(No Model.)

W. E. GOOD.

BLOWING ENGINE OR COMPRESSOR.

No. 560,707. Patented May 26, 1896.

Fig. 2.

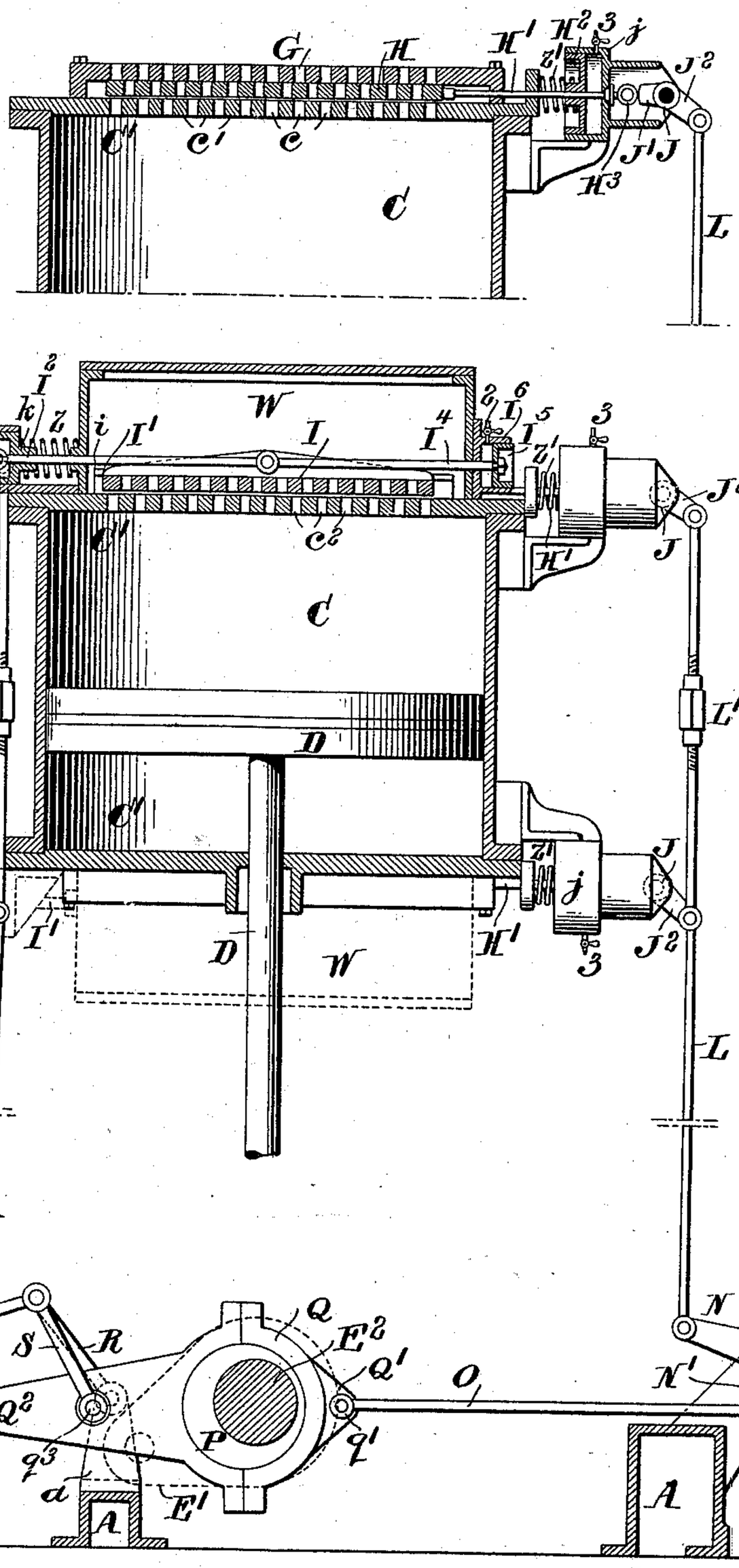

Fig. 1.

Witnesses.

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

BLOWING-ENGINE OR COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 560,707, dated May 26, 1896.

Application filed May 17, 1893. Serial No. 474,514. (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 or Compressors, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part hereof.

My invention relates to blowing-engines or compressors, and has for its object to provide improved mechanism for acting upon the admission and delivery valves through which the air is drawn to and forced from the tub.

The nature of my improvements will be best understood as described in connection with the drawings, in which they are illustrated, and in which—

Figure 1 is a sectional side elevation showing the tub and also the shaft of the engine and a link valve-motion connected therewith and to the valves upon the tub, the other parts of the engine being omitted as not necessary to a full understanding of my invention; and Fig. 2 is a sectional elevation taken through the upper end of the tub and through the admission-valve thereof, the valve shown in Fig. 1 being the delivery-valve.

C indicates the compressing cylinder or tub of the engine; D, the piston-rod, which is driven by a steam-engine, (not shown,) and D′ the blowing or compressing piston. C′ and C′ indicate the heads of the tub. On one side of each head a slotted valve-seat c^2 is formed for the delivery-valve, while on the other side air-ports *c* are formed through the head for the admission of air. In the construction shown, however, the admission-valve is not seated directly upon the head, but upon the slotted valve-seat G, secured on the outside of the head, and between which and the head moves the admission-valve H. (See Fig. 2.) This construction, however, forms the subject-matter of another application for Letters Patent filed herewith and bearing Serial No. 474,513, and need not be further described in this case, especially as this peculiar construction or the older construction shown in my former patent, No. 381,876, of April 24, 1888, can be used as alternatives, the only important feature of construction so far as my present invention is concerned being that the valve-seat shall be so arranged that the valve will be between it and the inside of the tub; and at this point I may note with respect to the delivery-valve shown at I, Fig. 1, that for my present invention it is important that the said valve shall rest upon a seat, such as c^2, which lies between it and the inside of the tub; and it is important with respect to both valves that their back bearings (indicated at *i*) for the delivery-valve, and which in case of the admission-valve consists of the head C′ of the tub, should be at a distance from the seat slightly greater than the thickness of the valve, so that the valve can rise from its seat for a short distance when the air is passing through it.

To the admission-valves I connect a spring Z, so arranged as to tend to open the valve. The strength of the spring for the best results should be somewhat less than that required to move the valve when pressed against its seat on the cylinder-head by the pressure of air in the tub. As shown, the valve is provided with a spindle H′, on the end of which is a piston H^2, and the spring Z′ is interposed between this piston and a projection from the tub-head. The piston H^2 fits in a cylinder *j*, on the inside of which is an escape-cock 3. The device made up of the piston, cylinder, and escape-orifice constitutes a dash-pot, the function being to take up and neutralize the momentum of the valve when moving under the influence of the spring, so as to prevent destructive shocks and blows. The end of the spindle H′ projects through the piston H^2 and has secured upon it a cam-roller H^3, and in front of this roller is secured a cam J′, fastened to a hub or rock-shaft J, which in turn is actuated by a lever-arm J^2, to which is attached a rod L, the lower end of which is connected by a bell-crank lever N N^2 N′ and a rod O with a link valve-motion, which will be referred to in detail hereinafter. Motion is imparted to the cam J′ by the mechanism shown or any other desired mechanism which will give it a positive motion and cause it to close the admission-valve H at determined intervals. The face of the cam is preferably made of such form as will impart proper motion to the valve both in opening and closing,

the spring holding the end of the valve-rod in contact with the cam-face; but the opening of the valve should be left, preferably, entirely to the action of the spring, which when the valve is lifted from its seat by an incoming current of air will exercise its maximum power against the least resistance and cause the valve to open quickly. Referring now to the delivery-valve I, it, like the admission-valve, is combined with a spring, (indicated at Z,) the arrangement being such that the action of the spring tends to open the delivery-valve. As shown, the spring is situated between the back end of the receiver and a head *k*, secured to the valve-spindle I′. A dash-pot similar in character to that described with respect to the admission-valve should also be used to take up the momentum of the delivery-valve when moving under the influence of the spring. Such a dash-pot is indicated at the right-hand side of Fig. 1, an extension I^4 of the valve-spindle I′ having upon it a piston I^5, fitting in an open-ended cylinder I^6, said cylinder having an escape-orifice 2 upon its inside. The delivery-valve is closed by an intermittently-moving cam K′, acting against a cam-roller I^3, secured on the end of the spindle I′. The said cam, as shown, is secured to a hub or rock-shaft K, to which is also secured a lever-arm K^2, in turn connected by a rod M with a moving part of the engine. The shape and movement of the cam K′ are such as to seat and close the valve I at the end of the motion of the piston toward it or just before the piston begins to recede from it. It is also preferably made of such form as to hold the valve shut not only while the piston is moving away from it, but during the part of the time when the piston is moving toward it, care being taken, however, that the cam shall be so formed and moved as not to interfere with the opening of the delivery-valve at such time as the pressure in the tub and receiver become equal or substantially so; but as this time varies with the variation of pressure in the receiver it is advisable that the motion of the cam should also be varied, so as to permit of the opening of the valve at differing times with respect to the motion of the piston. In other applications filed herewith and bearing Serial Nos. 474,513 and 474,515 I have described positively-acting but adjustable devices for opening the delivery-valve and by means of which the time of opening relative to the motion of the piston can be varied at will; and in the drawings I have illustrated as a device for varying the motion of my cam the same arrangement of link valve-motion which in my application Serial No. 474,513 I use to give direct motion to the delivery-valve. In the present case, however, the adjustable link valve-motion or other adjustable positively-actuated valve mechanism which may be used in place of it does not act directly upon the valve, but merely upon the cam, which in turn is not connected to the valve, and the motion of which simply gives the valve freedom to move in the direction to open, but does not open it. The opening of the valve is accomplished, as already stated, by the action of the spring Z, and this spring should be made of such strength as to move the valve rapidly when raised from its seat by an excess of pressure in the tub over that in the receiver, or rather to act upon the valve when the pressure of air in the receiver is nearly equalized by the pressure in the tub. In this way the pressure of air in the receiver acting upon the back of the valve holds it tight against its seat irrespective of the position of the cam until the advancing piston has compressed the air in the tub to or nearly to the pressure in the receiver. At this point the pressure of air which clamps the valve to its seat is overcome by the pressure against the inside of the valve and the spring is enabled to open it with great rapidity, the dash-pot preventing any destructive blow or jar.

The valve-actuating mechanism shown in the drawings consists of an eccentric P, secured to the main shaft E^2 of the engine and having secured to it by means of an eccentric-strap a link Q, having a long arm Q^2 and a short arm Q′. The long arm Q^2 of this link is further supported by means of pivoted links S, which are secured to the arm Q^2 at a point q^3, and which links S are themselves pivoted on the upper ends of pivoted arms R, which arms are supported on a standard or standards *a*, and to a point q^2 of the arm Q^2 is secured the rod M, which actuates the cams K′. The motion of the points q^2, which is transmitted to the cams, is varied by shifting the position of the upper end of the arms R. This is accomplished by means of a rod T, fastened to said arms and, as shown, to a point U^2 of a lever U, pivoted at U′ and adjustable along a toothed rack V. It will readily be seen that the adjustment of the link valve-motion described will not materially affect the motion of the points q' in the short arm Q′ with which the rod L is connected, and consequently the adjustment of the cams effecting the motion of the delivery-valves will not materially affect the motion of the cams governing the movements of the admission-valves.

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 tub, of a slotted valve-seat having its face directed toward the inside of the tub, a slotted admission-valve moving on the inside face of the seat so that an excess of pressure in the tub will tend to clamp the valve to its seat, a spring having a pull sufficient to move the valve when not clamped to its seat by the aforesaid excess of air-pressure but insufficient to move the valve when so clamped, said spring being connected to said valve substantially as described and operating to open the same when the pressure inside

the tub is not substantially greater than that outside, a cam arranged to close said valve at regulated intervals, and means for actuating said cam driven by a moving part of the engine.

2. In a blowing-engine or compressor, the combination with the tub, of a slotted valve-seat having its face directed toward the inside of the tub, a slotted admission-valve moving on the inside face of the seat so that an excess of pressure in the tub will tend to clamp the valve to its seat, a spring having a pull sufficient to move the valve when not clamped to its seat by the aforesaid excess of air-pressure but insufficient to move the valve when so clamped, said spring being connected to said valve substantially as described, and operating to open the same when the pressure inside the tub is not substantially greater than that outside, a cam arranged to close said valve at regulated intervals, and formed also to prevent premature opening of the valve, and means for actuating said cam driven by a moving part of the engine.

3. In a blowing-engine or compressor, the combination with the tub, of a slotted valve-seat having its face directed toward the inside of the tub, a slotted admission-valve moving on the inside face of the seat so that an excess of pressure in the tub will tend to clamp the valve to its seat a spring having a pull sufficient to move the valve when not clamped to its seat by the aforesaid excess of air-pressure but insufficient to move the valve when so clamped, said spring being connected to said valve substantially as described and operating to open the same when the pressure inside the tub is not substantially greater than that outside, a cam arranged to close said valve at regulated intervals, a dash-pot arranged to take up the momentum of the valve in opening, and means for actuating said cam driven by a moving part of the engine.

4. In a blowing-engine or compressor, the combination with the tub, of a slotted valve-seat having its face directed toward the outside of the tub, a slotted delivery-valve moving on the outside face of the seat so that an excess of pressure in the receiver over that in the tub will tend to clamp the delivery-valve to its seat, a spring having a pull sufficient to move the valve when not clamped to its seat by the aforesaid excess of air-pressure but insufficient to move the valve when so clamped, said spring being connected to said valve as described and operating to open the same when the pressure in the receiver is not substantially greater than that in the tub, a cam arranged to close said valve at regulated intervals, and means for actuating said cam driven by a moving part of the engine.

5. In a blowing-engine or compressor, the combination with the tub, of a slotted valve-seat having its face directed toward the outside of the tub, a slotted delivery-valve moving on the outside face of the seat so that an excess of pressure in the receiver over that in the tub will tend to clamp the delivery-valve to its seat, a spring having a pull sufficient to move the valve when not clamped to its seat by the aforesaid excess of air-pressure but insufficient to move the valve when so clamped, said spring being connected to said valve as described and operating to open the same when the pressure in the receiver is not substantially greater than that in the tub, a cam arranged to close said valve at regulated intervals, a dash-pot arranged to take up the momentum of the valve in opening, and means for actuating said cam driven by a moving part of the engine.

6. In a blowing-engine or compressor, the combination with the tub, of a slotted valve-seat having its face directed toward the outside of the tub, a slotted delivery-valve moving on the outside face of the seat so that an excess of pressure in the receiver over that in the tub will tend to clamp the delivery-valve to its seat, a spring having a pull sufficient to move the valve when not clamped to its seat by the aforesaid excess of air-pressure but insufficient to move the valve when so clamped, said spring being connected to said valve as described and operating to open the same when the pressure in the receiver is not substantially greater than that in the tub, a cam arranged to close said valve at regulated intervals, a valve-motion actuated by a moving part of the engine and connected to the cam aforesaid, and means for adjusting said valve-motion to vary the movement of the cam and the time of motion of the valve.

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