

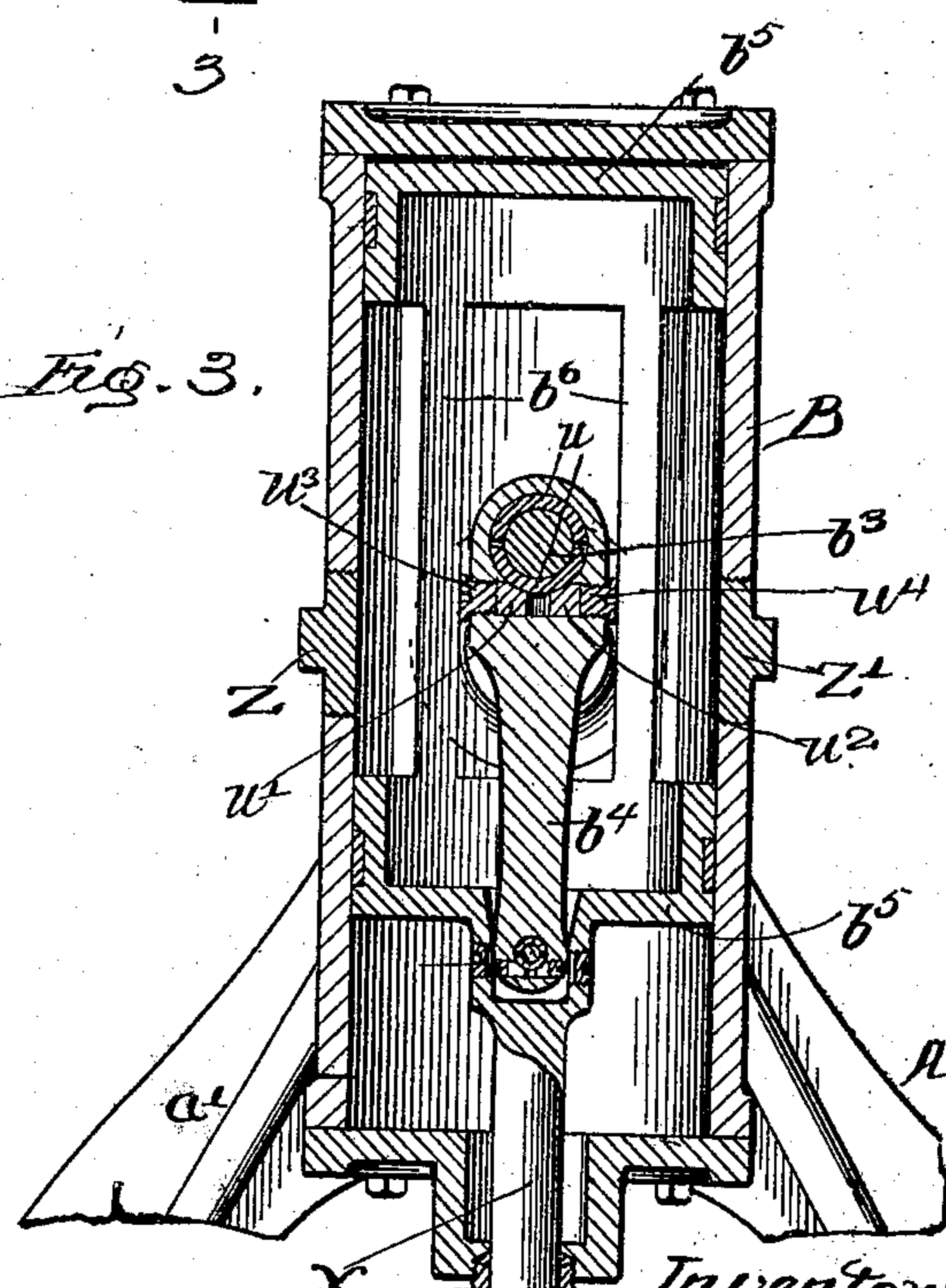
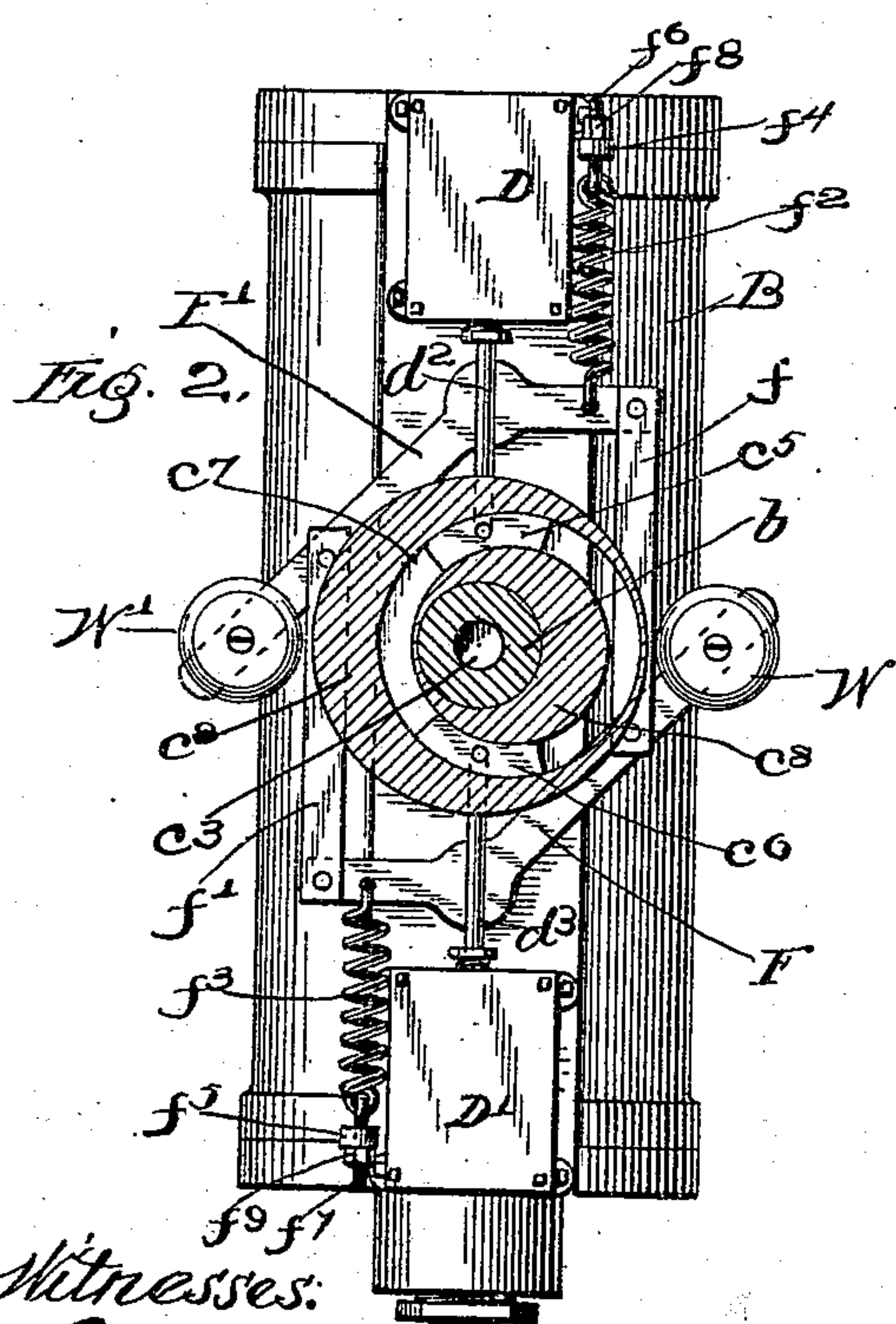
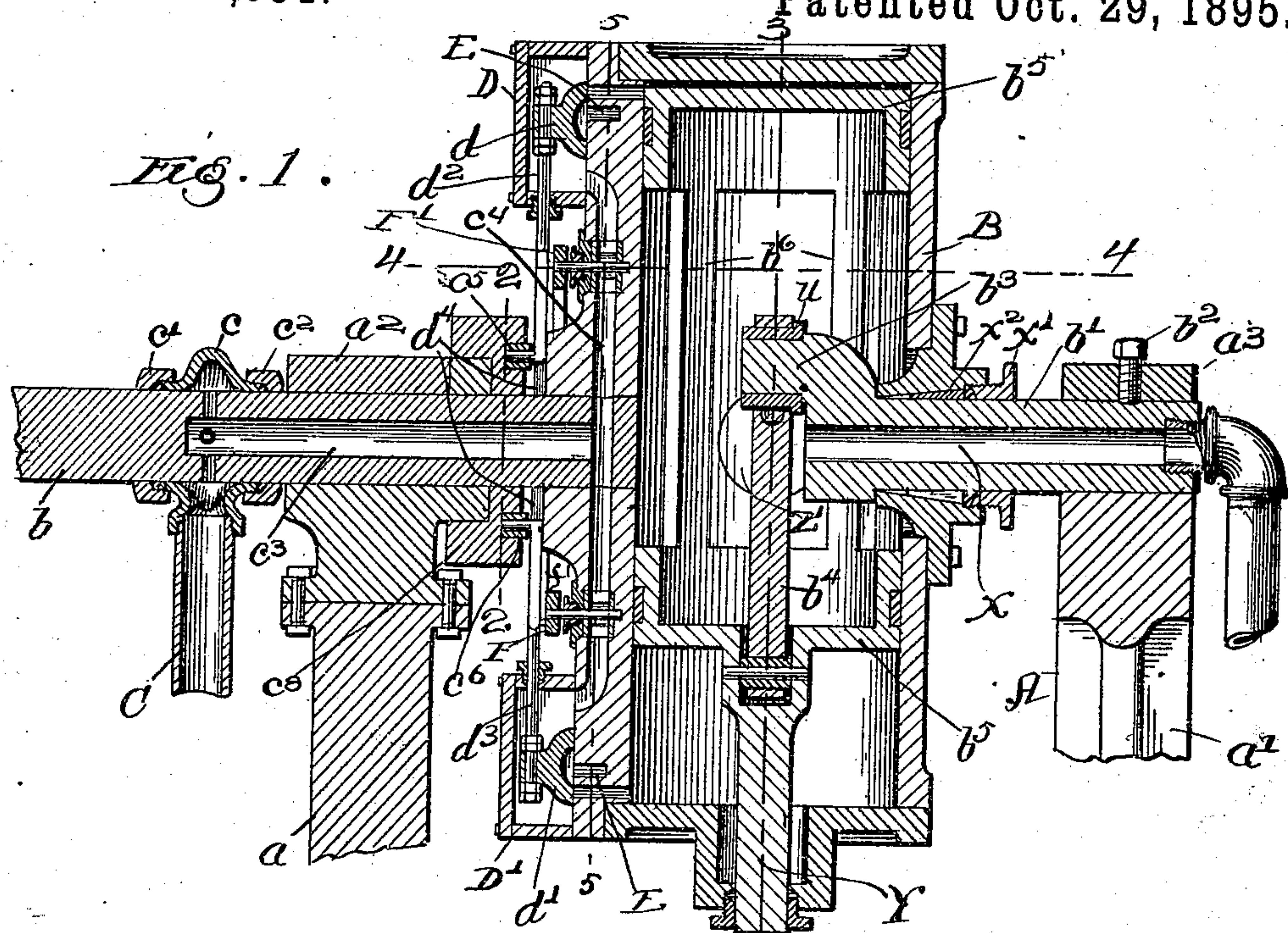
(No Model.)

3 Sheets—Sheet 1.

J. ZANDER.  
STEAM ENGINE.

No. 548,691.

Patented Oct. 29, 1895.



Witnesses:

Chas. C. Shurway  
A. H. Ebbesen

Inventor:

John Zander  
by Milburne Bitner  
Attys



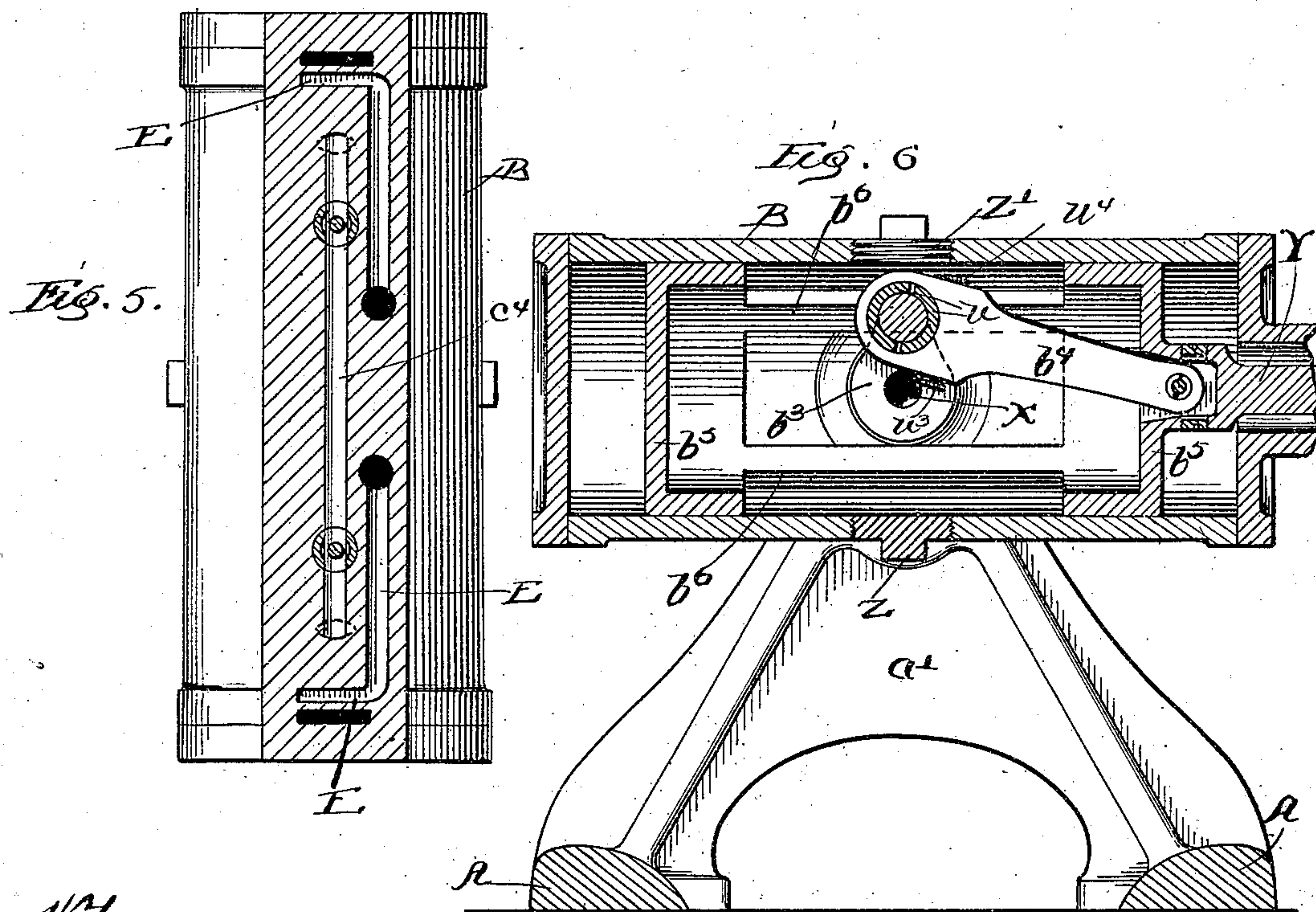
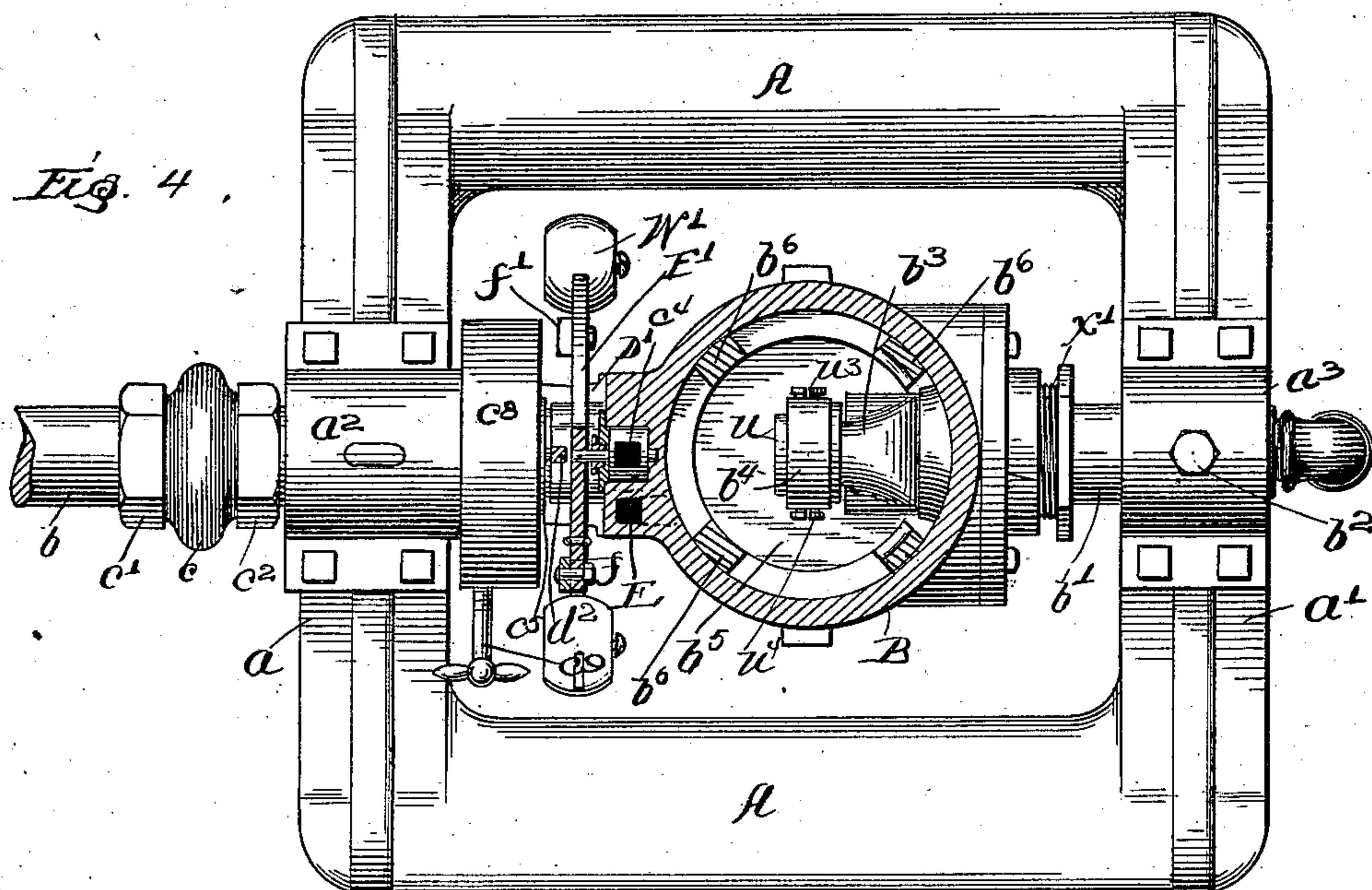
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3 Sheets—Sheet 2.

J. ZANDER.  
STEAM ENGINE.

No. 548,691.

Patented Oct. 29, 1895.



Witnesses:

Chas. O. Sharkey  
C. H. Ebbesen

Inventor:

John Zander  
by Miles Suer-Pitman  
Attor.



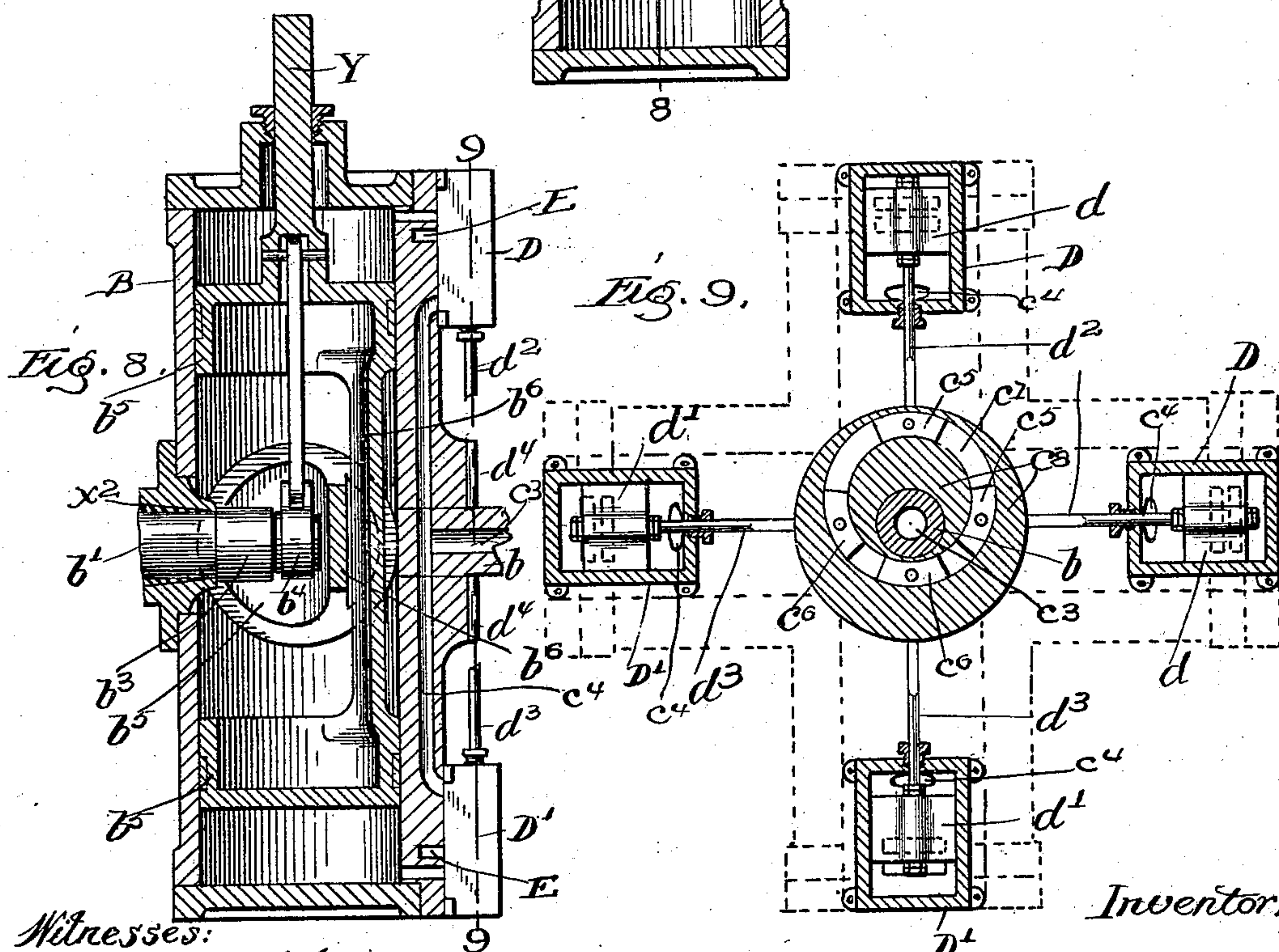
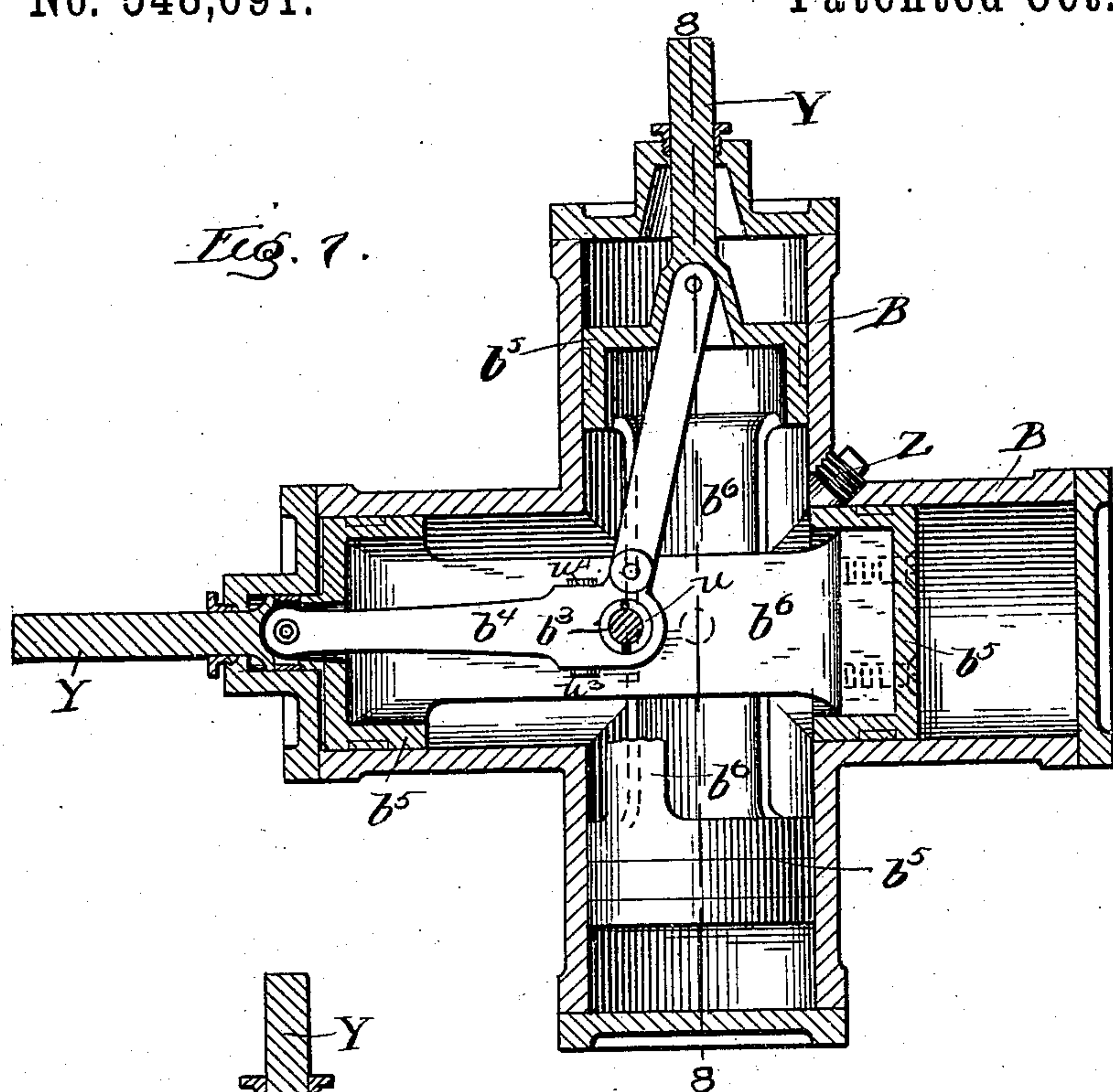
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3 Sheets—Sheet 3.

J. ZANDER.  
STEAM ENGINE.

No. 548,691.

Patented Oct. 29, 1895.



Witnesses:

Chas. O. Sheroy  
A. H. Ebbesen

Inventor:

John Zander  
by Wm. Green Bitner  
attys



# UNITED STATES PATENT OFFICE.

JOHN ZANDER, OF CHICAGO, ILLINOIS.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 548,691, dated October 29, 1895.

Application filed February 16, 1895. Serial No. 538,660. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN ZANDER, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

My invention relates to certain improvements in steam-engines, the purpose of which is to construct a compact, strong, and rapidly-moving engine at moderate cost and of great durability.

To such end my invention consists in certain features of construction, which will appear from the following description and be carefully pointed out in the appended claims.

In general my engine is constructed by mounting the cylinder centrally upon a shaft, so that the cylinder may itself turn, connecting the piston by means of a short pitman-rod with an eccentric-pivot, so that the reciprocation of the piston tends to revolve the cylinder, and providing an inlet for the steam and an outlet for the exhaust within the shaft upon which the engine turns, so that the piston-rod and pitman-rod are both contained within the space occupied by the cylinder and the cylinder itself becomes a balance-wheel and dispenses with the use of the latter.

The invention is illustrated in the accompanying drawings by means of nine figures, of which—

Figures 1 to 6, both inclusive, illustrate the construction of a single-cylinder engine; and Figs. 7 to 9, both inclusive, show the construction of a double-cylinder engine. Fig. 1 is a vertical section through the center of the shaft upon which the cylinder is mounted. Fig. 2 is a vertical section transversely of Fig. 1 in line 2 2. Fig. 3 is a similar section in line 3 3. Fig. 4 is a horizontal section in line 4 4 of Fig. 1. Fig. 5 is a vertical section in line 5 5 of Fig. 1. Fig. 6 is a section similar to that shown in Fig. 3, but showing the cylinder at right angles to the position seen in Fig. 3. Fig. 7 is a vertical section of a double-cylinder construction, taken in the plane of the axes of the two cylinders. Fig. 8 is a section taken transversely of Fig. 7 in line 8 8; and Fig. 9 is a section in line 9 9 of Fig. 8, to show the valve movement of the double-cylinder construction.

The engine is mounted upon a frame A, from which rise two standards  $a a'$ , upon the top of the former of which is a box  $a^2$  and upon the top of the latter of which is a socket  $a^3$ . The box  $a^2$  furnishes a bearing for a shaft  $b$ , which is rigidly fastened in the cylinder B. From the socket  $a^3$  extends a rigid shaft  $b'$ , prevented from turning within the socket by means of a set-screw  $b^2$  and extending within the piston, which is adapted to turn upon this rigid shaft. Upon the end of the shaft is a crank-arm  $b^3$ , upon which is pivoted one end of the pitman-rod  $b^4$ , the other end of which is pivoted to one end of a double piston  $b^5$ . It will be seen that this construction practically dispenses with the piston-rod and brings the pitman-rod within the cylinder. Because of the eccentricity of the crank-arm  $b^3$  the reciprocation of the piston  $b^5$  within the cylinder B rotates the latter cylinder, and therefore with the shaft  $b$ . The steam enters through a pipe C to the interior of a thimble  $c$ , mounted steam-tight upon the shaft  $b$  by means of suitable packing-rings  $c' c^2$  and packing confined thereby. The shaft  $b$  is perforated within this thimble to furnish access to a passage  $c^3$  within the shaft connected with a port  $c^4$ , formed in the cylinder. This port leads in opposite directions to two steam-chests D D' upon the opposite ends of the cylinder, within which are arranged ordinary slide-valves  $d d'$ . These valves are operated by means of rods  $d^2 d^3$ , guided in grooves  $d^4$  in the cylinder and having ends bent at right angles and pivoted to slides  $c^5 c^6$ , fitted to an eccentric groove  $c^7$  in a cylindrical block  $c^8$ , journaled upon the shaft  $b$ , and adjustably secured to the box  $a^2$  by means of a set-screw  $c^9$ , which also serves as a handle to throw the eccentric around to reverse the engine or to adjust the movement of the slide-valves. The exhaust-port, which is lettered E, leads through the metal of the cylinder, as shown in Fig. 5, and discharges into the interior of the cylinder between the opposite ends of the double-ended piston, which is composed of a series of struts  $b^6$  between its ends to permit the exhaust-steam to enter the interior of the piston and escape through the port X in the rigid shaft  $b'$ . This shaft is made steam-tight with the piston by means of a stuffing-box  $x'$ , and provision is made for taking up



wear by means of a tapered bearing-block  $x^2$ . The double-ended piston is provided upon its lower end, as seen in Fig. 1, with a guide-rod Y, guided and packed within the end of the cylinder to take whatever side-thrust may be caused by the eccentricity of the crank-arm  $b^3$ . Upon the cylinder between the steam-chests I pivot two levers F F', connected together by means of links  $ff'$ , and each provided with weights W W' upon the ends of their longer arms. Coiled springs  $f^2 f^3$  are placed under tension between the shorter arms of the levers and brackets  $f^4 f^5$  upon the cylinder, wherein they are adjusted by means of bolts  $f^6 f^7$  and nuts  $f^8 f^9$ . The tension of the springs tends to throw the weights toward the center of rotation, and the centrifugal force developed by the rotation of the cylinder tends to throw the weights away from said center. These levers are extended into the cylinder in the form of cut-off valves in the port  $c^4$ , so that this device becomes a governor adapted to regulate the speed of the engine.

Inasmuch as the bearing upon the crank-arm would be ordinarily inaccessible, I provide openings in the sides of the cylinder, which are normally closed by means of screw-plugs Z Z'. Figs. 7, 8, and 9 show a double cylinder containing pistons working at right angles and bearing upon the same crank-arm, so that when one piston is on the center the other piston has its maximum leverage upon the crank-arm. The double-ended pistons are provided with struts disposed about the crank-arm and the pitman-rods so that they can move freely back and forth without interfering with each other.

The bearing about the crank-arm  $b^3$  consists of an ordinary divided bearing-block  $u$ , the two parts of which are pressed together by means of wedges  $u' u^2$  in a transverse hole in the pitman-rod and pressed inward by screws  $u^3 u^4$ . The method of forming the wedges  $u' u^2$  consists in boring the transverse hole in the pitman, plugging it up with a suitable metal plug, and then boring the hole which is to receive the bearing-blocks. The plug is then taken out and the portions cut out of it which are not needed.

I claim as new and desire to secure by Letters Patent—

1. The combination with a suitable base, shaft journaled therein, and steam supply port of one or more cylinders rigidly mounted upon the shaft and having ports connected with the steam supply port and provided with suitable valves and valve operating devices, the steam exhaust ports of which empty into the interior of the middle portion, or portions, of the cylinder, or cylinders, a rigid shaft supported upon the base and entering said cylinder, or cylinders, in line with the first mentioned shaft, an exhaust port adapted to take the exhaust steam from the interior of the cylinder, or cylinders, a suitable bearing about the rigid shaft, a crank arm upon the inner end thereof, one or more double-ended hollow pistons consisting of two ends connected by suitable struts, each provided with suitable piston packing and a pitman rod, or pitman rods, pivoted thereto and to the eccentric crank; substantially as described.

2. The combination with a double rotating cylinder consisting of two connecting cylinders arranged at right angles in the form of a cross and carried upon one side by a suitably journaled shaft, suitable steam supply ports and valves which exhaust into the interior of the double cylinder, a rigid shaft carrying the other side of the double cylinder and entering through the walls thereof and bearing an eccentric crank arm within the same, a passage for the exhaust steam connected with the interior of the cylinders, double ended pistons, within the respective cylinders, each connected by a pitman rod with the eccentric crank arm and each having struts connecting their opposite ends, said struts being arranged so as not to interfere with each other as the pistons move back and forth; substantially as described.

In witness whereof I hereunto set my hand, at Chicago, Illinois, this 7th day of February, 1895.

JOHN ZANDER.

In presence of—

CHARLES O. SHERVEY,  
A. I. H. EBBESEN.