(No Model.) 2 Sheets—Sheet 1.

W. E. GOOD.

BLOWING ENGINE OR COMPRESSOR.

No. 526,031. Patented Sept. 18, 1894.

Fig. 1.

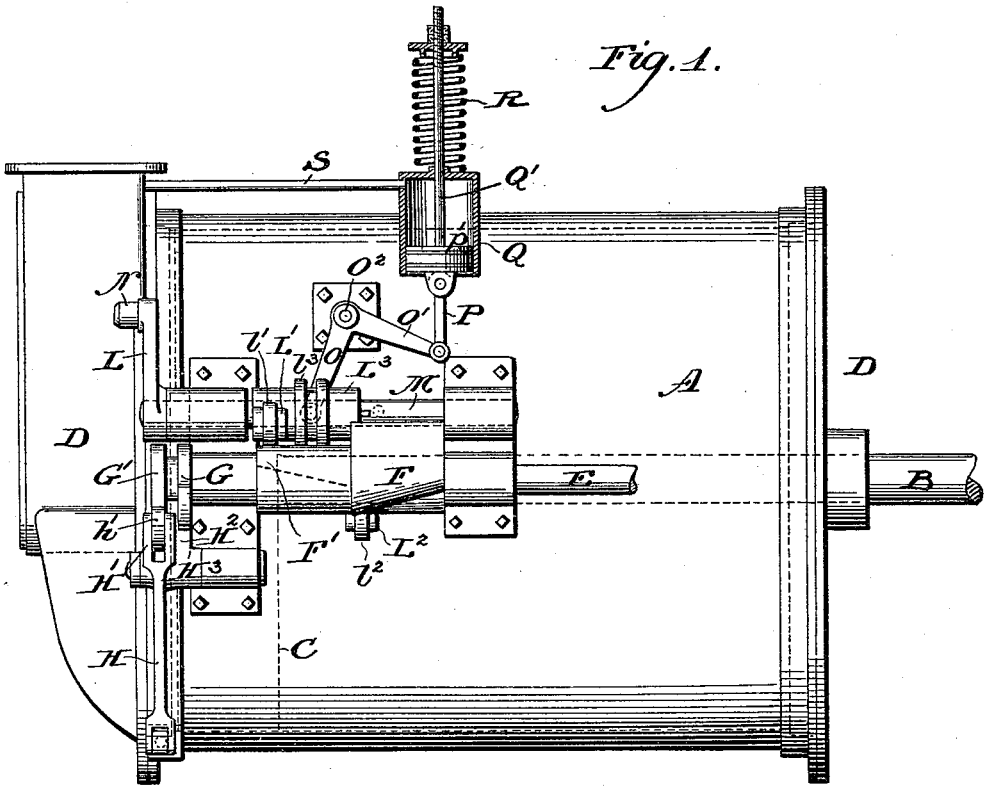
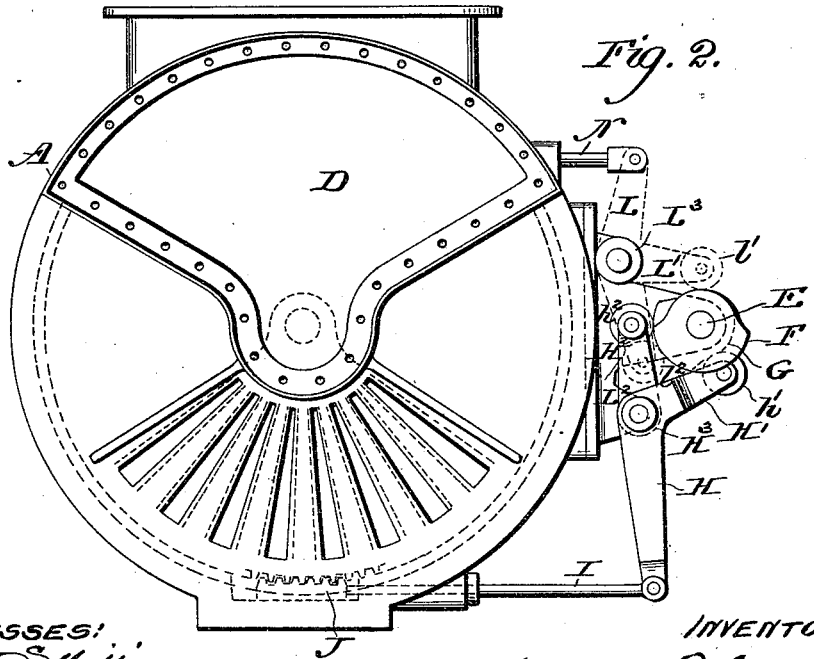


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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BLOWING ENGINE OR COMPRESSOR.

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Fig. 3.

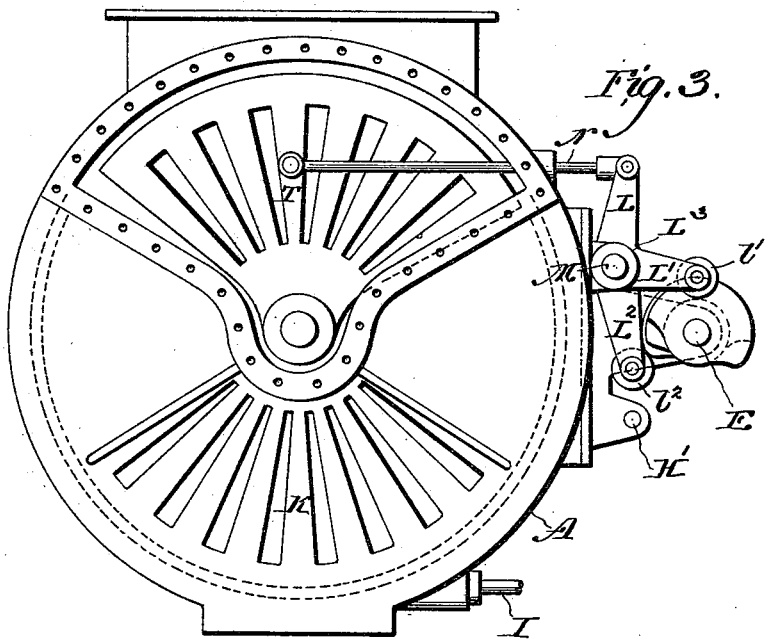
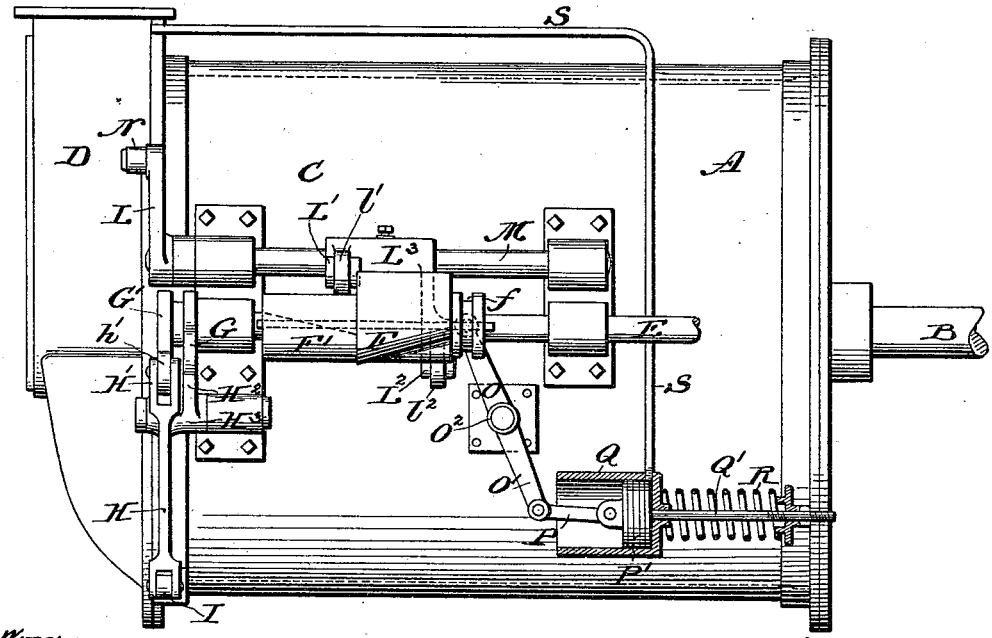


Fig. 4.



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UNITED STATES PATENT OFFICE.

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BLOWING-ENGINE OR COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 526,031, dated September 18, 1894.

Application filed May 15, 1893. Serial No. 474,197. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. GOOD, a citizen of the United States, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Blowing Engines or Compressors, 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 or compressors and particularly to the mechanism for actuating the valves through which the air is drawn into and forced out of the main cylinder or tub.

The object of my invention is to provide mechanism which will positively move the valves in one or both directions in a fixed relation to the constantly moving parts of the engine, but which at the same time will be adjustable so that the time of opening a valve can be varied either automatically or at will.

The nature of my improvement will be best understood as described in connection with the drawings, in which I have illustrated an apparatus adapted for the purposes above noted, and in which—

Figure 1 is a side elevation of the tub of a blowing engine and of the valve actuating mechanism. Fig. 2 is an end elevation of the apparatus shown in Fig 1, and Figs. 3 and 4 are respectively end and side elevations of a modified apparatus of the same general kind.

A indicates the main cylinder or tub of the engine, the rest of which may be of any ordinary construction and is not shown in the drawings.

B is the piston rod and C the piston working in the cylinder A.

D is the receiver, of which in ordinary constructions there is one upon each end of the tub. In Fig. 3 of the drawings the receiver is removed to show the delivery valve.

E indicates a shaft supported in proper bearings and to which is imparted a positive motion by means of some mechanism not shown connecting it with the main shaft or other moving part of the engine.

F and F′ indicate cams secured to the shaft E so as to turn with it and having their working faces of suitable breadth and set obliquely to the axes of the cam. The obliquity of the working faces in the cam F is equal to, but in the opposite direction to that of the cam F′ for a purpose which will be hereinafter described. G and G′ are also cams secured to the shaft E, the function of which is to operate upon the admission valve K. The motion of these cams is transmitted to the valve through cam levers H′ H^2 each having at their end a cam roller h' h^2 resting in contact with the cams G and G′ and connected with a common hub or rock shaft H^3 to which is also connected the lever arm H from the end of which extends a rod I which communicates motion to the admission valve K. In the construction shown the rod I has a rack J at its end which engages a curved rack on the edge of the pivoted admission valve. I have shown the two cams, G and G′, the outline of one being the converse of that of the other and each acting to hold the cam roller of the other in contact with its face.

Obviously any other means for holding the cam roller in contact with the cam can be employed and in that case but one cam, as for instance G, need be used; the double cam is simply, so far as the cam G G′ is concerned, the equivalent for a closed cam, and this is true also in a sense, of the cam F F′ although there is a special reason for making that cam double as will be understood from a further description of the apparatus.

L, is a lever arm secured at one end to a rock shaft M and having connected with its other end a rod N secured in turn to the delivery valve T of the tub. Also connected with the rock shaft M so as turn or oscillate with it are the cam levers L′ and L^2 each having at its end a cam roller as l' and l^2 which rest, the one upon the cam F, and the other upon the cam F′. These cam levers are connected with the shaft, as shown, through the medium of a common hub L^3 which, as shown in Figs. 1 and 2, is keyed to the shaft M so as to have longitudinal motion along it; while in the construction shown in Figs. 3 and 4 it is clamped fast to the shaft transversely.

The double cam F F′ in the construction of Figs. 1 and 2 is rigidly fastened to the shaft

E while in the construction shown in Figs. 3 and 4 it is secured to said shaft by a feather so as to give it longitudinal motion upon said shaft, thus by either construction, the cams and cam levers are, relatively speaking, movable longitudinally with respect to each other. The function of the double cam and double cam lever as in the case of the cam acting upon the admission valve is simply to insure the contact of the cam roller with the cam and in place of using a double cam and double cam lever any of the many known devices for holding a cam lever in contact with a cam face can be employed. It is obvious, of course, that by shifting either the cams or the cam levers in a longitudinal direction the time of action upon the delivery valve will be changed and the valve made to open sooner or later as may be desired.

In Figs. 1 and 2 the hub L^3 is shown as provided with an annular groove l^3 in which rests a pin secured to the arm O of a lever O O′ pivoted at O^2. In the construction of Figs. 3 and 4 a similar annular groove is formed in an extension of the cam F as indicated at *f* and in this groove fits a pin secured on the end of the arm O of the lever O O′ pivoted at O^2. The form of the lever in the two constructions is somewhat different but this of course can be varied at will and is simply a matter of convenience. By moving the lever in either case the relative longitudinal adjustment desired is effected with the consequent modification in the time of opening of the delivery valve.

Preferably I effect the adjustment of the mechanism for giving opposite intermittent motion to the delivery valve automatically, making the said adjustment dependent upon the amount of pressure in the receiver of the engine, because for the efficient working of the said engine it is important that the delivery valve should open just at the time when the pressure in front of the advancing piston becomes equal to the pressure in the receiver. I accordingly connect the arm O′ of the lever O O′ with a piston P′ as by means of link P, the said piston moving in a cylinder Q into the rear end of which leads a pipe S connecting with the receiver D. The piston rod Q′ is connected with a spring R the action of which is to drive the piston with regulated force in the opposite direction to that in which it is acted upon by the receiver pressure. By properly proportioning the strength of the spring it is obvious that the piston can be made to move out under the pressure of air from the receiver to a definite extent for each variation of pressure; and as the pressure in the receiver increases, the movement of the piston effects the desired adjustment in the valve actuating mechanism so as to delay the opening of the delivery valve as the pressure increases and make the valve open earlier as the pressure in the receiver decreases.

I believe I am the first to combine in a blowing engine the delivery valve with positively actuated mechanism for communicating intermittent motion thereto and with mechanism for adjusting said valve operating mechanism by means of the varying pressure in the receiver so as to change the time of operation to open the valve without interfering with the regular and constant motion of the valve mechanism.

The apparatus shown by me is capable of extensive modifications without departure from the spirit of my invention and except where specifically referred to in the claims I do not wish to be understood as limiting the said claims to the specific form of apparatus illustrated in the drawings.

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

1. In a blowing engine or compressor the combination with the delivery valve of a device positively actuated from some moving part of the machine for communicating intermittent motion to said valve, and automatic mechanism actuated by the pressure of air in the receiver arranged to act upon the device for communicating motion as described and so as to vary the adjustment and time of operation of said positively actuated device without interfering with its regular motion.

2. In a blowing engine or compressor the combination with the delivery valve of a device positively actuated from some movable part of the machine for communicating intermittent motion to said valve, a cylinder Q connected at one end to the receiver of the engine, a piston F′ moving in said cylinder, a spring R connected to the piston to draw it in the direction opposite to that in which the receiver pressure acts upon it and a connection from said piston to the device for communicating motion to the valve whereby its adjustment and time of operation can be changed without interfering with its regular motion.

3. In a blowing engine or compressor the combination with the delivery valve of a rock shaft as M, a lever arm L moving with the rock shaft and connected to the valve, a cam lever as L′ oscillating with the rock shaft, a cam as F′ having a broad obliquely set working face, means as shaft E for constantly rotating said cam and means for shifting the relative longitudinal position of the cam and cam lever all substantially as specified and so as to adjust the time of operation on the valve.

4. In a blowing engine or compressor the combination with the delivery valve, of a rock shaft as M, a lever arm L moving with the rock shaft and connected to the valve, a cam lever as L′ oscillating with the rock shaft, a cam as F′ having a broad obliquely set working face, means as shaft E for constantly rotating said cam, a cylinder Q connected at one end to the receiver of the en-

gine, a piston working in said cylinder, a spring as R connected to said piston and connections from the piston arranged to shift the relative longitudinal positions of the cam and cam lever, substantially as and for the purpose specified.

5. In a blowing engine or compressor the combination with a positively rotating shaft E having cams F′ and G′ connected thereto, of a cam lever L′ connected with the shaft M and relatively movable to cam F′ in a longitudinal direction, a cam lever H′ H resting in contact with cam G′ and connected to the admission valve, automatic mechanism actuated by the pressure in the receiver arranged as described to effect the relative adjustment of the cam F′ and lever L′ and a delivery valve connected to shaft M.

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