F. BOERCKER.

AIR COMPRESSOR.

APPLICATION FILED OCT. 23, 1909.

968,234.

Patented Aug. 23, 1910.

3 SHEETS—SHEET 1.

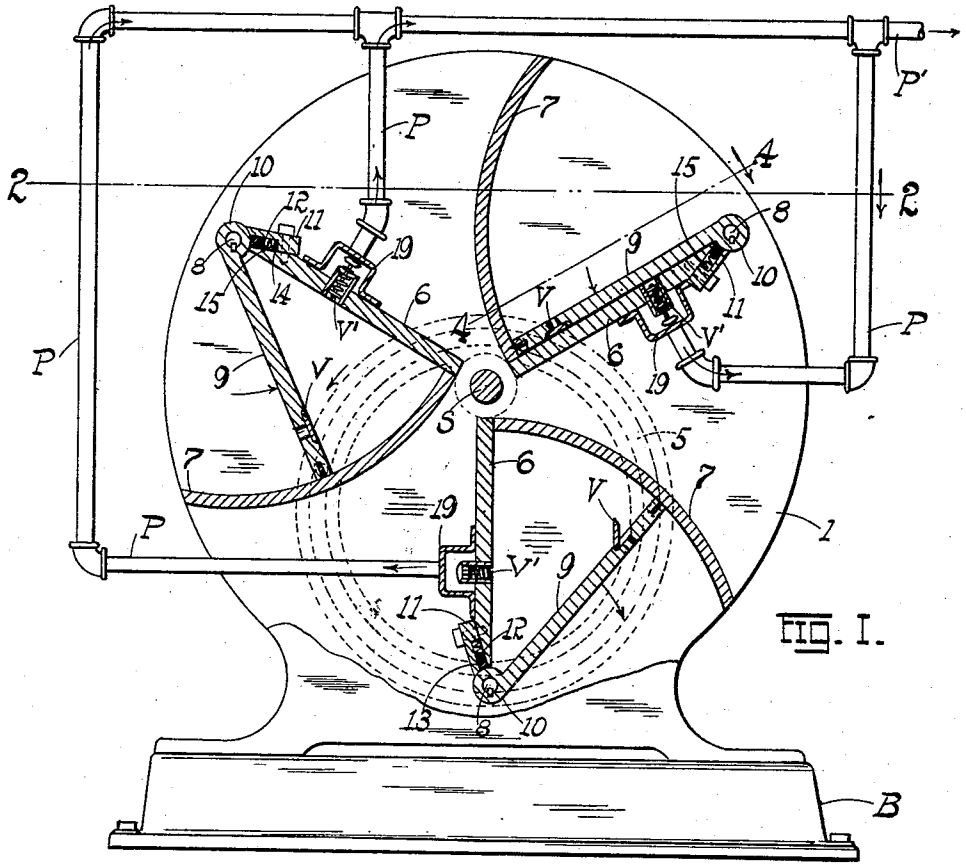

FIG. 1.

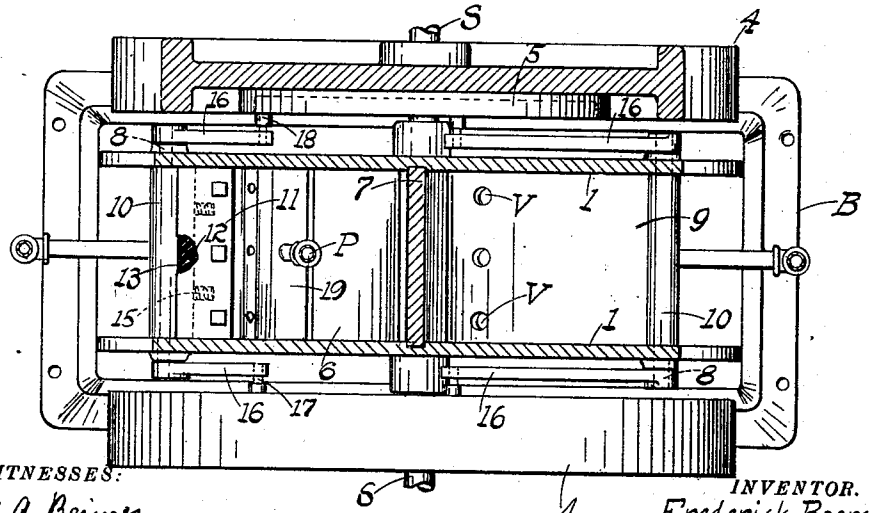

FIG. 2.

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3 SHEETS—SHEET 2.

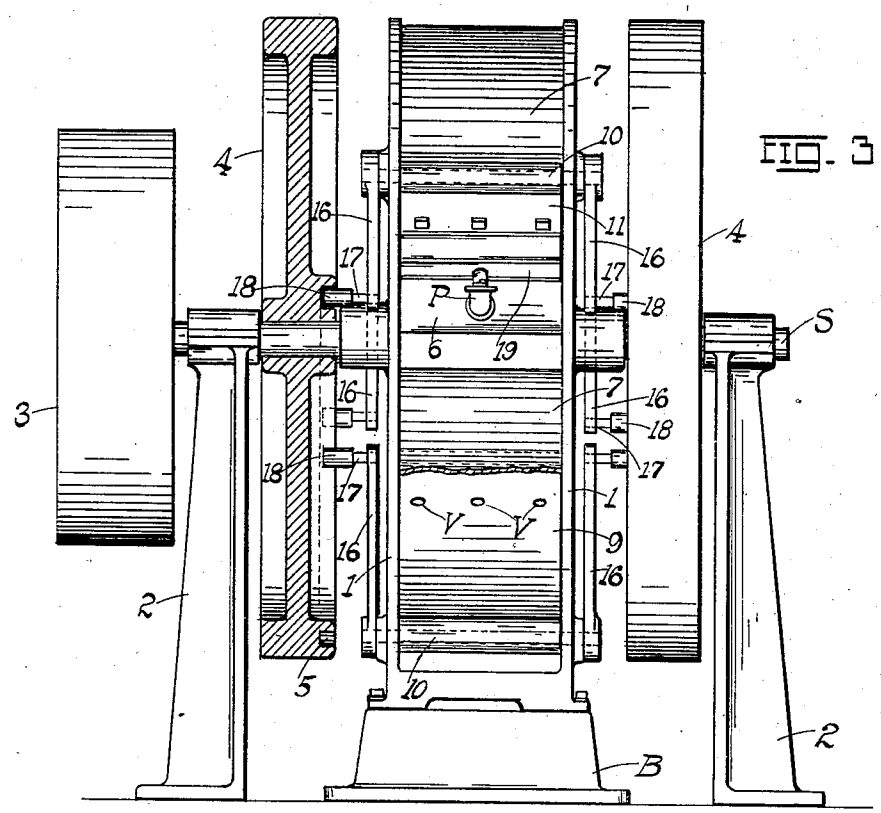

FIG. 3.

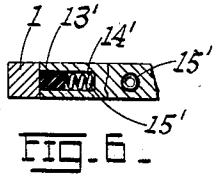

FIG. 6.

FIG. 4.

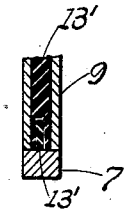

FIG. 5.

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3 SHEETS—SHEET 3.

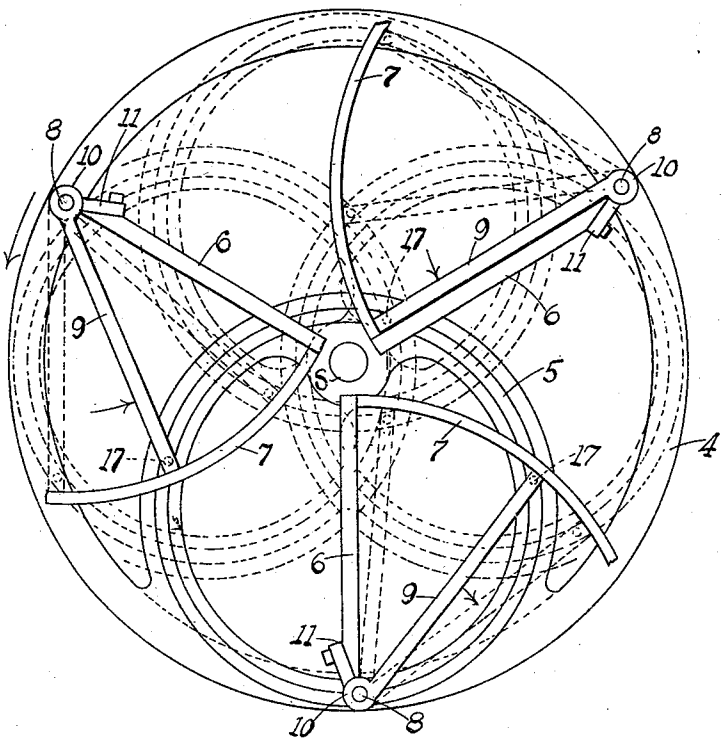

FIG. 7.

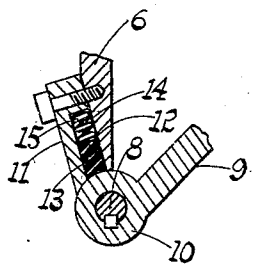

FIG. 8.

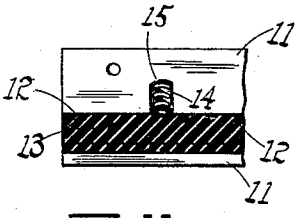

FIG. II.

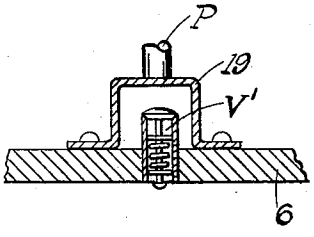

FIG. 9.

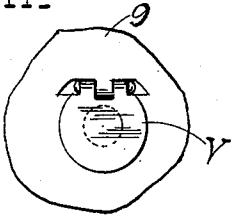

FIG. 10.

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UNITED STATES PATENT OFFICE.

FREDERICK BOERCKER, OF ST. LOUIS, MISSOURI.

AIR-COMPRESSOR.

968,234. Specification of Letters Patent. **Patented Aug. 23, 1910.**

Application filed October 23, 1909. Serial No. 524,184.

To all whom it may concern:

Be it known that I, FREDERICK BOERCKER, a citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Air-Compressors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in air-compressors; and it consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a vertical middle section (with parts in elevation) of my invention; Fig. 2 is a horizontal section on the line 2—2 of Fig. 1, the shaft supporting standards being omitted; Fig. 3 is an end elevation with parts in section; Fig. 4 is an enlarged cross-sectional detail taken on the line 4—4 of Fig. 1 through one of the cylinder compartments, with piston in elevation (partly broken away) showing the manner of connecting the piston to the eccentric-disk; Fig. 5 is a sectional detail on the line 5—5 of Fig. 4; Fig. 6 is a sectional detail on the line 6—6 of Fig. 4; Fig. 7 is a diagrammatic view showing the relative positions of the several pistons with respect to the actuating eccentric disk; Fig. 8 is an enlarged cross sectional detail taken through the hinge axis of the piston and the wall supporting the same, showing the manner of making a tight joint at such axis; Fig. 9 is a sectional detail of one of the discharge check-valves; Fig. 10 is an enlarged detail of one of the intake valves; and Fig. 11 is a detail showing the inner face formation of the plate for securing the packing at the hinge-axis of the piston.

The present invention relates to a class of air compressors in which are employed a series (one or more) of oscillating pistons operating each in a compartment or compression chamber of a common cylinder or casing, and in which the necessary movement is imparted to the pistons by an eccentric disk (or cam) rotating about the axis of the cylinder or the axis about which the chambers are disposed.

The object of the invention is to effect a connection between any piston and the eccentric disk by devices located wholly outside the cylinder or casing walls, leaving the latter undisturbed so as to maintain a perfectly air-tight joint between them and the sides of the piston during the oscillation of said piston.

A further object is to provide means for insuring a tight joint at the hinge axis of the piston.

A further object is to provide means for effectively driving the packing carried by the piston, against the walls of the cylinder, all as will hereinafter more fully appear from a detailed description of the invention which is as follows:—

Referring to the drawings, B, represents a suitable base to which is bolted the casing or cylinder composed of the side walls 1, 1. Passing axially through the cylinder is a drive-shaft S mounted on the top of the standards 2, 2, one end of the shaft carrying a belt-pulley 3 from which leads a belt (not shown) to any suitable source of power (not shown.) Carried by the shaft S on the inside of each standard 2 and immediately adjacent thereto is a disk 4, on the inner face of which is disposed an eccentric circular track or groove 5, the diameter of the circle defining the groove being slightly in excess of the radius of the disk 4, the groove encircling or circumscribing the axis of the disk at one end of its diameter, and being substantially tangent to the periphery of the disk at the opposite end of said diameter (Figs. 1, 3, 7.) Dividing the space between the walls 1, 1, into a series of cylinder compartments or compression chambers, are the radially and transversely disposed partition walls 6, and the cylindrically curved transverse walls 7 leading from the inner ends of the plane radial walls 6 to the outer edges of the cylinder walls 1, 1.

The features above described are well known and understood and form no part of the present invention, the latter being confined to the following details of construction:—Hinged adjacent to and slightly beyond the outer tapering or chamfered edge of each plane wall 6, and keyed to a rock-shaft or pin 8 mounted between and extending slightly outside of, the cylinder walls 1, 1, is an oscillating piston 9 with its free end directed toward the shaft S, the shaft 8 passing through and being keyed to the hollow boss or cylindrical hub 10 formed at the base of the piston. Bolted directly over the bevel or tapering end of said wall 6 is a

plate 11 provided with an offset or shoulder 12 facing the bevel, whereby there is formed a groove or depression between the bevel face of the wall 6 and the inner face of the plate 11 for the reception of a packing strip 13 (Fig. 8) the outer edge of the plate 11 bearing against the periphery of the boss 10. Drilled in the offset 12 are a series of pockets 14 for housing the coiled expanding springs 15 which press against the packing strip and thus force it into contact and positive engagement with the surface of the boss 10, and making an air-tight joint. The sides and end of the piston are provided with grooves for the reception of packing-strips 13′, at the base of which grooves are bored pockets 14′ for the reception of coiled springs 15′ which force the packing into positive engagement with the walls 1, 1, and 7, and thus insure an air tight joint. At the corners of the piston, the packing strip on one edge instead of abutting against the side of the strip on an adjacent edge, is grooved so as to receive a tongue on the end of the adjacent strip, thus insuring an air tight joint at the corner (Fig. 5). Each piston is provided with a hinged or equivalent intake-valve V as shown.

As was stated at the outset, the connection between the eccentric disks 4 and the pistons 9 is made altogether by devices located on the outside of the cylinder, this arrangement dispensing with the necessity of connecting the piston with the eccentric through the cylinder wall, an objection which necessitates the presence of a follower for covering up the slot through which such connection is made, with each intake stroke of the piston, the follower never making in practice a joint sufficiently tight to prevent the discharge of compressed air through the walls of the cylinder. In the present improvement the rock-shaft 8 of the piston projects beyond the walls 1, 1, where it has secured thereto a crank-arm 16 disposed in the plane of the piston and extending in the same direction therewith, and likewise parallel, to the plane of the casing wall 1, (or at right angles to the axis of the shaft S) the free end of the crank-arm being provided with a pin 17 carrying an anti-friction roller 18 traversing the eccentric groove or track 5. Since there are two cam-disks 4, one on each side of the piston, the eccentrics exercise an even driving pressure on the crank-arms and hence actuate the piston without binding. Each wall or abutment 6 is provided with a hood 19 into which the compressed air is initially discharged after passing the discharge valves V′, the latter being of any approved construction. The hood 19 and valves V′ are well understood in the art and form no part of my invention. Leading from the several hoods are discharge pipes or branches P which connect with a common discharge pipe P′ conducting the air to any suitable point of consumption (not shown).

The operation may be best understood by a reference to the diagrammatic illustration in Fig. 7. Assuming the disks 4 rotating as illustrated by arrow, and assuming the eccentric or cam 5 to have reached the full position in the figure, it is obvious that the pins 17 of the crank-arms of the several pistons will be constrained to follow the eccentric tracks 5 as indicated, the right-hand upper piston having been forced to the limit of its discharge or expelling stroke; the left-hand piston is half way on its discharge stroke, and the bottom piston is substantially a half way on its intake or outward stroke. As the disks 4 continue their rotation corresponding changes take place in the positions of the several pistons, the eccentrics oscillating the crank-arms 16 back and forth and hence oscillating the pistons inwardly and outwardly. With each outward stroke air rushes past the valves V into the vacuum behind the piston, and with each inward stroke such air is compressed and expelled past the valves V′ into the hood 19 whence it flows through the pipe P into the common discharge or compressed-air pipe P′. Since every side of the piston is bounded by a packing strip as described, it is obvious that no air can escape during the compression or expulsion stroke, except by way of the valves V′ and pipes P. Of course, a crank-disk would be a full equivalent of the crank-arm or member 16, and I desire to include a crank-disk within the scope of the present invention.

Having described my invention, what I claim is:—

1. In combination with a compression-chamber wall having a straight edge and having one face chamfered contiguous to said edge, a rock-shaft mounted adjacent to said edge, a piston secured at one end to the rock-shaft and provided with a cylindrical formation about the axis of the shaft, a member secured to the chamfered portion of the wall and having a portion spaced therefrom and forming a groove therewith adjacent to the cylindrical formation aforesaid, a packing strip in said groove, means for forcing said strip against the cylindrical formation of the piston and making an air-tight joint, and means coupled to the shaft for actuating the piston.

2. In combination with a compression-chamber wall having a straight edge and having one face chamfered contiguous to said edge, a rock-shaft mounted adjacent to said edge, a piston secured at one end to the shaft and provided with a cylindrical formation about the axis of the shaft, a member secured to the chamfered portion of the wall and having a portion spaced therefrom

and forming a groove therewith adjacent to the cylindrical formation aforesaid, a packing strip in said groove, and means for forcing said strip against the cylindrical formation of the piston and making a tight joint.

3. In combination with a compression-chamber wall having a straight edge and having one face chamfered contiguous to said edge, a rock-shaft mounted adjacent to said edge, a piston secured at one end to the shaft and provided with a cylindrical hub about the axis of the shaft, a plate having a shoulder secured to the chamfered portion of the wall, said shoulder spacing a portion of the plate from the face of the chamfered portion and forming a groove therewith, a packing strip in the groove, a series of pockets being disposed along the face of the shoulder opposite the packing, and springs confined in the pockets for forcing the packing against the hub of the piston.

4. In combination with a wall having a straight edge, a rock-shaft mounted thereon adjacent to said edge, a piston secured at one end to the shaft and provided with a cylindrical boss or hub, a plate having a shoulder, secured to the wall at the axis of oscillation of the piston, the shoulder spacing a portion of the plate from the wall and forming a groove therewith, a packing strip in the groove, a series of pockets being disposed along the face of the shoulder opposite the packing, and springs confined in the pockets for forcing the packing against the hub of the piston.

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

FREDERICK BOERCKER.

Witnesses:
EMIL STAREK,
JOS. A. MICHEL.