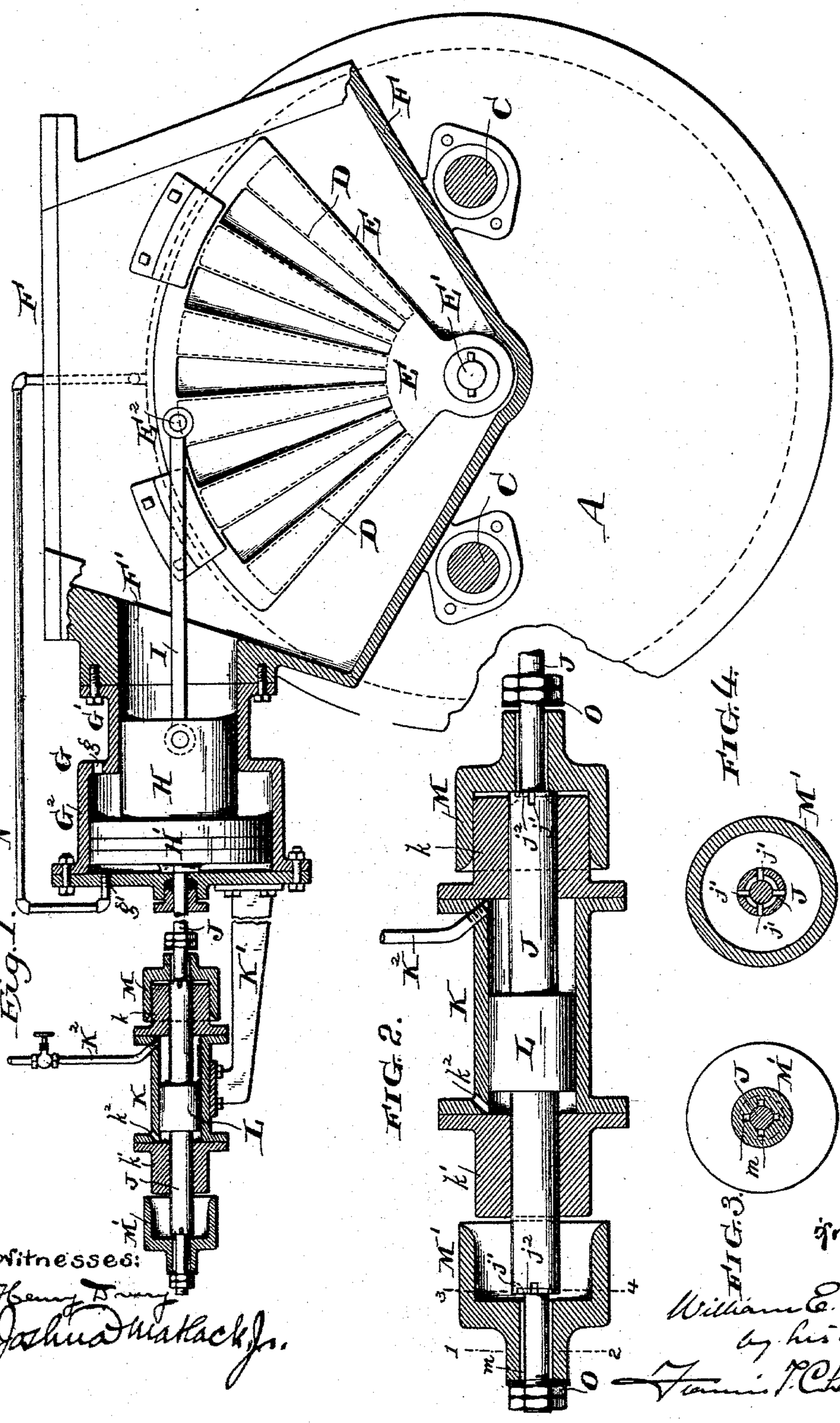
(No Model.) 2 Sheets—Sheet 1.

W. E. GOOD.

BLOWING ENGINE.

No. 490,109. Patented Jan. 17, 1893.



Witnesses:
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Joshua Whitlock Jr.

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(No Model.) 2 Sheets—Sheet 2.

W. E. GOOD.

BLOWING ENGINE.

No. 490,109. Patented Jan. 17, 1893.

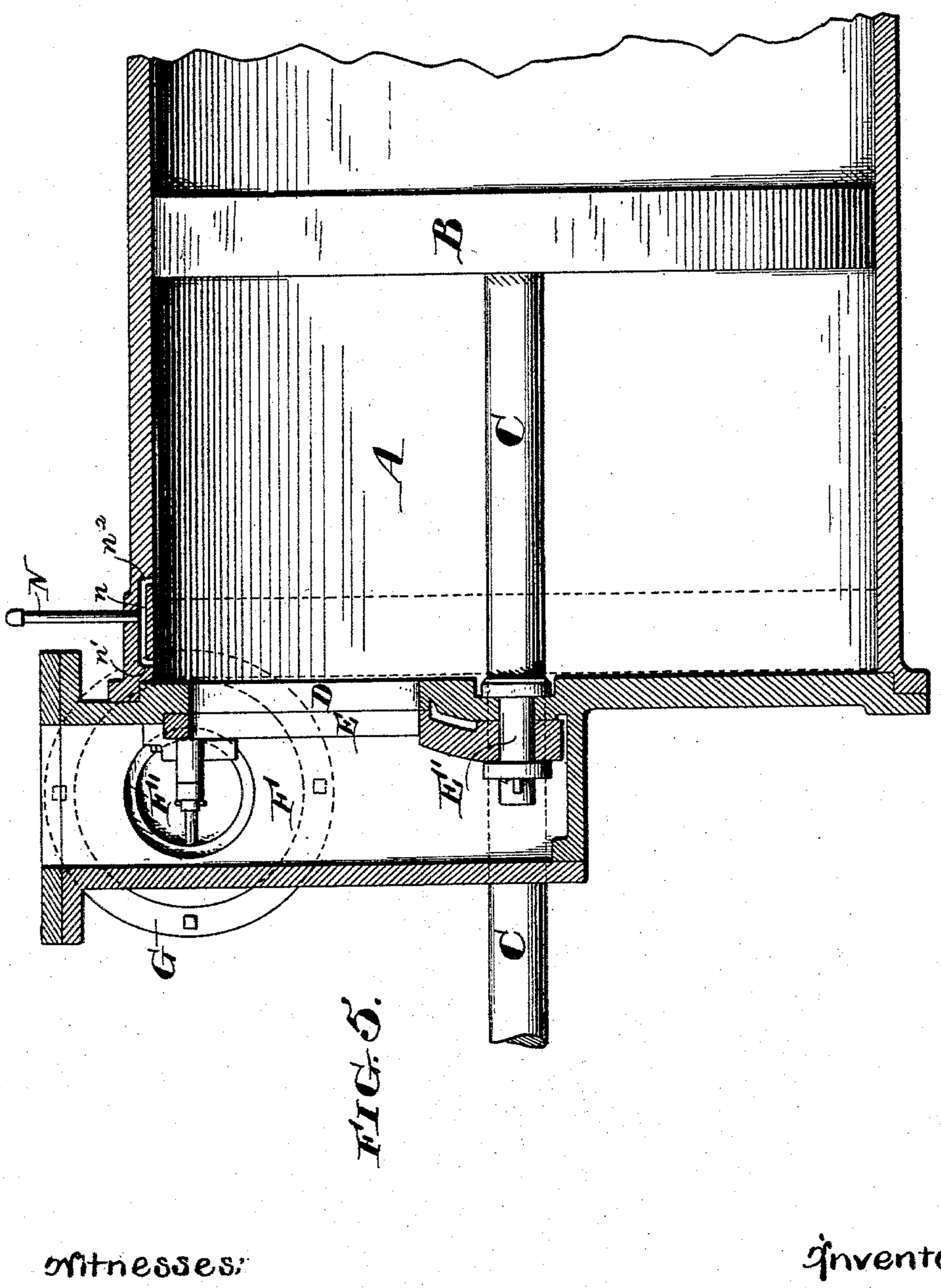

FIG. 5.

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UNITED STATES PATENT OFFICE.

WILLIAM E. GOOD, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO THE SOUTHWARK FOUNDRY AND MACHINE COMPANY, OF SAME PLACE.

BLOWING-ENGINE.

SPECIFICATION forming part of Letters Patent No. 490,109, dated January 17, 1893.

Application filed August 11, 1891. Serial No. 402,348. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. GOOD, of the city and county of Philadelphia, State of Pennsylvania, have invented a certain new and useful Improvement in Blowing-Engines, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to the construction of blowing engines and may be considered as an improvement or modification of the devices described in my patent No. 381,876 of April 24, 1888, or the blowing engine described in my patent No. 463,964, dated December 15, 1891.

The object of my present invention is to combine with the pneumatic cylinders used to actuate the sliding discharge valve of the engine additional means connected with the valve and acting with a constant though yielding pressure to close and keep it closed.

Broadly speaking this device is not new with me; the novel features for which I seek protection, being those set out in my claims.

The nature of my improvement will be best understood as described in connection with the drawings, in which it is illustrated in the form which I believe to be well adapted for use, and in which,—

Figure 1 is an end view partly in section of a blowing cylinder, its sliding discharge valve, and the mechanism for actuating the said valve. Fig. 2 is an enlarged view of a part of the mechanism shown in Fig. 1. Fig. 3 is a cross-sectional view on the line 1—2 of Fig. 2. Fig. 4 a cross-section on the line 3—4 of Fig. 2; and Fig. 5 a vertical section through the blowing cylinder and its valve.

A is the blowing cylinder; B the piston working therein; C C the piston rods.

D indicates radially-arranged discharge ports in the head of the cylinder; E a radially-slotted sliding valve pivoted at E′ and actuated by the means of a pin E^2 in its outer rim.

F is the receiver into which the air is discharged from the blowing cylinder.

G is the pneumatic cylinder which, as shown, consists of two communicating cylinders G′ and G^2—the cylinder G′ opening into the receiver of the engine and the cylinder G^2 connecting through pipe N with the blowing cylinder near one end, and *g* indicates openings through the annular head of cylinder G^2 to the air.

H and H′ constitute a compound or differential piston—part H working in the cylinder G′ and part H′ in the cylinder G^2.

I is a connecting rod connecting the differential piston with the pin E^2 of the slide valve. In the arrangement thus shown and described it is evident that whenever the pressure on the head of H′, which varies with the pressure in the blowing cylinder, exceeds the pressure on the piston H that the two pistons will move inward together and acting through the rod I will open the slide valve.

For certain reasons and under certain conditions it is advisable that entire reliance should not be placed on the pressure of air in the receiver to close the slide valve and for that reason I provide my blowing engine with means connected with the slide valve and acting with a constant though yielding pressure to close and keep it shut. And I also, in connection with this device, prefer to use means for taking up the motion of the slide valve at its two extremities gradually and with a yielding opposing pressure; thus, I provide a rod J connecting either directly or indirectly with the slide valve—as illustrated, it connects with the same through the pistons H H′ and rod J. This rod in the plan shown passes through a cylinder K which connects at one end with the boiler through pipe K^2 and at the other end with the open air through passage k^2.

Attached to the rod J and moving in cylinder K is a piston L which is normally held in the position shown by the pressure of steam entering through pipe K^2. It is obvious that this pressure will act constantly to keep the valve closed and will keep it closed until the pressure of air on the piston H′ exceeds the force acting in the opposite direction. Obviously air can be used instead of steam, or a spring or even water pressure; though the two latter plans have obvious defects.

In order to prevent undue jar from the rapid movements of the valve I provide what I may call dash pots to check the motion of

rod J in either direction. These consist of the flanged heads M M′ and the projections *k k′* from the heads of the cylinder K; the flanged heads M M′ fit neatly on these projections and obviously as the flanged head moves toward the projection the air in the head will form a cushion which will take up the blow of the moving parts.

As shown, and as I prefer to construct this device, the hubs of the heads M M′ by which they are attached to the rod J are provided with slotted passages *m;* and the heads are permitted to have a slight longitudinal motion between shoulders j^2 on rod J and washers O. When the heads M and M′ are moving toward the projections *k k′* they press up against the washer O and close the passages *m;* but when they are moving in the opposite direction they are drawn away from the washer O and the air can then enter freely through the passages *m;* in this way they are made to offer opposition at the end of the movement of the rod in either direction but not to offer opposition at the commencement of its movement.

Instead of using steam to actuate piston L, I also contemplate the use of any other fluid under a substantially uniform pressure; the essential feature of my invention being to provide a retractile force of uniform strength tending at all times to close the valve irrespective of its position, and for this purpose a spring which varies in force as it is compressed is not an equivalent to my fluid actuated piston.

Having now described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In a blowing engine the combination of an air compressing cylinder, a sliding discharge valve, an independent source of constant pressure, a cylinder K connected therewith, a piston L working in said cylinder and arranged to close and hold the slide valve shut with constant though yielding force; a cylinder G connected with the blowing cylinder near one end and with the air receiver of the engine at the other end, and a piston working in said cylinder and connected with the discharge valve as described and so that the valve will be opened when the pressure on said piston exceeds the force tending to keep it shut.

2. In a blowing engine the combination of an air compressing cylinder, a sliding discharge valve, an independent source of constant pressure, a cylinder K connected therewith, a piston L working in said cylinder and arranged to close and hold the slide valve shut with constant though yielding force; a cylinder G consisting of parts G′ G^2 of different diameters—part G′ connecting with the air receiver of the engine and part G^2 with the head of the blowing cylinder; and a differential piston H H′ working in said cylinder and connected with the slide valve as described so that it will move to open the valve when the pressure on piston H′ exceeds the forces tending to hold the valve shut.

3. In combination with a compressing cylinder and a sliding discharge valve thereof, a pneumatic cylinder and piston actuated by the pressure of air in the blowing cylinder and arranged to open the valve as described; a rod J connected with the slide valve; means as cylinder K and piston L acting on rod J so as to hold the valve shut with constant though yielding pressure; and means as described for gradually checking the motion of rod J in each direction at the end of its stroke.

4. In combination with a compressing cylinder and a sliding discharge valve thereof, a pneumatic cylinder and piston actuated by the pressure of air in the blowing cylinder and arranged to open the valve as described; a rod J connected with the slide valve; means as cylinder K and piston L acting on rod J so as to hold the valve shut with constant though yielding pressure; flanged heads M M′ secured on rod J so as to have a slight longitudinal movement thereon and having air chambers along their hubs; washers O arranged to close the air passages when the flanged hubs rest against them; and cylinders *k k′* arranged to fit in the flanged heads, all substantially as and for the purpose specified.

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