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COMPRESSOR.

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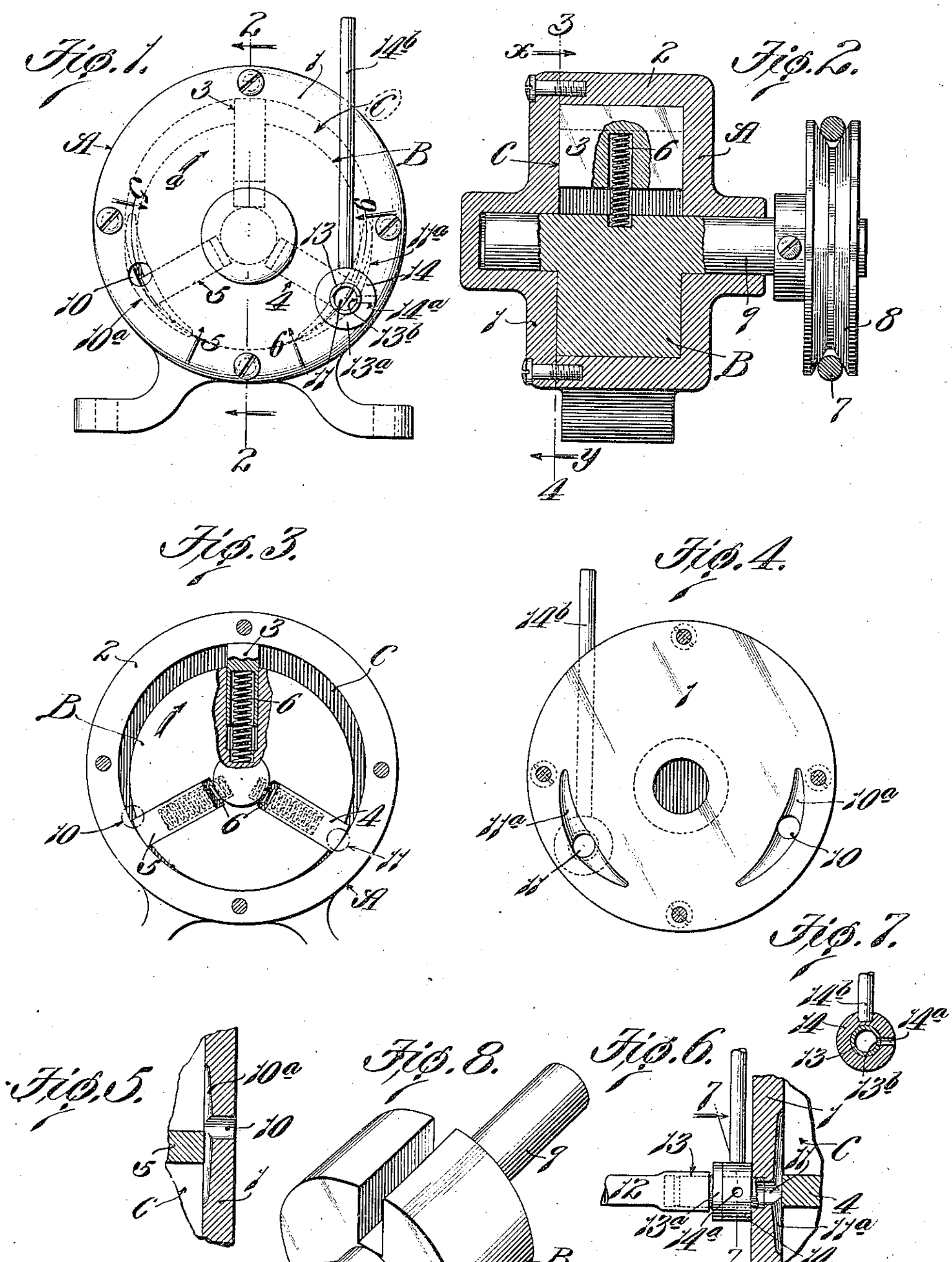
1,018,221. Patented Feb. 20, 1912.



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UNITED STATES PATENT OFFICE.

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COMPRESSOR.

1,018,221. Specification of Letters Patent. Patented Feb. 20, 1912.

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To all whom it may concern:

Be it known that we, JAMES B. VERNON and GEORGE DE CAMP, both citizens of the United States, residing at St. Louis, Missouri, have invented a certain new and useful Improvement in Compressors, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to compressors and rotary pumps of that type which comprises a cylindrical-shaped casing and a cylindrical-shaped piston hub arranged eccentrically inside of said casing and provided with pistons that bear against the inner face of the casing.

The main object of our invention is to provide a compressor or pump of the type referred to which is so designed that it will deliver a constant or steady stream of fluid or liquid under pressure.

Another object is to provide a compressor that will successfully operate a blow-pipe, and which is so designed that the force of the flame which emerges from the blow-pipe can be varied without changing the speed of the means which drives the compressor.

Another object is to provide a compressor or pump of the type previously referred to which is so designed that a vacuum or suction will not be created on the rear side of the pistons when the pistons approach the induction port and thus retard the movement of the machine. And still another object is to provide a compressor or pump of the type referred to which is so designed that the suction at one side of the machine is of practically the same relative degree as the compression at the other side of the machine.

Figure 1 of the drawings is a side elevational view of an air compressor constructed in accordance with our invention; Fig. 2 is a vertical sectional view taken on approximately the line 2—2 of Fig. 1; Fig. 3 is a vertical sectional view taken on the line 3—4 of Fig. 2, looking in the direction indicated by the arrow *x;* Fig. 4 is a vertical sectional view taken on the line 3—4 of Fig. 2, looking in the direction indicated by the arrow *y;* Fig. 5 is a detail sectional view taken on the line 5—5 of Fig. 1; Fig. 6 is a detail sectional view taken on the line 6—6 of Fig. 1; Fig. 7 is a detail sectional view taken on the line 7—7 of Fig. 6; and Fig. 8 is a perspective view of the piston hub.

Referring to the drawings which illustrate the preferred form of our invention, A designates a cylindrical-shaped casing provided with a removable head 1, and B designates a cylindrical-shaped piston hub arranged eccentrically inside of said casing, and in such a manner that a portion of its periphery always bears against the inner face of the cylindrical-shaped wall 2 of the casing. Said hub fits snugly between the heads of the casing, and a plurality of pistons 3, 4 and 5, which are slidingly mounted in said hub, also bear against the side walls of the casing. Said pistons are forced outwardly into engagement with the circular wall 2 of the casing by means of coiled expansion springs 6 mounted in pockets formed in the pistons, as shown in Figs. 2 and 3, the rotary movement of the piston hub B causing said pistons to move inwardly when they approach the point where the periphery of the hub bears against the circular wall 2 of the casing, and then move outwardly when they move away from this point. Any suitable means may be used for holding the outer ends of the pistons in intimate engagement with the circular wall 2 of the casing, and while we have herein shown the hub B as being provided with three pistons we wish it to be understood that our invention is not limited to a machine having this exact number as the hub may be provided with two pistons or any desired number of pistons.

Any suitable means can be used for rotating the hub B such, for example, as a belt 7 passing over a pulley 8 secured to the shaft 9 of the hub, the rotary movement of said hub causing the fluid or liquid being operated on to be drawn in through an induction port in the casing A and then compressed and discharged through an eduction port in said casing.

In the embodiment shown in the drawings the induction port 10 and the eduction port 11 are both formed in the removable head 1 of the casing, adjacent to the ends of the crescent shaped chamber C formed between the periphery of the hub B and the cylindrical wall 2 of the casing. The hub rotates in the direction indicated by the arrow *a*, Fig. 1. In the inner face of the head 1 adjacent to the induction and eduction ports are elongated grooves, that at the induction port being designated 10^a and that at the eduction port being designated 11^a. These grooves extend in both directions from the induction and eduction ports, respectively, and form by-passes around the pistons as they travel past these ports, as shown in Fig. 6, thereby preventing the flow of fluid into and out of the compression chamber from being interrupted intermittently, and also equalizing pressures on the opposite sides of the pistons as they approach or recede from the end of the chamber C. In other words, the groove 10^a is so disposed that the fluid being pumped can enter the end of chamber C behind the piston as soon as the latter begins to project beyond the periphery of the hub B, and prevents a vacuum or suction from being created on the rear side of said piston as it approaches the induction port. Similarly the groove 11^a permits the compressed fluid which is in advance of the piston after it passes the eduction port 11 to escape backwardly into the chamber C and prevents back pressure against said piston as it travels beyond the eduction port. The part of the groove 11^a extending toward the large part of the crescent shaped chamber C permits fluid being urged forward by a piston sweeping the large part of chamber C to flow underneath the preceding piston to the eduction port and compensate for the reduced outflow of fluid which would otherwise occur on account of said preceding piston sweeping through a reduced part of the crescent shaped chamber C. Consequently a constant and steady stream under pressure flows out of the eduction port 11, because said eduction port is not completely closed even when the pistons are traveling past the same. The groove 10^a also has the advantage that it increases the area of the induction port and permits a large quantity of air to be drawn into the machine.

It will be observed, Figs. 1 and 3, that the induction and eduction ports are located different distances from the point at which the hub B bears against the cylindrical wall 2 of the casing, and that the grooves 10^a and 11^a extend different distances from their respective ports, Fig. 4. The induction port 10 is removed farther from the point of contact of hub B with the cylinder walls than is the eduction port 11, but the groove 10^a is longer toward said neutral point than in the opposite direction, while at the eduction port the groove 11^a is shorter toward the neutral point than in the opposite direction. Both of these grooves taper in both directions so that they permit the escape of fluid underneath the piston in direct proportion to the amount necessary to compensate for the movements of the pistons through portions of the chamber C of different capacities and hence assist in the production of a steady and uniform flow of liquid both into and out of the machine, and producing a machine in which the suction is of the same relative degree as the compression and adapting the pump equally as well for suction purposes as for compression purposes. These grooves enlarge from their comparatively pointed or tapered ends to the full size of the induction and eduction ports, thereby giving a large capacity to said ports even though these are located at a point in which the cross section of the crescent shaped chamber C is much less than the diameter of said ports. By locating the eduction port as close to the end of the crescent shaped chamber as possible each piston is enabled to force directly out of said eduction port most of the fluid in advance of the blade, while by locating the induction port farther from the end of said crescent shaped chamber a larger flow of air into the chamber in front of each piston is provided for.

A machine of the construction above described can be used for numerous purposes where a constant stream of fluid or liquid under pressure is required, but it is particularly well adapted for operating a blowpipe, the air being supplied to the blowpipe by means of a conduit 12 that is connected to a sleeve 13 whose inner end projects into the eduction port 11 in the side wall of the casing, as shown clearly in Fig. 6. In order that the force of the stream of compressed air which passes through said conduit 12 may be varied without changing the speed of the means which drives the piston hub of the machine, we have provided the machine with a relief valve which can be adjusted so as to permit some of the air to escape from the sleeve 13 when it is desired to cut down the blast. Said relief valve consists of a collar 14 rotatably mounted on the sleeve 13 between the side wall 1 of the casing and a flange 13^a on said sleeve, and provided with a port 14^a that alines with a port 13^b in the sleeve 13 when the collar 14 is in the position shown in Fig. 7. Said collar is provided with a handle 14^b or other suitable device for enabling the collar to be turned easily so as to arrange the port 14^a therein in alinement with the port 13^b or out of alinement with said port, or in such a position that the port 13^b is only partly closed.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a rotary pump, a stationary cylinder, a rotatable piston hub arranged eccentrically in said cylinder and at one side bearing against the cylindrical wall and providing a crescent shaped chamber between itself and said cylindrical wall, a plurality of ra-

dially disposed reciprocating pistons carried by said hub and constantly contacting the cylindrical wall of the cylinder, said piston hub and pistons extending the full length of the cylinder, the cylinder head being provided with induction and eduction ports located respectively adjacent to the ends of the crescent shaped chamber and of a larger diameter than the crescent shaped chamber at those points, and grooves in the inner face of said head adjacent to said ports and extending in opposite directions therefrom, one arm of each groove extending toward the end of the crescent shaped chamber and the other arm extending in the opposite direction.

2. In a rotary pump, a stationary cylinder, a rotatable piston hub arranged eccentrically in said cylinder and at one side bearing against the cylindrical wall and providing a crescent shaped chamber between itself and said cylindrical wall, a plurality of radially disposed reciprocating pistons carried by said hub and constantly contacting the cylindrical wall of the cylinder, said piston hub and pistons extending the full length of the cylinder, the cylinder head being provided with induction and eduction ports located respectively adjacent to the ends of the crescent shaped chamber and of a larger diameter than the crescent shaped chamber at those points, the induction port being located farther from its end of the crescent shaped chamber than the eduction port, the inner face of the cylinder head being provided with arc shaped grooves adjacent to said induction and eduction ports and extending in opposite directions therefrom, that portion of the groove at the induction port extending toward the end of the crescent shaped chamber being longer than the corresponding portion of the groove in the eduction port.

3. In a rotary pump, a stationary cylinder, a rotatable piston hub arranged eccentrically in said cylinder and at one side bearing against the cylindrical wall and providing a crescent shaped chamber between itself and said cylindrical wall, a plurality of radially disposed reciprocating pistons carried by said hub and constantly contacting the cylindrical wall of the cylinder, said piston hub and pistons extending the full length of the cylinder, the cylinder head being provided with induction and eduction ports located respectively adjacent to the ends of the crescent shaped chamber and of a larger diameter than the crescent shaped chamber at those points, and grooves in the inner face of said head adjacent to said ports and extending in opposite directions therefrom, one arm of each groove extending toward the end of the crescent shaped chamber and the other arm extending in the opposite direction, said grooves where they join the ports being of the full width of said ports and tapering toward both ends.

4. In a rotary pump, a stationary cylinder, a rotatable piston hub arranged eccentrically in said cylinder and at one side bearing against the cylindrical wall and providing a crescent shaped chamber between itself and said cylindrical wall, a plurality of radially disposed reciprocating pistons carried by said hub and constantly contacting the cylindrical wall of the cylinder, said piston hub and pistons extending the full length of the cylinder, the cylinder head being provided with induction and eduction ports located respectively adjacent to the ends of the crescent shaped chamber and of a larger diameter than the crescent shaped chamber at those points, the induction port being located farther from its end of the crescent shaped chamber than the eduction port, the inner face of the cylinder head being provided with arc shaped grooves adjacent to said induction and eduction ports and extending in opposite directions therefrom, that portion of the groove in the induction port extending toward the end of the crescent shaped chamber being longer than the corresponding portion of the groove in the eduction port, said grooves where they join the ports being of the full width of said ports and tapering toward both ends.

In testimony whereof, we hereunto affix our signatures, in the presence of two witnesses, this 13th day of August, 1910.

JAMES B. VERNON.
GEORGE DE CAMP.

Witnesses:
GEORGE R. LADSON,
GEORGE BAKEWELL.