G. A. GASE.

COMPRESSOR.

APPLICATION FILED JULY 8, 1920.

1,425,192. Patented Aug. 8, 1922.

Fig. 2.

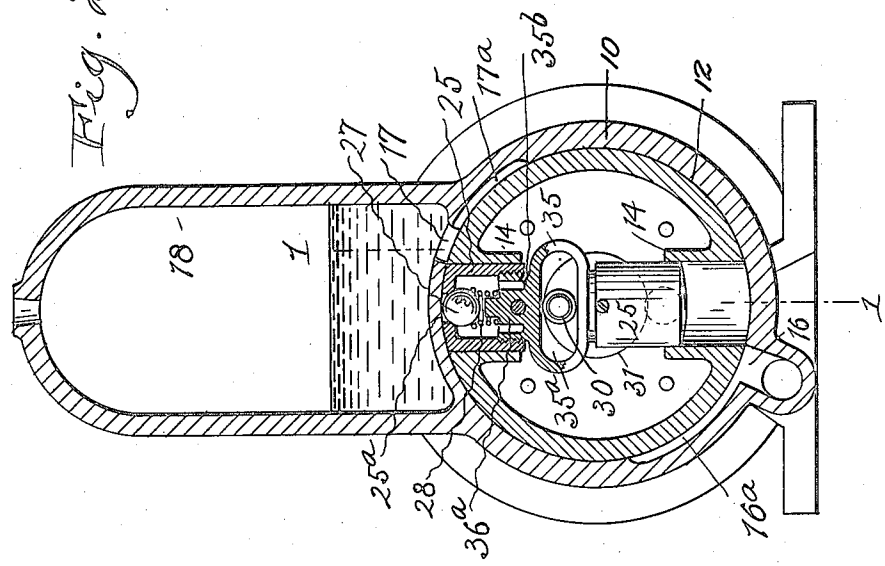
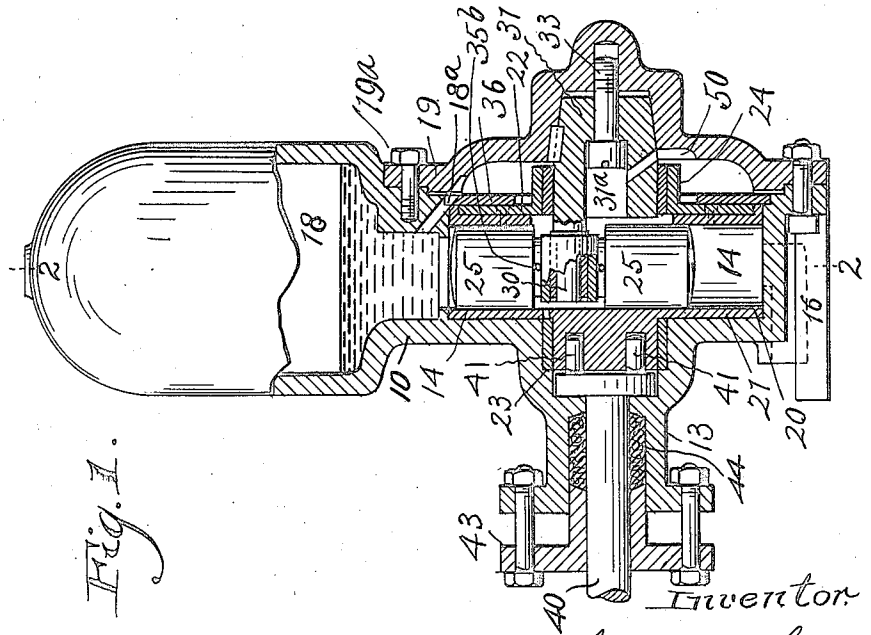


Fig. 1.



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UNITED STATES PATENT OFFICE.

GEORGE A. GASE, OF CLEVELAND, OHIO, ASSIGNOR TO THE CHAMPION ICE MACHINE COMPANY, A CORPORATION OF OHIO.

COMPRESSOR.

1,425,192. Specification of Letters Patent. Patented Aug. 8, 1922.

Application filed July 8, 1920. Serial No. 394,639.

To all whom it may concern:

Be it known that I, GEORGE A. GASE, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Compressors, of which the following is a full, clear, and exact description.

This invention is a compressor which is especially adapted for use in connection with a refrigerating apparatus for compressing anhydrous ammonia or other gaseous substances used therein.

One object of the invention is to provide an efficient compressor from which there will be no escape of gas under any of the conditions of use or idleness thereof.

Another object is to provide a compressor which will require practically no care to insure effective lubrication at all times.

Another object is to provide a valveless compressor.

Another object is to provide an inexpensive compressor of small size, especially adapted for use in connection with domestic refrigeration, that is, small refrigerating units.

The invention consists in the construction and combination of parts shown in the drawing and hereinafter described and pointed out definitely in the appended claims.

In the drawings, Fig. 1 is a sectional side elevation of the compressor, the section being in the place indicated by line 1—1 on Fig. 2; Fig. 2 is a sectional end view of the compressor in the plane of line 2—2 on Fig. 1.

Referring to the parts by reference characters, 10 represents a casing in which is a cylindrical chamber 12. A hollow cylindrical rotor 20 is fitted into this chamber and is rotated therein by power applied to it by means to be presently described. This rotor is formed with one or more radial compression cylinders 14. In the construction shown there are two of these cylinders, and they are diametrically opposed. The bore of each opens through the periphery of the rotor.

Fitted to each cylinder is a piston 25. Means are provided for connecting all of the pistons with an eccentrically disposed crank 30 which is fixed to one side wall of the chamber and projects therefrom into the rotor through an opening in one side thereof. In the specific construction shown there is a Scotch yoke 35 which is connected with both pistons; and the crank 30 projects into the slot 35ª of this yoke. The crank is located above the axis of the rotor and therefore, as the rotor turns, the piston which is approaching the top of the casing will be moved away from the axis of the rotor, that is, will go through its compression stroke, while that piston which is moving from the top toward the bottom of the casing will be drawn inward, that is to say, will go through its suction stroke.

An inlet port 16 is provided in the casing near the bottom thereof, and an outlet port 17 is formed through the wall of the casing at a diametrically opposite point near the top of the casing. Upon the casing and preferably integral therewith is a chamber 18 with which the outlet port 17 communicates.

In the cylindrical wall of the casing communicating with the inlet port 16 and extending therefrom backward a short distance, is a groove 16ª. A similar groove 17ª is formed in the cylindrical wall of the casing in communication with the exhaust port 17 and extends backward therefrom.

The rotor 20 is composed of a principal member 21 of which the cylinders are a part, and a member 22 which is secured to one side of the principal member. On the principal member a trunnion 23 is formed and this is rotatably mounted in suitable bearings in the fixed side wall of the casing. The member 22 of the rotor is formed with a coaxial tubular hub 24 which is rotatably mounted upon a bearing which is in turn supported by the crank shaft 31. The casing 10 is formed with one removable side 19. The crank shaft 31 is fitted into a tapered hole in the inner face of the plate 19 and is keyed therein, so that it may not rotate and is securely fastened in place by a screw 33, the head of which is in a recess 31ª in the inner end of said shaft. The part of this shaft which projects out of this hole into the casing chamber is cylindrical, and this cylindrical part is coaxial with the rotor; and therefore the tubular hub 24 of the rotor member 22 may be and is rotatably mounted thereon. The crank 30 projects

eccentrically from the shaft 31 into the chamber 12 of the casing.

A packing plate 36, which is in the form of a flat ring, is clamped between the main portion 21 of the casing and the removable plate 19. This packing plate 36 bears against and makes a substantially tight joint with the outer face of the rotor member 22. The opposite flat face of the rotor member makes a substantially tight rubbing joint with the inner end wall of the casing.

The casing 10 is provided with a hollow hub 13. A driving shaft 40 is rotatably mounted in this hub and in the gland 43, and is provided on its inner end with driving pins 41 which engage in holes in the hub 23 of the rotor. There is a stuffing box 43 associated with this hub; and the packing 44 in the hub around the shaft 40 will be compressed so as to make a tight joint around the shaft 40, when the gland 43 of the stuffing box is tightened. To operate the device a motor of some kind is connected with the projecting outer end of the shaft 40.

Before this compressor is set in operation the otherwise unoccupied part of the chamber 12 and the hollow interior of the rotor are filled with oil, and sufficient oil is employed for this purpose to partially fill the chamber 18. There is an oil duct 18ª extending from the chamber 18 into the space within the casing and between the removable side thereof and the rotor member 22; and there is also an oil duct 50 extending from this space within the casing up through the crank shank into the recess 31ª thereof which communicates with the hollow center of the rotor. Oil will therefore flow from the chamber 18 into the hollow rotor.

All of the described parts therefore are submerged in oil at all times. As the rotor is turned, the piston which is descending will be gradually drawn inward. When the open outer end of the cylinder comes into communication with the groove 16ª the anhydrous ammonia gas will be drawn in through the port 16 into the cylinder. When the outer end of the cylinder passes port 16 the entry of gas from the cylinder will be cut off. Thereafter, as the cylinder moves upward the piston will be forced outward, thereby compressing the gas in this cylinder. When the open end of the cylinder containing the compressed gas reaches the groove 17ª it will begin to discharge into the same, and this compressed gas will continue to be discharged from the cylinder into this groove or through port 17 until the open end of the cylinder passes the last named port. The compressed gas is obliged to pass upward through the oil in the chamber 18 into the upper part of the chamber having a discharge opening through which this compressed gas will be delivered into a pipe (not shown) for carrying said gas to the expansion coils in which it will expand and produce the desired refrigerating effects.

In the operation of the pump, oil may find its way into the cylinders and inasmuch as the oil is practically uncompressible, the pressure which builds up in the cylinder during the compression stroke of each piston is liable to cause damage to the pump.

In order to insure against this contingency, provision is made so that oil which collects in the cylinders may be bypassed from the cylinders when the pressure builds up within the cylinders beyond a predetermined amount.

As shown in the drawing, each piston is hollow and at its outer end is provided with a port or opening 25ª, which, however, is normally closed by means of a ball valve 27 which is within the piston. This ball valve is held in its position by means of a spring 28 which is seated over a part 36ª, which in the present instance forms a part of the Scotch yoke. Adjacent the inner end of each piston is an opening such as indicated at 35ᵇ.

If by any chance oil accumulates within a cylinder during the compression stroke the pressure builds up within the cylinder to an amount greater than that which will be resisted by the spring 28, the ball valve 27 is unseated and oil which may be within the cylinder will pass into the interior of the piston and through the duct or opening 35ᵇ through the interior of the rotor. It will be recalled that the interior of the rotor communicates through the passages 50 and 18ª with the chamber 18 so that oil may be caused to move in the manner indicated whenever the pressure in a cylinder builds up beyond the pressure which exists in the chamber 18.

Having described my invention, I claim.

1. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated inlet and discharge ports through its cylindrical wall, a hollow rotor which is rotatably fitted in said chamber and is formed with a radially disposed cylinder, the bore of which extends through the cylindrical wall of the rotor in position to communicate with said inlet and discharge ports, a crank which is fixedly connected with one side wall of said chamber and which occupies an eccentric position within the rotor, a reciprocating piston in said cylinder, connections between the piston and crank, means to rotate said rotor, a body of liquid within said chamber and rotor and serving as a packing and seal, and means for relieving excessive pressure which may develop in said cylinder.

2. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated in-

let and discharge ports through its cylindrical wall, a hollow rotor which is rotatably fitted in said chamber and is formed with a radially disposed cylinder, the bore of which extends through the cylindrical wall of the rotor in position to communicate with said inlet and discharge ports, a crank which is fixedly connected with one side wall of said chamber and which occupies an eccentric position within the rotor, a reciprocating piston in said cylinder, connections between the piston and crank, a body of liquid within said casing and rotor and serving as a packing and seal, and means for bypassing oil which may collect in the cylinder.

3. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated inlet and discharge ports through its cylindrical wall, a hollow rotor which is rotatably fitted in said chamber and is formed with a radially disposed cylinder, the bore of which extends through the cylindrical wall of the rotor in position to communicate with said inlet and discharge ports, a crank which is fixedly connected with one side wall of said chamber and which occupies an eccentric position within the rotor, a reciprocating piston in said cylinder, connections between the piston and crank, a body of liquid within said casing and rotor and serving as a packing and seal, a valve located in said piston and conduit means connecting the interior of the piston with the interior of the rotor.

4. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated inlet and discharge ports through its cylindrical wall, a hollow rotor which is rotatably fitted in said chamber and is formed with a radially disposed cylinder, the bore of which extends through the cylindrical wall of the rotor in position to communicate with said inlet and discharge ports, a crank which is fixedly connected with one side wall of said chamber and which occupies an eccentric position within the rotor, a reciprocating piston in said cylinder, connections between the piston and crank, and means to rotate said rotor, an oil chamber arranged above said casing and communicating at its lower end with said chamber through the outlet port therefrom, and there being oil passageways from said oil chamber to the interior of the rotor.

5. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated inlet and discharge ports thrugh its cylindrical wall, a hollow rotor which is rotatably fitted in said chamber and is formed with a radially disposed cylinder, the bore of which extends through the cylindrical wall of the rotor in position to communicate with said inlet and discharge ports, a crank which is fixedly connected with one side wall of said chamber and which occupies an eccentric position within the rotor, a reciprocating piston in said cylinder, connections between the piston and crank, a body of liquid within said casing and rotor and serving as a packing and seal, and means for relieving pressure which may build up within the cylinder.

6. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated inlet and discharge ports through its cylindrical wall, a hollow rotor which is rotatably fitted in said chamber and is formed with a radially disposed cylinder, the bore of which extends through the cylindrical wall of the rotor in position to communicate with said inlet and discharge ports, a crank which is fixedly connected with one side wall of said chamber and which occupies an eccentric position within the rotor, a reciprocating piston in said cylinder, connections between the piston and crank, a body of liquid within said casing and rotor and serving as a packing and seal, and means for bypassing oil which may accumulate in the cylinder.

7. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated inlet and discharge ports through its cylindrical wall, which casing includes one removable side wall, and there being in one side wall of said chamber a cylindrical axial recess, a rotor which is rotatably fitted in said chamber and has a trunnion which is rotatably mounted in said cylindrical recess and is formed with a radially disposed cylinder, the bore of which extends through the cylindrical wall of said rotor, said rotor being provided on the side opposite said trunnion with a hollow hub, a cylindrical crank shaft which is fixed to the side of said casing and projects through and is rotatably fitted within said hollow hub, a crank fixed to the inner end of said crank shaft and disposed eccentrically within said hollow rotor, a reciprocating piston in said cylinder, connections between the piston and crank, a body of liquid within said casing and rotor and serving as a packing and seal, and means to rotate the rotor.

8. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated inlet and discharge ports through its cylindrical wall, which casing includes one removable side wall, and there being in one side wall of said chamber a cylindrical axial recess, a rotor which is rotatably fitted in said chamber and has a trunnion which is rotatably mounted in said cylindrical recess and is formed with a radially disposed cyl-

inder, the bore of which extends through the cylindrical wall of said rotor, said rotor being provided on the side opposite said trunnion with a hollow hub, a cylindrical crank shaft which is fixed to the side of said casing and projects through and furnishes a cylindrical bearing for the hollow hub of said rotor, a crank fixed to the inner end of said crank shaft and disposed eccentrically within said hollow rotor, a reciprocating piston in said cylinder, connections between the piston and crank, means to rotate the rotor, an oil chamber arranged above said casing and communicating therewith through the discharge port from said casing, there being oil ducts through which oil may flow from said oil chamber into the hollow rotor.

9. In a compressor, the combination of a casing containing a cylindrical chamber which is provided with widely separated inlet and discharge ports through its cylindrical wall, a hollow rotor which is rotatably fitted in said chamber and is formed with a radially disposed cylinder, the bore of which extends through the cylindrical wall of the rotor in position to communicate with said inlet and discharge ports, a crank which is fixedly connected with one side wall of said chamber and which occupies an eccentric position within the rotor, a reciprocating piston in said cylinder, connections between the piston and crank, means to rotate said rotor, a body of liquid within said casing and rotor and serving as a packing and seal, and an inwardly opening spring actuated check valve in the end of each piston.

10. In a compressor, the combination of a casing having a cylindrical chamber which is provided with separated inlet and discharge ports in its walls, a hollow rotor fitting within the said cylindrical chamber, said rotor being provided with a radially disposed cylinder, a piston within said cylinder, a removable end plate for said casing, a packing plate between the said end plate and the rotor, a crank fixedly connected with one of the walls of the said casing which crank occupies an eccentric position within the rotor, connections between the piston and crank, a body of liquid within said casing and rotor and serving as a packing and seal, and means for rotating the rotor.

In testimony whereof, I hereunto affix my signature.

GEORGE A. GASE.