(No Model.) 2 Sheets—Sheet 1.

R. FORSYTH & J. A. POTTER.

VALVE MECHANISM FOR BLOWING ENGINES, PUMPS, AND SIMILAR APPARATUS.

No. 378,438. Patented Feb. 28, 1888.

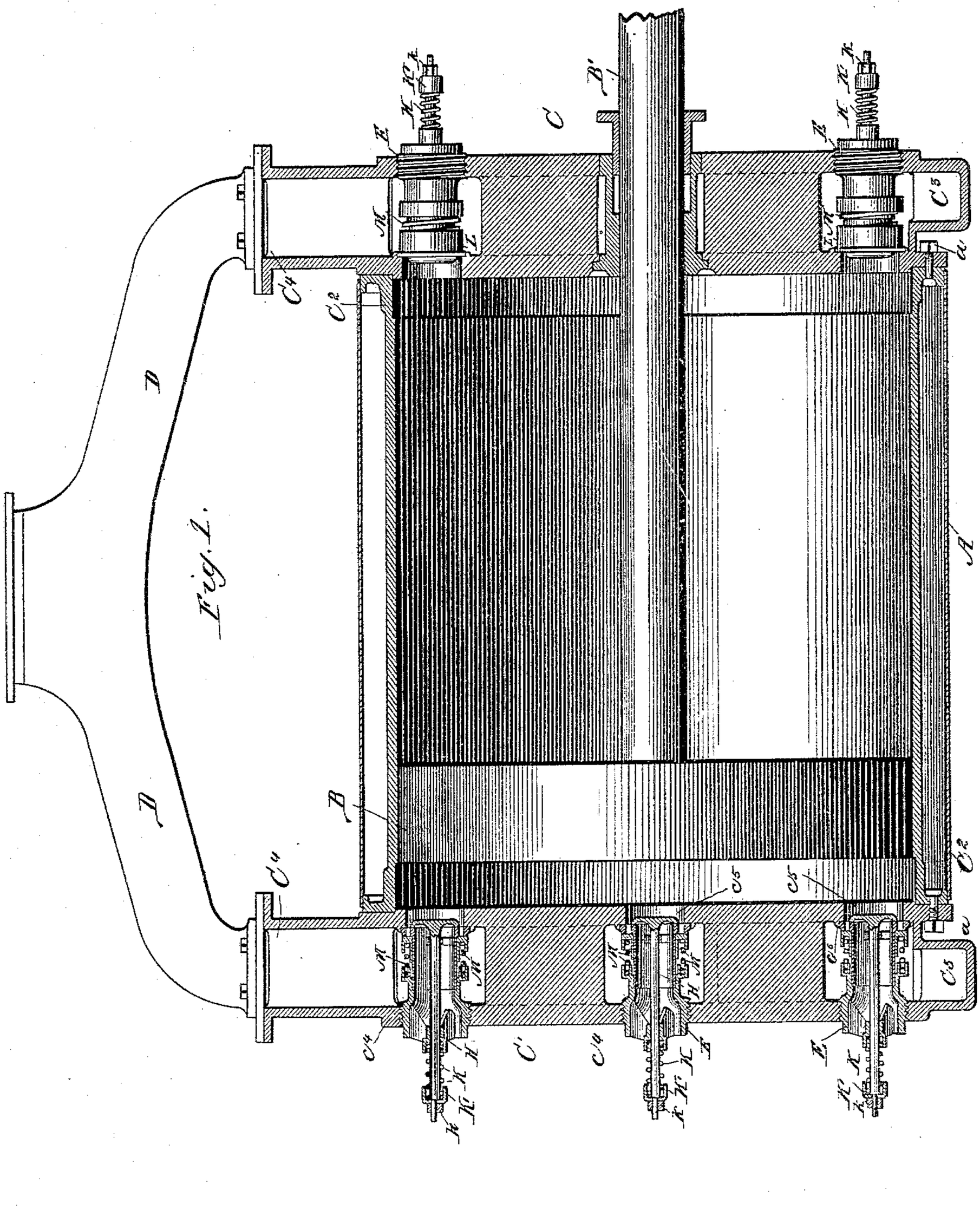

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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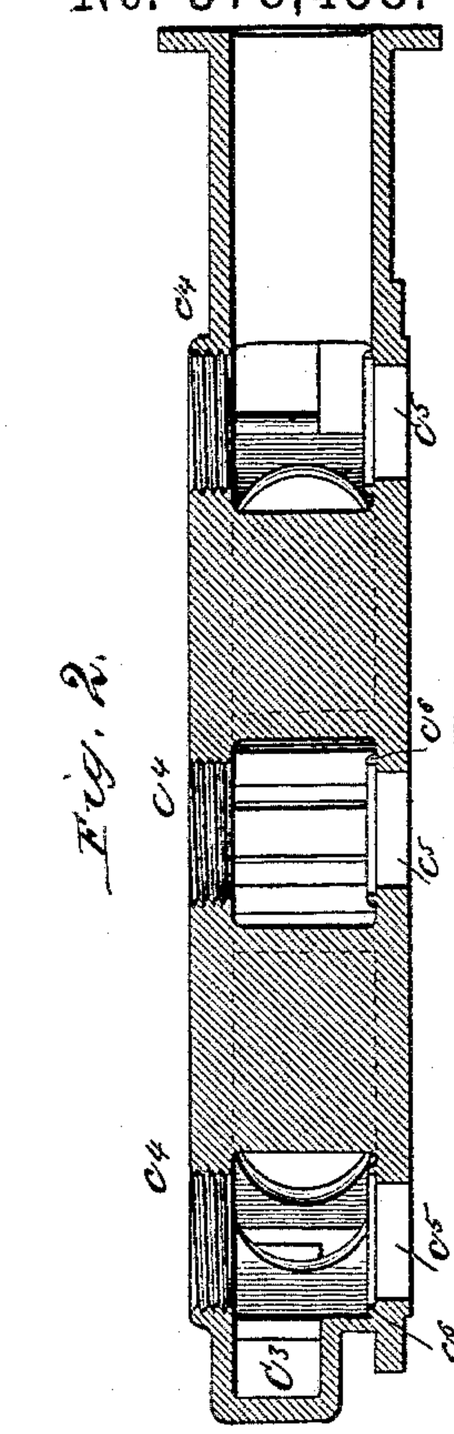

Fig. 2.

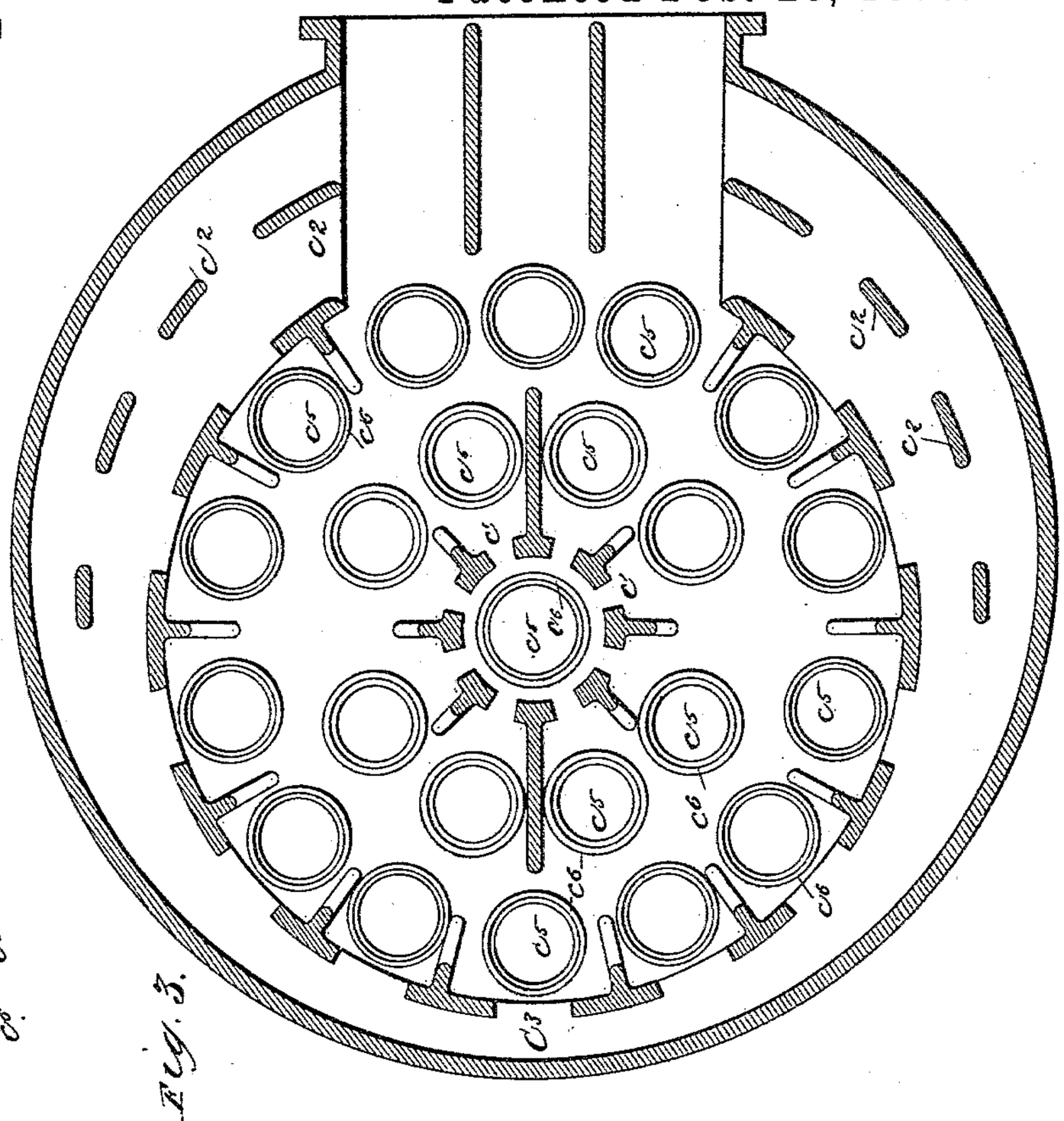

Fig. 3.

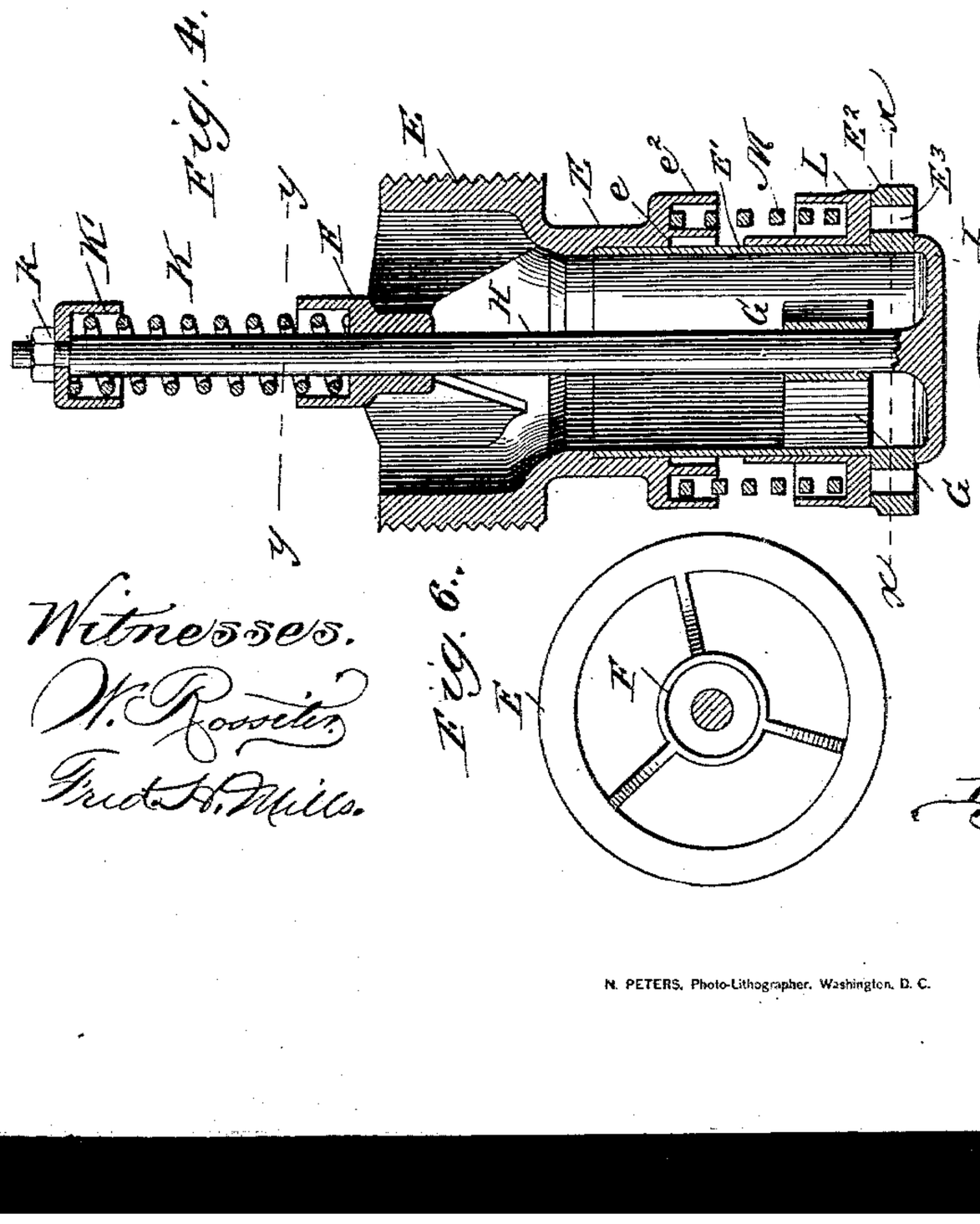

Fig. 4.

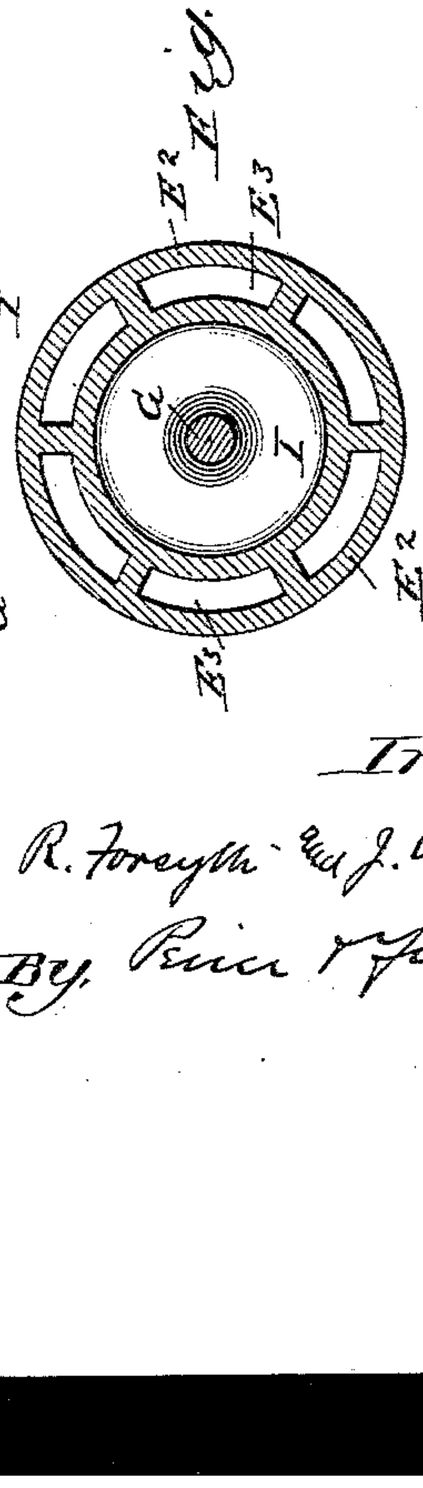

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

ROBERT FORSYTH AND JOHN A. POTTER, OF CHICAGO, ILLINOIS.

VALVE MECHANISM FOR BLOWING-ENGINES, PUMPS, AND SIMILAR APPARATUS.

SPECIFICATION forming part of Letters Patent No. 378,438, dated February 28, 1888.

Application filed August 27, 1887. Serial No. 248,019. (No model.)

To all whom it may concern:

Be it known that we, ROBERT FORSYTH and JOHN A. POTTER, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Valve Mechanism for Blowing-Engines, Pumps, and Similar Apparatus, of which the following is hereby declared to be a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification.

In the construction of blowing-engines as heretofore commonly practiced it has been customary to provide each of the heads of the compression-cylinder with two distinct sets of valves, one set opening inward to admit air to the compression-cylinder and the other set opening outward to permit the passage of the air from the cylinder into an air-chamber formed in the cylinder-head and communicating with the eduction-pipe that leads therefrom to a suitable receiver. This construction has been found objectionable in practice for the reason that the employment of distinct valve mechanisms for controlling separately the admission and discharge of the air to and from the compression-cylinder, and arranged at a distance from each other, prevented the use of air-ports in the cylinder-head in sufficient number to secure the most effective operation of the engine, and for the further reason that these separate valve mechanisms entail considerable expense in manufacture and necessitate a form of cylinder-head very difficult of construction. Moreover, in the use of the old form of blowing-engine it has been found that the valves employed to control the admission of air from the compression-cylinder into the chambers of the cylinder-head become heated to such extent as to injure them, and owing to their peculiar location it was difficult or impossible to provide means for properly cooling them.

Our present invention has for its object to provide an improved construction of valve mechanism for the cylinders of blowing-engines and similar apparatus, and to provide an improved construction of cylinder-head for use in connection with such valve mechanism; and to this end our invention consists, primarily, in a two-way-valve mechanism comprising a casing or cylinder through which the air may pass into the compression-cylinder, and having a valve for obstructing the flow of air through said casing, and comprising, also, a discharge-valve for controlling the flow of the air from the compression-cylinder into the chamber formed in the cylinder-head. In this connection our invention further consists in certain details of construction of the valve mechanism, hereinafter described, and particularly pointed out in the claims at the end of this specification.

Our invention also consists in the improved construction of cylinder-head for use in connection with a two-way valve, which construction will be hereinafter described, and particularly defined in the claims at the end of this specification.

Figure 1 is a view in central horizontal section through the compression-cylinder and the air-chambers at its ends, certain of the valve mechanisms in the ends of said cylinder being shown in longitudinal section and others being shown in side elevation. Fig. 2 is a view in cross-section through one of the air-chambers at the end of the compression-cylinder. Fig. 3 is a view in central longitudinal section through one of the air-chambers at the end of the cylinder, the valve mechanisms being removed therefrom. Fig. 4 is an enlarged detail view in longitudinal section of one of the valve mechanisms. Fig. 5 is a view in cross-section on line *x x* of Fig. 4. Fig. 6 is a view in cross-section on line *y y* of Fig. 4.

A designates the compression-cylinder of a blowing-engine, within which works the piston B, the rod B′ of which extends through one of the heads of the cylinder, and is reciprocated by the usual mechanism employed for this purpose. To each end of the cylinder A is bolted, as shown at *a*, an air-chamber, C, these two chambers being preferably set eccentrically upon the ends of the compression-cylinder, for a purpose to be presently explained. Each chamber C consists of the double heads or plates C′ and C² and the side wall or rim, C³, which connects the heads; and at suitable points between the heads C′ and C², and preferably cast integral therewith, are the brace-ribs *c*, *c′*, and *c²*, which serve to give increased strength to the walls of the chamber. The chambers C at each end of the compression-cylinder are alike in all respects, with the

exception that the chamber at the inner end of the cylinder is provided with the central bearing, through which will pass the rod B′ of the piston, and from the periphery of each of the chambers C are extended the eduction or discharge pipes C^4, from which will lead the pipes D, that deliver the compressed air to a suitable receiver. Each of the plates C′ and C^2 of the chambers C is provided with a number of perforations, c^3 and c^4, the perforations of the two plates being coincident, and the perforations c^3 of the outer plates being of sufficient size to receive the casings of the two-way valves, which are screw-threaded to engage the corresponding threads of the perforations. The two-way-valve mechanisms are alike in all respects, and the casing of each is preferably formed of the upper and lower parts, E and E′, of cylindrical shape, the upper part, E, of the casing being of somewhat larger diameter than the lower part, E′, and formed with an interior shoulder, *e*, against which the inner end of the lower part of the casing, E′, will bear. The lower part of the casing, E′, of the valve mechanism is by preference provided with a base or seat, E^2, having slots or perforations E^3 formed therein, and this slotted or perforated base E^2 of the casing is of slightly larger diameter than the perforations c^4 of the plate C^2, whereon the base E^2 will rest, and the plates C^2 will be furnished with the annular ribs c^5 adjacent to the perforations c^4, in order to more securely hold the perforated base of the several valve-casings in position.

Upon the interior of the upper portion, E, of the valve-casing is formed the bracket or spider frame F, and upon the interior of the lower portion, E′, of the casing is formed a bracket or spider frame, G, and through the hubs of these brackets F and G is held in a manner free to slide the stem H of the valve I, which normally obstructs the casing by closing the inner mouth thereof. Upon the outer end of the stem H of the valve I is carried a coil compression-spring, K, the ends of this spring being held between the cup-shaped socket formed upon the hub of the bracket F and the cup-shaped bearing-plate K′, which encircles the end of the stem H and is held in position thereon by means of the nut or washer *k*.

The lower portion, E′, of the casing is encircled by the annular valve L, which bears upon the upper face of the base E^2 of the casing and normally covers the slots or perforations E^3 thereof, and above this annular valve L, and also encircling the lower portion, E′, of the casing, is also placed a coiled compression-spring, M, which serves to force the annular valve L against the base E^2, the ends of this spring M being retained within an annular seat, *m*, formed in the upper side of the valve L, and within a similar seat, e^2, formed at the inner end of the part E of the casing. The purpose in thus forming the casing of the valve mechanism in two parts is to more readily permit the annular valve and its compression-spring to be placed in position above the slotted base E^2 of the casing; and it will be observed that the perforations through the outer plate, C′, are of larger diameter than those of the inner plates, C^2, in order to permit the valve mechanism to be readily inserted in position and to afford a firm support for the base E^2 of the casing. By providing the casing of the valve mechanism with screw-threads adapted to engage with the correspondingly-threaded perforations of the plates C′, the valve mechanism will be thereby held within the outer plate with its base E^2 bearing firmly against the inner plate, C^2, and this, too, without the necessity of employing other means of attachment. In case it should be desired to form the seat of the annular valve L upon the inner plate, C^2, of the cylinder-head, suitable slots or ports might be cut through the plate C^2 adjacent each of the perforations c^4 thereof and beneath the annular valve, and where such construction is followed the base or seat E^2 of the casing need not be formed as part of the valve-casing, as the perforated part of the plate C^2 will to this extent serve as the equivalent of the base E^2 when the valve is in position for use. By reference to Figs. 1, 2, and 3 of the drawings it will be seen that the perforations in the plates or heads C′ and C^2 of the compression-cylinder are formed above the cylinder, and as the heads are set eccentrically upon the cylinder that portion of each chamber C nearest the eduction-pipe is left unobstructed, so that the discharge of the air from the chamber is accomplished much more freely than would be possible if the chambers were of the same diameter as the compression-cylinder and set concentrically therewith.

From the foregoing construction it will be seen that as the piston B is moved in the direction of the arrow, Fig. 1, the induction-valves I, which normally obstruct the casings of each of the valve mechanisms at the outer end of the compression-cylinder, will be opened against the action of the coiled springs K upon the stems of such valves, and air will be admitted into the compression-cylinder until the stroke of the piston B is reversed, when the springs K will draw the valves I to their seats and obstruct the further flow of air through the casings. As the piston makes its reverse stroke the eduction-valves L will be forced backward and the compressed air will be caused to pass through the perforations c^4 of the plate or head C^2 and through the ports E^3 of the base E^2 of the valve mechanisms, and will pass into the chamber C, and thence into the discharge-pipes C^4 and D to the receiver. It is obvious that as the piston recedes from each of the chambers C the springs M, which encircle the valve-casings, will force the annular valves L against their bases or seats E^2, and thus cause the valves L to obstruct the ports leading from the compression-cylinder into the chambers. As the volume of cold air flows through the valve-casings into the compression-cylinder at each stroke of the piston, all

danger of the heating of the casings and of the annular valves L incident to the passage of the air from the compression-cylinder to the chambers will be avoided. Each end of the compression-cylinder being similarly constructed, the operation of the valve mechanisms at the inner end of the cylinder will be the same as that above described.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A two-way-valve mechanism consisting of a casing for the inlet-valve, a valve for obstructing said casing, a base for said casing, perforated externally thereto, and a valve for controlling the flow through the perforated base, substantially as described.

2. A two-way-valve mechanism comprising the combination of a casing, a spring-seated valve for obstructing said casing, an annular spring-seated valve encircling said casing, and a perforated base or seat for said valve, substantially as described.

3. A two-way-valve mechanism comprising the combination of a casing provided with brackets, a valve for obstructing said casing, having a stem passing through said brackets, a spring encircling said valve-stem, an annular valve encircling said casing, a perforated base or seat for said annular valve, and a spring encircling the casing and bearing upon the annular valve, substantially as described.

4. A two-way-valve mechanism comprising the combination of a casing formed of the separate parts E and E′, a valve for obstructing said casing, an annular valve encircling said casing, a perforated base or seat for said valve, and a spring encircling said casing and bearing upon the annular valve, substantially as described.

5. The combination, with the compression-cylinder, of the perforated double heads or plates forming a chamber, a suitable discharge-pipe leading from said chamber, and a two-way-valve mechanism comprising a casing extending between the two heads, and having its ends fitted to the perforations thereof, a valve for obstructing said casing, a discharge-passage leading from the compression-cylinder to the chamber formed by the double heads, and a valve for obstructing said passage, substantially as described.

6. The combination, with the compression-cylinder, of the perforated double heads or plates forming an air-chamber, the perforations of one of said plates being screw-threaded, and valve mechanism comprising an exteriorly-screw-threaded casing, a valve for obstructing said casing, a perforated base for said casing, and a valve for controlling the flow through said perforated base, substantially as described.

In testimony whereof we have hereunto set our hands.

ROBERT FORSYTH.
JOHN A. POTTER.

Witnesses to signature of R. Forsyth:
GEO. P. FISHER, Jr.,
JAMES H. PEIRCE.

Witnesses to the signature of John A. Potter:
CHAS. E. BALDWIN,
T. W. HAMMOND.