G. B. PETSCHE.

BLOWING ENGINE.

APPLICATION FILED JUNE 6, 1906.

912,486. Patented Feb. 16, 1909.

Fig. 1.

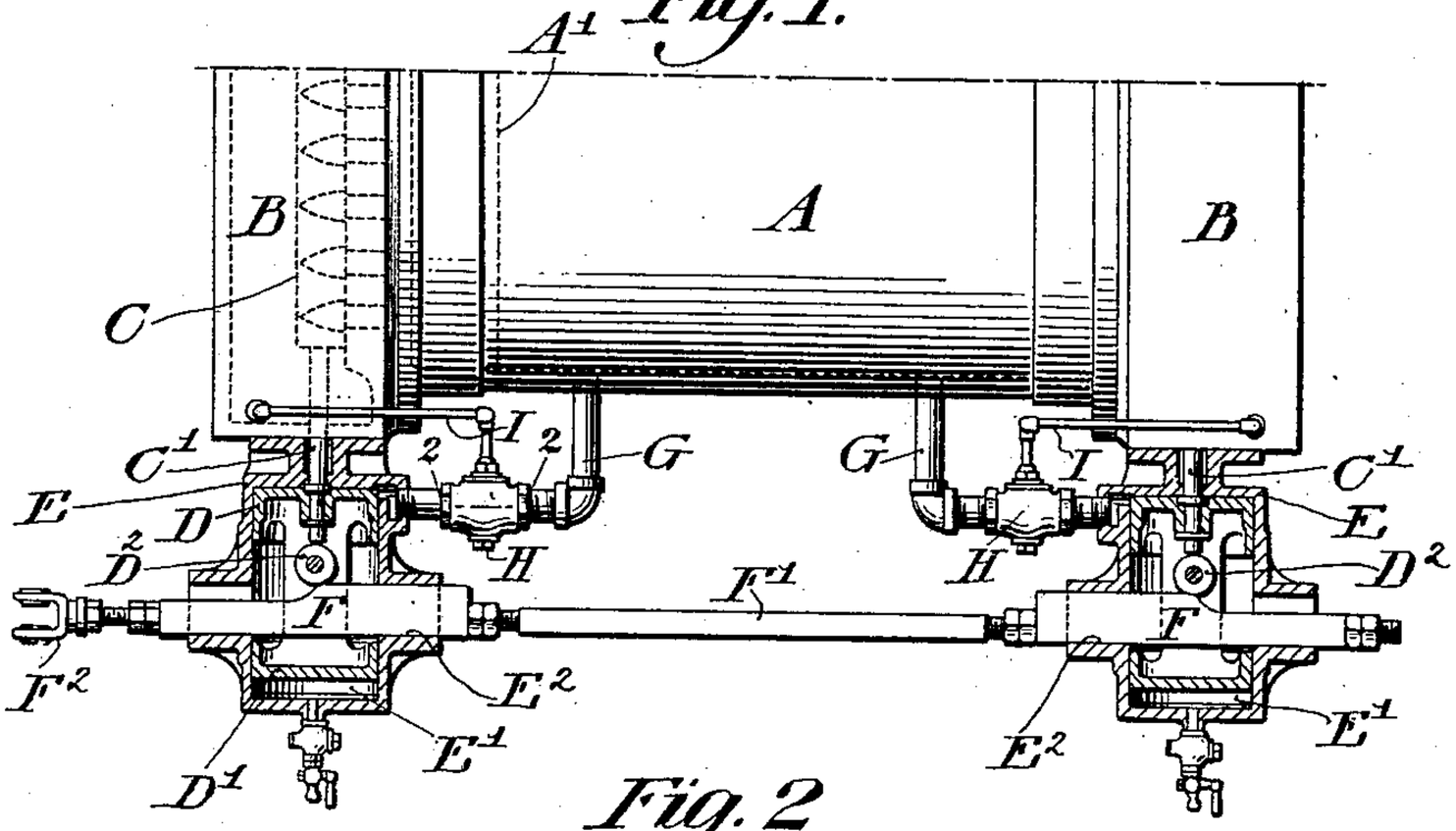


Fig. 2

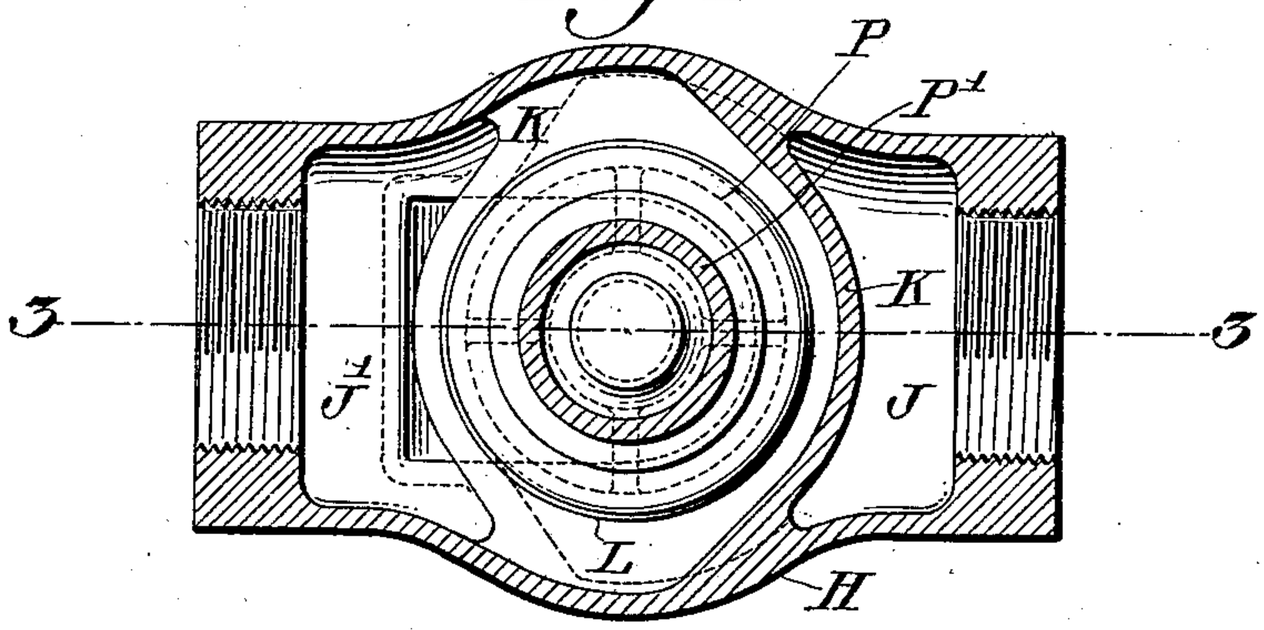
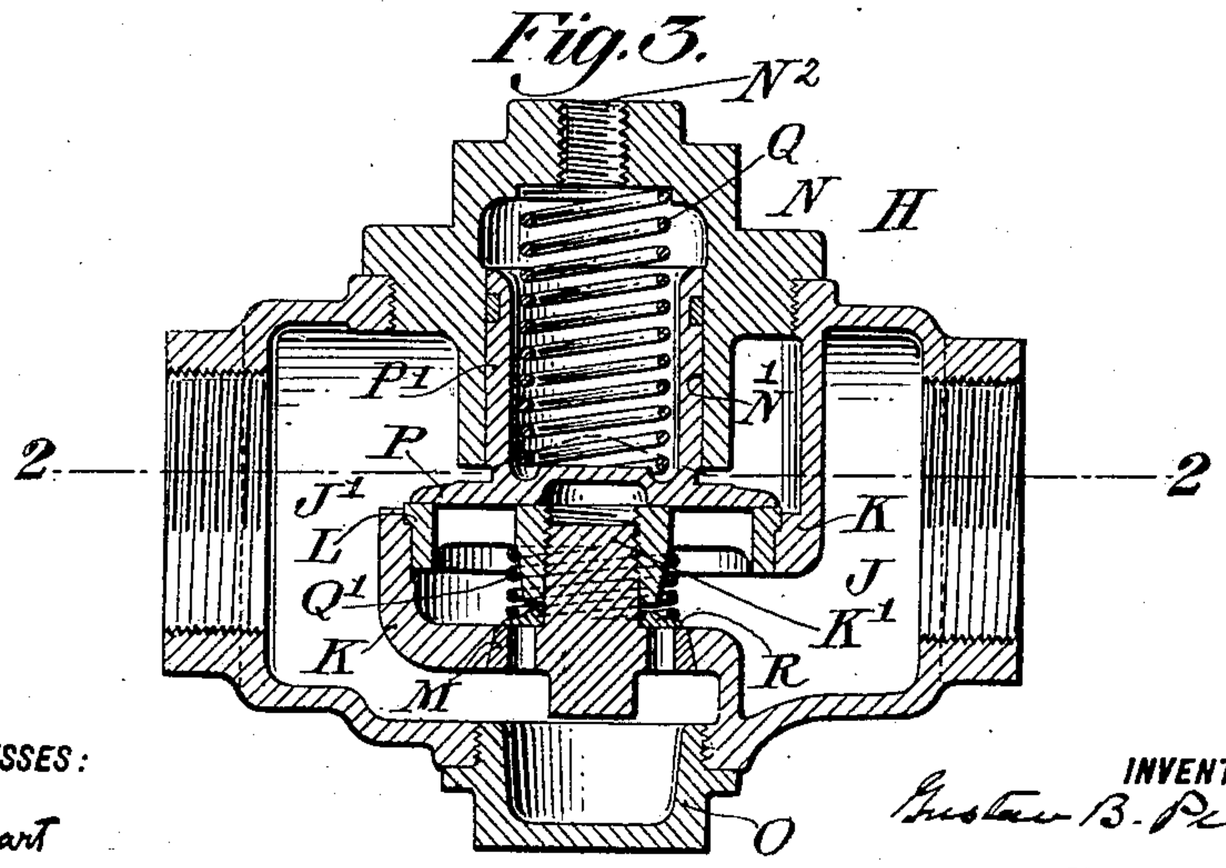


Fig. 3.



WITNESSES:

D. Stewart

D. S. Williams

INVENTOR

Gustav B. Petsche

BY

Francis J. Clarke

his ATTORNEY.

UNITED STATES PATENT OFFICE.

GUSTAV B. PETSCHE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO SOUTHWARK FOUNDRY AND MACHINE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

BLOWING-ENGINE.

No. 912,486. Specification of Letters Patent. Patented Feb. 16, 1909.

Application filed June 6, 1906. Serial No. 320,395.

To all whom it may concern:

Be it known that I, GUSTAV B. PETSCHE, a subject of the Emperor of Germany, residing in the city and county of Philadelphia, in the 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 thereof.

My invention relates to blowing engines or compressors of the kind in which the ports connecting the compressing cylinder and the receiver are controlled by valves actuated by auxiliary cylinders and pistons, the cylinders being connected with the compressing cylinders so that the increasing pressure in said cylinder is transmitted to the face of the auxiliary piston to move it in a direction to open the delivery valve, the return movement of the piston and the closing of the valve is generally effected by some positively actuated part of the engine, such as a cam.

The object of my invention is to regulate the admission of compressed air to the auxiliary cylinder so that the pressure in said cylinder will only rise high enough to exert a substantial opening force on the auxiliary piston at or immediately before the point where the pressure in the compressing cylinder and receiver are equal. By proceeding in this manner I avoid any injurious strains on the valve or valve actuating mechanism, and the leading feature of my invention consists in placing in the conduit containing the compressing cylinder and auxiliary cylinder a normally seated valve arranged to open under the pressure of air in the compressing cylinder and held to its seat by the pressure of air in the receiver so that the valve will only open where the two pressures acting upon it bear a determined ratio to each other which is less than unity.

Other features of my invention will be best understood as described in connection with the drawings in which it is illustrated and in which—

Figure 1, is a side elevation of a portion of a compressing cylinder showing the valve actuating cylinders in section and such of the connections therewith as are necessary for the understanding of my present invention. Fig. 2, is a sectional view of one of the valve casings H, taken as on the section line 2—2 of Fig. 3, and Fig. 3 is a sectional view of the same valve casing taken on the line 3—3 of Fig. 2.

A, indicates the compressing cylinder; A′, the compressing piston; B, B, the receivers at the ends of the cylinder; C, indicates the gridiron delivery valves controlling the ports at the delivery end of the receiver.

C′, is the valve stem which is connected to the piston D, having, as shown, a second piston extension D′, connected with it; a cam roller D^2, being secured to the double piston between its two heads. The pistons, which are double headed pistons D, D′, move in a double headed cylinder E, E′, having lateral bearings E, on which moves a cam F, arranged to contact with the cam roller D^2, as indicated. The cams F, F, are shown connected by a rod F′, which are actuated by proper mechanism connected with the end F^2.

G, G, are conduits connecting the compressing cylinder A, with the cylinder ends E, E, as shown, and in this conduit are situated the valve casings H H, the construction of which is shown in Figs. 2 and 3. The casings are provided with a partition K which supports two valve seats, one indicated at L and the other at M. A movable head N, of the casing is formed with a cylinder N′, opening downward and connected at its upper end through the opening N^2, with a pipe I, see Fig. 1, connecting in turn with the receiver D, of the engine.

O, indicates a removable head in the lower part of the casing H. P, the main valve normally seated on the seat L, and arranged to be acted up and held to its seat through a piston P′, which may conveniently be formed integral with it as shown, and which works in the cylinder E. A light spring Q should be provided to hold the valve to its seat.

R, is a valve normally seated on the seat M and held lightly to its seat by a spring K′. It will be understood that the normal flow of compressed air from the compressing cylinder to the auxiliary cylinder is from the side J, to the side J′, of the casing. Assuming the compressing piston to be moving toward the left in Fig. 1, the valve C, at the left hand end of the cylinder is closed and

the valve P, held firmly to its seat by the pressure from the receiver B, connecting through the pipe I, with the cylinder Q, and acting on the piston P′. As the compressing piston moves toward the left the cam F, is withdrawn from contact with the roll D^2, and the pressure accumulating in the compressing cylinder is transmitted to the under side of the valve P, the valve, however, remaining seated until this pressure has reached a determined ratio to the pressure in the receiver at which point the valve P, will open and admit the compressed air to the auxiliary cylinder E, where, acting on the piston D, it effects a rapid opening of the valve C. The valve P and piston extension P^1 form in effect a differential piston of which the area at the bottom end of the piston, exposed to the pressure of the side J of the casing H is substantially greater than the area of the end of the piston working in the cylinder N^1. As the spring Q is a light spring, the valve P opens consequently when the ratio of the pressure in the chamber J of the casing H to the pressure in the cylinder N^1 is appreciably less than unity. By proceeding in this manner, it is possible to prevent a rise in pressure in the valve actuating cylinder E to a valve large enough to exert a strong opening force on the piston D until the instant, or but very slightly before the instant when the delivery valve should open, while, on the other hand, the valve P opens early enough in the stroke of the compressing piston to give time for air to pass into the cylinder E and build up the pressure therein at the proper instant to the point necessary to open the heavy delivery valve.

It will be understood by those skilled in the art that the ratio between the pressure in chamber J and cylinder N^1 at which the valve P should open, will depend to some extent on the speed at which the engine is run. The light spring Q is therefore so chosen for any particular condition of use as to insure that the valve P will open when the pressure in the seat J of the casing H rises to a ratio with the pressure in the cylinder N^1, which is proper under the circumstances. As soon as the compressing piston has crossed and uncovered the opening of the conduit G, into the cylinder the pressure behind the piston of course falls to atmospheric or less than atmospheric pressure and the compressed air in the cylinder E, can then escape back into the cylinder by raising the valve R, from its seat, and thus enables the valve C, to be closed by the action of the cam F, without undue compression of the air in the cylinder E. The function of the cylinder end E′, and piston head D′, is simply to serve as a cushioning device in the opening of the delivery valves, the construction being described in former patents and forming no part of my present invention.

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

1. The combination in a blowing engine having a compressing cylinder, a receiver, a delivery valve opening and closing communication between said cylinder and receiver, an actuating piston and cylinder for the delivery valve, a conduit connecting the valve actuating and compressing cylinders, and means responsive to the pressure in the receiver and compressing cylinder for preventing air from passing through said conduit to the valve actuating cylinder to open the delivery valve except when the ratio of the pressure in the compressing cylinder to the pressure in the receiver rises to a predetermined value which is appreciably less than unity.

2. The combination in a blowing engine having a compressing cylinder, a receiver, a delivery valve opening and closing communication between said cylinder and receiver, an actuating piston and cylinder for the delivery valve, a conduit connecting the valve actuating and compressing cylinder, means responsive to the pressure in the receiver and compressing cylinder for preventing air from passing through said conduit to the valve actuating cylinder to open the delivery valve except when the ratio of the pressure in the compressing cylinder to the pressure in the receiver rises to a predetermined value which is appreciably less than unity, and means acting independently of the receiver pressure for permitting air to flow through said conduit from the valve actuating cylinder to the compressing cylinder.

3. In a blowing engine having a receiver, a gridiron delivery valve opening thereto and a valve actuating cylinder connected to the compressing cylinders as described, a normally seated valve situated in the conduit leading from the compressing cylinder to the valve actuating cylinder, said valve having a surface acted on by the pressure of the air in the compressing cylinder in a direction tending to open said valve, and means for holding the valve to its seat comprising a piston surface smaller than the first mentioned surface and acted on by the pressure of the receiver.

4. In a blowing engine having a receiver, a gridiron delivery valve opening thereto and a valve actuating cylinder connected to the compressing cylinders as described, a normally seated valve situated in the conduit leading from the compressing cylinder to the valve actuating cylinder, said valve having a surface acted upon in a direction to open the valve by the pressure of the air in the compressing cylinder, means for holding the valve to its seat comprising a piston surface smaller than the first mentioned surface

acted on by the pressure in the receiver and means for permitting the escape of air from the actuating cylinder during the closing of the delivery valve.

5. In a blowing engine having a receiver, a delivery valve opening thereto, and a valve actuating cylinder connected to the compressing cylinder as described, a conduit leading from the compressing cylinder to the valve actuating cylinder, and means regulating the flow of air from the compressing cylinder to the valve actuating cylinder through said conduit, said means comprising a differential piston having its larger end acted on in the direction to open the conduit by the pressure in the compressing cylinder, and its smaller end acted on in the direction to close the conduit by the pressure of the receiver, and a light spring also acting on said piston in a direction to close said conduit.

6. In a blowing engine having a receiver, a delivery valve opening thereto and a valve actuating cylinder connected to the compressing cylinders as described, a valve casing H, situated in the conduit connecting the compressing cylinder and valve actuating cylinder, said casing having a main seat L, and supplemental seat M, and a cylinder N′, in combination with a conduit connecting cylinder N′ with the receiver, a piston working in cylinder N′, a valve P, acted on by said piston and normally closing seat L, and a normally seated valve R, closing seat M.

GUSTAV B. PETSCHE.

Witnesses:

ARNOLD KATZ,

S. STEWART.