H. O. JACKSON.

ROTARY AIR COMPRESSOR.

APPLICATION FILED JUNE 1, 1914. RENEWED JUNE 20, 1916.

1,197,579. Patented Sept. 5, 1916.

5 SHEETS—SHEET 1.

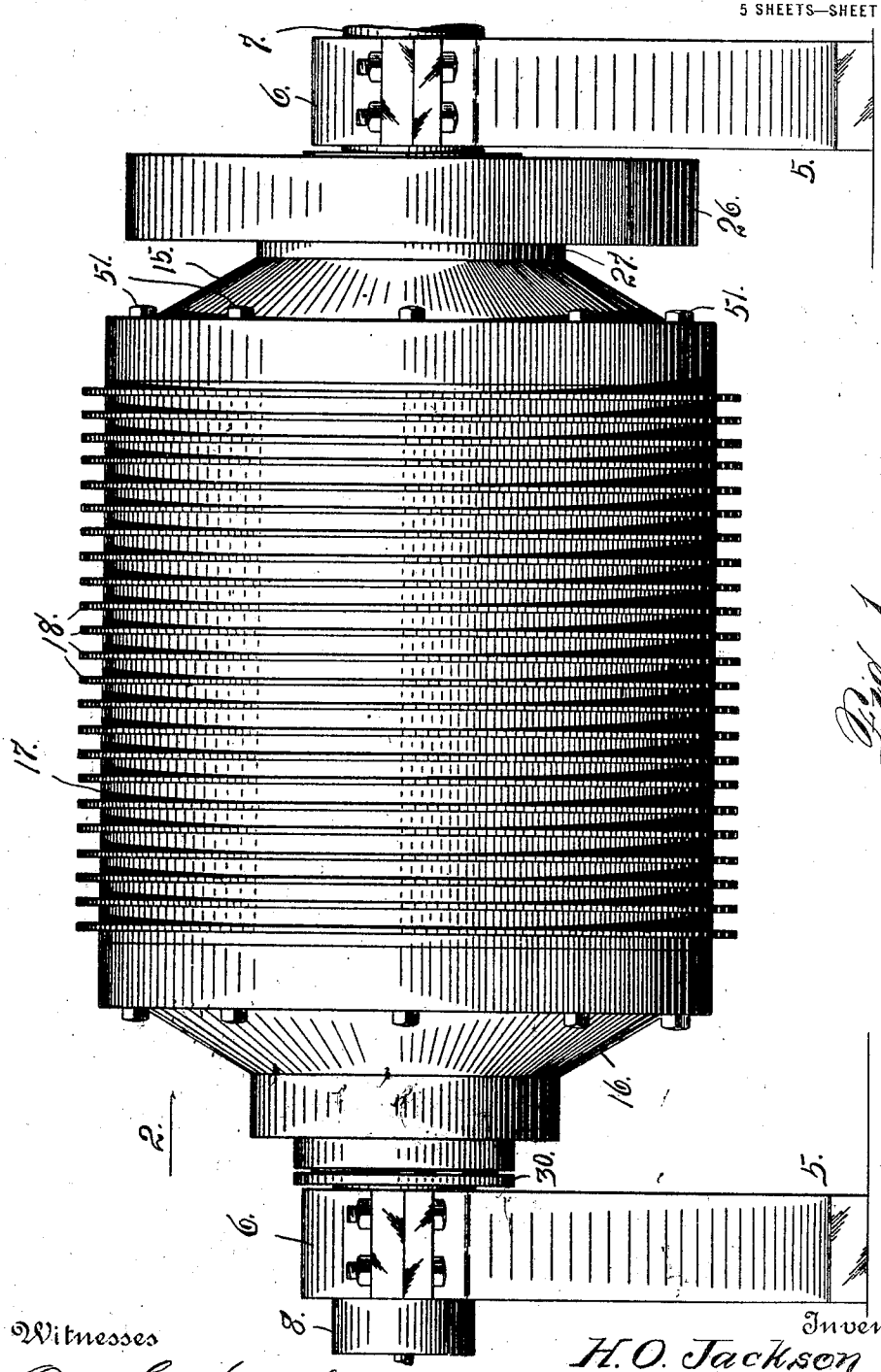


Fig. 1.

Witnesses

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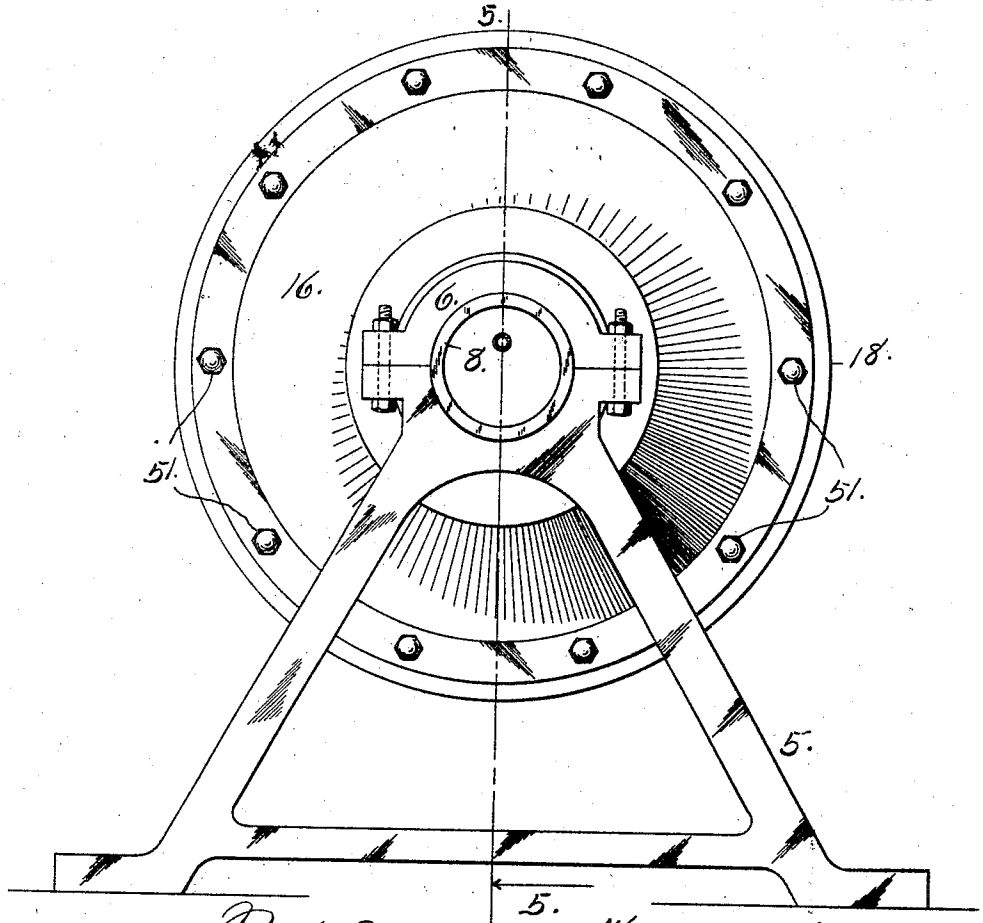


Fig. 2

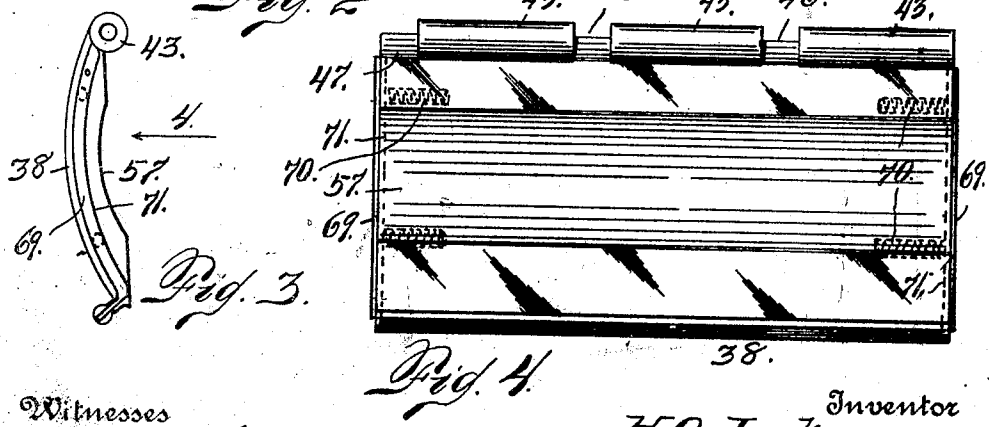


Fig. 3.

Fig. 4.

Witnesses

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5 SHEETS—SHEET 3.

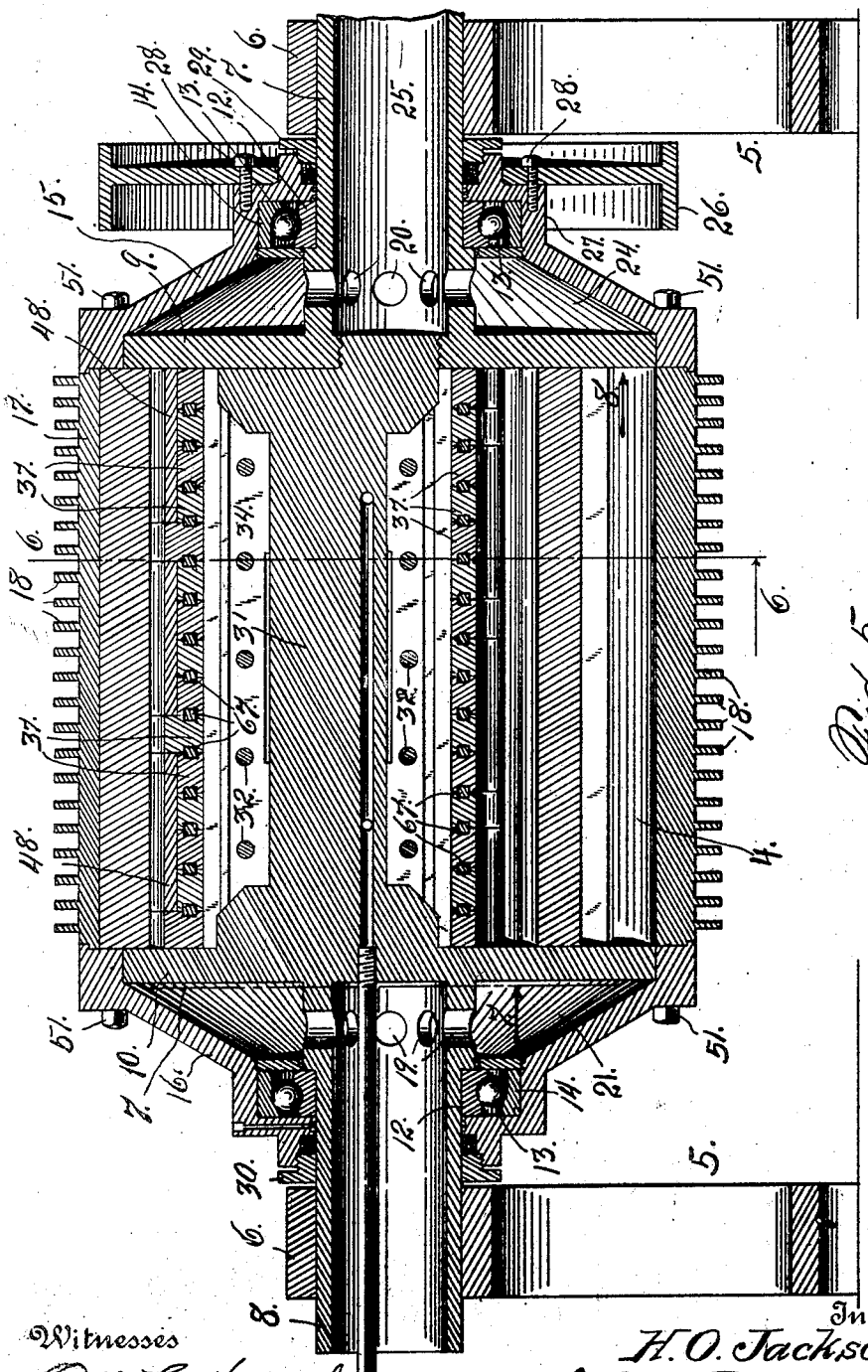


Fig. 5.

Witnesses

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5 SHEETS—SHEET 4.

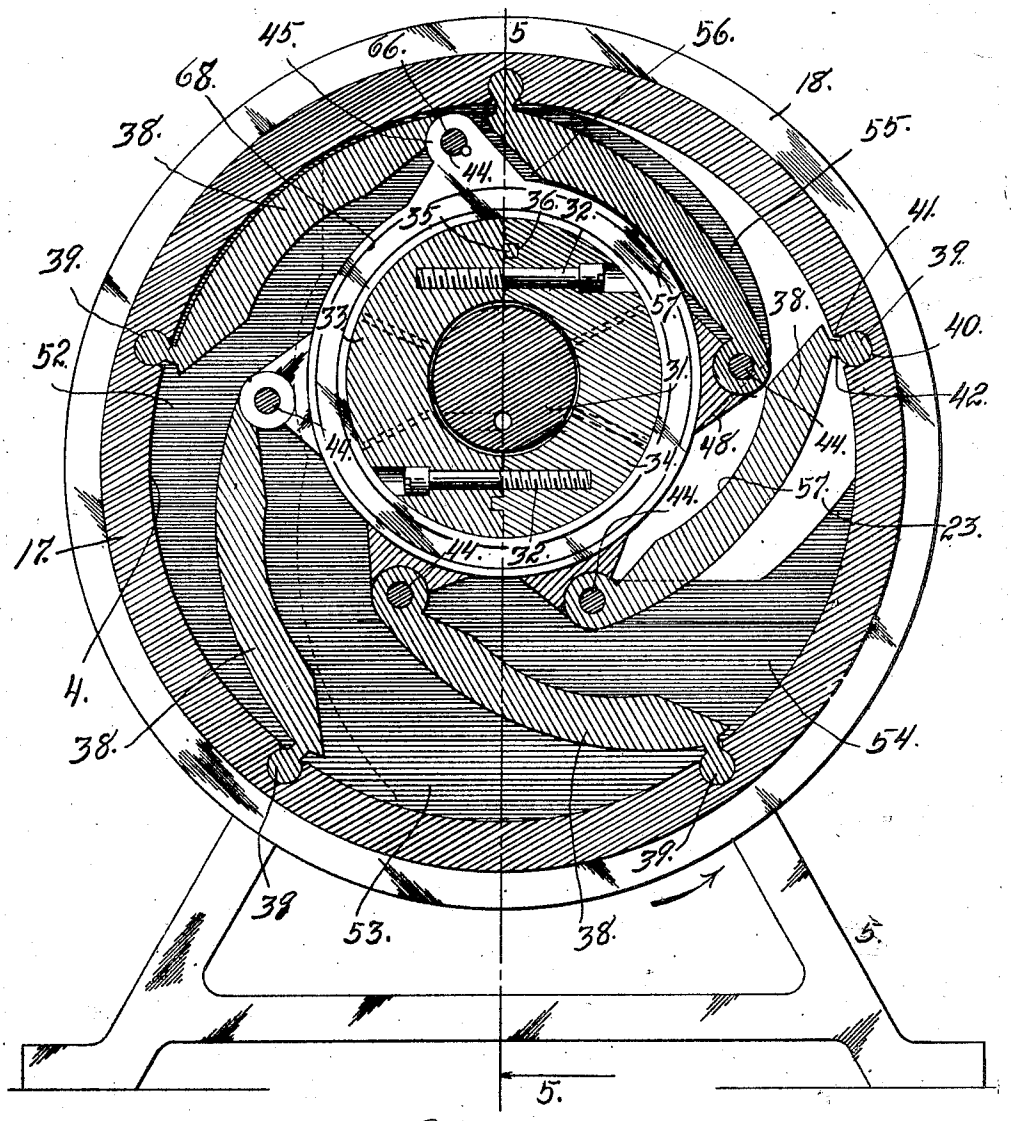


Fig. 6.

Witnesses

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ROTARY AIR COMPRESSOR.

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5 SHEETS—SHEET 5.

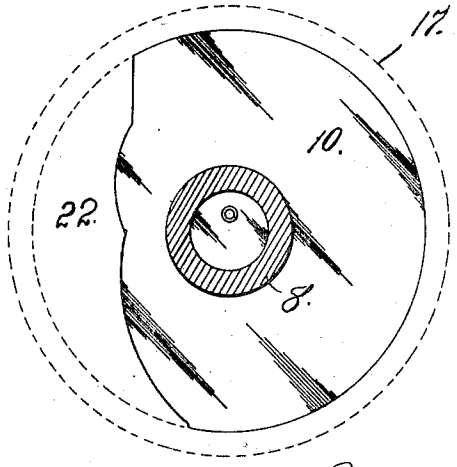


Fig. 7.

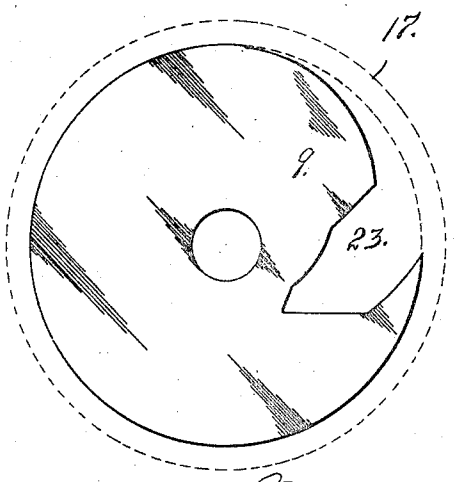


Fig. 8.

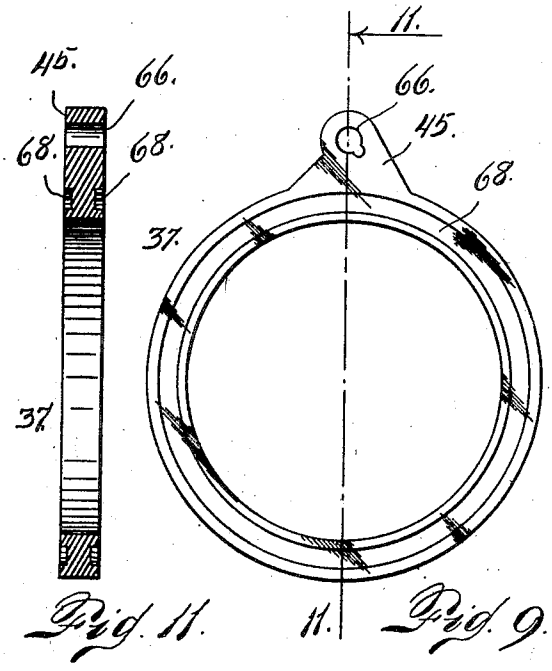


Fig. 11. Fig. 9.

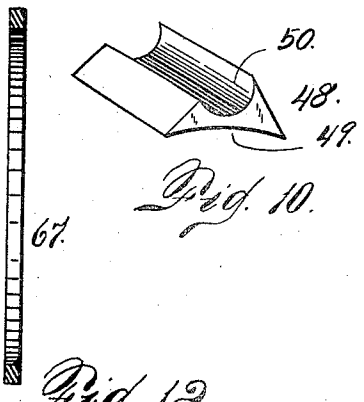


Fig. 10. Fig. 12.

Witnesses

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UNITED STATES PATENT OFFICE.

HENRY ORR JACKSON, OF DENVER, COLORADO, ASSIGNOR TO THE JACKSON COMPRESSOR COMPANY, OF DENVER, COLORADO, A CORPORATION OF COLORADO.

ROTARY AIR-COMPRESSOR.

1,197,579. Specification of Letters Patent. Patented Sept. 5, 1916.

Application filed June 1, 1914, Serial No. 842,047. Renewed June 20, 1916. Serial No. 104,805.

To all whom it may concern:

Be it known that I, HENRY O. JACKSON, citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Rotary Air-Compressors; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the characters of reference marked thereon, which form a part of this specification.

My invention relates to improvements in rotary air compressors of the class and general construction disclosed in my previous application, Serial No. 811,506, filed January 12, 1914.

The invention disclosed in my present application is a modification of the construction of the previous application.

The object of my present application as well as that disclosed in my aforesaid application, is to provide an air compressor which shall have large capacity as compared with its size and weight. This is an important feature, since machines of this character are used in connection with air operated drills and other similar machines in mines which are usually so located as to make it difficult to transport large heavy machinery thereto. My present construction is believed to sufficiently accomplish said object.

The main features of my present improvement generally considered, are the same as disclosed in my aforesaid application, namely, a series of coöperating blades pivotally connected at one extremity of a rotary member of the apparatus, and at the opposite extremity to rings which are eccentrically mounted with reference to the axis of the aforesaid rotary member. In this case, the said rotary member is the exterior or outer casing portion of the structure and the rings are interiorly located and mounted to rotate upon a stationary member whose axis is non-coincident with the axis of the outer rotary member. The blades which are interposed between the interior rings and the outer rotary member are alternately caused to swing toward and away from the interior rings with which their inner extremities are connected, and by virtue of this arrangement, the compartments into which the chamber between the outer member and the interior rings, are formed by the said blades, are alternately expanded and contracted. During the expansion of these compartments, air is drawn into them through an inlet port located at one extremity of the apparatus, whereas, as the compartments are contracted whereby the air is compressed, the latter is forced out of said compartments through an exhaust port in the opposite end of the cylindrical structure.

Having briefly outlined my present improvement, I will proceed to describe the same in detail, reference being made to the accompanying drawing in which is illustrated an embodiment thereof.

In this drawing,—Figure 1 is a side elevation of my improved air compressor. Fig. 2 is an end elevation of the same, looking in the direction of arrow 2, Fig. 1. Fig. 3 is an end view of one of the oscillatory blades of the structure. Fig. 4 is a face view of the same, or a view looking in the direction of arrow 4, Fig. 3. Fig. 5 is a vertical longitudinal section of the machine, being a view taken on the lines 5—5, Figs. 2 and 6, looking toward the left. Fig. 6 is a cross section of the machine taken on the line 6—6, Fig. 5, viewed in the direction of the arrow. Fig. 7 is a view of one head of the structure, being a section taken on the line 7—7, Fig. 5, looking in the direction of the arrow, but on a somewhat smaller scale. Fig. 8 is a view of the opposite head of the machine, looking in the direction of the arrow 8, or viewed from the interior thereof, and also shown on a smaller scale. Fig. 9 is a detail view of one of the rings which are mounted on the interior stationary member of the apparatus, shown on approximately the same scale as Fig. 6. Fig. 10 is a detail view of a feature of the construction. Fig. 11 is a section taken on the line 11—11, Fig. 9. Fig. 12 is a sectional view in detail of one of the auxiliary sealing rings employed in connection with the main rings.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate two supports arranged at opposite extremities of the machine and having journal boxes 6 at their upper extremities in which are mounted hollow members 7 and 8 which are formed integral with the stationary heads 9 and 10

of the structure. The hollow members 7 and 8 are suitably secured against rotation and are provided with rings 12 engaged by bearing balls 13, which also engage outer rings 14 forming a ball bearing structure between the members 7 and 8 and the hollow heads 15 and 16, which are secured to the rotary cylindrical casing 17, which is exteriorly ribbed or corrugated as shown at 18 for cooling purposes.

The hollow members 7 and 8 are perforated as shown at 19 and 20, the perforations 19 permitting air to enter from the atmosphere to the induction chamber 21 of the hollow head 16, whence it passes through an induction port 22 to the chamber 4 of the cylindrical casing 17. The opposite head 9 is provided with an exhaust or exit port 23 through which the compressed air passes to the chamber 24 of the hollow head 15, and thence through the perforations 20 of the hollow member 7 and into the passage 25 of said chamber, whence the compressed air may be delivered to a receiver or as may be required.

An operating pulley 26 is secured to the hub 27 of the hollow head 15 by means of cap screws 28 or other suitable fastening devices. Suitable stuffing boxes 29 and 30 are located at the opposite extremities of the structure, surrounding the hollow members 7 and 8 whereby fluid tight joints are formed.

Formed integral with the stationary head 10 of the apparatus, is a shaft or spindle 31, whose axis is non-coincident with the axis of the rotary casing 17. To this shaft 31 is applied by means of screws 32, a bushing composed of two members 33 and 34, the member 33 having a circumferential tongue 35 engaging a counterpart groove 36 formed in the other member. This bushing may be composed of hard steel or other suitable material, or material adapted to form a wearing surface for rings 37, which are mounted thereon. This bushing may rotate on the shaft or spindle 31 in response to the friction between it and the rings 37 or the rings may rotate thereon. This bushing will, therefore, have a tendency to reduce the friction between the rings and the spindle, since if the spindle were solid or integral and were of the same diameter as the spindle and bushing combined, there would be a relatively large friction surface between the rings and the spindle. However, by employing the bushing element and so arranging it that it may rotate on the spindle, with the rings, the area of the wearing surface is reduced, and consequently, the friction incident to the rotary action of the rings around the spindle is lessened.

Between the rings and the inner surface of the outer cylindrical casing 17 of the structure, is located a number of oscillatory blades 38, whose outer extremities 39 are approximately cylindrical in shape and engage recesses 40 of counterpart shape formed in the casing. These recesses are open, as shown at 41, to allow the relatively narrow parts 42 which lead from the parts 39 to the adjacent extremities of the blades, to move therein during the oscillatory action of the blades, due to the proper performance of their function, whereby the compartments between the blades are alternately expanded and contracted, as hereinafter more fully explained.

It will be understood that the recesses 40 are open at both ends, thus permitting the introduction of the bearing members 39 in an endwise direction before the heads of the structure are applied to the cylindrical casing. The parts 41 as well as the bearing members 39, together with the bodies of the blades 38, extend the entire length of the cylindrical structure and between the heads thereof, whereby the compartments between the adjacent blades are tight, and have no communication with the adjacent compartments. The inner extremities of these blades are each provided with a number of sleeve members 43 through which hinge pins 44 are passed, whereby the inner extremities are connected with a number of rings 37, the rings having projections 45 provided with perforations 66 through which the hinge pins also pass. As illustrated in the drawing, the sleeves 43 are spaced as shown at 46, to receive the perforated projections of the rings, whereby the perforations are caused to register with the openings of the sleeves. Furthermore, one of the sleeves is spaced from the adjacent extremity of the blade as shown at 47, to make room for the projection 45 of another ring. In this way, provision is made as illustrated in the drawing, for connecting the inner edge of each blade with three of the rings 37.

The projections 45 of the rings extend a considerable distance from the periphery of their body portions, or the exterior circumference struck from the axis of the rings. By virtue of this fact, it becomes necessary to fill a space which would otherwise be left, between the sleeves 43 of each blade, and the periphery of the rings, and for this purpose I employ segmental blocks 48 which are curved on their inner surfaces as shown at 49 to fit the peripheries of the rings and on their outer surfaces, as shown at 50, to fit the sleeves 43 of a blade. Each of these blocks is of a length to fit between the projections 45 of the rings, with which each blade is connected, while another block is employed between the projection 45 of one ring with which the blade is connected, and the stationary end wall or head 9 of the structure (see Fig. 5). By virtue of this construction, an air tight joint is formed

between the inner extremities of the blades and the rings, whereby there is no opening for the air to leak from one compartment to another. This is an important feature in a structure of this class.

According to the drawing, there are fifteen rings 37 and five of the oscillatory blades whose inner edges are connected with these rings there being three rings connected with each blade.

By virtue of the construction explained, it will be understood that fluid tight joints may be formed between the outer casing and the outer edges of the blades, and between the rings and the inner edges of the blades.

From the foregoing description, the use and operation of my improved rotary air compressor will be readily understood.

The casing 17 will be rotated through the medium of any suitable power which may be connected with the pulley 26, as by a belt. The rotation of this pulley imparts a corresponding movement to the hollow heads 15 and 16 of the structure, together with the casing, which is secured to the said heads by the cap screws 51. The rotation of the casing imparts a rotary movement to the blades 38, as the outer edges of the blades are anchored in the casing. This movement of the blades imparts a corresponding movement to the rings 37 with which the inner edges of the blades are connected. Assuming that the structure is in the position indicated in Fig. 6, as the casing is rotated, the two blades at the left (see Fig. 6) forming the compartment 52 are moved to expand the latter until it reaches its maximum volume. During this expansion air is drawn into the compartment through the induction port 22 of the head 10 of the structure, since the expansion of the compartment due to the operation of the inclosing blades, produces the necessary suction or partial vacuum for the purpose. Approximately as soon as the compartment 52 has reached its maximum expansion, this compartment will be cut off from communication with the induction port 22 and the contraction of the compartment will commence, whereby the air will be compressed within the compartment until it reaches the desired degree. By the time the compression is sufficient, the compartment 52 will be brought into communication with the exhaust or outlet port 23 in the opposite head of the machine, and the compressed air will be forced into the chamber 24 between the stationary head 9 and the hollow head 15, whence it will pass through the perforations 20 into the passage 25 of the hollow member 7, whence it passes to a receiver (not shown). The process of expansion of the compartments is well illustrated in Fig. 6, in which the chamber 53 next in front of the chamber 52, assuming that the casing and its connections are traveling in the direction indicated by the arrow in Fig. 6, is considerably larger than the compartment 52; while the compartment 54 next forward of the compartment 53 is in the process of contraction, whereby the air has been compressed to the desired degree, and is escaping through the exhaust or outlet port 23 of the stationary head 9. Again, the compartment 55 next forward of the compartment 54 is further contracted, whereby the volume of the compartment 55 is comparatively small. And finally, the compartment next forward or the compartment 56 is practically eliminated, or its volume reduced to zero, approximately, by virtue of the fact that the rearmost blade 38 of the two blades forming this compartment, is practically collapsed, or so arranged that its inner or curved face 57 is brought into, or approximately into engagement with the peripheries of the rings 37. In this way, the process of alternate expansion and contraction of the various compartments of the chamber is continued during the rotary action of the casing and its connections. In order to more perfectly seal the compression compartments against the escape of air or other fluid during the maximum compression, I locate auxiliary rings 67 between the main rings 37, the sealing rings occupying circumferential grooves 68 formed in the main rings. Each sealing ring engages the grooves 68 of two rings, each groove having a depth equal to half the thickness of the sealing ring.

Attention is called to the fact that my improved construction may be employed for pumping liquids as well as in the compression of air or other gases. Hence, whenever the term "air compressor" is employed, it must be interpreted as sufficiently comprehensive to include a construction for pumping liquids as well as adapted for use in compressing air or other gaseous fluids.

During the operation of a machine of this character for air compression purposes, considerable heat is developed and if the blades 38 normally, or when in use, fit the opposite heads of the chamber closely, during use, the increase in temperature will expand the material of which the blades are composed and cause them to engage tightly, or probably lock within the chamber. In order to avoid this difficulty, the opposite ends of the blades which are located between the stationary heads 9 and 10 of the structure, are equipped with packing members 69 which may be acted upon by springs 70 which normally force them outwardly into proper engagement with the stationary heads. Or provision may be made for introducing air into the grooves 71 in which the packing members 69 are located, for performing the function of the springs. This is a feature of

considerable importance, from a commercial standpoint, as has been demonstrated by actual practice.

Attention is called to the fact that my improved construction may be advantageously employed as a motor adapted to be actuated by any suitable motive fluid, as air or steam. When this construction is employed as a motor, the motive fluid should be introduced through what is herein termed the outlet port 23, and escapes through what has herein been termed the induction port 22. Hence, wherever the term "air compressor" is employed, it must be considered sufficiently comprehensive to include the term "motor", as the same construction may be either a motor or an air compressor, or a pump for fluids of all kinds, without changing the construction, or departing from the spirit of the invention.

Having thus described my invention, what I claim is,—

1. An air compressor comprising a rotary casing, a member eccentrically mounted in said casing, rings loose on the said member, and blades whose extremities are respectively connected with the rotary casing and the said rings.

2. An air compressor comprising a rotary casing, rotary rings eccentrically mounted in the casing chamber, blades having their extremities respectively connected with the casing and said rings, the different blades being connected with different rings to permit independent movement of the inner extremities of the blades, and filler means located between the rings and blades for the purpose set forth.

3. The combination of a rotary casing, a series of rings eccentrically mounted to rotate in the casing chamber, and blades located between the casing and the rings, the outer extremities of the blades being all journaled in the casing and their inner extremities being pivotally connected with the rings, each blade being connected with a number of rings and no two blades being connected with the same rings.

4. The combination of a rotary casing, a series of rings eccentrically mounted to rotate in the casing chamber, and blades located between the casing and the rings, the outer extremities of the blades being journaled in the casing, the rings having perforated projections and the inner extremity of each blade having sleeves which register with the perforations of the rings with which the blade is connected, and a pin connecting each blade with its corresponding rings.

5. The combination of a rotary casing, a series of rings eccentrically mounted to rotate in the casing chamber, and blades located between the casing and the rings, the outer extremities of the blades being journaled in the casing, the rings having perforated projections and the inner extremity of each blade having sleeves which register with the perforations of the rings with which the blade is connected, a pin connecting each blade with its corresponding rings, and filler blocks located between the sleeves of each blade and the rings with which the other blades are connected, whereby the said blades are arranged to form fluid tight joints.

6. An air compressor comprising an outer rotary casing, a series of rotary rings mounted in the casing chamber to rotate on an axis non-coincident with the axis of said chamber, collapsible blades located between the casing and the said rings and connected with both, the blades being spaced to form the chamber into a number of compartments which alternately expand and contract as the blades travel with the rotary casing around the axis of the rings.

7. An air compressor comprising an outer rotary casing, a series of rotary rings mounted in the casing chamber to rotate on an axis non-coincident with the axis of said chamber, collapsible blades located between the casing and the said rings and connected with both, the blades being spaced to form the chamber into a number of compartments which alternately expand and contract as the blades travel with the rotary casing around the axis of the rings, the chamber being provided with inlet and outlet ports with which each compartment is alternately in communication.

8. An air compressor comprising an outer rotary casing, a series of rotary rings mounted in the casing chamber to rotate on an axis non-coincident with the axis of said chamber, collapsible blades located between the casing and the said rings and connected with both, the blades being spaced to form the chamber into a number of compartments which alternately expand and contract as the blades travel with the rotary casing around the axis of the rings, the chamber being provided with inlet and outlet ports with which each compartment is alternately in communication, the said ports being respectively formed in the opposite stationary heads and non-coincidently arranged.

9. A structure of the class described comprising a rotary casing, an eccentrically mounted stationary member located within the casing, a concentric bushing loose on said member, rings loose on the bushing and blades located between the casing and said rings and movably connected with both, to cause them to oscillate as they travel around the stationary member, with the rings.

10. The combination of a cylindrical casing having hollow exterior heads fast thereon, the said casing being mounted to rotate, a shaft eccentrically mounted in the casing and having interior heads fast there-

on, the said last named heads having inlet and outlet ports, rings concentrically mounted on said shaft, and blades located between the cylindrical shell of the casing and the rings, and connected with both to form a number of compartments which alternately expand and contract during the rotary travel of the blades with the casing.

11. The combination of a cylindrical casing having hollow exterior heads fast thereon, the said casing being mounted to rotate, a shaft eccentrically mounted in the casing and having interior heads fast thereon, the last named heads being respectively provided with inlet and outlet ports, rings concentrically mounted on the said shaft, and blades located between the cylindrical shell of the casing, and the said rings and also between the said interior heads, the said blades being connected with the rings at one extremity and with the cylindrical shell at their opposite extremities, to form a number of compartments which alternately expand and contract during the rotary travel of the blades with the casing, the ports of the interior heads communicating with the chambers of the exterior hollow heads, the stationary heads having hollow bearings around which the hollow heads rotate, the said bearings being in communication with the chambers of the hollow heads.

12. An air compressor comprising exterior and interior rotary members forming an interposed chamber, the axes of the two members being non-coincident, and blades having their opposite extremities respectively connected with the two members to form a number of collapsible compartments.

13. An air compressor comprising exterior and interior rotary members, the interior member being eccentrically mounted with reference to the exterior member, and blades having their opposite extremities respectively connected with the two members to form the interposed chamber into a number of fluid tight collapsible compartments.

14. An air compressor comprising exterior and interior rotary members, the interior member consisting of a series of independently movable rings eccentrically mounted with reference to the exterior member, and blades having their outer extremities all connected with the exterior rotary member, and their inner extremities each connected with a number of the said rings, no two blades being connected with the same set of rings, the said blades being arranged to form the chamber between the interior and exterior rotary members, into a number of collapsible compartments.

15. A construction of the class described, comprising a rotary casing, a member eccentrically mounted in said casing, main rings loose on the said member, interposed sealing rings engaging grooves formed in the main rings, and blades whose extremities are respectively connected with the rotary casing and the said rings.

16. The combination of a rotary casing, rotary rings eccentrically mounted in the casing chamber, interposed sealing rings engaging grooves formed in the main rings, and blades having their extremities respectively connected with the casing and said rings, the different blades being connected with different rings to permit independent movement of the inner extremities of the blades.

17. The combination of exterior and interior rotary members, the interior member consisting of a series of independently movable rings eccentrically mounted with reference to the exterior member, interposed sealing rings engaging grooves formed in the first named rings, and blades having their outer extremities all connected with the exterior rotary member, and their inner extremities each connected with a number of the said rings, no two blades being connected with the same set of rings, the said blades being arranged to form the chamber between the interior and exterior rotary members, into a number of collapsible compartments.

18. Apparatus of the class described, comprising interior and exterior elements mounted in eccentric relation to form an interposed chamber, one of said elements being rotatable, a series of rings loosely mounted on the interior element, blades whose opposite extremities are movably anchored in the exterior element and in the rings of the interior element respectively, and means independent of the rings with which any blade is connected and also independent of the blade for forming a tight joint between the blade and the other rings.

19. Apparatus of the class described, comprising an interior and an exterior element mounted in eccentric relation to form an interposed chamber, one of said elements being rotatable, the interior element having engaging rings free to move rotatably thereon, blades whose opposite extremities are respectively movably mounted in the rings of one element and in the wall of the other element, and means independent of the rings and blades for forming tight joints between the rings and blades.

20. Apparatus of the class described, including an interior element and an exterior element mounted in eccentric relation to form an interposed chamber, one element being rotatable, the interior element having loose rings, blades located between the exterior element and the rings, the outer extremities of the blades being journaled in the casing, the rings having perforated projections and the inner extremity of each blade having sleeves which register with the perforations of said rings with which the

blade is connected, a pin connecting each blade with its corresponding rings, and packing blocks located between the sleeves of each blade and the rings with which the other blades are connected, whereby the said blades are arranged to form fluid tight joints.

21. Apparatus of the class described, comprising an interior and an exterior element mounted in eccentric relation to form an interposed chamber, one element being rotatable, the interior element having loose rings, blades whose opposite extremities are respectively movably anchored in the rings of one element and in the wall of the other element, means independent of the rings and blades for forming tight joints between the rings and blades, said means comprising perforated projections formed on the rings, sleeves formed on the inner extremity of each blade, the openings of the sleeves registering with the perforations of the projections on the rings, a pin connecting each blade with its corresponding rings, and packing blocks located between the sleeves of each blade and the rings with which the other blades are connected.

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

HENRY ORR JACKSON.

Witnesses:
MAZE KIRBY,
A. ERNEST O'BRIEN.