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F. L. BROUSSOUSE

COMPRESSOR OF AIR AND OTHER FLUIDS

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Fig. 1

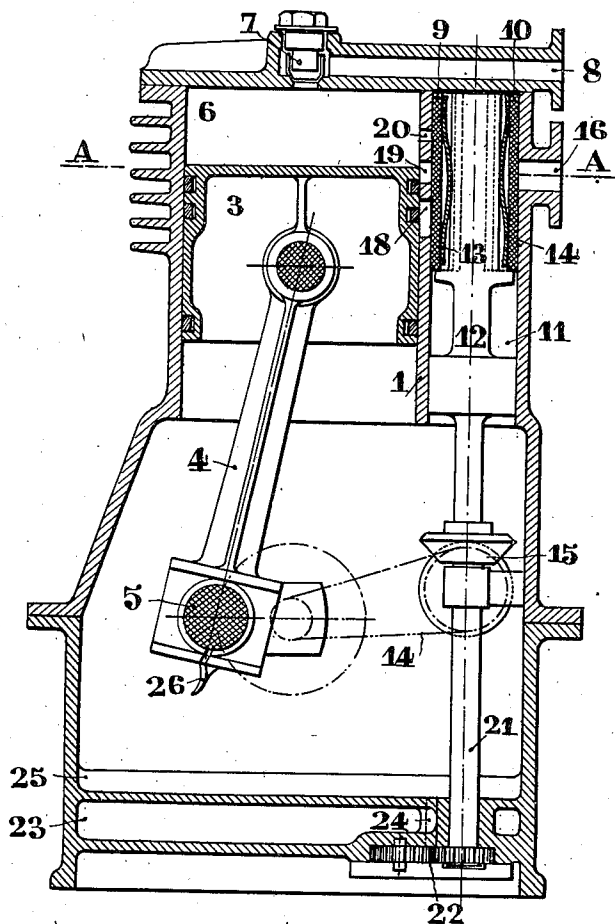
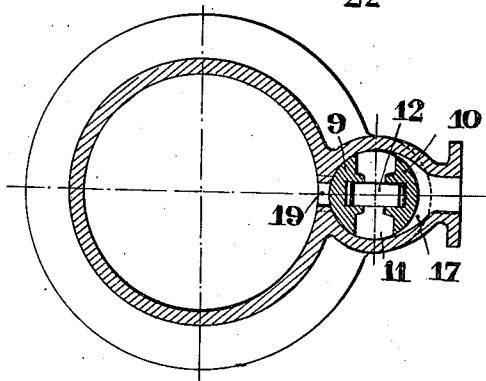


Fig. 2



INVENTOR
FERNAND LOUIS BROUSSOUSE
BY *Mumford*
ATTORNEYS

UNITED STATES PATENT OFFICE.

FERNAND LOUIS BROUSSEUSE, OF PARIS, FRANCE, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE WESTINGHOUSE AIR BRAKE COMPANY, OF WILMERDING, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

COMPRESSOR OF AIR AND OTHER FLUIDS.

Application filed September 15, 1921. Serial No. 500,951.

To all whom it may concern:

Be it known that I, FERNAND LOUIS BROUSSEUSE, a citizen of the French Republic, and residing in Paris, France, 4 Rue Sainte Anne, have invented certain new and useful Improvements in and Relating to Compressors of Air and Other Fluids, of which the following is a complete specification.

This invention relates to fluid compressors and more particularly to a valve mechanism for controlling the inlet of fluid to the compressor cylinder.

When a fluid compressor is run at high speed, it has been found difficult to charge the compressor cylinder with fluid on the suction stroke at such a rate that the full free air capacity of the compressor is approximated.

One object of my invention is to provide a fluid compressor having inlet valve means adapted to overcome the above difficulty.

Another object of my invention is to provide a fluid compressor having a minimum clearance space so as to increase the efficiency of the compressor.

Another object is to provide a fluid compressor having an inlet valve mechanism adapted to permit the running of the compressor at a high speed and at the same time secure a high efficiency rate.

Other objects and advantages will appear in the following more detailed description of the invention.

In the accompanying drawing; Fig. 1 is a central sectional view of a fluid compressor embodying my invention; and Fig. 2 a section on the line A—A of Fig. 1.

As shown in the drawing, the fluid compressor may comprise the usual casing having a compressor cylinder 1 containing piston 3, connected by the usual connecting rod 4 to crank shaft 5. Fluid compressed by piston 3 in piston chamber 6, flows past outlet valve 7 to pipe 8 and thence to the usual storage reservoir or the desired point of utilization.

Disposed in the compressor casing with its axis parallel to the axis of the compressor cylinder 1 is a cylindrical valve chamber 11 and mounted to rotate in said chamber are oppositely disposed valve members 9 and 10 in the form of segments of

a cylinder for controlling the admission of fluid to the piston chamber 6. Said members are carried by a rotatable valve rod 12 and interposed between the members 9 and 10 and the rod 12 are leaf springs 13 and 14, for yieldingly maintaining said members in contact with the interior cylindrical walls of the valve chamber 11.

The valve rod 12 is rotated through an operative connection to the crank shaft 5 such as by providing a pinion 15 on said rod which meshes with another pinion adapted to be driven by a transmission member 14. An inlet or suction port 16 opens into the valve chamber 11 and preferably said port opens to a lateral recess 17, as shown in Fig. 2, so as to ensure a full inlet from the port 16 to valve chamber 11 when desired. Controlled by the valve members 9 and 10 are a series of orifices 18, 19, and 20 through the wall between the valve chamber 11 and the piston chamber 6 which provide communication from the valve chamber 11 to the piston chamber 6, said orifices or ports have a decreasing sectional area from the end of the suction stroke to the compression end of the cylinder, as shown in Fig. 1.

In order to lubricate the compressor, the valve rod 12 is provided with a rod extension 21, at the lower end of which is operatively connected an oil pump 22. The oil pump is adapted to force oil in the oil chamber 23 through a passage 24 into an outflow groove or trough 25 and thence the oil is taken up by a blade 26, carried by the connecting rod 4, so as to lubricate the parts on the splash system.

In operation, with the piston 3 in the position shown in Fig. 1 with the crank at 90°, the valve members 9 and 10 will be in the positions shown in Fig. 2, closing communication through the ports 18, 19, and 20. As the piston 3 moves upwardly from this position on its compression stroke, the valve members 9 and 10 are rotated at one half the speed of the crank shaft 5 owing to driving pinion on the shaft 5 being one half the diameter of the pinion associated with the pinion 15, the driving pinions being operatively connected by the transmission member 14. As a consequence, at the end of the compression stroke, the

valves 9 and 10 will have moved 45° from the position shown in Fig. 2, in which the valves 9 and 10 partially uncover the ports 18 and 19.

5 As the piston 3 moves downwardly on its suction stroke, the valves 9 and 10 continue their movement to further open the inlet ports, so that fluid is free to pass from the inlet port 16 to the piston chamber 6. When
10 the crank shaft has turned 90° on the suction stroke, the valves 9 and 10 will be in a position at right angles to the position shown in Fig. 2 so that the inlet ports 18, 19, and 20 are fully open in this position.

15 At the end of the suction stroke or the beginning of the compression stroke, the valves 9 and 10 are rotated so that the port 18 is closed and the ports 19 and 20 are partially closed.

20 It will now be seen that on the up or compression stroke, the ports 18, 19, and 20 are either wholly or partially closed by the valve members 9 and 10, so that the pressure of fluid as it is compressed in the piston
25 chamber 6 acts through the ports 18, 19, and 20, on the valve members 9 and 10, but as the piston 3 moves upwardly, the ports 18, 19, and 20 are successively cut off by the piston 3 and the surface of the valve members
30 9 and 10 exposed to this pressure is reduced, on the one hand, by the piston 3 covering the ports and on the other hand by the decreasing area of the ports. The areas of the ports 18, 19, and 20 are so calculated and
35 the ports are so positioned that although the pressure in piston chamber 6 increases as the piston moves up on its compression stroke, the effective pressure acting through the ports 18, 19, and 20 on the valve members
40 9 and 10 will always be less than the pressure of the springs 13 and 14 tending to hold the valve members seated.

45 It will thus be seen that the valve members 9 and 10 may be held seated by means of light springs and thus frictional resistance to rotative movement of the valve members is minimized.

On the suction stroke, the area of the inlet ports increases as the piston moves down
50 and an unobstructed, free open communication is provided for the inlet of fluid from the port 16 to the piston chamber 6. The area of the inlet ports increases as the piston 3 moves downwardly on its suction
55 stroke, thus ensuring a rapid charging of the chamber with fluid and thereby providing a compressor of increased efficiency, the efficiency being large dependent upon the amount of free fluid which can be taken in
60 on the suction stroke.

The fluid inlet being controlled by positively moving mechanically controlled valves, the admission of fluid will be early and there will be no throttling of the inlet
65 orifices, even when the compressor is run at

very high speeds, such as would be the case with the usual type of inlet valve.

Since the inlet valve members constantly rotate in the same direction without reversal, the running of the compressor at a high
70 speed is greatly facilitated.

Since no space open to the compressor cylinder is required for inlet valves of the usual type, the clearance or dead space is reduced to a minimum, which further in-
75 creases the efficiency of the compressor.

The arrangement of the inlet ports in the walls of the piston cylinder permits lubrication of the valve members 9 and 10 by the passage of lubricating oil from the piston
80 chamber 6 through the ports 18, 19, and 20 to the valve members 9 and 10.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be per-
85 formed, I declare that what I claim is:—

1. In a fluid compressor, the combination with a fluid compressing cylinder, a piston therein, and a fluid inlet port positioned to be covered by said piston before said piston
90 has moved to the end of its compression stroke, of a valve chamber into which said inlet port opens and a rotating valve for controlling said port.

2. In a fluid compressor, the combination with a fluid compressing cylinder, a piston therein, and a fluid inlet port positioned to be covered by said piston before said piston
95 has moved to the end of its compression stroke, of a valve chamber into which said inlet port opens and a rotating spring pressed valve for controlling said port.

3. In a fluid compressor, the combination with a compressing cylinder and a piston therein, of a cylindrical valve chamber hav-
100 ing its axis parallel with the axis of the compressing cylinder, an inlet port connecting said valve chamber with said cylinder, oppositely disposed cylindrical valve members rotatably mounted in said valve chamber for controlling said port, and a spring
105 for yieldingly pressing each valve member to its seat.

4. In a fluid compressor, the combination with a compressing cylinder and a piston therein, of a valve chamber, an inlet port
115 connecting said valve chamber with said cylinder and controlled by said piston, and a valve for also controlling said port, the relation of the parts being such that the inlet port is first opened by the movement of the valve and is then uncovered by the piston on its suction stroke.

5. In a fluid compressor, the combination with a compressing cylinder and a piston therein, of a valve chamber, an inlet port
125 connecting said valve chamber with said cylinder and controlled by said piston, and a valve for also controlling said port, the relation of the parts being such that the in-
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let port is first closed by the movement of the valve and is then covered by the piston on its compression stroke.

6. In a fluid compressor, the combination with a compressing cylinder having a plurality of inlet ports in the cylindrical wall of the cylinder and a piston in said cylinder controlling said ports, of an inlet valve for also controlling said ports and means for operating said valve.

7. In a fluid compressor, the combination with a compressing cylinder having a fluid inlet of diminishing cross section and a piston in said cylinder controlling said inlet, of an inlet valve for also controlling said inlet.

8. In a fluid compressor, the combination with a compressing cylinder having a plurality of inlet ports of diminishing areas and disposed in longitudinal alinement and a piston in said cylinder controlling said ports of an inlet valve for controlling said ports.

9. In a fluid compressor, the combination with a compressing cylinder having a plurality of inlet ports having areas which successively decrease toward the end of the compression stroke, a piston in said cylinder controlling said ports, and an inlet valve for also controlling said ports.

10. In a fluid compressor, the combination with a compressing cylinder having an inlet port area which diminishes toward the end of the compression stroke, of a piston in said cylinder controlling said port area, the port area open to the compressing side of the piston during the compression stroke

being inversely proportional to the pressure of fluid compressed and an inlet valve for also controlling said ports.

11. In a fluid compressor, the combination with a compressing cylinder and a piston therein, of a cylindrical valve chamber in axial alinement with the compressing cylinder, the dividing wall between said cylinder and said chamber having a plurality of inlet ports of varying areas and an inlet valve in said chamber for controlling said ports.

12. In a fluid compressor, the combination with a compressing cylinder and a piston therein, of a cylindrical valve chamber in axial alinement with the compressing cylinder, the dividing wall between said cylinder and said chamber having a plurality of inlet ports of varying areas, an inlet valve rotatably mounted in said chamber for controlling said ports, and means for rotating said valve.

13. In a fluid compressor, the combination with a compressing cylinder having a plurality of inlet ports of varying cross section and a piston in said cylinder controlling said ports, of a cylindrical valve chamber in axial alinement with said cylinder with which said ports communicate, cylindrical valve means rotatably mounted in said chamber for controlling said ports, and means for rotating said valve means.

In testimony I have hereunto set my hand at Paris (France), this 26 day of August 1921.

FERNAND LOUIS BROUSSEUSE.