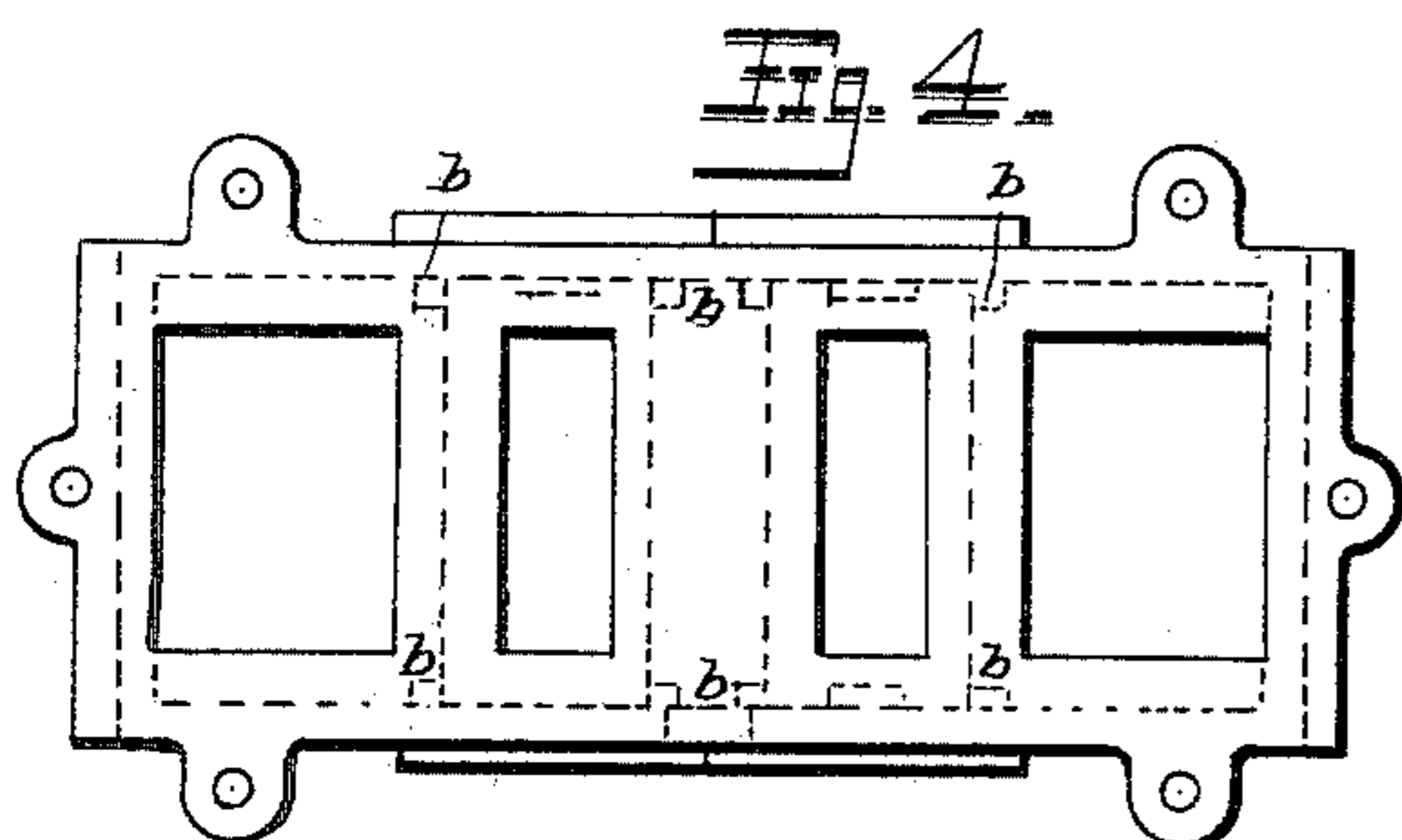
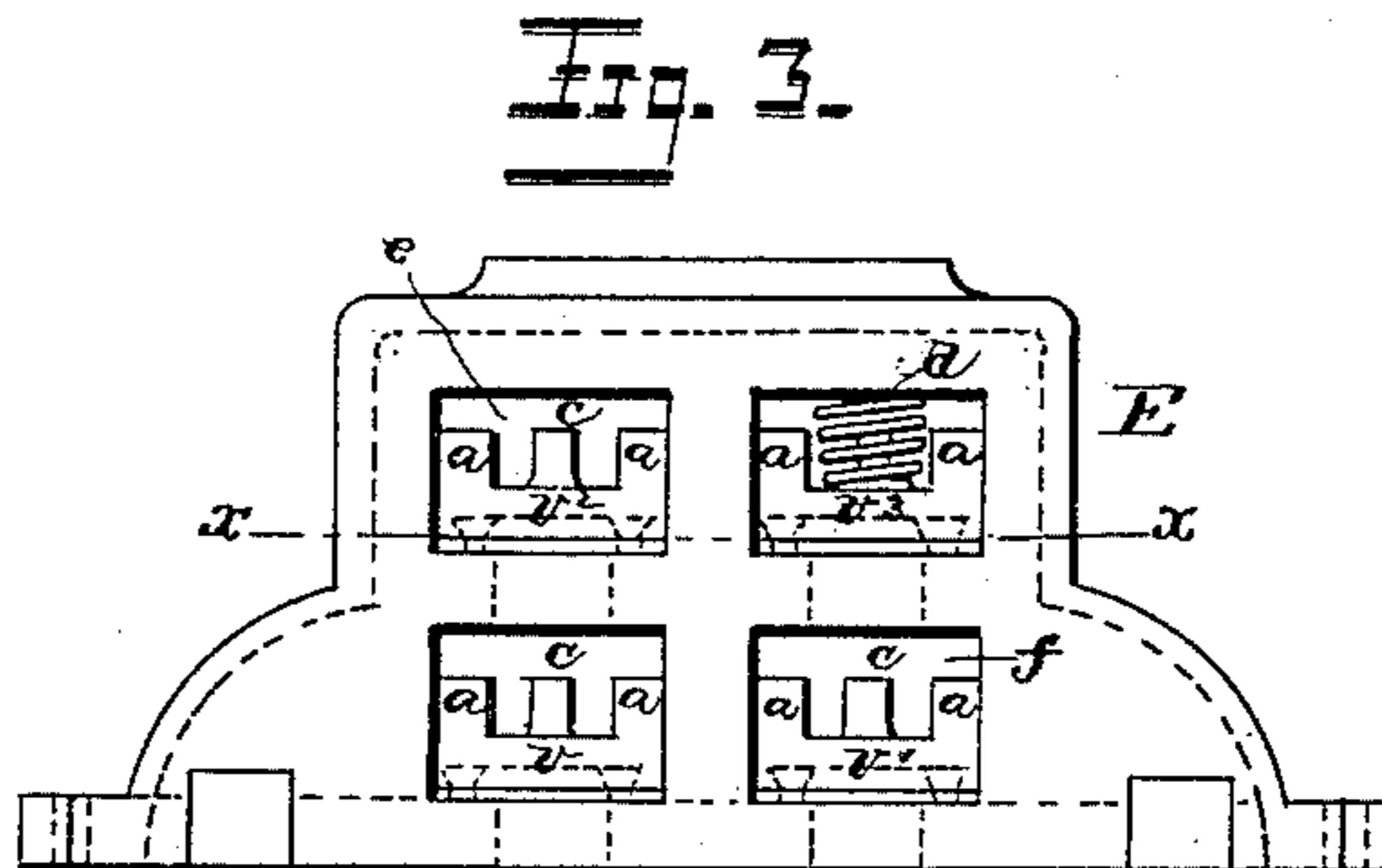
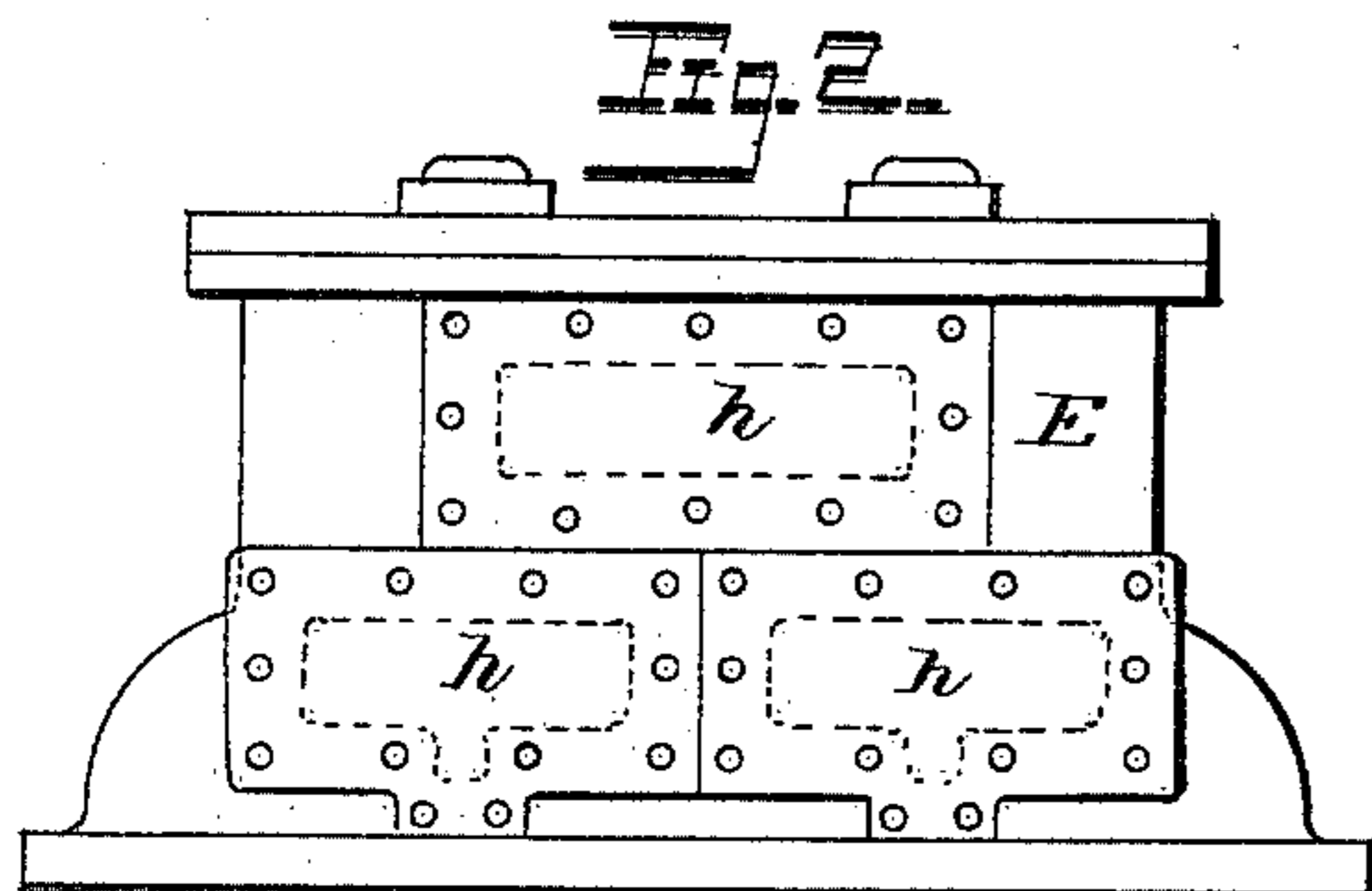
(No Model.)

2 Sheets—Sheet 2.

D. EVANS.
MINING PUMP.

No. 442,311.

Patented Dec. 9, 1890.



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UNITED STATES PATENT OFFICE.

DAVID EVANS, OF CONNELLSVILLE, PENNSYLVANIA, ASSIGNOR TO THE
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MINING-PUMP.

SPECIFICATION forming part of Letters Patent No. 442,311, dated December 9, 1890.

Application filed August 4, 1890. Serial No. 360,857. (No model.)

To all whom it may concern:

Be it known that I, DAVID EVANS, a citizen of the United States, residing at Connellsville, Fayette county, in the State of Pennsylvania, have invented new and useful Improvements in Mining-Pumps, of which the following is a specification.

I have improved the mining-pump in particulars which serve to render the renewal of certain of its parts comparatively quick and convenient when destroyed by the acids of the water and without having to remove the pump from the mine for such work.

My improvements are also directed to a construction of the water-chest and its square valves, whereby these parts may be conveniently and easily removed and replaced when destroyed by the acids in the water and the valves rendered more durable and fitted with corner-guides adapted to act upon vertical guides of the water-chest walls and fitted with packing in a dovetail-face groove, which can be better packed and not liable to get out of order, and rendering the pump more effective. These and other matters I will now describe in connection with the accompanying drawings, and specifically point out my improvements in the concluding claims.

In the drawings I have shown in Figure 1 my improved pump in connection with a steam-engine and a bisected piston-rod connected to the engine-valves by a cross-head adapted to permit of the removal of the pump-piston without disturbing the engine. Fig. 2 is a side view of the water-valve chest. Fig. 3 is a side view of the same, showing the bonnets removed to expose the valves. Fig. 4 is a bottom view of the water-chest, showing the ports to the valves. Fig. 5 is a side view of the valve, showing its wall-guides. Fig. 6 is a bottom view of the valve, showing the face packing-groove. Fig. 7 is a top view of the valve, showing its corner-guides and their relation to the wall-guides. Fig. 8 is a horizontal section of the valve-chest on the line $x x$ of Fig. 3, showing the wall-guides; and Fig. 9 is a cross-section of the valve.

In Fig. 1 I have shown the pump-cylinder A and the engine-cylinder B and their respective piston-rods separately and adjust-

ably connected to a cross-head C, which is connected with and operates an oscillating valve of the engine. The water-chest E is formed of a single casting, is removably secured to the cylinder, and contains all the water-valves, which are of rectangular flat form and are arranged crosswise in the chest. At their four corners these valves are formed with flat guide-bearings a , which project above the upper surface of the valve a distance about equal to the thickness of the latter and stand at both edges of each corner in the form of the letter L, so as to bear with their outer faces against the inner vertical walls of the chest and against vertical wall-ribs b , whereby the valves are held in place and guided in their vertical movements without central guide-stems. These valves are formed with a central teat c , for holding in position a coil-spring d , which I prefer to make of conical form, and which bears against the top of the valve-chamber to exert a downward pressure upon the valve to properly seat it. These valves are in sets, one above the other, in separate water-chambers e and f , the valves $v v'$ in the lower chambers f being the inlet-valves and those $v^2 v^3$ in the upper chamber e being the outlet-valves. The lower valve-chamber has ports which open into the piston-cylinder, and the upper valve-chamber has ports which open into the lower valve-chamber and has the discharge-opening. As these valves are liable to be cut and destroyed by the acids in the water, I provide for their removal and replacement by means of openings formed in one side of the water-chest sufficiently large to admit of placing and removing the valves and closing said openings by covers h , screwed to the chest, as seen in Fig. 2. The under flat faces of these valves are formed with a quadrangular groove i , dovetailed so as to be widest at the bottom and into which the packing of fibrous material j is driven, so that a portion of it stands out from the face of the valve and spreads so as to form a flat-ridge surface, which works with a tight joint upon the seat like a hollow square, and it can be removed and replaced. The square valves give the advantage of making larger ports and of forming wall-guides upon their edges,

so that they open and close free from binding. The valve-chest as a single casting gives the advantage of allowing it to be removed to refit the packing, the valve-chest can be
 5 easier finished, and the cylinder can be easier bored out.

The provision for detaching the pump-piston from the steam-piston allows the removal and replacement of the pump-piston by merely
 10 taking off the outer bonnet of the pump-cylinder, so that the water-chest, its valves, and the piston can be removed and replaced by new ones without having to take the pump out of the mine.

15 The construction of the water-chest and its square valves is particularly adapted for large pumping-engines having a long stroke.

Looking at Figs. 3, 5, 7, and 8, it will be seen that the conical spring *d* stands inverted, so
 20 that its apex bears centrally upon the valve and forms a sort of pivot-bearing to give better freedom for the valve to yield at either end and at either corner, and thus prevent being jammed or bound between the chest-
 25 wall and between the chest guide-ribs and to preserve the parallelism of the valve when suddenly forced up to open the port and forced down to close the port. Co-operating
 30 with this action of the inverted conical spring, it will be seen that the bearing of the spring upon the valve is below the top of the valve-guides *b*, so as to bring the bearing-point of the spring on a horizontal line about midway
 35 between the surface of the packing and the top of the valve-guides, and thereby more effectively preserve the parallelism of the valve and the better permit it to rise and fall freely upon and between the said guides. This construction is of special importance in pumps
 40 having large ports and large flat valves, such

as are required in mining-pumps having a long stroke.

I claim as my improvement—

1. The valve-chest of the pump, cast in one piece, with side openings, separate chambers, and interior wall guide-ribs, and containing all the pump-valves and their seats and having separate covers for said side openings, as set forth.

2. In a mining-pump, the valve-chest having ribs *b* on its inner opposite walls, in combination with a valve of rectangular form having at its four corners guide-bearings *a*, standing up at the side and end edges thereof and coacting with the wall guide-ribs, a packing *j* in the joint-forming face of said valve, a central stud *c* on its back, and a central conical spring fitted with its apex upon said stud, as described, and for the purpose stated.

3. The combination, with the valve-chest having guide-ribs *b* on its opposite inner walls, of a rectangular valve having guide-bearings *a* at the side and end edges of the four corners thereof standing above the top of said valve, and a spiral spring of conical form having its apex bearing centrally upon said valve on a plane below the tops of said valve-corner guides, whereby to maintain the parallelism in the movement of the valve and to permit it to rise and fall freely upon and between the said guides, as shown and described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

DAVID EVANS.

Witnesses:

C. D. SCHELL,

B. E. WITHERS.