E. A. RIX.

AIR VALVE GEAR.

APPLICATION FILED AUG. 19, 1908.

931,650. Patented Aug. 17, 1909.

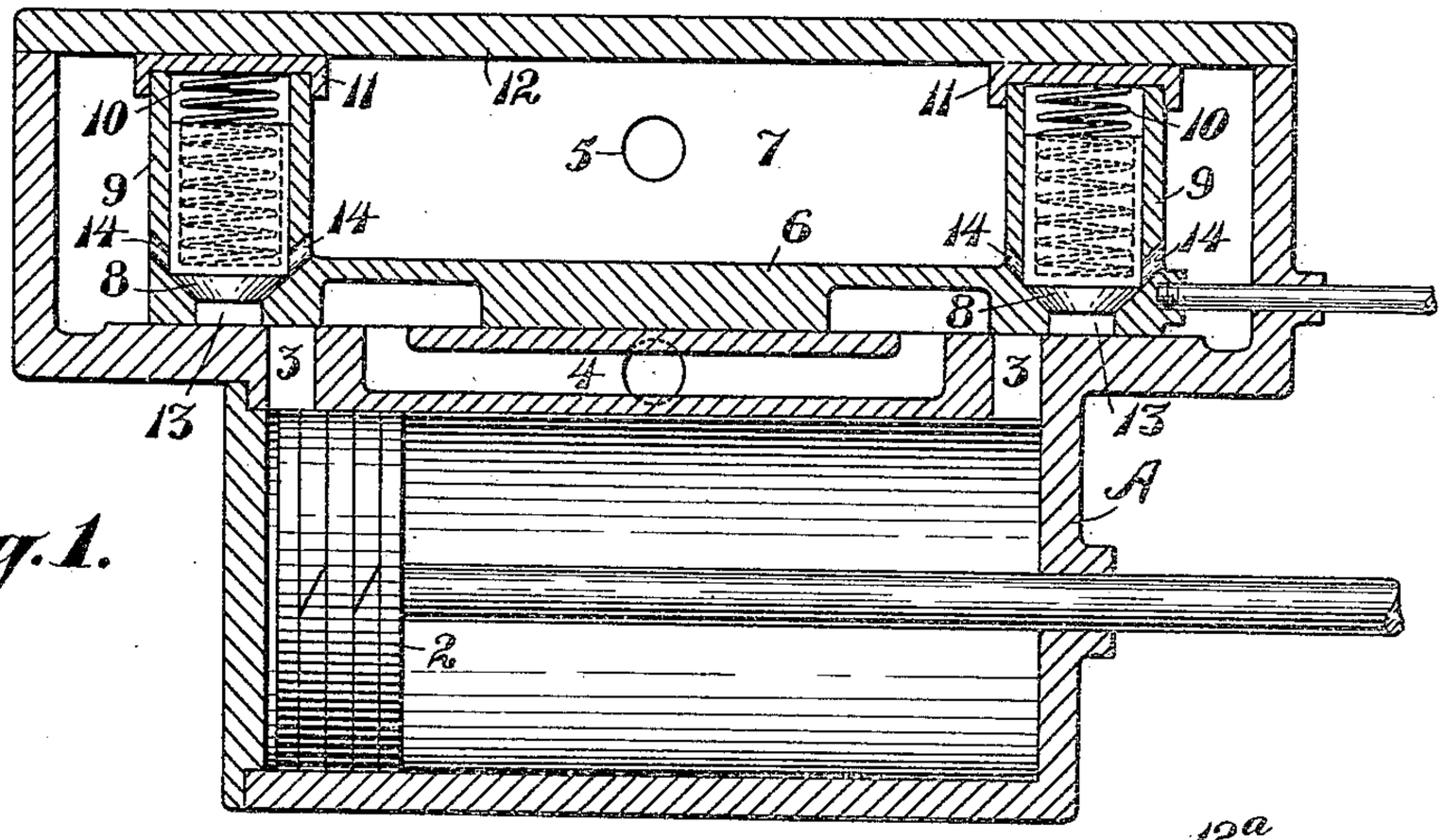

Fig. 1.

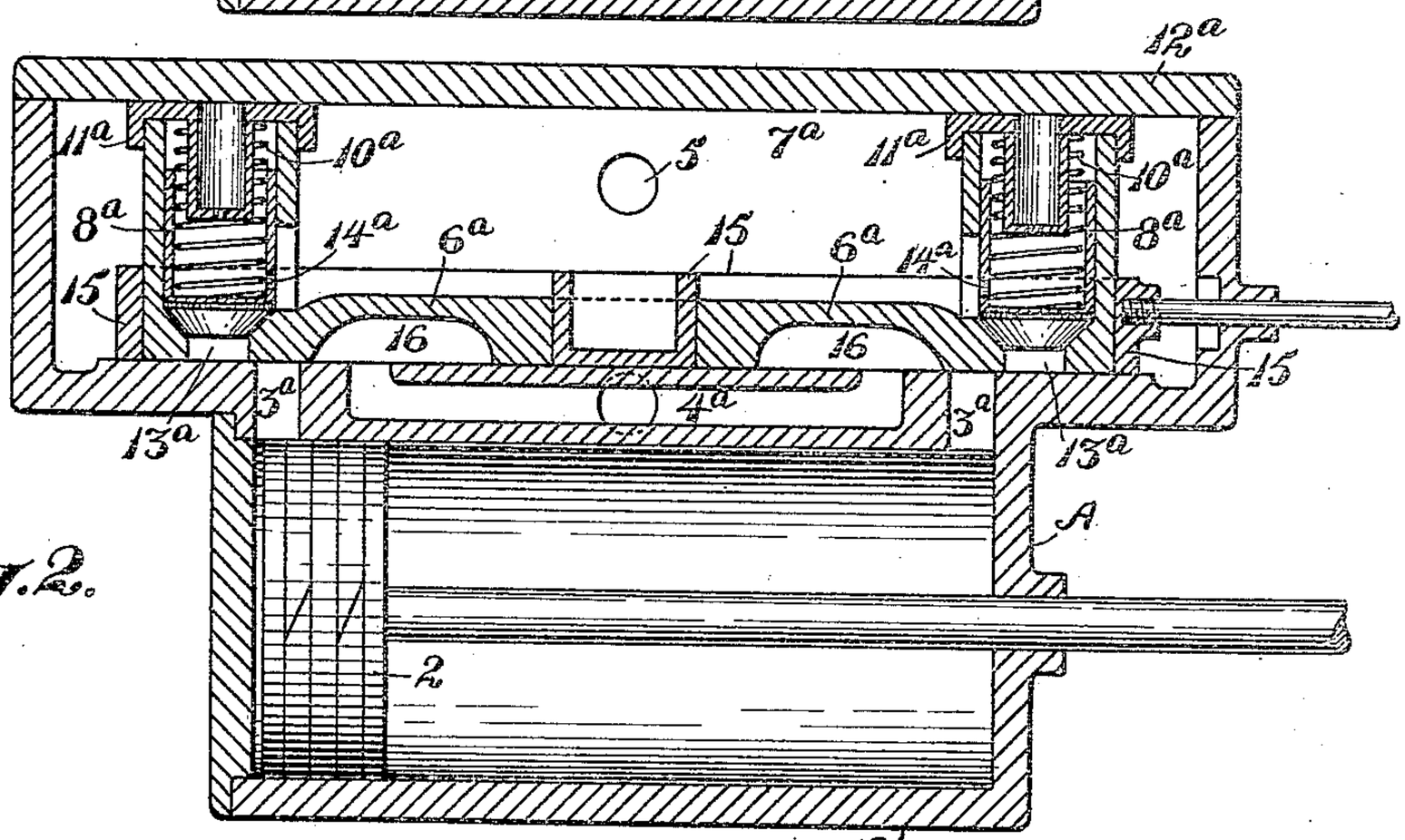

Fig. 2.

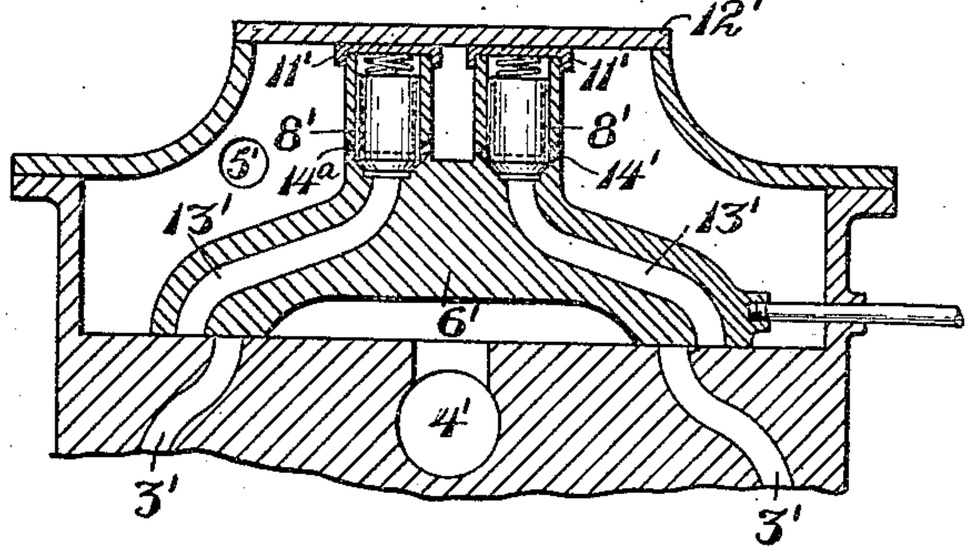

Fig. 3.

WITNESSES

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AIR-VALVE GEAR.

No. 931,650. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed August 19, 1908. Serial No. 449,208.

To all whom it may concern:

Be it known that I, EDWARD A. RIX, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Air-Valve Gears, of which the following is a specification.

This invention relates to valve gears, and pertains especially to a valve gear for air compressors.

The object of the invention is to provide a simple, cheap, practical, readily removable and interchangeable valve construction, particularly designed and adapted for use with high speed air compressors; in which there is a minimum number of parts, and in which the seating and spring-actuated parts operate noiselessly; and in which the pressure on the surface of both the inlet and outlet valves is always in communication with the receiver.

Another object or rather advantage of the present invention is that an ordinary steam engine may be readily converted into an efficient air compressor by substituting for the old slide valve my improved valve; all of which will be more clearly understood hereinafter.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a central section through a cylinder and chest showing the application of my valve gear. Fig. 2 is a modification showing the valves interchangeable. Fig. 3 shows my valves applied to the valve chest of an ordinary steam engine.

Having reference to Fig. 1, A represents the cylinder of an air compressor, provided with the usual piston 2. At each end of the cylinder are ports 3 brought alternately into communication with a centrally disposed air inlet 4, and with a discharge outlet 5 for the compressed air through the medium of the slide valve 6. Synchronous motion is given to the slide valve 6 and piston 2 through appropriate connections with a crank shaft, not necessary here to be shown. The valve 6 operates in the valve chest 7, and the valve is so fashioned that the top of the valve is always in communication with the air pressure in the discharge pipe and receiver so as to cause the valve 6 always to seat properly. Each end of the valve 6 is provided with a puppet valve 8 properly seating in a casing 9 of the slide valve 6; the valve 8 being maintained ordinarily on its seat by suitable means, as the helical spring 10 inside the casing 9, with one end of the spring operating on the valve, and the other acting against a cap 11 which fits over the puppet valve casing 9, and slides back and forth in unison with the valve 6, on the inner side of the steam chest cap plate or cover 12. It is understood that both puppet valves and their various parts are symmetrical. Each puppet valve seats over a port 13 formed in the slide valve, and these ports are alternately registrable with the respective ports 3. On the compression of a charge of air in the cylinder, the corresponding puppet valve 8 is lifted, when its port 13 and a corresponding port 3 are brought into register, and a compressed charge passes into the valve chest 7 through the ports 14 in the puppet valve casing 9; and thence out through the discharge 5 to the receiver. Thus, when the piston 2 moves in one direction to suck in a charge of air into the cylinder, the slide valve 6 is moved in the opposite direction to open up communication between the inlet 4 and the corresponding port 3; at the same time that the air inlet 4 is in communication with the suction end of the cylinder, the air inlet is cut off from the opposite end of the cylinder, and the compressed charge forced out through a corresponding set of ports 3, 13 and 14 into the valve chest, and thence to the receiver. This valve arrangement affords a positive and mechanical control for the several steps in the cycle of compression; that is, the opening of the suction, the closing of the same, and the opening and closing of the discharge. The puppet valves, it is to be remembered, are carried by and travel always with the slide valve 6. The moment that the slide valve 6 is shifted to cut off one port 13, this port 13, which is thus out of communication with its respective port 3, retains a cushion of air under its puppet valve at receiver pressure. This happens with each puppet valve at the end of the closing stroke of the valve 6; consequently, the puppet valves are given the time of the entire return stroke in which to seat, and thereby preventing all shock or noise in their closing. The result is that by giving plenty of time to the puppet valves to seat, the compressor can be run

at high speed, and consequently a compressor of half the size and less than half the cost, will do the work of an ordinary low speed compressor, in which the discharge valves have a less time to seat in.

In Fig. 3, I have shown how the invention is applicable to an ordinary steam engine by simply substituting for the ordinary D slide valve, a valve 6′ of my improved design; this valve 6′ having ports 13′ alternately registrable with the cylinder ports 3′. Each port 13′ is controlled by a spring seating puppet valve 8′ partially incased by a corresponding cap 11′; the caps and puppet valves being held normally seated by the sliding action of the caps on the removable cover plate 12′ of the chest. The action is similar to that of the valve previously described.

In Fig. 2, I have shown a modification in which the same principle is involved of a slow seating puppet valve carried by the slide valve, but in which all the parts are readily removable and interchangeable. In this case I employ practically two slide valves 6^a, one for each port 3^a. These slide valves are each adapted to fit loose in a sliding yoke 15, working back and forth in the chest 7^a synchronously with the movements of the piston. Each of the valves 6^a has a port 16 adapted to bring the inlet 4^a, and a corresponding port 3^a into communication. The valve 6^a also has a port 13^a, over which is normally seated a puppet valve 8^a; this valve 8^a being acted on by a spring 10^a which abuts against a cap 11^a, sliding back and forth in a cover plate 12^a. The advantage of a construction of this sort is that if anything goes wrong with either of the puppet discharge valves, or with either of the inlet slide valves, by simply taking off the cap plate 12^a, the trouble can easily be gotten at and the part adjusted, replaced, or repaired in a very short time, and at very small expense, and it also permits a better seating, there being less distortion of the valve by heat. This construction is especially advantageous in very small compressors; but manifestly all these forms are applicable and practical in compressors and engines of any size.

In all the forms here shown it is to be observed that the inlet valve is constantly subjected to the air receiver pressure, and insures its proper seating; that the discharge or puppet valves are carried by the inlet valve, and that each puppet valve seats against an air cushion.

By the term "air compressor," I mean any form of fluid pressure engine to which this invention is applicable.

It is not necessary that the puppet valves be placed perpendicular to the slide valve face; they may be at any angle, or horizontal, as circumstances require; but the design as shown seems to possess the best features.

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

1. The combination with a cylinder and a valve chest, of a slide valve in the valve chest, said cylinder having ports alternately registrable with an air inlet port on the reciprocation of the slide valve, and puppet valves at the opposite ends of the slide valve and carried by the slide valve and disposed in ports in the slide valve, which ports are alternately registrable with the cylinder ports on the reciprocation of the slide valve to open communication between the interior of the cylinder and the valve chest, said slide valve being formed with casings in which the puppet valves are contained said puppet valves each inclosing, when the slide valve is moved to cut off communication with the cylinder, an air chamber having an air cushion under receiver pressure whereby a slow closing movement of each puppet valve is secured.

2. The combination with a cylinder and a valve chest, of a two-part slide valve in the chest, said cylinder having inlet ports controlled by said slide valve, each part of said slide valve controlling one of said ports having, also, a discharge port intermittently registrable with its respective cylinder port, an outlet valve carried by each part of the said slide valve, and seating in a corresponding one of said discharge ports, and a sliding yoke in which said slide valve is fitted; each part of said slide valve being independently removable therefrom.

3. The combination with a cylinder and a valve chest, of a slide valve in the chest, said cylinder having an inlet port controlled by said slide valve, said slide valve having extended casings and said chest having a removable cover forming a closure for the outer ends of the casing, said slide valve having, also, a discharge port intermittently registrable with said cylinder port, a puppet valve in each of said casings, and a cushion in the casing between said valve and the closure of the casing.

4. The combination with a cylinder and a valve chest, of a slide valve in the chest, said cylinder having an inlet port controlled by said slide valve, said slide valve having rigid casings projecting from it and said chest having a removable cover plate, said slide valve having discharge ports intermittently registrable with said cylinder port, puppet valves within the projecting casings of the slide valve, seating in said discharge ports, springs within said casings and acting upon the puppet valves to seat the same, and a cap closing the upper end of said casings and operating in contact with the inner wall of the cover plate of the chest, said springs

seating against said caps, and said cover plate forming a guide against which the caps are slidable on the reciprocation of the slide valve.

5. The combination with a cylinder and a valve chest, a slide valve in the chest, said cylinder having an inlet port controlled by said slide valve, said slide valve having a discharge port intermittently registrable with said cylinder port, a puppet valve carried by the slide valve, seating in said discharge port, a spring carried by the slide valve and operative to seat the puppet valve, a cap against which the spring seats in opposition to the puppet valve, said chest having a removable wall forming a guide against which said cap is slidable on the reciprocation of the slide valve, and a sliding yoke forming a carriage for the slide valve, and in which the same loosely fits.

6. The combination with a cylinder and a valve chest, of a slide valve in the chest, said cylinder having an inlet port controlled by said slide valve, said slide valve having a discharge port intermittently registrable with said cylinder port, a puppet valve carried by the slide valve, seating in said discharge port, a spring carried by the slide valve and operative to seat the puppet valve, a cap against which the spring seats in opposition to the puppet valve, said chest having a removable wall forming a guide against which said cap is slidable on the reciprocation of the slide valve, in which the same loosely fits, said chest being in communication with the air-receiver pressure, and said slide valve maintained seated by means of the air pressure in the chest.

7. In an air compressor, the combination with its cylinder, of an inlet valve controlling inhaust and exhaust to and from the cylinder, a discharge valve carried by said inlet valve, said discharge valve acting subsequent to said inlet valve, and means for giving it a slow cushioned closing movement.

8. In an air compressor, the combination with the valve chest and cylinder having inlet and outlet ports, of a slide valve controlling said ports, said slide valve having ports registrable with said outlet ports, spring-pressed puppet valves in said valve ports, said slide valve having cylindrical casings on its back to house said puppet valves, said housings having caps which press the springs of said puppet valves down thereon to seat said valves, and which caps have a sliding contact with a removable wall of the valve chest.

9. In an air compressor, the combination with the valve chest and cylinder, the latter having a port near each end, a two-part slide valve in the chest controlling said ports, each part of said slide valve having an outlet port intermittently registrable with a corresponding one of said cylinder ports, a spring-pressed puppet valve in each of said outlet ports, and means for moving the two parts of the slide valve with the respective puppet valves in unison; and each part of said slide valve with its respective puppet valve being independently removable.

10. The combination with a cylinder and its valve chest, said cylinder having ports at opposite ends, a sliding yoke in the valve chest, a slide valve carried by said yoke, said slide valve having outlet ports registrable with the respective of said cylinder ports, and puppet valves seating in said outlet ports, said slide valve having casings for said puppet valves integral with the slide valve and movable therewith, and said slide valve and puppet valves being removable from the yoke without disturbing the "set" of the slide valve.

11. In an air compressor, the combination with a valve chest and cylinder, said cylinder having ports at its opposite ends, a sliding valve in the valve chest having pockets, individually removable outlet valves in said pockets, each of said valves controlling one of said ports, and each of said valves having an outlet port, and a normally closed valve in each of said outlet ports.

12. In an air compressor, the combination with a valve chest and cylinder, said cylinder having ports at its opposite ends, a sliding valve in the valve chest having pockets, individually removable outlet valves in said pockets, each of said valves controlling one of said ports, and each of said valves having an outlet port, a normally closed valve in each of said outlet ports, and means by which either of said inlet valves with its puppet valve, may be removed from the chest without disturbing the other.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EDWARD A. RIX.

Witnesses:
JAMES MASON,
CHARLES W. PENFIELD.