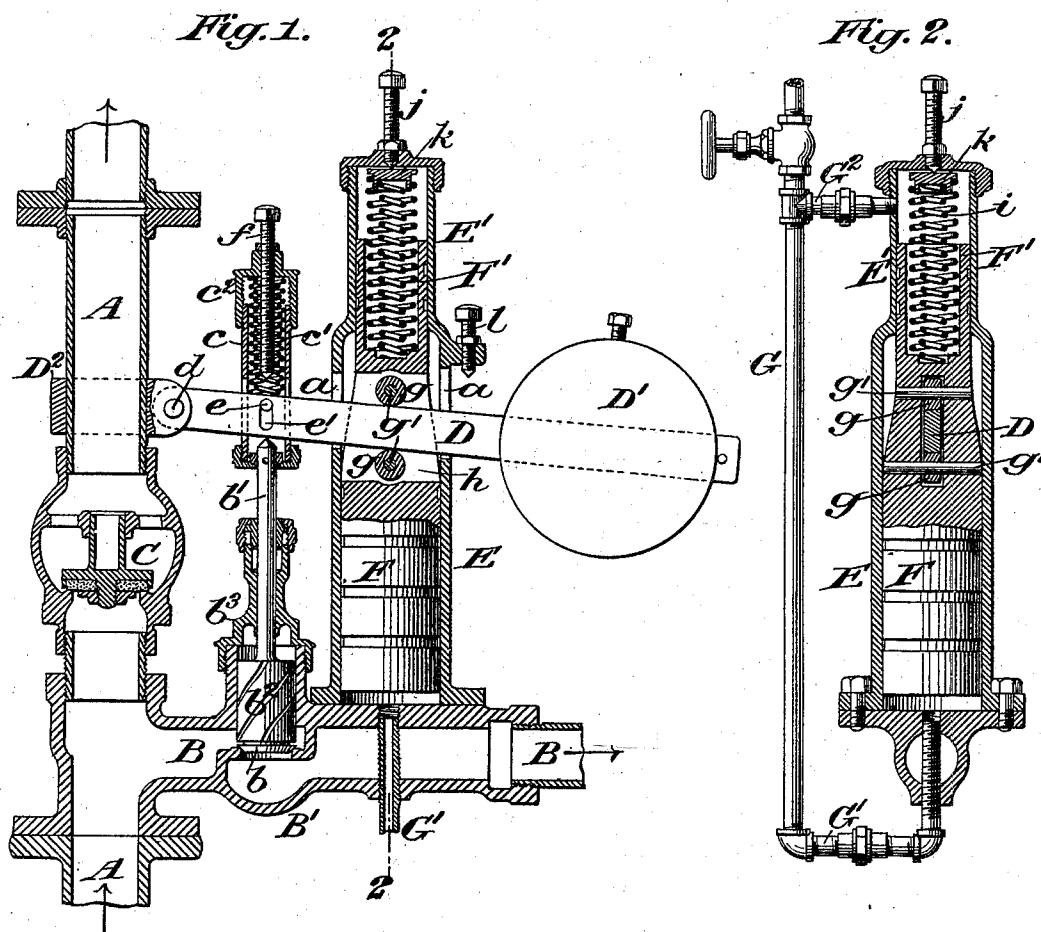


(No Model.)

J. CLAYTON.
REGULATOR FOR AIR COMPRESSORS.

No. 534,814.

Patented Feb. 26, 1895.



Witnesses:-
George Barry,
James B. Decker

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UNITED STATES PATENT OFFICE.

JAMES CLAYTON, OF BROOKLYN, NEW YORK.

REGULATOR FOR AIR-COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 534,814, dated February 26, 1895.

Application filed June 28, 1894. Serial No. 515,951. (No model.)

To all whom it may concern:

Be it known that I, JAMES CLAYTON, of the city of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Improvement in Regulators for Air-Compressors, of which the following is a specification.

This improvement relates to that class of regulators for compressors which consist principally of an automatic relief valve employed between the compressor and a receiver into which the compressed air or fluid is delivered and stored for motive power or other purpose, the said valve opening to the atmosphere to relieve the compressor of the resistance of the compressed air or fluid in the receiver whenever the pressure of said air or fluid exceeds the maximum desired and closing automatically when such pressure is reduced to said maximum and remaining closed while such pressure remains at or below the said maximum. An example of such regulator may be found in my United States Letters Patent No. 351,043, dated October 19, 1886.

Figure 1 represents a central vertical section of a regulator embodying my improvement; Fig. 2, a section taken transversely to Fig. 1, in the line 2, 2.

Similar letters of reference designate corresponding parts in both the figures.

A designates a delivery pipe for delivering compressed air from the discharge chest of the air compressor to the receiver, the said pipe as represented communicating at its lower end with the compressor and at its upper end with the receiver. This pipe A has projecting from it an outlet pipe B which is open to the atmosphere, and immediately above the entrance to the pipe B the said pipe A has in it a check valve C which will open to permit air to pass from the compressor to the receiver but will close automatically and prevent the return of any air from the receiver.

In the outlet pipe B is a valve casing B' containing the relief or outlet valve b represented as a puppet valve which opens upward and is held to its seat when closed, by the pressure of air above it as hereinafter more fully described. The stem b' of this valve is prolonged upward and is, as shown, connected with the lever D which works on

a fixed fulcrum d and which is provided with an adjustable weight D' by which the valve b is loaded. As here represented the fulcrum d is supported in a clamp D² affixed to the pipe A and it is guided in slots aa in the fixed cylinder E E' of a motor E E' F F'. The piston F F' of this motor is connected with the said lever and is acted upon by compressed air introduced to its cylinder through a pipe G either from a point in the pipe A beyond the check-valve C, or from the compressed air receiver to which said pipe leads. The said motor serves to exert a force on the lever D in the opposite direction to that exerted by the weight D' and thus to open the valve b.

As I have thus far described it, the regulator herein illustrated does not differ essentially from that which is the subject of my Letters Patent No. 351,043. I will now proceed to further describe it with particular reference to the present improvement.

The valve stem b' instead of being connected directly with the lever D as in my aforesaid Letters Patent, is connected by a spring box c c' which consists of a cylindrical box c slotted for the lever D to pass through it, and a coiled spring c' placed within the said box above the lever. The valve stem b' is connected with the bottom of the box c below the lever and projects upward a little way into the box. The said box has passing through it and firmly secured within it a pin e which passes through a slot e' in the lever D. Through the top of the box there is screwed a screw f between the lower end of which and the upper end of the valve stem b' there is a space for play corresponding substantially with that provided in the slot e' in the lever for the pin e. The valve b is represented as having a solid cylindrical head b² which is grooved for the passage of the compressed air from the pipes A and B to the space provided above the said valve within its casing b³, the said groove serving to admit the compressed air from the pipe B on to the top of the valve to hold it down firmly until lifted by the operation of the lever D as hereinafter described.

The motor cylinder E E' has a differential bore, that is to say, its lower part E has a larger bore than its upper part E'. The lower and upper parts F F' of the piston are fitted to

the respective portions E and E' of the cylinder in which they work. The connection of the lever D with the motor piston is represented as made by two antifriction rollers *g* 5 *g* which are pivoted by pivots *g'* within the slot *h* provided in the said piston for the passage of the lever D through it, the said rollers being one above and the other below the lever.

10 Between the upper part of the piston and the head of the cylinder E E', is arranged a spiral spring *i* the pressure of which on the top of the piston is adjusted by a screw *j* which screws through the closed head of the said cylinder and acts upon a cap *k* which 15 bears upon the top of the said spring. The upper part of the piston is made hollow to receive the greater portion of the spring *i* and serve as a guide thereto.

20 The pipe G has two branches, one G' leading to the bottom of the motor cylinder and the other G² leading to the upper part of said cylinder so that both the top and bottom of the piston are exposed to the pressure of the 25 air in the receiver or pipe A, the pressure on the bottom of the piston preponderating by reason of its greater area. The pressure of the spring *i* on the piston is so adjusted by means of the screw *j* that the downward 30 pressure produced by the combined action of the weight D', the air above the piston, the spring *i* and the air above the valve *b* when the latter is closed, will be balanced by the upward pressure of the air upon the bottom 35 of the motor piston when the air in the delivery pipe A and the receiver is of the maximum pressure desired.

The spring *c'* as herein represented, consists of two coil springs arranged one within 40 the other and coiled in opposite directions. The tension of the said spring and its pressure on the lever D is adjusted by a screw cap *c*² on the top of the box *c*. The springs *c'* and *i* are represented as each composed of 45 two coils. An adjustable stop screw *l* is represented in Fig. 1, applied on the outside of the motor cylinder to prevent the lever from being raised higher than is necessary.

While the pressure in the pipe A and the 50 receiver is not above the maximum desired the parts remain at rest with the valve *b* closed. When the pressure exceeds this maximum, the piston F F' is caused to rise and with it the lever D but the valve *b* is not 55 immediately opened by the movement of the lever as the spring *c'* through which the lever acts to raise the valve is not in its normal condition strong enough to overcome the pressure of the air upon the upper side of the 60 valve, and consequently there is some lost motion between the lever and the valve. This lost motion or upward movement of the lever without operating upon the valve is permitted by the slot *e'* in the lever until the lever 65 strikes the lower end of the screw *f* in the spring box *c* and the continued upward movement of the lever starts the valve from its

seat. As soon as this starting takes place, the pressure above and below the valve *b* is equalized and the spring *c'* instantly throws 70 the valve wide open and makes a free communication through the pipe B to the atmosphere from that portion of the pipe A below the check-valve, which latter is held closed by the pressure in the upper part of the pipe 75 A and the receiver. The compressor then works without resistance from the air in the receiver until the pressure in the latter gets below the maximum desired when the combined action of the weight D', the air above 80 the motor piston and the spring *i* overcomes the pressure on the bottom of the piston and allows the lever to descend, but this descent of the lever D does not at once close the valve as the latter is held open by the spring until 85 the lever strikes the top of the stem *b'*, after which the continued descent of the lever closes the valve.

By the above described connection between the lever and the valve by means of a spring, 90 the wide opening of the valve and the free relief of the compressor are made certain, which is not always the case when the connection between the lever and the valve is made positive and unyielding. With such positive and 95 unyielding connection the valve is apt to open but a little way without giving a free relief to the compressor, its action being more like that of a safety valve.

By properly proportioning the diameters of 100 the upper and lower parts of the motor cylinder and its piston and giving a proper strength to the spring *i*, the weight D' might be dispensed with, the spring being in such case the equivalent of the weight D'. I prefer, however, to use the weight D' as it in- 105 sures greater steadiness of operation.

What I claim as my invention is—

1. The combination with a pipe provided with a check-valve for the delivery of fluid 110 under pressure from a compressor, of an outlet situated below or inward of the check-valve and provided with a puppet valve capable of being held to its seat by the pressure of the delivered fluid, a motor cylinder having 115 two unequal diameters and fitted with a piston of corresponding unequal diameters, a spring in said cylinder acting upon the smaller end of the piston, a pipe with branches for the introduction to both ends of the said cyl- 120-inder of the delivered fluid, and a connection between said motor and said puppet valve whereby the said piston is made to operate the said valve for opening said outlet and the said piston and the said spring together are 125 made to operate the said valve for closing said outlet, substantially as herein set forth.

2. The combination with a pipe for the delivery of fluid under pressure from a compressor and an outlet from said pipe provided 130 with a valve capable of being held to its seat by pressure of the delivered fluid, the said pipe being provided with a check-valve beyond said outlet, of a weight for holding the

first named valve to its seat, a motor to be operated on by the delivered fluid and acting upon the weight in a direction to raise it and open said first named valve, and a spring forming a connection between said motor and first named valve for opening the latter, substantially as herein set forth.

3. The combination with a pipe for the delivery of fluid under pressure from a compressor and an outlet from said pipe provided with an outlet valve capable of being held to its seat by pressure of the delivered fluid, the said pipe being provided with a check-valve beyond said outlet, of a weight for holding said outlet valve to its seat, a motor to be operated on by the delivered fluid and acting upon the weight in a direction to raise it and open said outlet valve, a spring and a containing box therefor through which spring and box the motor acts upon said outlet valve, and a screw in said box for regulating a lost motion allowed between said lever and outlet valve, substantially as herein set forth.

4. The combination with a pipe for the delivery of fluid under pressure from a compressor and an outlet from said pipe provided with an outlet valve capable of being held to its seat by pressure of the delivered fluid, the said pipe being provided with a check-valve beyond said outlet, of a weight for holding

said outlet valve to its seat, a motor to be operated on by the delivered fluid and acting upon the weight in a direction to raise it and open said outlet valve, a spring and a containing box therefor through which spring and box the motor acts upon said outlet valve, the said box having a screw cap for the adjustment of said spring, substantially as herein set forth.

5. The combination with the delivery pipe A provided with a check-valve C for delivering fluid under pressure from a compressor, of the outlet B opening to the atmosphere from the pipe A below the said check-valve and provided with the downwardly closing valve *b*, the lever D for pressing on said outlet valve, the motor cylinder E E' and its contained piston F F' each having two unequal diameters, the said piston being connected with said lever, the spring *i* in said cylinder for pressing on said piston, the pipe G with branches to both ends of the cylinder, and the box *c* with its contained spring *c'* forming a connection between said lever and said valve *b*, all substantially as and for the purpose herein set forth.

JAMES CLAYTON.

Witnesses:

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