

G. D. WARREN.

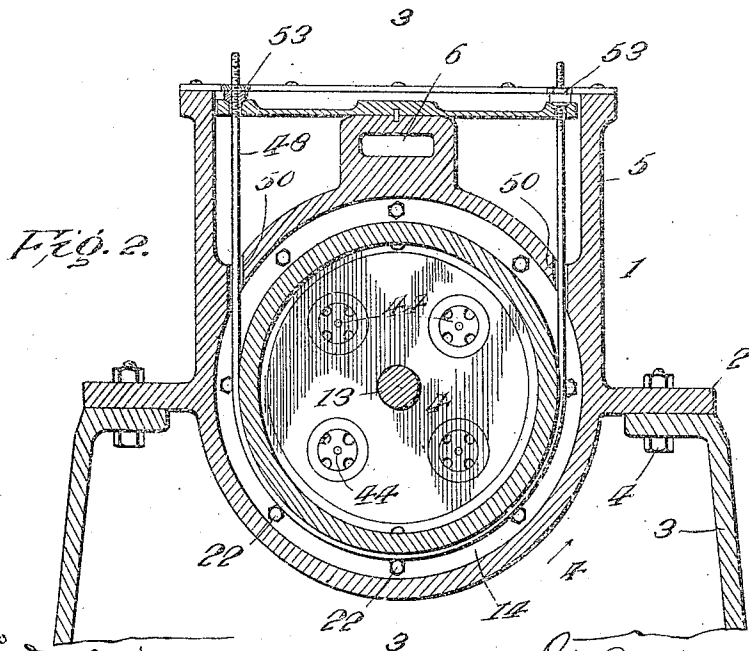
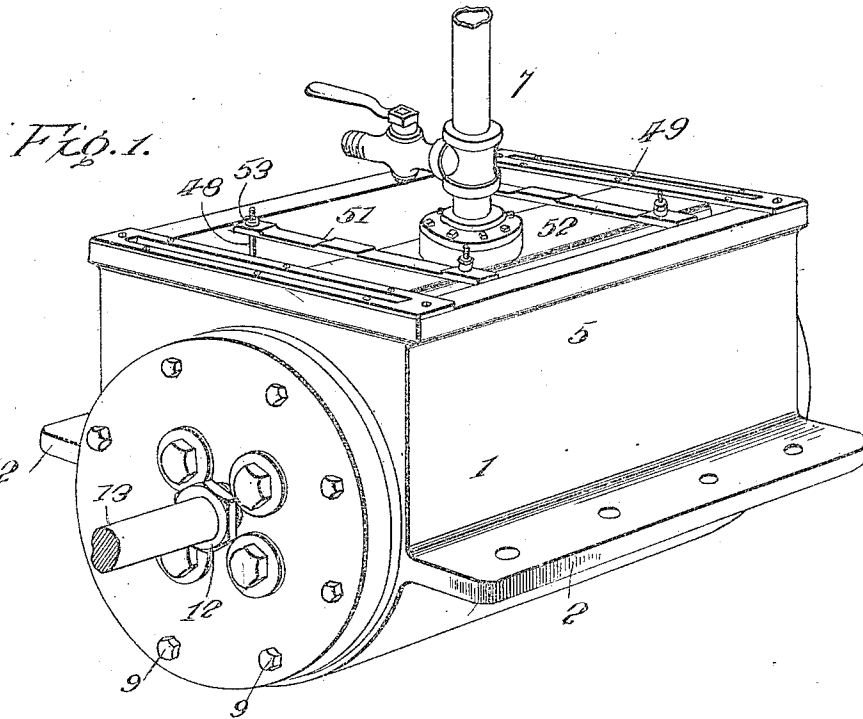
COMPRESSOR.

APPLICATION FILED DEC. 1, 1905. RENEWED SEPT. 24, 1909.

957,129.

Patented May 3, 1910.

2 SHEETS—SHEET 1.



Inventor

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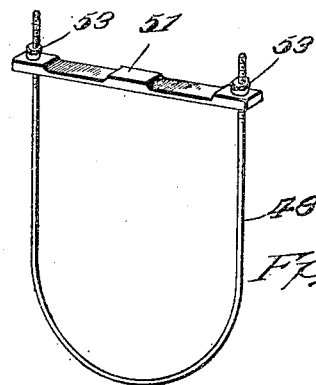
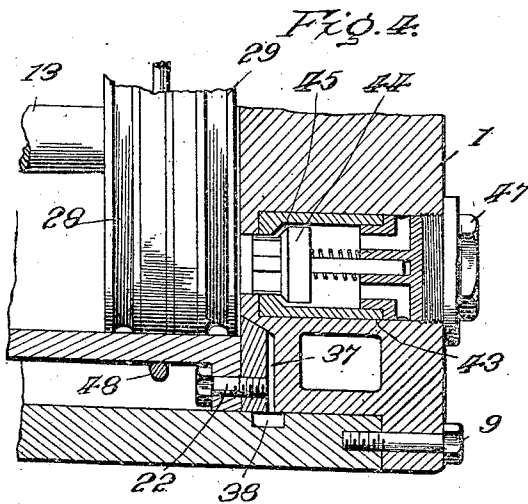
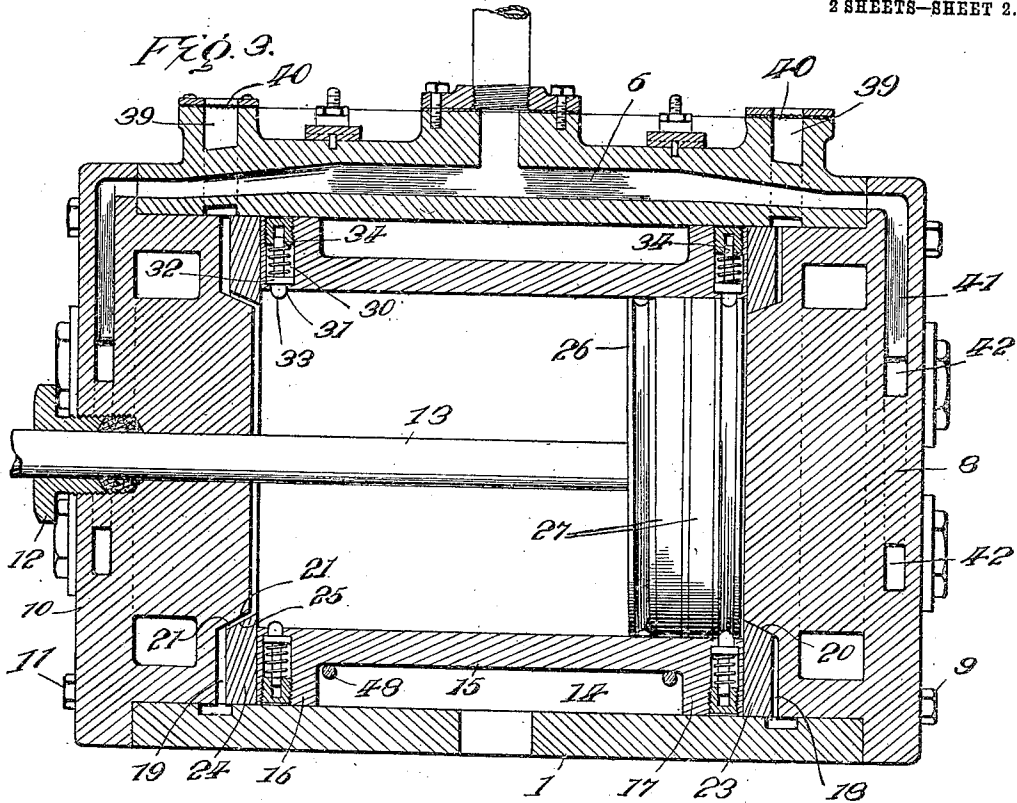
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UNITED STATES PATENT OFFICE.

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COMPRESSOR.

957,129.

Specification of Letters Patent.

Patented May 3, 1910.

Application filed December 1, 1905, Serial No. 289,803. Renewed September 24, 1909. Serial No. 519,407.

To all whom it may concern:

Be it known that I, GOVERNOR DREW WARREN, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Compressors, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to improvements in compressors.

The object of my invention is to provide a compressor of this character, in which the compressing chamber is more readily filled with ample volume from the open end without practically any resistance, which causes a greater compression and necessarily a greater delivery of air per stroke than has been accomplished by the old methods of taking air.

Another object of my invention is to provide a compressor of this character which is double acting. That is, compressing air both on the forward and backward stroke, and in which I provide means for overcoming the wearing of the parts, and thus cause the compressor to at all times work to its full extent.

A still further object of my invention is to provide a more cheap, simple and effective compressor to accomplish the above results.

In the accompanying drawings, Figure 1, is a perspective view of my improved compressor. Fig. 2, is a transverse vertical sectional view taken on the line $u-u$ of Fig. 1. Fig. 3, is a longitudinal vertical sectional view taken on the line $x-x$ of Fig. 1. Fig. 4, is a sectional view partly broken away and taken on the line $y-y$ of Fig. 1. Fig. 5, is an enlarged perspective view of one of the cylinder-supporting loops.

Referring now to the drawings, 1 represents a cylinder casing which, as shown, is provided at opposite sides with the longitudinally-extending horizontal flange 2 which is bolted to the bed-plate 3 by means of bolts 4. The said cylinder-casing 1, as shown, is of a circular case form and provided at its upper edge with the upwardly-extending square housing 5 which is cast as a part of the cylinder, and has its upper end open, as clearly shown in Figs. 1 and 2. The said cylinder-casing 1, as shown at its upper face within the housing 5, has cast therein a passage-way 6 which is provided

at the center with the discharge pipe 7, and said passage has its outer end opened, as clearly shown in Fig. 3. The said cylinder has its rear end closed by the elongated cylinder-head 8, which extends quite a distance within the cylinder, the purpose of which will be hereinafter more fully described. The said cylinder-head 8 is bolted to the cylinder by means of bolts 9, or by any other desired means, but preferably as shown. The opposite end of the cylinder-head 10, which is precisely like the cylinder-head 8, is bolted to the cylinder by bolts 11 in the same manner as the cylinder-head 8, but is provided with a stuffing-box 12 centrally located. Passing through said stuffing-box is the piston rod 13, and by means of which an air-tight joint is made therewith for the purpose hereinafter more fully described. The casing or cylinder 1 has a central bore 14 therethrough which is of such a size as to receive a cylinder 15 which is of a length slightly less than the distance between the innermost portions of the two cylinder-heads 8 and 10, and thus the cylinder is free to slightly reciprocate within the outer cylinder or casing 1. The inner cylinder is also so positioned and constructed that it can rotate in the outer cylinder, but has no means for causing a positive rotation, but is simply so arranged that it is operative in any position, and thus does away with the necessity of means for holding the same against rotation. The inner cylinder, as shown, is of a size considerably less in diameter than the central bore, and is provided at each end with the outwardly-turned flanges or housings 16 and 17, the outer circumference of which is such that the same snugly fits within the central bore 14 of the outer cylinder 1.

The cylinder-heads 8 and 10, as before stated, are of an elongated form, and the inner faces thereof are provided with circumferential recesses 18 and 19 in their outer edges forming the beveled seats 20 and 21, the purpose of which I will now proceed to describe. The distance between the outer faces of the flanges 16 and 17 of the inner cylinder, as before described, is of a length slightly less than the distance between the innermost points of the two cylinder-heads, and the outer flange or housing 16 and 17 have bolted thereto by means of bolts 22, the circular rings 23 and 24 forming the valves,

and having the beveled inner faces 25 which are adapted to firmly seat themselves on the seats 20 and 21.

The piston-rod 13 is provided with a piston-head 26 which is of a diameter equal to the diameter of the inner bore of the inner cylinder 15, and is provided with packing rings 27 to snugly fit the bore of the inner cylinder 15, and said piston at each end is provided with circumferential grooves 28 and 29, the purpose of which I will now proceed to describe.

The outwardly turned end 17 of the inner cylinders are provided on opposite sides with the openings 30 which have smaller inner ends 31 communicating with the bore of the inner cylinder. Within said openings 30 are inwardly-spring-pressed plungers 32 which have smaller inner ends 33 which are adapted to pass through the opening 31, and extend within the central bore of the inner cylinder. The said inner end 33, as shown, is beveled, and adapted to enter the circumferential grooves 28 and 29 in the piston. Surrounding the inner reduced ends 34 of the plungers is a coil spring 35 which normally holds the said plungers in their inward position. Screwed within the outer end of the openings 30 are plugs 36 against which the springs 35 are adapted to bear and normally hold the plungers in their inward position.

As shown in Fig. 3, it will be seen that the construction of the rings 23 and 24, and the seats 20 and 21 is such that when seated, a space 37 entirely surrounds the rings and is in communication with the circular passages 38 which extend all the way around the outer casing, and is in communication at its upper end with the enlarged transverse air-passages 39 at the upper end of the housing 5, and said passages covered by a wire gauze 40 to prevent the passage of dirt, etc., to the compressing cylinder.

The cylinder-heads 8 and 9 as before described, are of an elongated form, and extend a distance within the outer casing 1, and at its upper ends are provided with passages 41 communicating with the passage 6, and which extend downward within the heads and have their lower ends in communication with the circular air passages 42 through which the air passes from the cylinder, as I will now proceed to describe. The cylinder heads 8 and 9 are each provided with a series of openings 43 extending longitudinally therethrough and communicating at their ends with the central bore of the inner cylinder, and intermediate their ends they are also in communication with the discharge passage 42. Located within said openings are valves 44 which are normally held closed upon the seats 45 by the coil spring 46, and said valves and seats are normally held within the said openings by

the screw-plugs 47 by means of which the tension of the spring on the valves is either increased or decreased.

In operation, it will be seen that the piston 26 is at the end of the inner cylinder 15, as shown, in Fig. 3, and the same is reciprocated toward the opposite end through the medium of the piston-rod and means connected thereto. The spring-plungers at that end of the cylinder are pressed inwardly and enter the circumferential recess 29 in the piston, and it will be seen that the inner cylinder is moved in the direction indicated by the arrow, and the valve 24 seated on the seat 21. The continued movement of the piston disengages the said plunger therefrom and the air is compressed within the space in front of the piston until the pressure thereof is such as to overcome the pressure of the springs in the valves 44 when the same are opened, and compressed air passes out through the air passages 42, 41 and 6, and thence through the pipe 7 to the place of storage. The movement of the inner cylinder 15, as indicated by the arrow, unseats the valve or ring 23 from the seat 20, and the air is drawn inward through the passage 30, and into the annular passage 38, 18 and between the valve 23, and seat 20 and into the cylinder. After the piston has traveled to the opposite end of the cylinder, the plungers carried by the opposite end of the cylinder enter the recess 28 in the piston, and upon the movement of the piston in the opposite direction, the valve at the opposite end of the cylinder 15 is seated, and the air is compressed at the opposite end of the cylinder, thus making a double-acting compressor.

From the foregoing description, it will be seen that the wear of the reciprocation of the inner cylinder is upon the laterally-turned portions 16 and 17, and the wear thereof to any extent will cause the valve carried by the ends thereof not to properly seat themselves, and thus after a certain amount of wear the compressor would become useless. In order to take the wear from said laterally-turned ends of the inner cylinder, and also preventing the same from wearing the central bore of the outer cylinder, I provide two loops 48 and 49 which extend downwardly through openings 50 in the outer casing 1 and pass around the outer face of the central cylinder within the space 14 surrounding the same. It is seen that said loops are arranged adjacent opposite ends and have their free upper ends passing through spring arms 51 and 52 resting upon and secured to the upper face of the compressed-air-passage. Above said arms the loops are provided with screw-threaded portions upon which are screwed the nuts 53, and the inner cylinder 15 is supported upon said loops and reciprocate thereon, relieving

the outer flanges 16 and 17, and the bore of the outer cylinder, from wear. The wearing of the cylinder 15, or that of the loop, is taken up by the nuts 53, and thus the valve and valve-seats are at all times held in an exact alinement.

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

1. A compressor, comprising a casing, a reciprocating cylinder therein, a piston reciprocating within the cylinder, and means at each end of the cylinder for coupling the piston to the cylinder.

2. A compressor, comprising a casing, a reciprocating cylinder therein, a piston reciprocating within the cylinder, and a spring plunger carried by the cylinder for coupling the piston thereto.

3. A compressor, comprising a casing, a reciprocating cylinder therein, a piston reciprocating within the cylinder and having recesses in its outer face adjacent the ends, and inwardly spring-pressed plungers carried by the ends of the cylinder and adapted to enter said recesses in the piston.

4. A compressor, comprising a casing, a reciprocating cylinder therein, a piston reciprocating within the cylinder and having circumferential grooves in its outer face, adjacent the ends, and inwardly spring-pressed plungers carried by the ends of the cylinder and adapted to enter the grooves in the piston.

5. A compressor, comprising a casing, a reciprocating cylinder therein, and of a diameter considerably less than that of the casing, and having outwardly extending annular flanges at the ends, and bearing against the inner circumference of the cylinder, a piston within the cylinder and having circumferential grooves in its outer face adjacent the ends, and inwardly spring-pressed plungers carried by the annular flanges at the ends of the cylinder and adapted to enter the grooves in the piston.

6. A compressor, comprising a casing, a cylinder within the casing, a reciprocating piston within the cylinder, means carried by the cylinder for coupling the piston thereto during a partial forward and rearward stroke and means carried by the cylinder for admitting air at one end of the cylinder and closing the ports at the opposite end of the cylinder during both the forward and backward stroke of the piston.

7. A compressor, comprising a casing, a cylinder within the casing, a reciprocating piston within the cylinder, means carried by the cylinder for coupling the piston thereto during a partial forward and rearward stroke the casing having inlet ports and spring-closed outlet ports at each end, and means carried by the cylinder whereby the inlet ports at one end of the cylinder are

opened and the one at the opposite end closed during both the forward and backward movement of the cylinder.

8. A compressor, comprising a casing, a cylinder within the casing and having a reduced central portion, loops carried by the casing and passing around the reduced end of the cylinder and slidably supporting the same.

9. A compressor, comprising a casing, a cylinder within the casing and having a reduced central portion, loops adjustably supported by the upper face of the casing and passing around the reduced portion of the cylinder and slidably supporting the same.

10. A compressor, comprising a casing, a cylinder within the casing and having outwardly-extending flanges fitting the bore of the casing, and loops adjustably supported by the upper face of the casing, and passing around the reduced portion of the cylinder between the flanges.

11. A compressor, comprising a casing, heads secured therein and having beveled valve seats, inlet ports in communication with said seats, spring-closed outlet ports in said heads, a reciprocating cylinder within the casing, valve rings carried by the ends of the cylinder and having beveled faces to snugly fit the beveled seats carried by the heads, a reciprocating piston within the cylinder, and means carried by the cylinder for coupling the same to the piston to cause the cylinder to reciprocate with the piston during a part of its stroke.

12. A compressor, comprising a casing, a cylinder within the casing, means carried by the cylinder for closing the inlet ports to the casing, a piston within the cylinder and having circumferential grooves in its outer face adjacent the ends, and inwardly-spring-pressed plungers carried by the ends of the cylinder and adapted to enter the grooves in the piston.

13. A compressor, comprising a casing, heads secured therein and having valve-seats, and inlet ports in communication with said seats, spring-closed outlet ports in said heads, a reciprocating cylinder within the casing having outwardly-extending flanges fitting the bore of the casing, rings removably secured to the said flanges and having beveled faces snugly fitting the beveled seats carried by the heads.

14. A compressor, comprising a casing, heads secured therein and having valve-seats, and inlet ports in communication with said seats, spring-closed outlet ports in said heads, a reciprocating cylinder within the casing and having outwardly-extending flanges fitting the bore of the casing, rings removably secured to the said flanges and having beveled faces snugly fitting the beveled seats carried by the heads, a piston within the cylinder and having circumfer-

ential grooves in its outer faces adjacent the ends, and inwardly spring-pressed plungers carried by the flanges of the cylinder and adapted to enter the grooves in the piston.

5 15. A compressor, comprising a casing, a reciprocating cylinder therein, a piston reciprocating within the cylinder and having a recess in its outer face adjacent each end, and inwardly spring-pressed plungers carried by the ends of the cylinder, and adapted
10 to enter said recess, and move the cylinder at the beginning of the stroke of the piston in each direction.

16. A compressor, comprising a casing
15 having an annular seat at each end in communication with air intake ports, a reciprocating cylinder within the casing having at its ends annular valves to tightly fit the seats carried by the casing, inwardly-extending spring-pressed plungers carried by
20 the ends of the cylinder, and a piston reciprocating within the cylinder and having an annular groove in its outer periphery to receive said plungers, whereby the cylinder
25 is moved forward during the first part of the stroke of the piston to seat the valve and prevent the escape of air from the air intake ports.

17. A compressor, comprising a casing,
30 heads secured therein and having valve seats, and air inlet ports in communication with said seats, spring-closed outlet ports in said heads, a reciprocating cylinder with-

in the casing and having outwardly extending flanges fitting the bore of the casing
35 rings, removably secured to said flanges and having beveled faces, snugly fitting the beveled seats in the heads, a piston reciprocating in the cylinder and having annular recesses in its outer face, inwardly spring-pressed members carried by the cylinder, and
40 means for supporting the cylinder between the outwardly-extending flanges.

18. A compressor, comprising a casing, heads secured therein and having valve
45 seats, and air inlet ports in communication with the said seats, spring-closed outlet ports in said heads, a reciprocating cylinder within the casing and having outwardly-extending flanges fitting the bore of the
50 casing, rings removably secured to said flanges and having beveled faces snugly fitting the beveled seats in the heads, a piston reciprocating in the cylinder and having annular recesses in its outer face, and means
55 carried by the cylinder for coupling the piston thereto, and loops carried by the casing and passing around the cylinder intermediate the outwardly-extending flanges and supporting the cylinder.
60

In testimony whereof I affix my signature in presence of two witnesses.

GOVERNOR DREW WARREN.

Witnesses:

M. C. GIBSON,
O. L. WAAL.