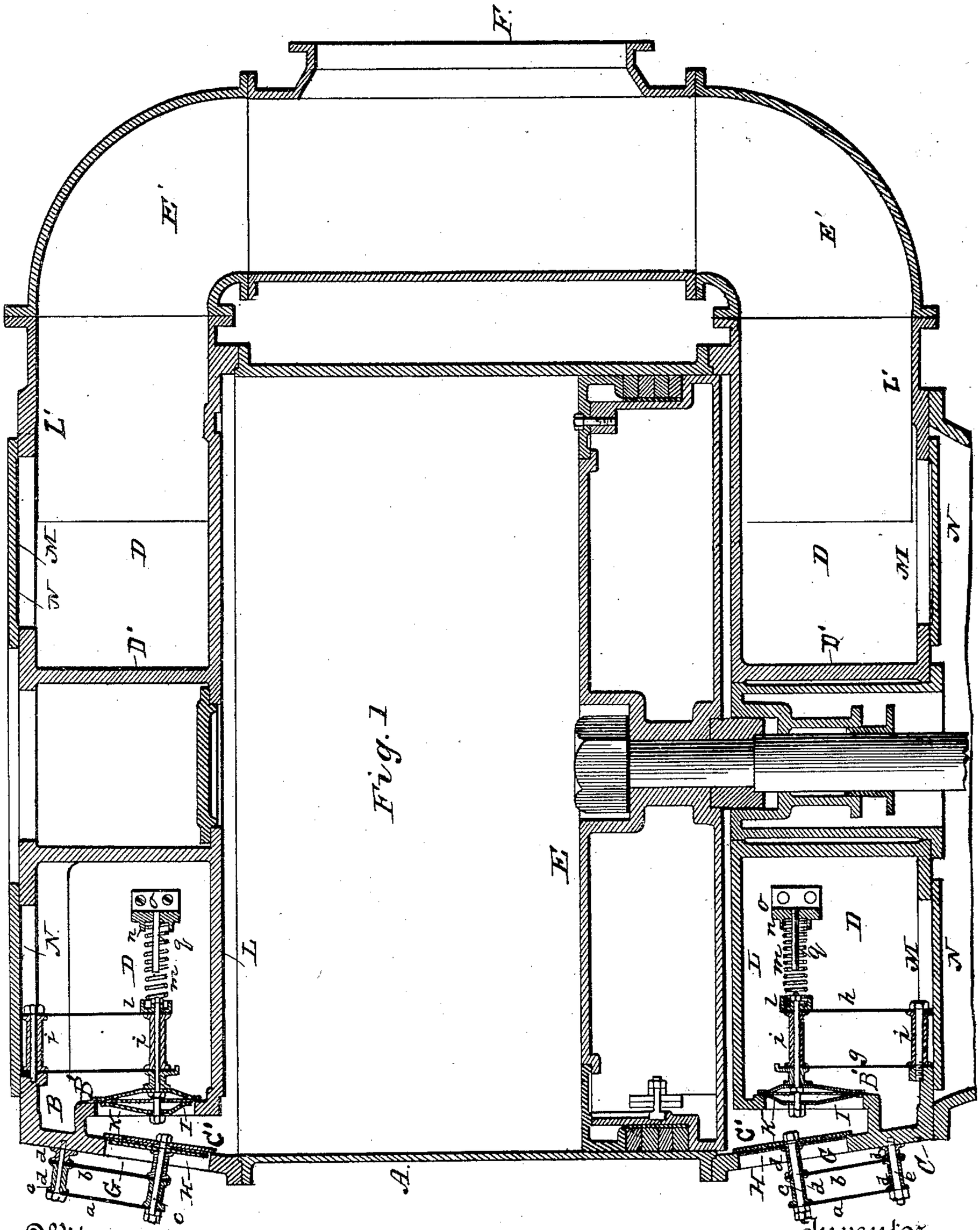
(No Model.) 4 Sheets—Sheet 1.

P. L. WEIMER.

BLOWING ENGINE.

No. 354,453. Patented Dec. 14, 1886.



Witnesses
Fred G. Dieterich
Wm. E. Dyre.

Inventor
P. L. Weimer

By his Attorneys
Johnston, Reinohl & Dyre

(No Model.) 4 Sheets—Sheet 2.

P. L. WEIMER.

BLOWING ENGINE.

No. 354,453. Patented Dec. 14, 1886.

Fig. 2

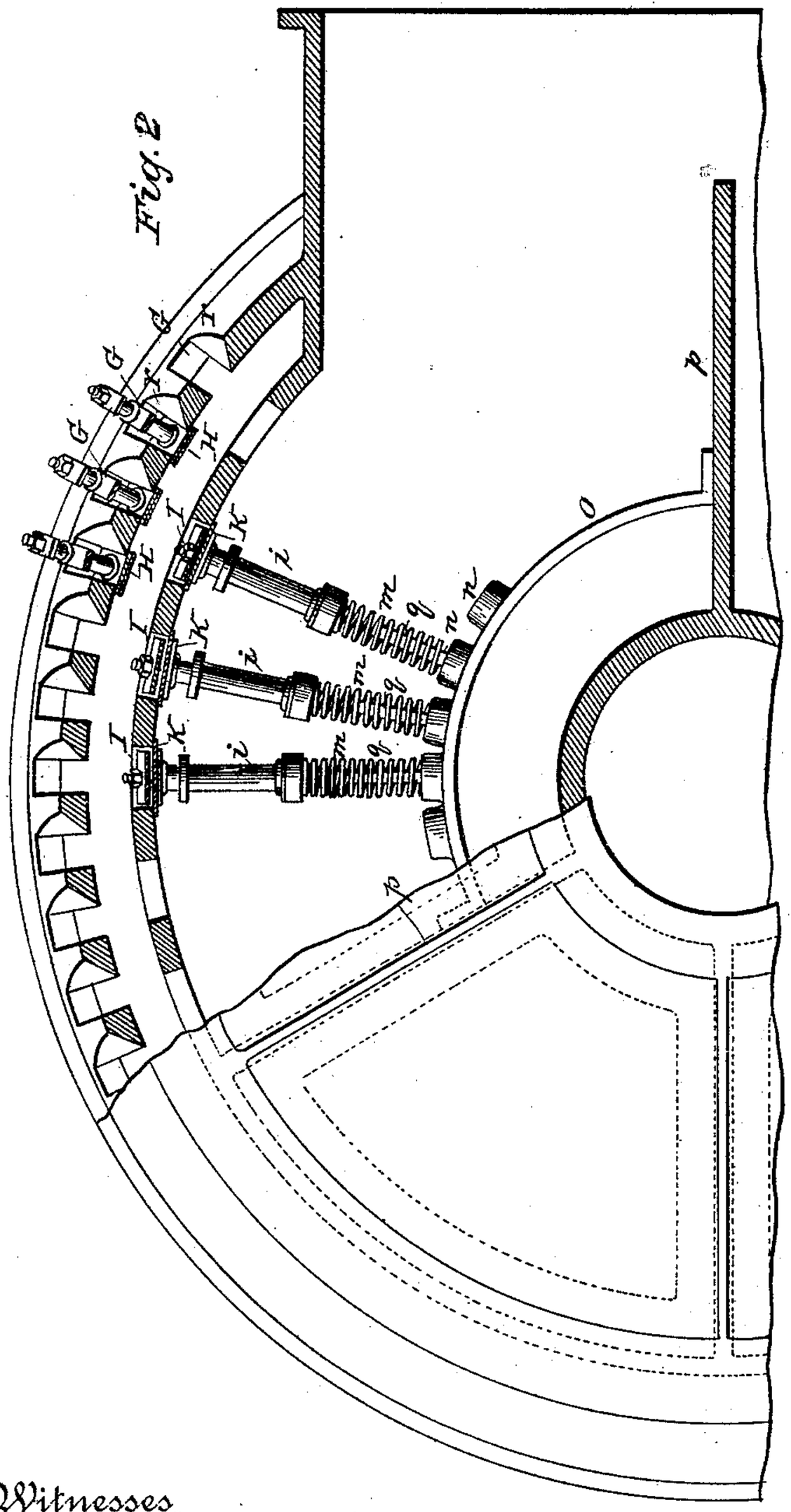
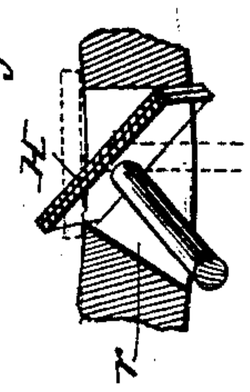


Fig. 4



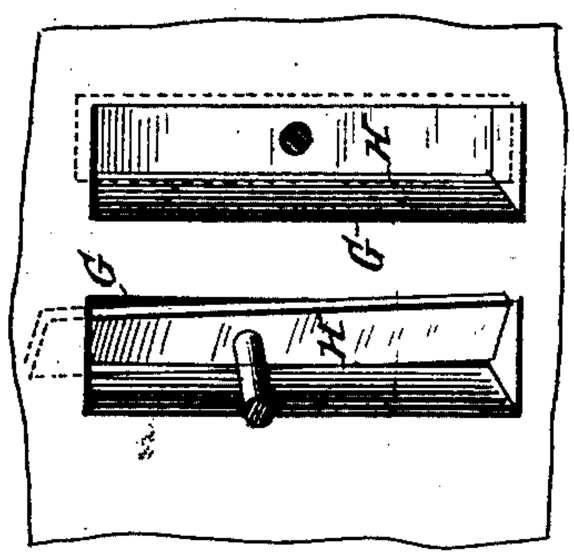


Fig. 3.

Witnesses
Fred G. Dieterich
Wm E. Dyre.

Inventor
P. L. Weimer

By his Attorneys
Johnston, Reinohl & Dyre

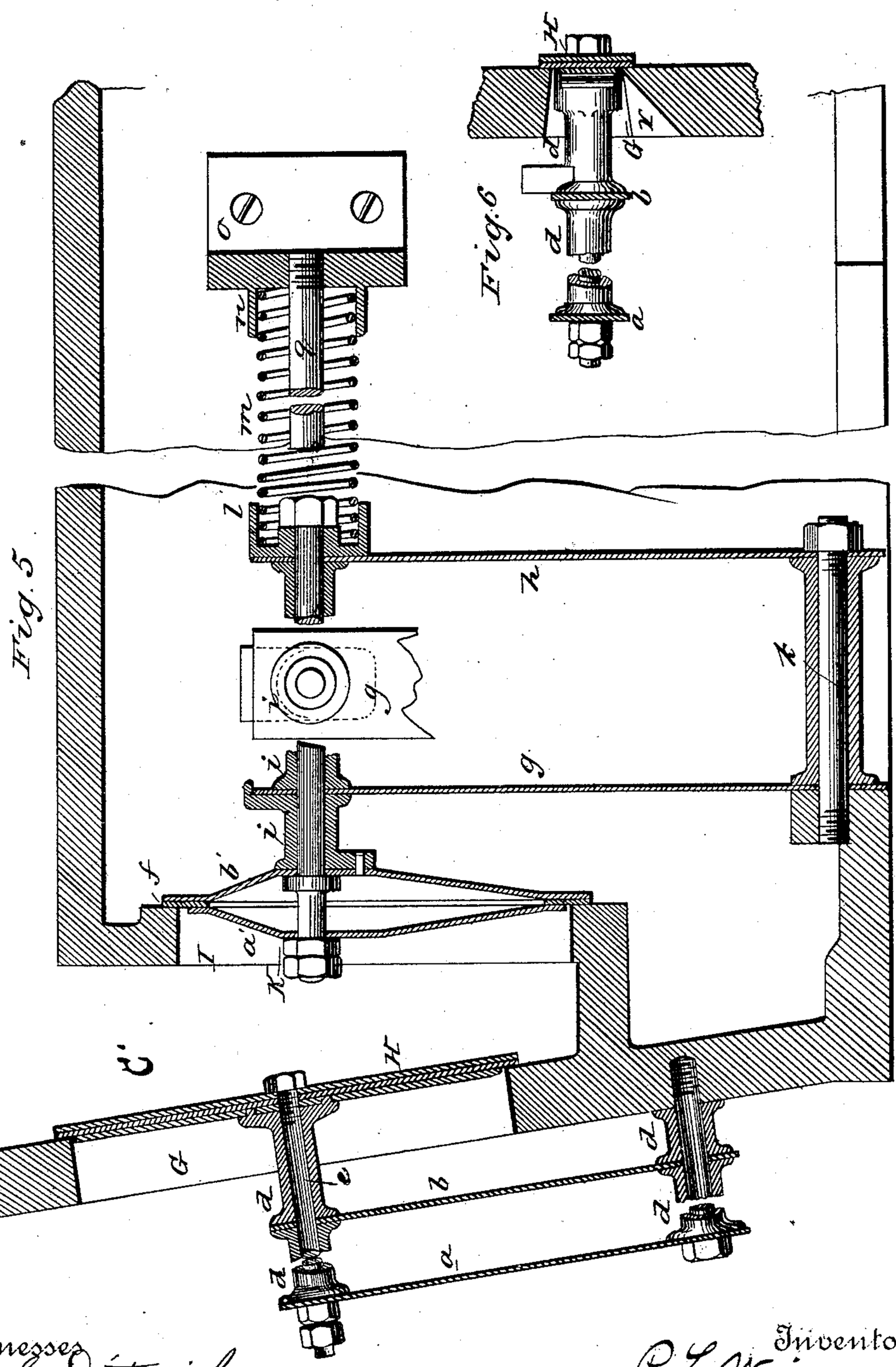
(No Model.)

4 Sheets—Sheet 3.

P. L. WEIMER.

BLOWING ENGINE.

No. 354,453. Patented Dec. 14, 1886.



Witnesses
Fred J. Dieterich
Wm. E. Dyer.

Inventor
P. L. Weimer

By his Attorneys
Johnston, Reinehl & Dyer

(No Model.) 4 Sheets—Sheet 4.

P. L. WEIMER.

BLOWING ENGINE.

No. 354,453. Patented Dec. 14, 1886.

Fig. 7.

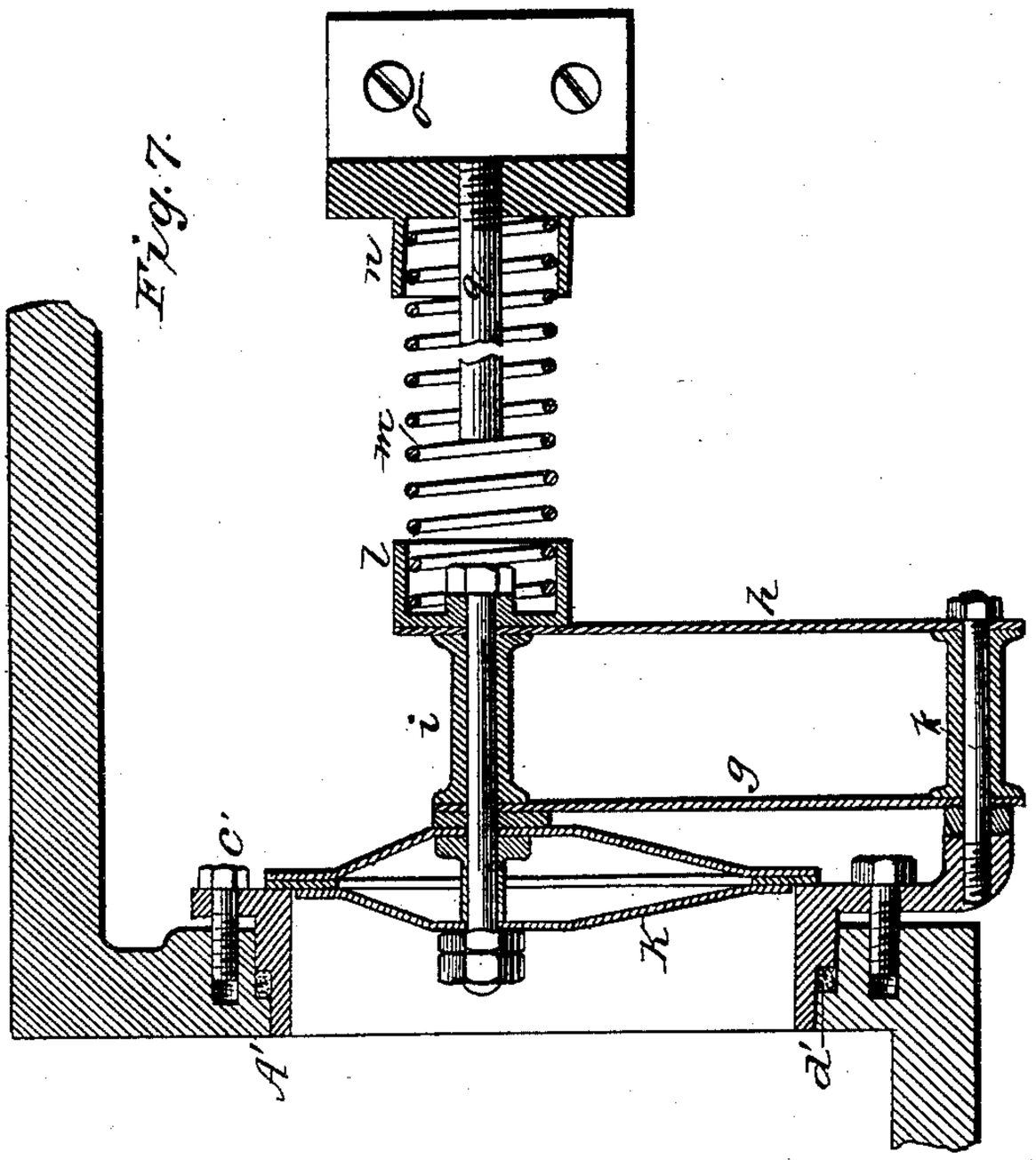
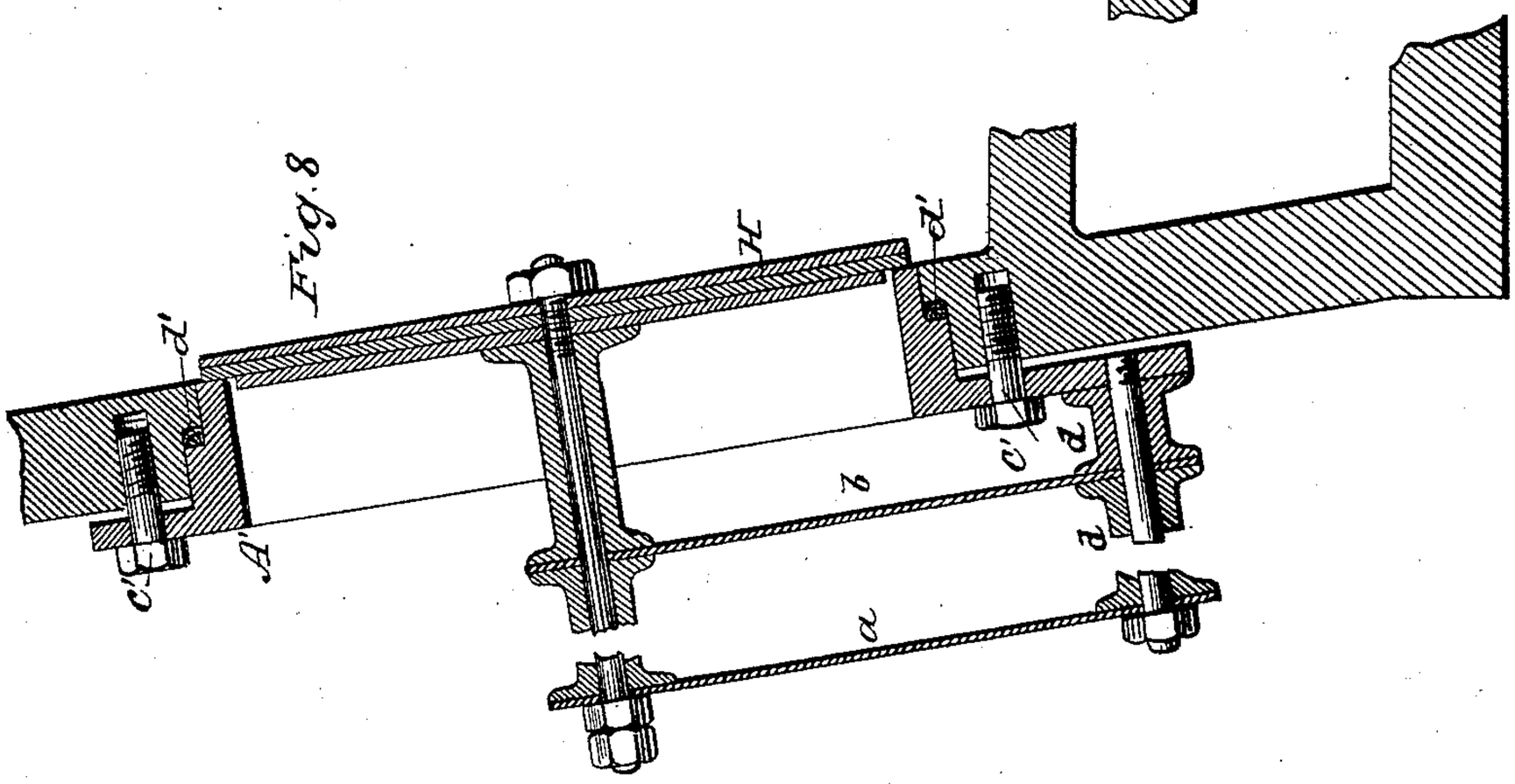


Fig. 8.



Witnesses
Fred. J. Dieterich
Wm. E. Dyre.

Inventor
P. L. Weimer

By his Attorneys
Johnston, Reinohl & Dyre

UNITED STATES PATENT OFFICE.

PETER L. WEIMER, OF LEBANON, PENNSYLVANIA.

BLOWING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 354,453, dated December 14, 1886.

Application filed May 13, 1886. Serial No. 202,070. (No model.)

To all whom it may concern:

Be it known that I, PETER L. WEIMER, a citizen of the United States, residing at Lebanon, in the county of Lebanon and State of Pennsylvania, have invented certain new and useful Improvements in Blowing-Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The invention relates to blowing-engines, and has for its object the improvement of my engines patented August 22, 1876, No. 181,295, reissued January 21, 1879, No. 8,545, and December 30, 1884, No. 309,904; and it consists in the constructions hereinafter described, and particularly pointed out in the claims.

In the construction of large blowing-cylinders in which the diameter is six (6) feet, and over, the chamber around the heads for receiving the air from the cylinder increases the diameter of the heads beyond ten (10) feet, which is the maximum of railroad shipping dimensions. To overcome this objection the head must be cast in sections, which greatly increases the cost of manufacture. By my present invention I locate the chamber for receiving the compressed air within the cylinder, and form it as an integral part of the head, thereby reducing the diameter of the cylinder to the least possible dimensions in excess of the diameter of the piston, and in the largest-sized engines known to the trade—one hundred (100) inches in diameter—the extreme diameters of flanges do not reach ten (10) feet. Another difficulty encountered was the wear upon the valve-stems, caused by metal working in frictional contact with metal in parts of the engine to which access could not be had to lubricate them. This objection has been overcome by securing the inlet and discharge valves to flexible arms rigidly secured to the valve-stems and to a post fixed to the cylinder-head or to the valve-seats. By this construction no lubricant is required, the valves have a free reciprocating movement and are guided and held against lateral displacement.

In the accompanying drawings, which form a part of this specification, Figure 1 represents a vertical section of my blowing-engine cylinder; Fig. 2, a plan partly in section. Figs. 3 and 4 are perspectives showing the manner of inserting the inlet-valves through the ports or passages which they control. Fig. 5 is a longitudinal section through the inlet and discharge valves. Fig. 6 is a cross-section of the inlet-valve and its seat. Fig. 7 represents a sectional view of the discharge-valve provided with a detachable valve-seat, and Fig. 8 a corresponding view of the inlet-valve.

Reference being had to the drawings and the letters marked thereon, A represents the cylinder, provided with removable heads B and C, having inner and outer closed horizontal walls, L L′, between which and the vertical walls B′ and D′ are formed chambers D, to receive the air compressed by the piston E during each of its strokes, alternately, and from which it is discharged through the passages E′ on one side of the cylinder and through the opening F, which is connected with a suitable conduit for delivering the air to the place where it is desired to use it.

The heads B and C are provided with inlet-passages G, which are arranged in the circumference of their outer walls, and are provided with valves H, which open inwardly and are held by flexible arms *a b*, secured at one end to the valve-spindle *c* by a nut and interposed thimbles *d d*, and at the opposite end they are secured in like manner to a post, *e*, which in turn is secured to the head or to the removable valve-seat.

In the vertical wall of the chamber D formed in the heads are a series of passages, I, controlled by valves K, composed of two separate disks or plates of sheet metal, *a′ b′*, between which is held an annulus or other formed sheet of flexible material, *f*, (such as leather,) upon which the valve seats. The discharge-valves open inwardly and are held in position by flexible arms *g h*, connected to the valve stem or spindle at one end, and are held by a thimble or spool, *i*, and a nut on the end of the valve-stem, and the opposite ends of the arms are secured in like manner to a post, *k*. A cup, *l*, is also secured to the stems of the discharge-valves, and forms a seat for one end of a helical spring, *m*, the opposite end of which is seated in a corresponding cup, *n*, formed on a curved bridge, *o*, attached to the

ribs *p*, formed in the heads. From the cups *n* project pins *q*, to prevent the displacement of the springs *m* and limit the lift of the valve to its proper area of discharge.

The inclined outer wall and the vertical inner wall of the cylinder-heads B C form an annular angular air-receiving chamber, C′, proportioned in cross-sectional area to the requirements of the cylinder in receiving its supply of air during each stroke of the piston. By this construction of the receiving-chamber the dead space at each end of the cylinder is reduced to the minimum, while ample space is provided for the incoming air. In the operation of the engine one half of the air admitted to each end of the cylinder enters above and the other half below the longitudinal center of the valve-openings. Therefore the increased cross-sectional area of the inner ends of the air-receiving chambers C′ must be sufficient to accommodate the air received through the valve-opening on both sides of its longitudinal center. Furthermore, any compressed air retained in the receiving-chamber after the discharge-valves have been closed will expand back into the working-cylinder, with the fresh supply of air coming in through the inlet-valves.

The valves shown are rectangular in form; but I do not confine myself to this form, as many other forms may be used without departing from the spirit of my invention so far as it relates to the construction of the valves.

It will be observed that the inlet-valves H, as shown in Figs. 1, 2, 3, and 4, are inserted from the outside of the heads B and C. To effect their insertion the metal is cut away on one side of the passages G, as shown at *r*. The valve is then tilted and inserted by first entering one end and moving it beyond the opening, as shown in the left-hand passage in Fig. 3, then entering the opposite end of the valve, after which it is adjusted, as shown by dotted lines in the right-hand passage of said figure, and is then secured to the spring or flexible supporting-arms *g h*.

To facilitate the construction of this engine I have devised the form of valve-seat shown in Figs. 7 and 8, in which the seat A′ is made separate and detachable from the cylinder-head, and is secured thereto by bolts *c′*, with a packing, *d′*, inserted between the wall of the head and the detachable seat, and the flexible arms *a b* and *g h*, secured to the seat instead of to the heads, as shown in Figs. 1 and 2. By this construction the valve-seats can be prepared separately and in advance of the cylinder-heads, the valves affixed, and the whole inserted in their respective passages G and I with great facility and saving of time.

By referring to the drawings it will be observed that the relative area of the several inlet and discharge valves is about one (1) of the former to one and one-half (1½) or two (2) of the latter; or the area of each discharge-valve is about one and one-half (1½) or two (2) times greater than the area of any one inlet-valve, and in the construction shown the combined area of the inlet-valves is slightly in excess of the combined area of the outlet-valves. This proportion of area of the valves is due to the form of the valve and the flexible supporting-arms *g h*. The rectangular valve-openings and their corresponding valves afford a ready supply of air to and discharge from the cylinder with the minimum of lift, while the rapid action of the valves induced by the flexible arms enables the piston to be run at a high speed. In this construction the lift or travel of the inlet-valves is about one (1) inch and the lift or travel of the discharge-valves about one and one half (1½) inch, or one-third (⅓) more than the inlet-valves. By providing the cylinder-heads with rectangular valve-openings I secure a far greater combined area of inlet and discharge ports than can be had in the same space by the use of circular passages, and by the use of rectangular valves the lift or travel of the valves is greatly reduced, thus admitting of an increase of speed, and consequent blowing capacity of the engine. A rectangular valve of fifty (50) square inches area, having a length of twelve and one-half (12½) inches and a width of four (4) inches, measures thirty-three (33) inches around its edges. To raise such a valve from its seat sufficiently to give fifty (50) square inches of opening it must rise or travel one inch and nine-sixteenths, ($1\frac{9}{16}$.) A circular valve of fifty (50) inches area measures twenty-five and thirteen one-hundredths ($25\frac{13}{100}$) inches around its circumference. To raise such a valve from its seat to give its full area of opening it must rise or travel within a small fraction of two (2) inches. This difference of lift or travel in the valves of a large blowing-engine is a matter of great importance, for the reason that the speed of the engine is controlled by the action of the valves. The greater the lift or travel of the valves the more time is consumed in their operation and the greater is the destruction of the valves in their seating.

Instead of forming the discharge ports or passages I in the vertical wall of the cylinder-heads B C, they may be formed in the horizontal wall L of said heads.

The valves K are inserted and removed through openings M in the heads provided with covers N.

Having thus fully described my invention, what I claim is—

1. A blowing-engine cylinder-head provided with two horizontal and two concentric walls, between which is formed a chamber of smaller diameter than the bore of the cylinder to receive air compressed by the piston, and with a side discharge-passage communicating with said chamber, substantially as described.

2. A blowing-engine cylinder-head having an outer inclined wall with inlet-passages formed therein, a vertical concentric wall having discharge-passages, and a chamber for compressed air formed within said walls, of smaller diameter than the bore of the cylin-

der, and provided with a lateral discharge-passage communicating with said chamber, in combination with inwardly-opening valves for both sets of passages, substantially as described.

3. In a blowing-engine, a valve composed of two concave or dished rectangular pieces of sheet metal with a layer or strip of flexible material held between them and forming an elastic seat for the valve, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

PETER L. WEIMER.

Witnesses:
SELIM S. THOMAS,
JOHN BIRKINBINE.