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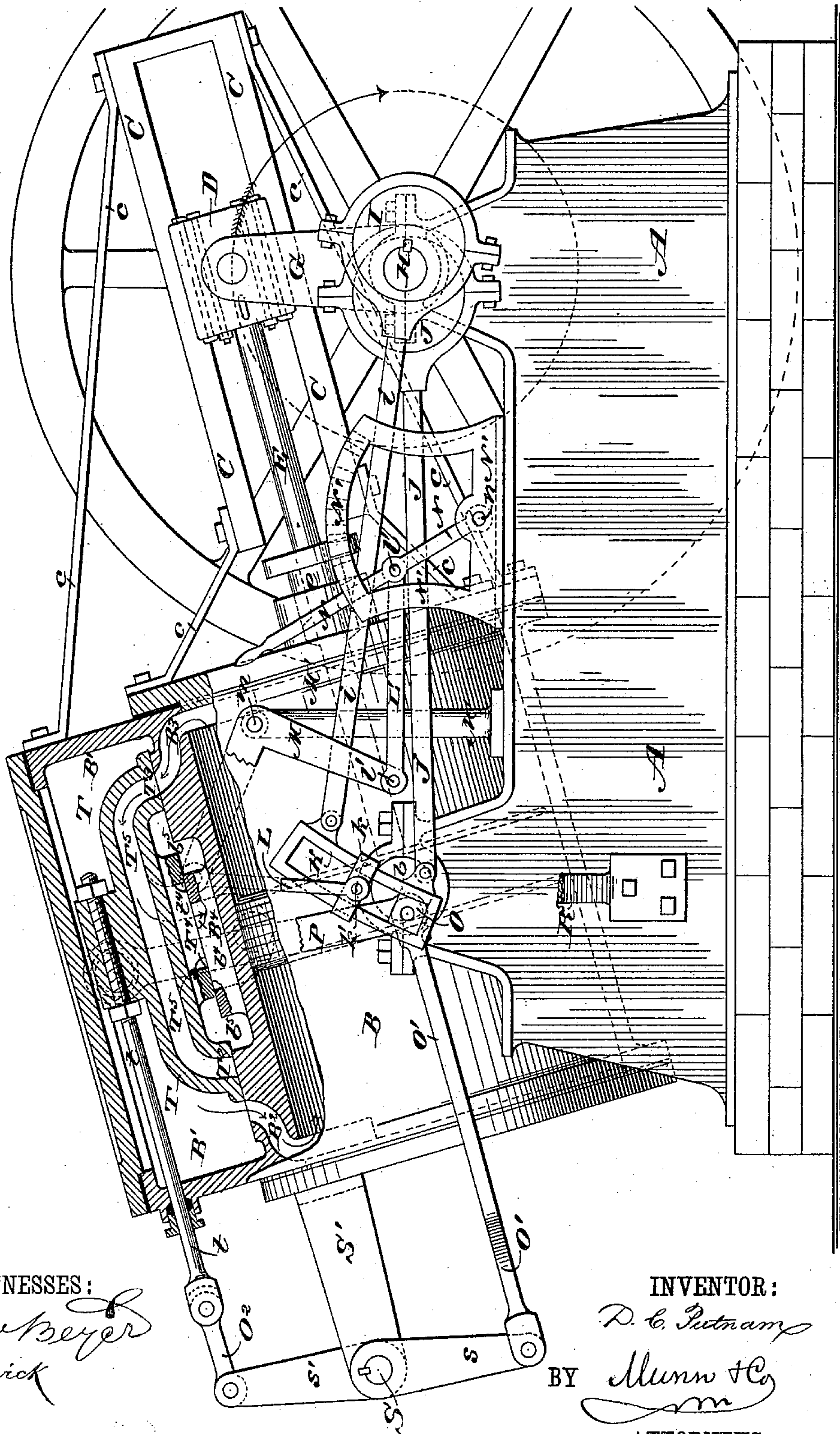
3 Sheets—Sheet 1.

D. C. PUTNAM.  
OSCILLATING ENGINE.

No. 334,282.

Patented Jan. 12, 1886.

Fig. 1.



WITNESSES:

*Thos Meyer*  
*C. Sedgwick*

INVENTOR:

*D. C. Putnam*

BY

*Munn & Co*

ATTORNEYS.

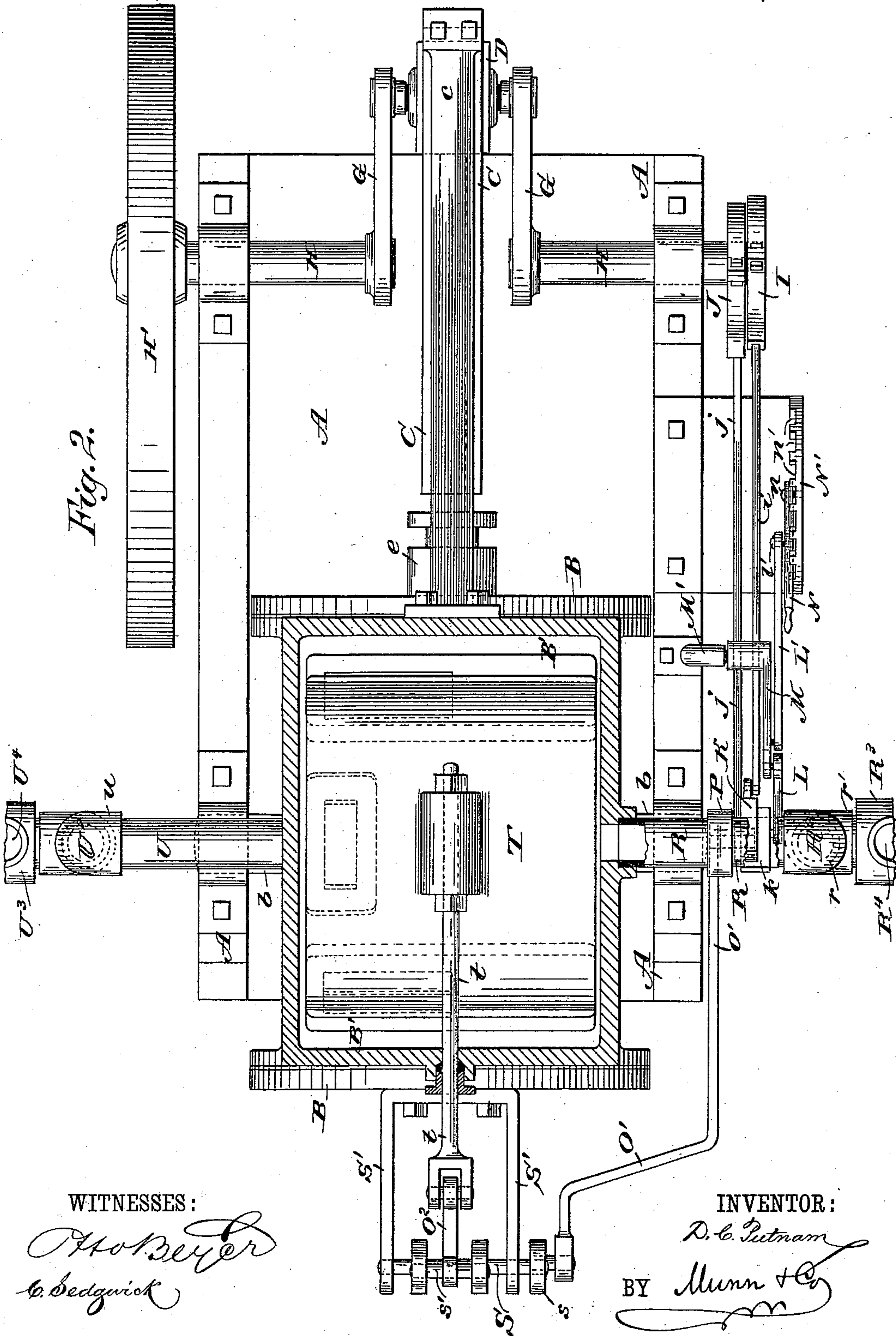
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3 Sheets—Sheet 3.

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Fig. 4.

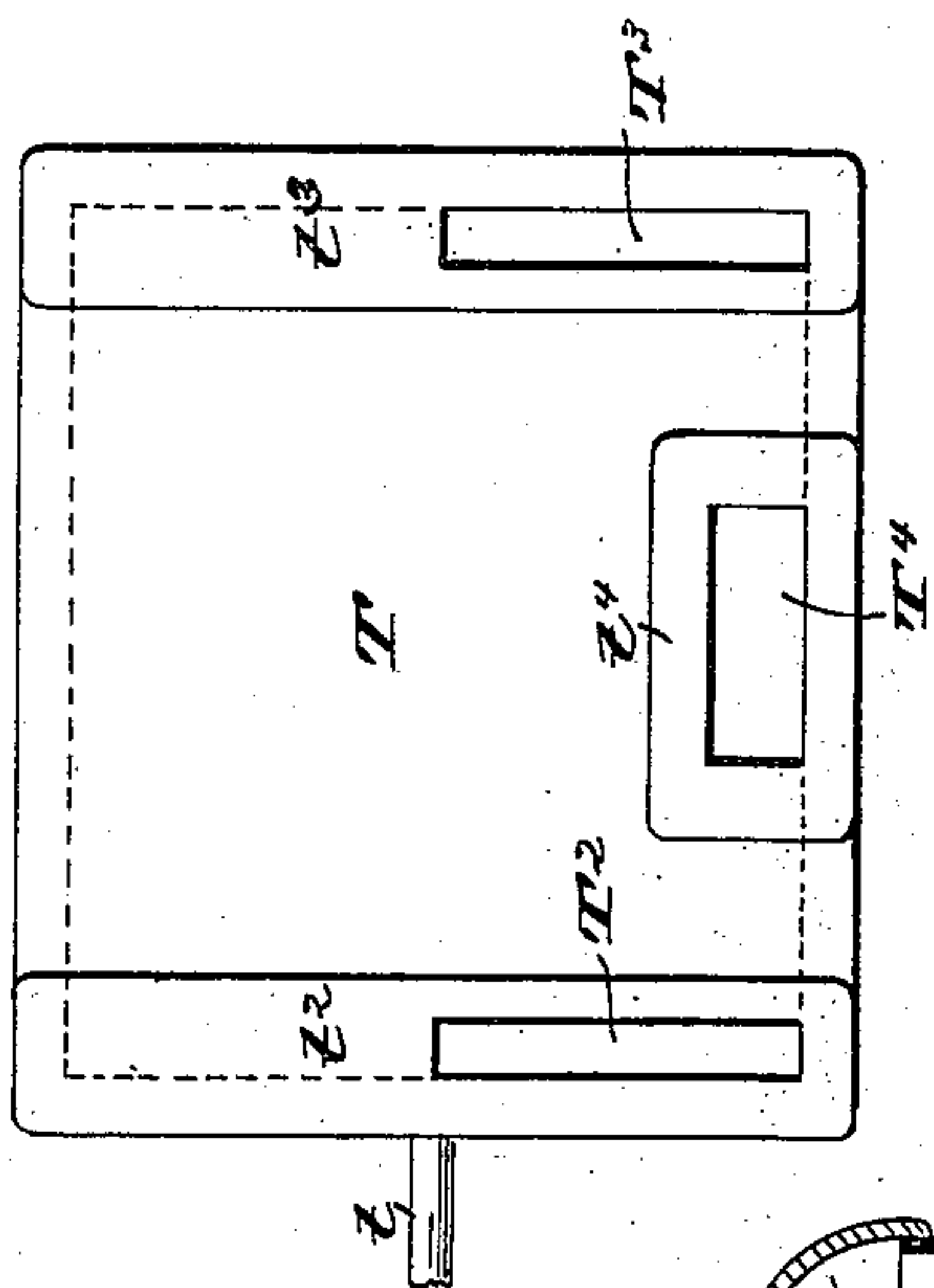


Fig. 5.

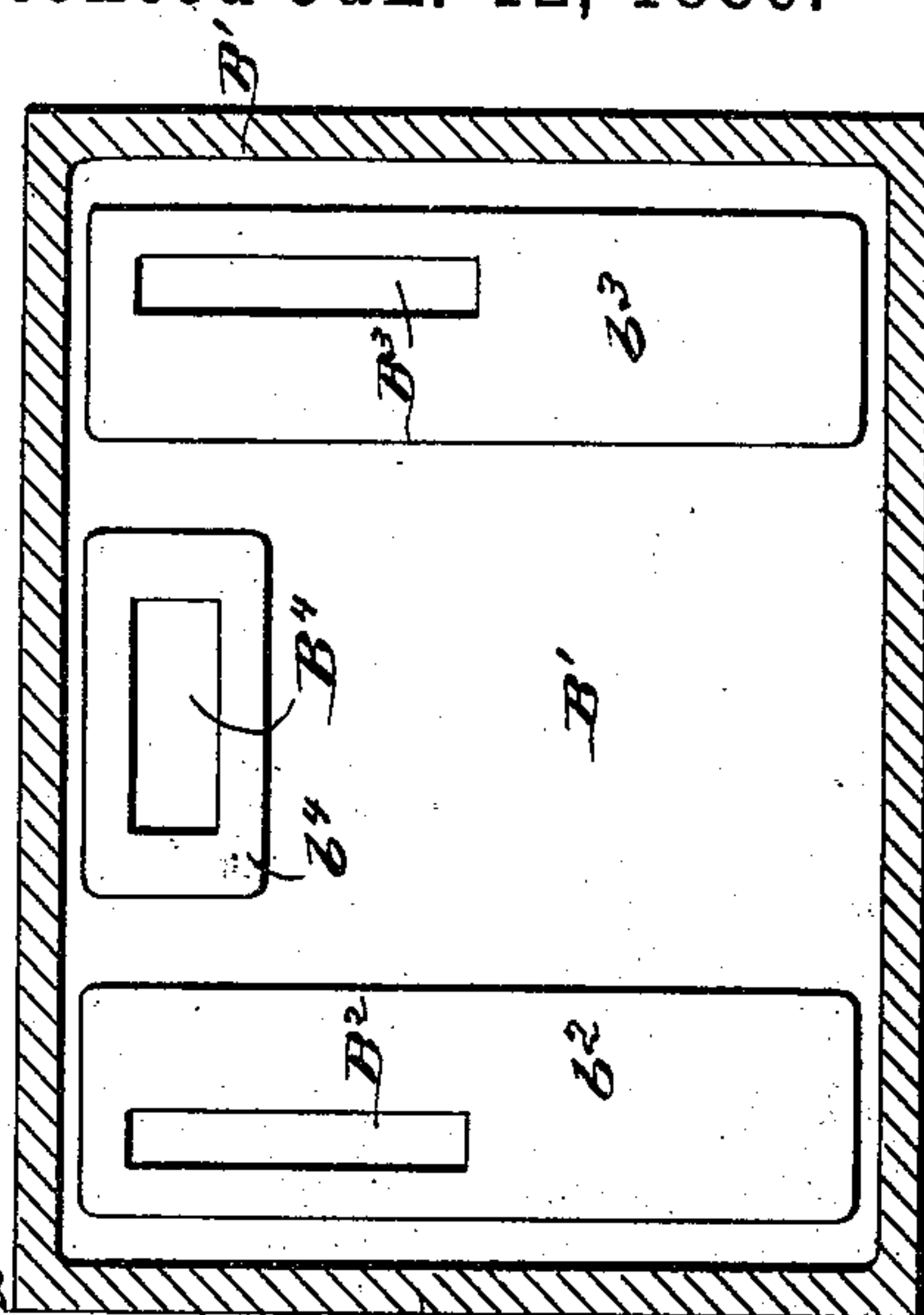
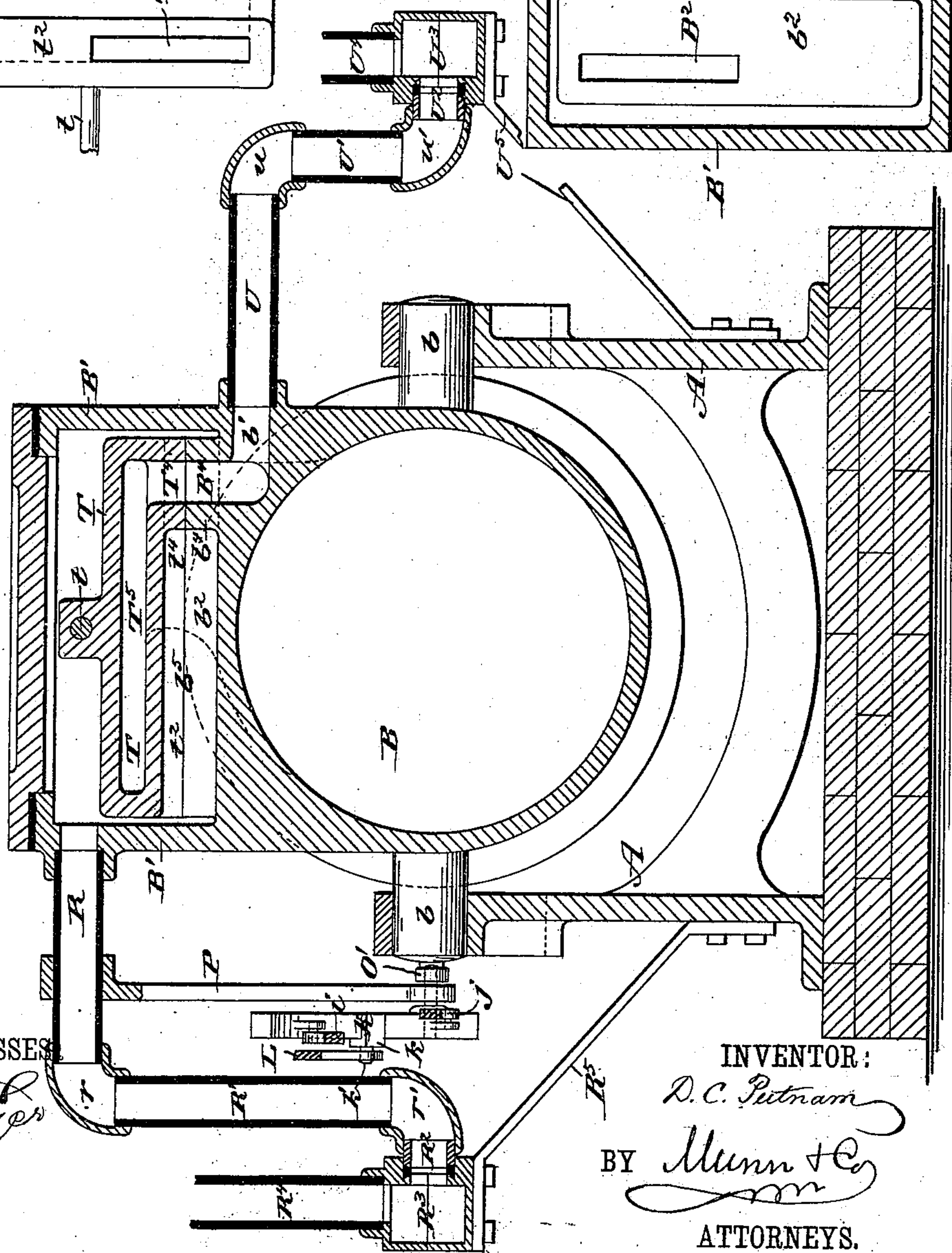


Fig. 3.



WITNESSES

*Wm. B. Lyster*  
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# UNITED STATES PATENT OFFICE.

DOUIA C. PUTNAM, OF WAYNE CENTRE, NEW YORK.

## OSCILLATING ENGINE.

SPECIFICATION forming part of Letters Patent No. 334,282, dated January 12, 1886.

Application filed June 1, 1885. Serial No. 167,320. (No model.)

*To all whom it may concern:*

Be it known that I, DOUIA C. PUTNAM, of Wayne Centre, in the county of Wayne and State of New York, have invented a new and  
5 Improved Oscillating Engine, of which the following is a full, clear, and exact description.

My invention relates to engines of the oscillating type, and has for its object to promote simplicity and durability in their construction and use, and secure accurate regulation of the steam supply and exhaust by means of a slide-valve operated by a link-motion.

The invention consists in certain novel features of construction and combinations of parts of the engine, all as hereinafter fully described and claimed.

Reference is to be had to the accompanying drawings, forming part of this specification, in which similar letters of reference indicate  
20 corresponding parts in all the figures.

Figure 1 is a partly sectional side elevation of my improved oscillating engine. Fig. 2 is a plan view with parts broken away and the steam-chest in horizontal section. Fig. 3 is a  
25 transverse sectional elevation about at the center of the cylinder. Fig. 4 is an under side view of the valve; and Fig. 5 is a sectional plan view of the valve-chest, showing the valve-seats.

The letter A indicates the engine bed or frame, in the sides of which are journaled the opposite trunnions *b b* of the cylinder B, to which are fixed by suitable brackets, *c*, the  
35 opposite guides C, in which the cross-head D slides, the piston-rod E passing through a stuffing-box, *e*, to connect with the piston F, which moves in the rocking cylinder in a manner common with oscillating engines. The  
40 cross-head D has connection by crank-arms G with a shaft, H, which is journaled in the bed A, and carries at one end the fly-wheel or belt-wheel H', and at its other end is fitted with two eccentrics, I J, which connect by  
45 suitable straps and the rods *i* and *j*, respectively, with the opposite ends of a link, K, to which is fixed a cross-piece, *k*, having a pivotal connection at *k'* with the lower end of a  
50 rod, L, the other end of which is connected to one arm of an elbow-lever, M, which is pivoted at *m* to a post or support, M', fixed to the

bed A, and connects by its other arm with a rod, L', which is pivoted at *l'* to a shifting-lever, N, pivoted at *n* to a frame, N', on bed A, and provided with a series of notches, *n'*,  
55 in its arched head-bar, into any one of which notches the lever N may be set to hold the link K higher or lower with relation to the block O, which is fitted in the link. The block O has pivotal connection with an arm, P, which  
60 is journaled on and hangs from the steam-inlet pipe R, and the block O is connected by the rod O' with an arm, *s*, of a rock-shaft, S, which is journaled in a bracket or frame, S', fixed to the back end of cylinder B, and has  
65 another arm, *s'*, to which the stem *t* of the valve T, working in the steam-chest B' on cylinder B, is connected by means of a link or rod, O<sup>2</sup>. With this construction, as the eccentrics I J are operated by crank-shaft H the  
70 link K will be rocked by the rods *i j*, and the block O will actuate the valve T, and by shifting the lever N into different notches *n'* of the frame N', so as to raise or lower the link K on the block O, which block always  
75 is retained at the lower end of the pendent arm P, the valve T will be moved on its seat, as the cylinder B oscillates, so as to uncover the steam-ports of the cylinder B more or less, for running at higher or slower speed in either  
80 direction, the engine running forward or backward, accordingly as the block O rests in the link K below or above the center of the link, the link O being held by arm P about at the center of oscillation of the cylinder. Live  
85 steam enters the steam-chest B' through a pipe, R, which is coupled at *r* to a pipe, R', which in turn is coupled rigidly at *r'* with a head or nipple, R<sup>2</sup>, which is journaled or fitted by a ground or packed joint and at the center  
90 of oscillation of the cylinder B into a box or chamber, R<sup>3</sup>, with which the supply-pipe R<sup>4</sup>, leading to the steam-boiler, connects. The steam exhausts from the cylinder through a pipe, U, which is coupled rigidly at *u* to another pipe, U', which in turn is coupled rigidly at *u'* to a head or nipple, U<sup>2</sup>, which is fitted by a ground or packed joint and at the center of oscillation of cylinder B into the  
95 box or chamber U<sup>3</sup>, with which the pipe U<sup>4</sup> connects to carry the steam from the engine. The chambers R<sup>3</sup> U<sup>3</sup> are supported by  
100



suitable brackets or braces,  $R^5 U^5$ , respectively, which are fixed at their lower ends to the frame A of the engine. It is obvious that as the cylinder B oscillates on its trunnions  $b b$  the opposite heads  $R^2 U^2$  will oscillate in the chambers  $R^3 U^3$  of the inlet and exhaust pipes, respectively. The valve T, is made hollow or with an interior chamber,  $T^5$  and with three ports,  $T^2 T^3 T^4$ , in its under side or face and at one side of the valve and opening into the chamber  $T^5$ , said ports  $T^2 T^3$  extending crosswise of the valve at opposite ends, and the port  $T^4$  extending lengthwise of the valve at its center, (see Fig. 4,) and the floor of the valve-chest is provided with ports  $B^2 B^3 B^4$ , which occupy about the same relative positions at one side of the cylinder that the ports  $T^2 T^3 T^4$  hold with relation to the valve T, the opposite ports  $B^2 B^3$  serving alternately as steam and exhaust ports, and the central port,  $B^4$ , serving always as an exhaust-port, from which a passage,  $b'$ , leads into the exhaust-pipe U. The inner side of the valve T is recessed, so as to leave projecting faces  $t^2 t^3 t^4$  around the ports  $T^2 T^3 T^4$ , said faces traveling over the raised surfaces  $b^2 b^3 b^4$  in the floor of the valve-chest and which form the valve-seat. This construction leaves a space, as at  $b^5$ , between the body of the valve and the floor of the steam-chest, in which space the live steam has free circulation, thereby partly balancing the valve, which is out of balance only to the extent of the pressure on an area of the valve corresponding with the combined areas of the projecting faces  $t^2 t^3 t^4$ , which allows a comparatively easy travel of the valve on its seat with very little friction.

In the operation of the engine the ports  $B^2 B^3$  will alternately take steam past the opposite ends of the valve T, and the steam will alternately exhaust through the ports  $B^3 B^2 T^4 B^4$ . In Fig. 1 of the drawings the steam is entering the port  $B^2$ , and is exhausting through the ports  $B^3 T^3$ , the chamber  $T^5$  of valve T, and the ports  $T^4 B^4$  and passage  $b'$  to pipe U, and on the return-stroke of the piston the steam will enter port  $B^3$  and exhaust through ports  $B^2 T^2$ , the chamber  $T^5$  of valve T, and the ports  $T^4 B^4$  and passage  $b'$  to pipe U. The valve faces and seats are so proportioned that the exhaust-ports  $T^2 T^3 T^4$  and chamber  $T^5$  of the valve T, and also the exhaust-port  $B^4$  in the cylinder, never are in communication with the live-steam space of the steam-chest, as said ports and chambers serve only and always as exhaust-steam passages. By making the valve T hollow to receive the exhaust, and also by forming the exhaust-ports  $T^4 B^4$  at one side of the valve and cylinder, I am enabled to bring the valve-seats quite close to the bore of the cylinder, so as to avoid excessive clearance or waste-room in the steam-inlet ports, and intricate passages requiring "blind-coring" in casting the cylinder also are avoided, thus reducing the cost of the cylinder. Furthermore, the side exhaust-ports discharge

more directly into the exhaust-chamber  $U^3$  through the rocking pipes U U' and their connections.

The herein-described valve-motion actuates the valve with a like movement for both the forward and backward strokes of the piston and with the engine running either way, the operation of the eccentrics and link being as precise as the eccentric and link motions of ordinary slide-valve engines having stationary cylinders.

The steam inlet and exhaust ports  $B^2 B^3$  in the cylinder and the exhaust-ports  $T^2 T^3$  in the valve T may be lengthened to any desired extent, to permit quicker steam inlet and exhaust in engines designed for any special duty; but the travel of the valve in any case is comparatively short, due to the rocking movement of the cylinder.

A governor of any approved construction may be attached to the inlet-pipe  $R^4$  at the chamber  $R^3$ .

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An oscillating engine comprising a rocking cylinder, cross-head guides thereon, a cross-head, a crank-shaft, a link supported about at the center of oscillation of the cylinder, means for rocking the link, a block fitted to the link and supported at about the center of oscillation of the cylinder, a slide-valve controlling the ports of the cylinder, and connections from the link-block to the valve for moving the valve, substantially as herein set forth.

2. An oscillating engine comprising a rocking cylinder, cross-head guides thereon, a cross-head, a crank-shaft, oppositely-set eccentrics on said shaft, a link supported pivotally about at the center of oscillation of the cylinder and connected pivotally to rods strapped to the eccentrics, a block fitted to the link and supported about at the center of oscillation of the cylinder, a slide-valve controlling the ports of the cylinder, and rod and rock-shaft connections from the link-block to the slide-valve, substantially as herein set forth.

3. The combination, in an oscillating engine, of the cylinder B, guides C, cross-head D, piston-rod and piston E F, cranked shaft H, eccentrics I J thereon, rods  $i j$ , link K, block O, rock-arm P, rod O', rock-shaft S, journaled in bearings fixed to the cylinder and having arms  $s s'$ , rod O<sup>2</sup>, valve-stem  $t$ , and a connected slide-valve controlling the ports of the cylinder, substantially as herein set forth.

4. The combination, in an oscillating engine, of the cylinder B, guides C, cross-head D, piston-rod and piston E F, cranked shaft H, eccentrics I J thereon, rods  $i j$ , link K, block O, arm P, rod O', rock-shaft S, having arms  $s s'$ , rod O<sup>2</sup>, valve-stem  $t$ , a connected slide-valve controlling the ports of the cylinder, a rock-lever, M, connected pivotally to link K, and a lever or equivalent device adapted to shift the lever M for adjusting the link-block O, substantially as herein set forth.



5. An oscillating engine constructed with rigidly-coupled steam inlet and exhaust pipes communicating with the steam-chest and exhaust-passage of the cylinder, and fitted to  
 5 rock in steam-chambers positioned at the center of oscillation of the cylinder, said chambers having connecting steam inlet and exhaust pipes, substantially as herein set forth.

6. The combination, with the steam-cylinder  
 10 provided at each end with a port serving both for steam inlet and exhaust, and also with an intermediate exhaust-port, of a slide-valve provided with an interior chamber for the exhaust-steam, and three exhaust-ports opening into  
 15 said chamber, or one port at each end of the valve and an intermediate port, substantially as herein set forth.

7. The combination, with the steam-cylinder  
 20 provided at each end with a port serving both for steam and exhaust, and also with an intermediate exhaust-port, of a slide-valve provided with an interior chamber for the exhaust-steam, and three exhaust-ports opening into  
 25 said chamber, or one port at each end of the valve and an intermediate port, and said valve and cylinder, either or both, being shaped to

provide a live-steam space at  $b^5$  between the opposing body portions of the valve and cylinder, substantially as herein set forth.

8. The combination of the steam-cylinder B, 30  
 constructed with transversely-ranging steam and exhaust ports  $B^2$   $B^3$  at opposite ends, and a longitudinally-ranging exhaust-port,  $B^4$ , located at one side of the steam-chest, and the valve T, formed with an interior exhaust-chamber,  $T^5$ , and provided with transversely-ranging exhaust-ports  $T^2$   $T^3$  at opposite ends, and  
 35 longitudinally-ranging exhaust-port  $T^4$ , located at one side of the valve, substantially as herein set forth.

9. The valve T, made with an interior exhaust-steam chamber,  $T^5$ , transversely-ranging exhaust-ports  $T^2$   $T^3$ , and longitudinally-ranging exhaust-port  $T^4$ , said ports being  
 40 formed through the raised valve-faces  $t^2$   $t^3$   $t^4$  into the chamber  $T^5$ , substantially as herein set forth.

DOUGLAS C. PUTNAM.

Witnesses:

W. S. GAVITT,  
 PARDON DUFFEE.