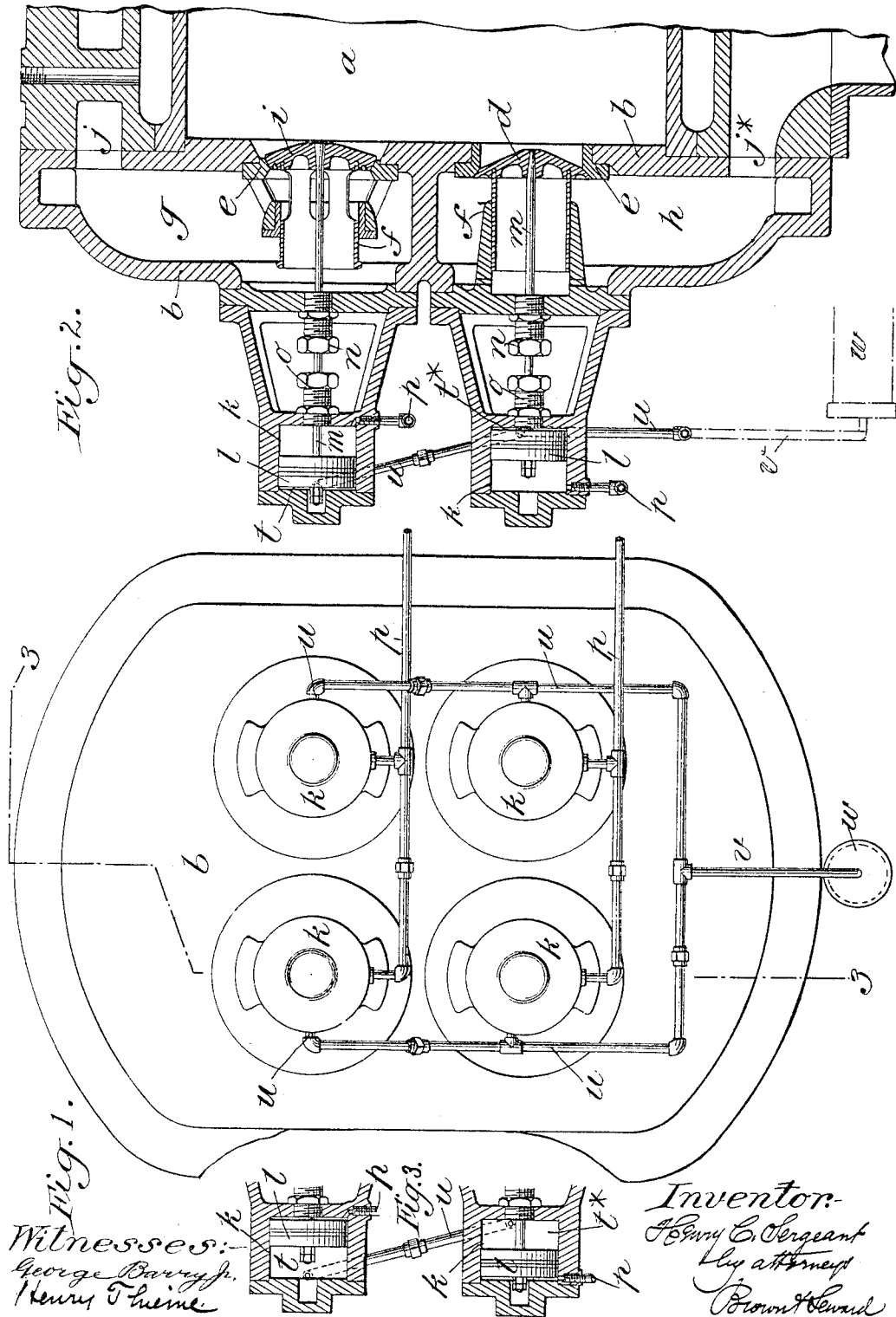


No. 818,567.

PATENTED APR. 24, 1906.

H. C. SERGEANT.
VALVE OPERATING DEVICE FOR COMPRESSORS.

APPLICATION FILED JUNE 26, 1902.



Witnesses:
George Barry Jr.
Henry Thine

Inventor:
Henry C. Sergeant
By attorney
Brown & Sewall

UNITED STATES PATENT OFFICE.

HENRY C. SERGEANT, OF WESTFIELD, NEW JERSEY, ASSIGNOR TO
INGERSOLL-RAND COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

VALVE-OPERATING DEVICE FOR COMPRESSORS.

No. 818,567.

Specification of Letters Patent.

Patented April 24, 1906.

Application filed June 26, 1902. Serial No. 113,342.

To all whom it may concern:

Be it known that I, HENRY C. SERGEANT, a citizen of the United States, and a resident of Westfield, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Valve-Operating Devices for Compressors, of which the following is a specification.

This invention relates to means for opening or assisting to open both the inlet-valves and discharge-valves of compressors for air and other gaseous bodies, and is especially applicable to such inlet and discharge valves as have their closing movements effected positively by motors actuated by compressed air or gas taken from the receiver to which the compressor delivers, as illustrated and described in United States Patent No. 641,896.

The object of said invention is to obtain a quicker opening movement of the valves; and to this end the improvement consists in the means hereinafter described and claimed for that purpose, comprising pneumatic cushions formed within the cylinders of the motors by the air or gas retained between the ends of said cylinders and their pistons.

Figure 1 is an end view of the cylinder of a compressor, illustrating my invention; Fig. 2, a section at right angles to Fig. 1, taken approximately in the line 3 3 of that figure and showing the valves closed; Fig. 3, a vertical section of the valve-operating motors and of the pneumatic cushions corresponding with Fig. 2, but showing the position of the motor-pistons when the valves are open.

a designates the compressor-cylinder, having in its head *b* the inlet and discharge valves *i* and *d*, of which there may be one or more of each. The said valves are shown as of a well-known kind, closing into seats *e* and fitted with tubular guides *f*. They and their seats are represented arranged, respectively, as is common, in a separate inlet-box *g* and discharge-box *h*, formed within the cylinder-head and communicating with passages *j j'* on the sides of the cylinder *a*, leading, respectively, to the inlet-pipe and discharge-pipe of the compressor.

The valves *i* and *d* are represented as having applied to them for the purpose of closing them fluid-pressure motors similar to those which are included in the subject-matter of

United States Patent No. 641,896 and which I will only here describe sufficiently for explanation of the connection with them of the present invention. The motor for each valve comprises a cylinder *k*, attached to the cylinder-head outside of its respective box *g* or *h*, and a piston *l*, working in said cylinder and connected with the stem *m* of the valve, the said stem passing through stuffing-boxes *n o* on the valve-box and motor-cylinder. The motor-cylinders are supplied with and exhausted of the actuating fluid from the receiver through pipes *p* under the control of a valve operated by a connection with the compressor or the engine which drives it, the pipe *p* of the inlet-valve motor communicating with its motor-cylinder *k* at the inner end thereof and the pipe *p* of the discharge-valve motor communicating with its motor-cylinder at the outer end thereof.

The pneumatic cushions exerting a constant tendency to open the valves are constituted by air which is contained in the spaces *t t** within the motor-cylinders *k* on the opposite sides of their respective pistons to those on which the fluid-pressure operates to close the valves—that is to say, the space *t*, which contains the air constituting the pneumatic cushion for opening the inlet-valve *i*, is on the outer side of its motor-piston *l*, and the space *t**, which contains the air constituting the pneumatic cushion for opening the discharge-valve *d*, is on the inner side of its motor-piston *l*. The said spaces in the several cylinders are represented in Figs. 1 and 2 as severally connected by the branches *u* of a pipe *v* with a reservoir *w*, which with said pipe and its branches and said spaces *t t** is kept constantly supplied by leakage past the motor-pistons with compressed air, the tension of which, though of course considerably less than that of the air employed to actuate the motors for the closing of the valves, will be sufficient to produce their openings, as that is not required to take place until the motor-pistons have been relieved of their closing pressure. The leakage above described is provided for by fitting the motor-pistons only moderately tight to their cylinders.

The pneumatic cushions thus formed by the air retained in the spaces *t t** within the motor-cylinders being in constant tension

produce the very quick and almost instantaneous opening of the valves to their full width when they are sufficiently relieved of whatever action tends to close them, whether such closing action depends only on the movement of the compressor-piston or upon any external agency, and this extremely quick opening to their full width being effected during an infinitesimally short portion of the stroke of the compressor-piston adds greatly to the efficiency of the compressor.

Fig. 1 illustrates an arrangement of pipes *u v* with one reservoir *w* for the application of the invention to a compressor with two inlet and two discharge valves at either end of the cylinder. It may be understood that one reservoir *w* may serve to contain air for opening similar valves at both ends of a double-action compressor-cylinder with a suitable system of pipes connecting said reservoir with the pneumatic cushion-spaces *t t**. If, however, the spaces *t t**, provided in the motor-cylinders should be made of sufficient capacity, such a reservoir would be unnecessary.

What I claim as my invention is—

1. The combination with the inlet-valve of a compressor, of a motor consisting of a cylinder and piston, means for admitting a pressure fluid to said cylinder on one side of the piston for closing said valve, and an elastic-fluid supply connected with said cylinder on the other side of said piston and exerting a constant tendency to open the valve, substantially as herein described.

2. The combination with the discharge-valve of a compressor, of a motor consisting of a cylinder and piston, means for admitting a pressure fluid to said cylinder on one side of the piston for closing said valve, and an elastic-fluid supply connected with said cylinder on the other side of said piston and exerting a constant tendency to open the valve, substantially as herein described.

3. The combination with the inlet-valve of a compressor, of a motor consisting of a cylinder and piston, means for admitting a pres-

sure fluid to said cylinder on one side of its piston for closing said valve and for permitting leakage of said fluid past the piston and storing said leakage whereby said leakage may act to open the valve when the pressure fluid is cut off.

4. The combination with the discharge-valve of a compressor, of a motor consisting of a cylinder and piston, means for admitting a pressure fluid to said cylinder on one side of its piston for closing said valve and for permitting leakage of said fluid past the piston and storing said leakage whereby said leakage may act to open the valve when the pressure fluid is cut off.

5. The combination with the inlet and discharge valves of a compressor and a motor for each of said valves consisting of a cylinder and piston, of means for admitting a pressure fluid to each of the motor-cylinders on one side of its piston for closing said valves, and pipes forming communication between the said motor-cylinders on those sides of their respective pistons opposite to the sides on which the pressure fluid acts for closing the valves, substantially as herein described.

6. The combination with the inlet and discharge valves of a compressor and a motor for each of said valves consisting of a cylinder and piston, means for admitting a pressure fluid to the several cylinders for closing said valves and for permitting leakage past the several pistons, and a reservoir common to the several cylinders for storing said leakage whereby said leakage may act to open the valves when the pressure fluid is cut off from their respective cylinders, substantially as herein described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 24th day of June, 1902.

HENRY C. SERGEANT.

Witnesses:

FREDK. HAYNES,
HENRY THIEME.