J. CLAYTON.

AIR COMPRESSOR.

No. 186,306 Patented Jan. 16, 1877.

Fig. 1.

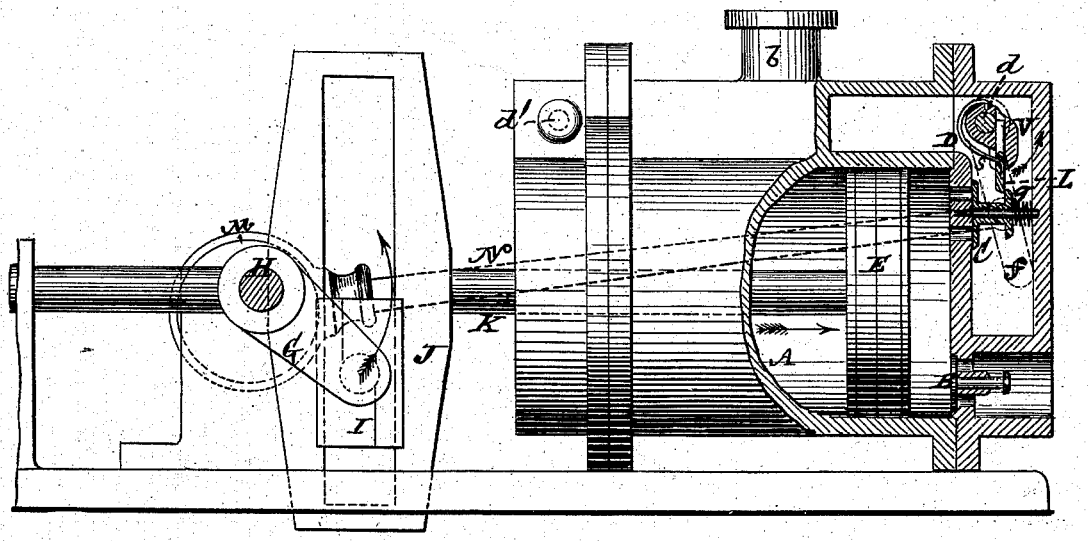


Fig. 2.

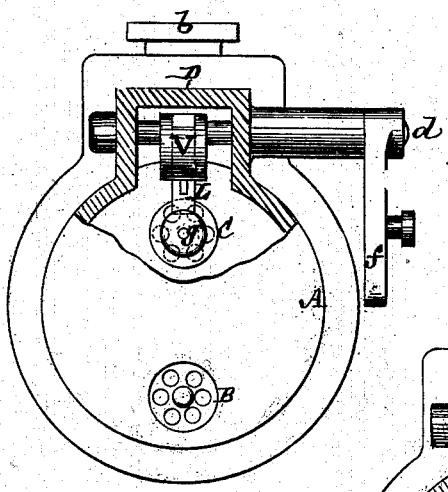


Fig. 3.

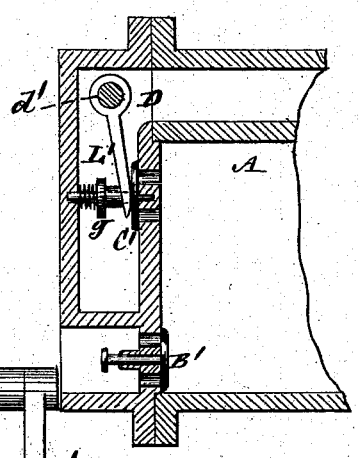
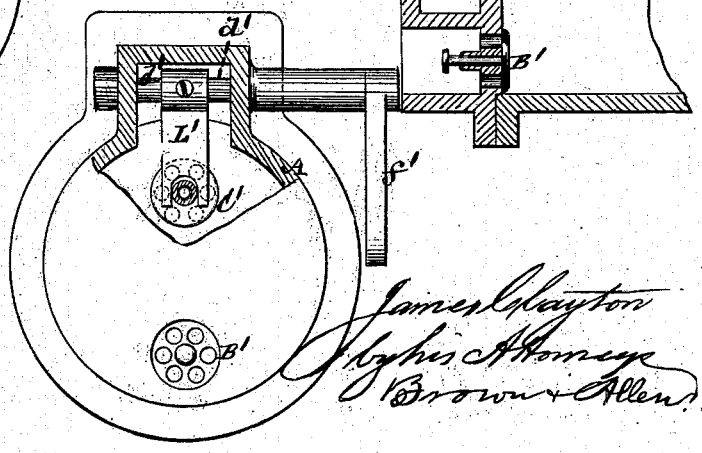


Fig. 4.



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UNITED STATES PATENT OFFICE.

JAMES CLAYTON, OF BROOKLYN, NEW YORK.

IMPROVEMENT IN AIR-COMPRESSORS.

Specification forming part of Letters Patent No. **186,306**, dated January 16, 1877; application filed July 1, 1876.

To all whom it may concern:

Be it known that I, JAMES CLAYTON, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Air-Compressors; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, which forms part of this specification.

In air-compressing pumps as heretofore constructed and operated, when the same have delivery-valves between the compressing-cylinder and the compressed-air receiver, which are kept tight by presenting, when closed, an excess of back surface under exposure to the pressure in the receiver, there is necessarily much waste of power, and a useless strain is thrown upon the working parts by reason of the necessity which exists of compressing the air in the cylinder higher than is required in the receiver for use, in order to effect the opening of the valve. There is also, under such a condition of circumstances, much waste of air by leakage, consequent on working under an unnecessarily heavy pressure.

This invention has for its object the obviating or reducing of these objections by opening the delivery valve or valves as soon as the same pressure has been produced in the cylinder as it is required for the air to be stored at in the receiver, and thereby always to compress to the same degree, and to obtain a uniform pressure in the receiver. This result has been accomplished before by using balance delivery-valves, which, however, it is difficult or impossible to construct without being liable to leakage, or which are more or less apt to stick, according to the description of balance valves employed.

My invention consists in accomplishing the hereinbefore-specified desired result of discharging the air from the compressing-cylinder at the pressure it is required to collect it in the reservoir or receiver for use, without resorting to the employment of balance delivery-valves, but by using valves which, when closed, present an extended back surface, to keep them tight under pressure of the air in the receiver, and combining therewith valve gear or mechanism which positively operates to merely overcome the pressure on the larger area of the valve, due to the pressure in the receiver or reservoir, or, in other words, which operates to just break the joint of the delivery-valves when the same pressure has been reached in the cylinder as it is required to use in the receiver, and then to leave said valves to work in equilibrium, or by the pulsations of the pump.

In the accompanying drawing, Figure 1 represents a broken side view of an air-compressing pump with my invention applied, showing one form or modification of means for starting the opening of the delivery valve or valves; and Fig. 2, a broken end view of the same. Fig. 3 is a vertical longitudinal section of one end of an air compressing pump, showing another form or modification of means for starting the opening of the delivery valve or valves; and Fig. 4, a broken end view of the same.

Either of the forms or modifications of means here shown, or other valve-gear and means operating in a like positive manner, for starting the opening of the delivery-valves of the pump, may be used at both ends of the compressing-cylinder when the pump is a double-acting one; but for the convenience of illustration and description, the two modifications of said means here shown will be supposed to be applied, one to one end of the cylinder, and the other to the other end thereof.

A is the air-compressing cylinder of a double-acting pump; B B′, its air-inlet valves, and C C′ its air outlet or delivery valves, the latter opening into a passage, D, which is connected by a branch, *b*, with the compressed-air receiver, reservoir, or collecting chamber. E is the reciprocating piston or plunger, working within the cylinder A, and deriving its motion by a crank, G, attached to a revolving driving-shaft, H, and connected with a slide, I, of a slotted cross-head, J, on the piston-rod K; or any other suitable means may be employed to reciprocate the piston E.

The delivery-valve C, which controls the discharge of the compressed air from the one end of the cylinder A into the receiver or reservoir, may either be a puppet one, as here shown, or any other form of valve having the peculiarity of presenting, when closed, an

increased area on its back exposed to the pressure of the air in the receiver, over or as compared with its facial exposure to the pressure of the air in the cylinder, in order that said valve may be kept tight when closed. This valve, which, after it has been opened, may be assisted in closing by a spring on its back, has its joint broken when closed, or, in other words, is started in its opening action, at any given fixed point in the compressing stroke of the piston E, against the superior pressure on the back of the valve, by reason of the greater exposed area of its back by a positive motion. This takes place so soon as the pressure in the cylinder A reaches, or but slightly exceeds, the required pressure of the air in the receiver for use, and is effected by a sliding or tripping toe, L, carried by an arm, V, on a rock-shaft, *d*, and controlled by a spring, *s*, so that, as said rock-shaft *d* is actuated by an eccentric, M, on the shaft H, eccentric rod N, and crank or arm *f*, the toe L acts upon a back collar, *g*, of the valve, to open or start the opening of the latter at the desired point, hereinbefore specified, and then to ride over said collar, so that the valve is free both to further open and afterward to close by the pulsation of the pump, the toe, when moving in the opposite direction, passing over the collar *g*, and resuming its position again in front of the valve-collar, without any further action on the valve until it is again required to break the joint or start the opening of the latter.

The delivery-valve C′, at the opposite end of the cylinder, is similar to the valve C, and has its joint broken, or is started in its opening action, in a like fixed relation with the compressing stroke of the piston—that is, when the air in the cylinder is compressed to the same degree that it is required to collect it in the receiver for use—and said valve afterward left free to further open, and subsequently to close, in an unrestricted manner by the pulsation of the pump; but the toe L′, by which said valve is started in its opening action, is not a tripping one, so far as its action on and over the valve-collar *g* is concerned, but simply presses against said collar to start the opening of the valve, and then moves freely between the collar and the valve. This toe L′ may also be actuated by an eccentric on the shaft H, said eccentric vibrating an arm, *f*′, on the rock-shaft *d*′, which carries the toe, and the operating-eccentric being so adjusted or set that the toe in no way impedes the closing of the valve when the piston reaches the end of its compressing stroke. In either case the positively-operated toe or valve mechanism simply overcomes the pressure on the larger area of the delivery-valve when closed, due to the pressure in the receiver or compressed-air-collecting chamber.

I claim—

1. The combination, with the delivery-valve of an air-compressing pump, which, after being removed from its seat, is free to act by the pulsation of the pump, of a positively-operated valve-opening mechanism or device, constructed to break the joint or commence the opening of the valve at a given point in the compressing stroke of the piston, and afterward to be relieved from further action on the valve, substantially as and for the purposes herein set forth.

2. The combination, with the delivery-valve C of the air-compressor, provided with a collar or shoulder, *g*, of the rock-shaft *d*, with its arm V, and sliding or tripping toe L, acting upon the said collar or shoulder while moving in a direction to open the valve, but passing over the said collar or shoulder while moving in the opposite direction, substantially as herein described.

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Witnesses:

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