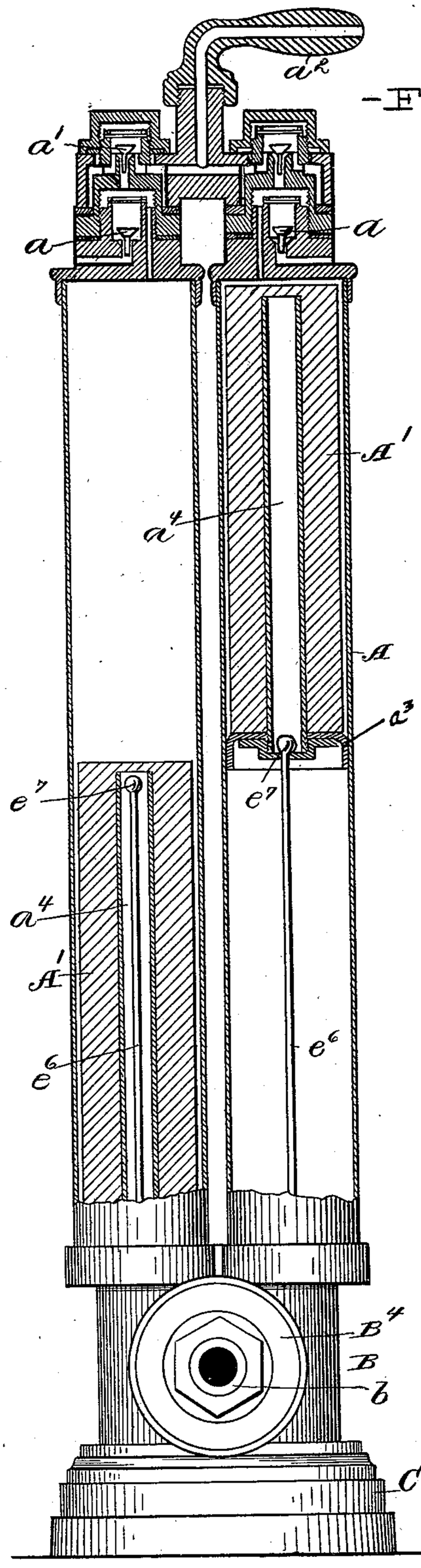
(No Model.) 3 Sheets—Sheet 1.

F. C. GUYSER.

HYDRAULIC AIR COMPRESSOR.

No. 560,987. Patented May 26, 1896.

-FIG.1-



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(No Model.) 3 Sheets—Sheet 2.

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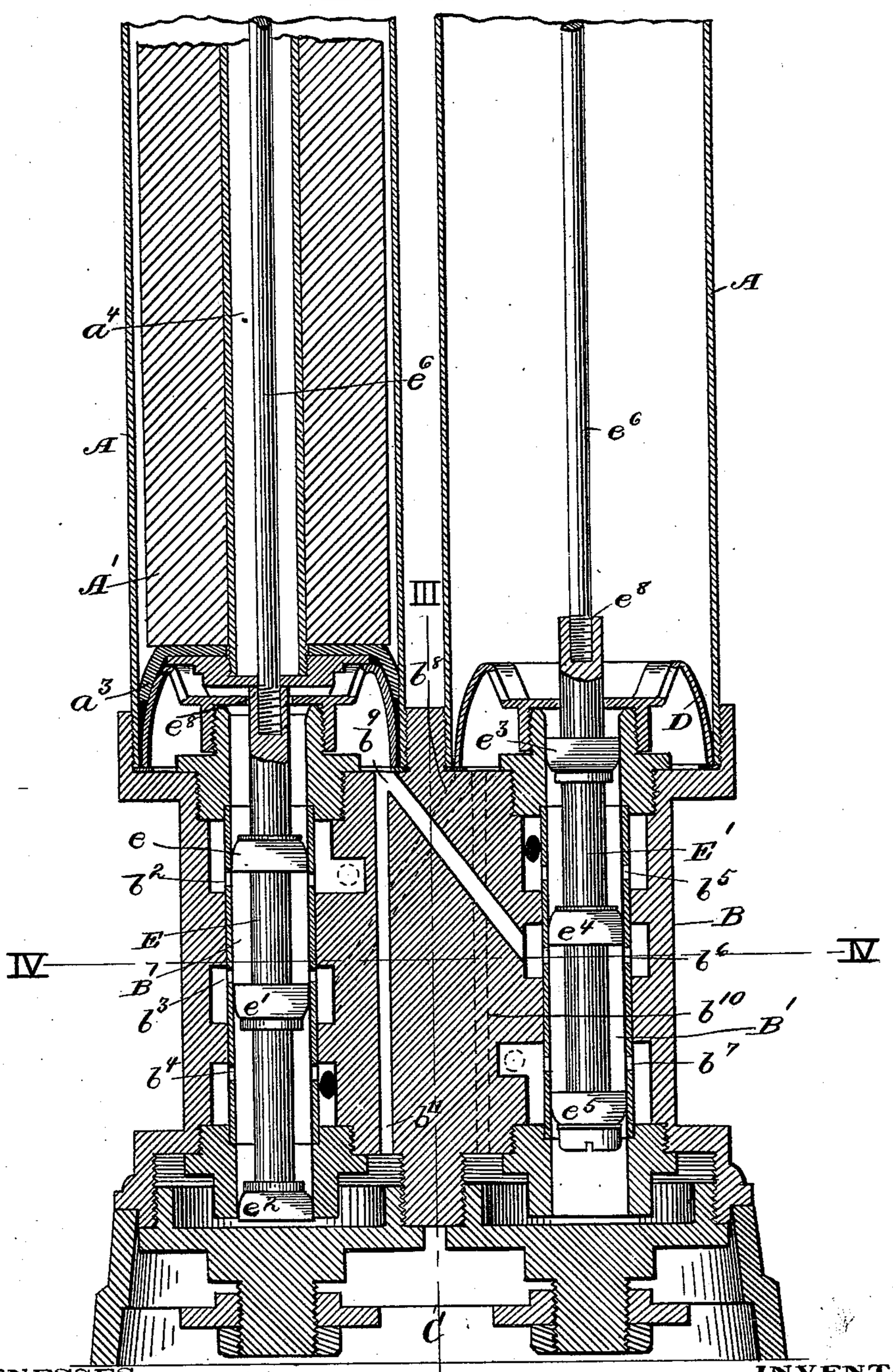
-FIG. II-



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(No Model.) 3 Sheets—Sheet 3.

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HYDRAULIC AIR COMPRESSOR.

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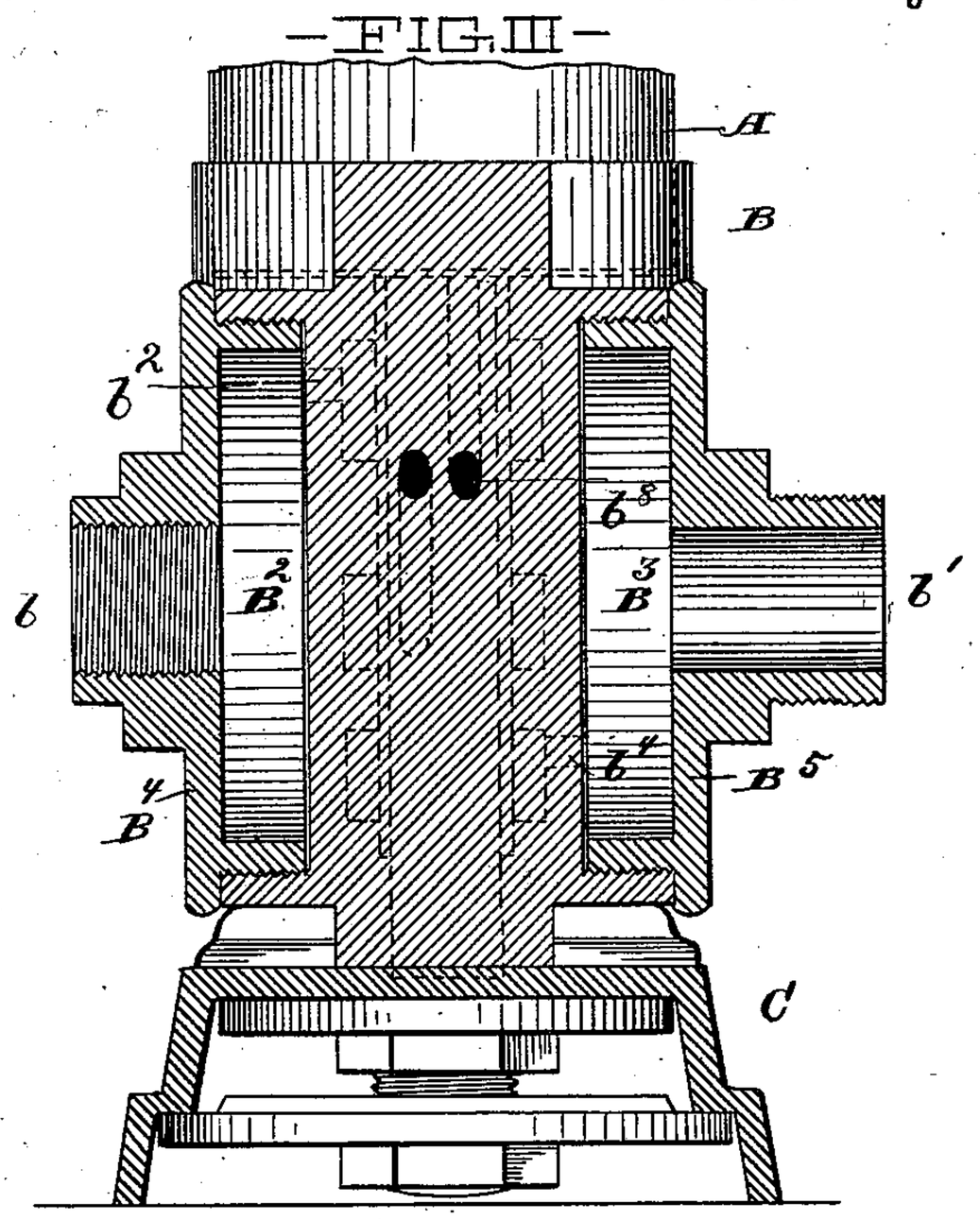
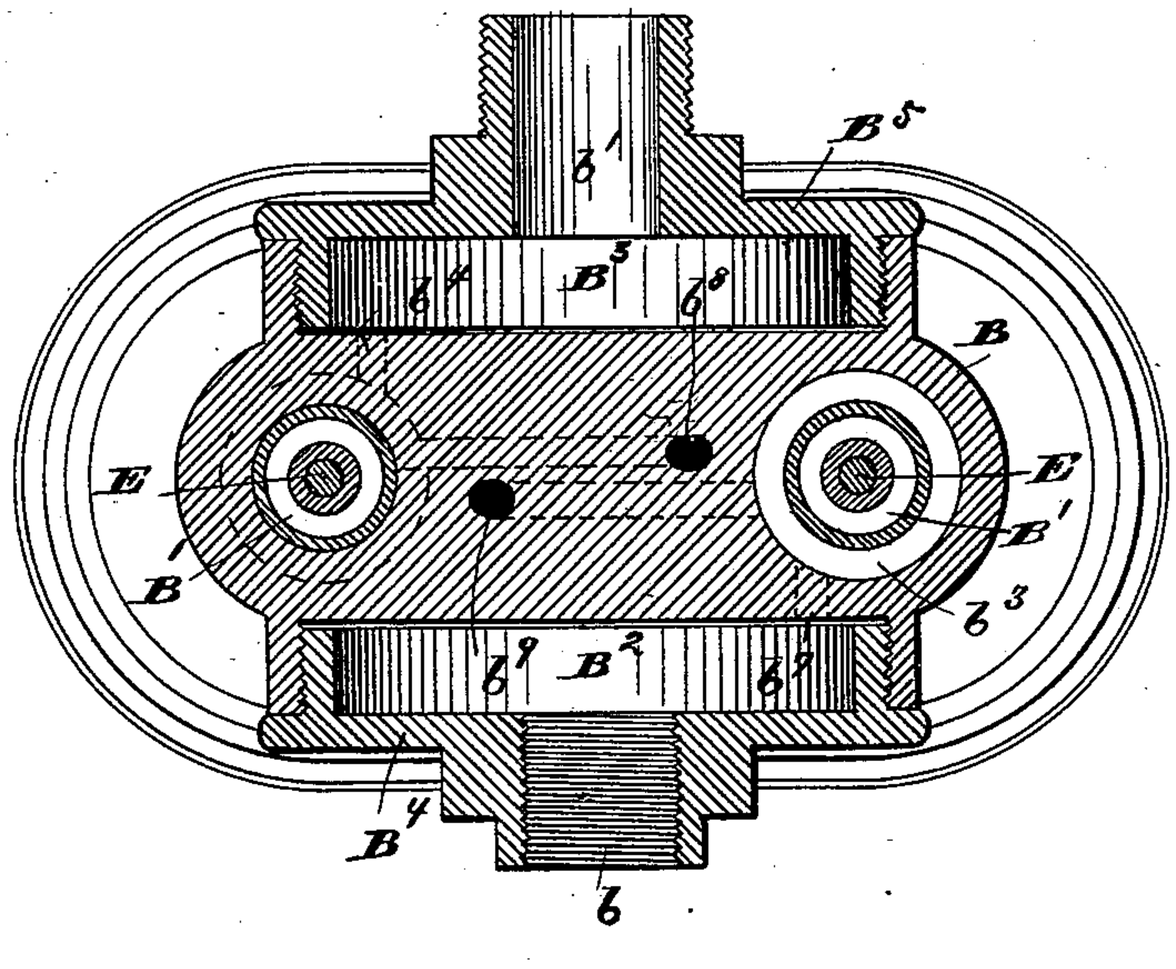
—FIG. III—



—FIG. IV—



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UNITED STATES PATENT OFFICE.

FRANK C. GUYSER, OF CLEVELAND, OHIO, ASSIGNOR TO THE VULCAN BRASS COMPANY, OF SAME PLACE.

HYDRAULIC AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 560,987, dated May 26, 1896.

Application filed May 13, 1895. Serial No. 549,065. (No model.)

To all whom it may concern:

Be it known that I, FRANK C. GUYSER, a citizen of the United States, and a resident of Cleveland, county of Cuyahoga, and State of Ohio, have invented certain new and useful Improvements in Hydraulic Air-Compressors, of which the following is a specification, the principle of the invention being herein explained and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

The annexed drawings and the following description set forth in detail one mechanical form embodying the invention, such detail construction being but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure I represents a front view of my improved air-compressor, illustrating the upper portions thereof in axial section; Fig. II, an axial section, on an enlarged scale, of the valve-chambers and the lower portions of the cylinders; Fig. III, a vertical section on the line III III in Fig. II, and Fig. IV a horizontal section on the line IV IV in Fig. II.

Two air and water cylinders A A are supported upon a valve-chest B, which has a base C. The upper ends of the cylinders have air-inlet valves a and air-outlet valves a', and the air-outlets are united and extend out through one air-outlet nozzle a^2, to which the tube or other conduit which conveys the compressed air to its destination may be attached. Weighted pistons A', having the usual form of cup-packings a^3 at their lower ends, are placed to reciprocate within the cylinders, the pressure of the actuating-water admitted beneath the pistons serving to raise them and the gravity of their weights serving to lower them. A truncate-conoidal spreader D is secured in the bottom of each cylinder and is formed with openings through it, so as not to interfere with the water inlet and outlet which opens through the bottom of the cylinder. Said spreaders serve to force the cup-packings of the pistons against the sides of the cylinders when the pistons are at the lowermost points of their stroke, thereby preventing leakage of water past the packings and into the air-spaces of the cylinders, which would be liable to take place were the spreaders not provided. Two cylindrical vertical valve-chambers B' B' are formed in the valve-chest, each concentric with the cylinder above it and having its upper end opening into the bottom of the cylinder. The valve-chest is formed at its front and rear with two cylindrical recesses B^2 and B^3, closed by screw-caps B^4 and B^5, having, respectively, a nipple b and b', to which the water-inlet pipe and water-outlet pipe may be secured. The cylindrical valve-chambers have, respectively, three annular channel-ports b^2, b^3, and b^4 and b^5, b^6, and b^7. The upper port b^2 of one valve-chamber and the lower port b^7 of the other valve-chamber communicate with the inlet-recess B^2, and the lower port b^4 of one chamber and the upper port b^5 of the other chamber communicate with the outlet-recess B^3. The middle port b^3 of one valve-chamber communicates through a channel b^8 with the bottom of the cylinder above the other valve-chamber, and the middle port b^6 of said latter chamber communicates through a channel b^9 with the bottom of the cylinder above said first-mentioned valve-chamber, the channels b^8 and b^9 crossing each other one behind the other. Vertical channels b^{10} and b^{11} extend, respectively, from the channels b^8 and b^9 to the bottoms of the valve-chambers. Valves E and E' slide, respectively, in the valve-chambers. Each valve is provided with three packings e, e', and e^2 and e^3, e^4, and e^5, respectively. The packings e and e' of the valve E are at such distance from each other that they may connect the upper and middle port of the valve-chamber in which the valve plays, and the lower packing e^2 is at such distance from the middle packing e' that said packings may connect the middle and lower ports of the valve-chamber. The upper and middle packings e^3 and e^4 are at such distance from each other that they may connect the upper and middle ports of the valve-chamber within which the valve plays, and the middle and lower packings e^4 and e^5 are at such distance from each other that they may connect the middle and lower ports in the valve-chamber. Each valve has a stem e^6, provided with a knob e^7 at its upper end, and each valve forms a shoulder e^8

at the junction between the stem and the valve-body. The stems project through axial bores a^4 in the weighted pistons, and said bores have contracted lower ends, which may engage the knobs upon the valve-stems and lift the valves at the upper end of the upstroke of the pistons, while the shoulders upon the valves may be struck by the weighted pistons, and the valves may be depressed when the pistons arrive at the lower end of their downstroke.

We will assume that the parts of the air-compressor are in the positions illustrated in the drawings, and that the water-inlet is suitably connected to a source of water under a head or pressure, and that the water-outlet is suitably connected to a waste. The water under pressure will pass through the lower port of the right-hand valve-chamber and from thence pass to the middle port of said valve-chamber and through the channel which leads into the bottom of the left-hand cylinder, where it will act upon the piston of said cylinder, raising the same. The inlet-water will also pass through the upper port of the left-hand chamber and through the middle port of the same and the channel into the right-hand cylinder, where it will sustain the piston in its raised position. When the left-hand piston arrives at the upper end of its upstroke, it will raise the left-hand valve, thereby connecting the right-hand cylinder with the waste, causing the weighted piston in the same to descend until it strikes the right-hand valve and depresses the same, when said valve will put the left-hand cylinder in connection with the waste and allow the weighted piston in said cylinder to descend. When the left-hand piston arrives at the lower end of its downstroke, it will depress the left-hand valve and will again connect the right-hand cylinder with the water-inlet, causing the weighted piston in said cylinder to ascend until it raises the right-hand valve, which will again place the left-hand cylinder in connection with the water-inlet and will cause the weighted piston in said cylinder to rise. The two pistons in the cylinders will consequently ascend and descend, one immediately after the other, and the piston of one cylinder will actuate the valve which controls the water inlet and outlet for the other cylinder. The truncate-conoidal spreaders will force the cup-packings of the pistons against the sides of the cylinders when the pistons are at the lowermost points of their downstrokes, thereby preventing any leakage past said packings, as the latter will be kept supported until the force of the water acting against them will itself serve to expand the packings. The channels which connect the bottoms of the cylinders with the bottoms of the valve-chambers will balance the valves, as the latter will have the same amount of pressure at their upper and lower ends.

Other modes of applying the principle of my invention may be employed for the mode herein explained. Change may therefore be made as regards the mechanism thus disclosed, provided the principles of construction set forth, respectively, in the following claims are employed.

I therefore particularly point out and distinctly claim as my invention—

1. The combination of two air and water cylinders, each having air inlet and outlet at its top and water inlet and outlet at its bottom, together with weighted pistons in such cylinders; a valve-chest formed with two recesses upon its faces, which recesses are respectively connected to the water-inlet and water-waste, and formed with two cylindrical valve-chambers; each said valve-chamber being concentric with its corresponding cylinder and formed with three ports, each middle port communicating with the water inlet and outlet of the companion cylinder, the upper port of one valve-chamber and the lower port of the other valve-chamber communicating with the water-inlet recess, the lower port of the first-named valve-chamber and the upper port of the last-named valve-chamber communicating with the water-waste recess; valves in the valve-chambers, each such valve having a middle piston playing to opposite sides of the middle port, and having end pistons permanently located to the outside of the end ports; slip-joint connections between said valves and weighted pistons, whereby each valve may be raised at the end of the upstroke of the weighted piston to which it is connected, and may be depressed at the end of the downstroke of such weighted piston; all substantially as set forth.

2. In a hydraulic air-compressor, the combination with a piston having a cup-packing, of a tapering spreader, secured at the end of the cylinder, and adapted to enter the packing and spread the same against the sides of the cylinder at the end of the stroke of said piston, substantially as set forth.

In testimony that I claim the foregoing to be my invention I have hereunto set my hand this 10th day of May, A. D. 1895.

FRANK C. GUYSER.

Witnesses:
WM. SECHER,
DAVID T. DAVIES.