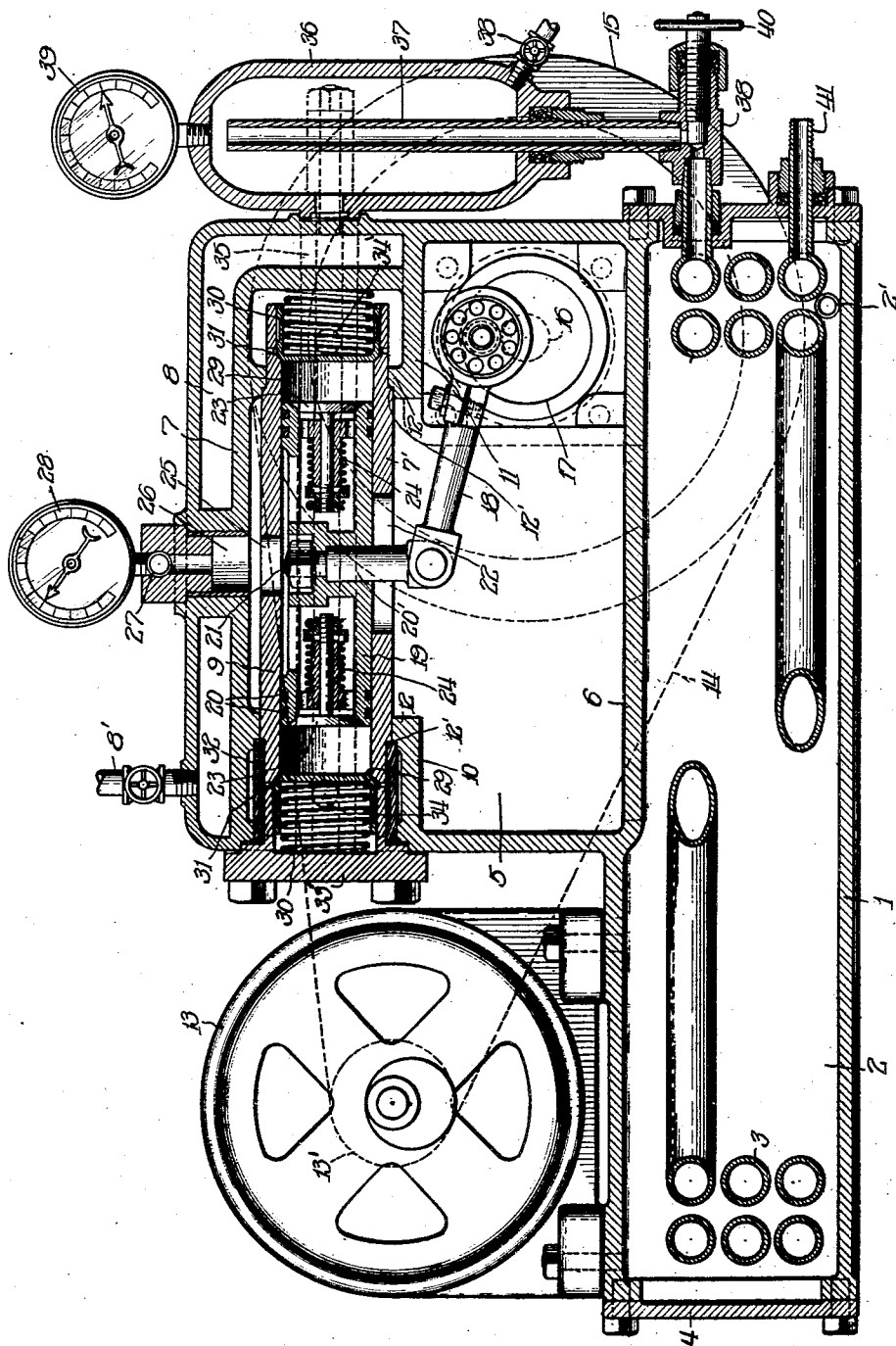


Jan. 5, 1926.

1,568,147

P. FISCHBACHER
REFRIGERATING APPARATUS

Filed March 16, 1923



Witness:
R. Burkhardt.

Inventor:
Philip Fischbacher,
By Williamson, Huxley, Byron & Knight,
attys.

UNITED STATES PATENT OFFICE.

PHILIP FISCHBACHER, OF QUINCY, ILLINOIS.

REFRIGERATING APPARATUS.

Application filed March 16, 1923. Serial No. 625,448.

To all whom it may concern:

Be it known that I, PHILIP FISCHBACHER, a citizen of the United States, residing at Quincy, in the county of Adams and State of Illinois, have invented certain new and useful Improvements in Refrigerating Apparatus, of which the following is a specification.

The present invention relates to refrigerating apparatus.

More particularly the present invention relates to machinery for compressing refrigerating medium and has for one of its objects the provision of a construction which will be very little subject to wear and leaks.

A further object is to provide a construction of refrigerating machine which is cheap to manufacture and in which the number of operating parts is reduced to a minimum.

A further object is to provide a compressor plant which will be compact and which will economize space.

A further object is to provide a refrigerating machine provided with a reciprocating valved piston which will perform compressive duties on both forward and back stroke and which without the use of stuffing boxes will prevent the escape of refrigerating medium.

A further object is to provide an efficient compressor of simple construction in which the bearing parts are readily accessible for inspection and repairs.

Further objects will appear as the description proceeds.

The one figure of the drawing is a sectional view illustrating one embodiment of the present invention.

The numeral 1 indicates a casing, which may be of cast metal and which is formed at its lower portion to provide a chamber 2, which may have an inlet 2'. The chamber 2 provides a receptacle for a condensing coil 3. The condensing coil 3 may be inserted or removed through the removable wall 4 located at one side of the casing.

Surmounting the chamber 2 is the chamber 5, which is separated from the chamber 2 by the intervening wall 6. The chamber 5, as will be referred to hereinafter, provides a receptacle for certain mechanical operating mechanism and may contain a supply of lubricant.

The chamber 5 has the wall 7, which wall is spaced from the wall of casing 1 to provide a space 8, which has communication with chamber 2. Said space 8 is provided with the outlet 8'.

Within the chamber 5 provided by the wall 6 and wall 7 are supporting means for a sleeve 9. Said sleeve 9 is supported near one end by the abutment 10 and near the other end by the abutment 11. The abutments 10 and 11 and the wall 7 are formed to provide cylindrical bosses 12—12, the left-hand sides of which, as viewed in the drawing, are shouldered as indicated by the numerals 12'—12' for a purpose which will later appear.

To the left of the chamber 5, as indicated in the drawing, the casing 1 is provided with a portion suitable for the mounting of an electric motor 13. Said electric motor may be provided with a pulley 13', which, by means of belt 14, may drive the pulley 15. The pulley 15 drives a shaft 16, which may be mounted in bearings in the casing 5 and housing 11. The shaft 16 may be provided with the crank disk 17, which may drive the connecting rod 18, said connecting rod 18 being preferably connected to said crank disk 17 by means of ball or roller bearings.

The removable sleeve 9 should preferably be of very hard metal, whereby to effectually resist the effect of wear. Said sleeve 9 is provided with the piston 19, which piston 19 may be fitted to the cylinder 8 by means of slip rings 20—20 or other suitable gas-tight fittings. The piston 19 is provided with a transversely extending pin 20', which may be held on said piston by means of a nut 21. Said pin 20' extends through a longitudinal slot 22 in the wall 7', which slot 22 permits a reciprocating movement of the piston 19. Inasmuch as the piston is tightly packed within the sleeve 9, there is no possibility of lubricating material from within the chamber 5 passing beyond the ends of said piston 19.

Each end of the piston 19 is provided with a valve 23, which valves 23—23 open outwardly and are pressed to closed positions by means of the springs 24—24. The interior of the piston 19 is hollow, which hollow space has communication in all positions of the piston with a substantially centrally placed aperture 25 in the sleeve 9. The aperture 25 has communication through the opening 26 and pipe 27 with a supply

of refrigerating medium, which, in practice, will be the refrigerating medium within the heat absorbing conduits of refrigerating apparatus. A gauge 28 may be provided for indicating the pressure of the refrigerating medium in the pipe 27, which is the low pressure side of the system. Needless to say, the passageways for the refrigerating medium are of such tight construction as to prevent the escape of said refrigerating medium. Each end of the sleeve 9 is provided with a valve 29. Said valves 29—29 are pressed inwardly, by springs 30—30, to a position in which they close the ports 31—31 located in the peripheral wall of said sleeve 9. The sleeve 9 is surrounded near its left-hand end, as viewed in the figure of the drawing, by a sleeve 32. Said sleeve provides an abutment means for preventing endwise movement of sleeve 9 and is itself held in place by means of the removable collar 33. The dividing line between sleeve 9 and collar 33 is indicated by the numeral 33'. As will be clear from the drawing, the abutting relation is accomplished by reason of co-operation between the shouldered portions 12'—12' of bosses 12—12, the sleeve 32 and corresponding shouldered portions of said sleeve 9. The sleeve 32 is provided with a port 34, which port 34 communicates with a similar port in the wall 7 through which communication is had with a conduit 35. At the right hand end of the apparatus, as shown in Figure 1, the port 34' in the wall 7 also provides communication to the conduit 35.

Mounted at the end of the casing 5 is the receiver 36, which receiver 36 has communication with the conduit 35 at a point spaced materially from the top of casing 36. Mounted vertically within the casing 36 is the pipe 37, which extends to a point materially above the point of communication with conduit 35. Said pipe 37, which is closely sealed to casing 36, leads to the valve 38. By reason of the construction of casing 36 and pipe 37, any fluid which may enter conduit 35 and casing 36 is separated from the gaseous refrigerating medium, said fluid being removed from casing 36 through the connection 38'. A pressure gauge 39 may be provided for indicating the pressure of the gas in the casing 36, which is the high pressure side of the system.

The flow of gas from the casing 36 into the coil 3 of the lower part of the apparatus is controlled by means of the valve 38, which connects with the condensing coil 3, said valve being controllable by means of the handle 40. An outlet from the cooling coil 3 is shown at 41.

In operation, cooling fluid will flow into the chamber 2 through the inlet 2'. Inasmuch as chamber 2 has communication with

the sleeve 9, which surrounds the piston 19, the cooling effect of the fluid will be communicated to said piston and to the gas being compressed thereby. The cooling fluid after having performed its cooling functions will be discharged through the outlet 8'. The pipe 27 is connected to the low pressure side of a refrigerating system, the high pressure side of the system being connected to the outlet pipe 41 leading from the condensing coil 3. Operation of the motor 12 will result in rotation of the crank disk 17, thereby producing a reciprocating movement of piston 19. When said piston 19 is moved in a direction toward the left, as viewed in the figure of the drawing, the right hand valve 23 will be opened against the pressure of spring 24 due to the reduction of pressure in the chamber to the right of the right hand valve 23. Gas will pass through pipe 27, opening 26, port 25, into the interior of piston 19, past the right hand valve 23 to the space between said valve and the right hand valve 29. At this time the left hand end of the piston is exerting a compressive force upon the gas at the left of said piston. When the piston 19 has reached the limit of its travel toward the left and has started on its movement toward the right, the compression of the gas in the chambers to the right of the right hand valve 23 will cause valve 29 to be moved from its seat, uncovering the corresponding ports 29. Refrigerating medium passing from ports 29 will pass through the port 34 into conduit 35 and will be delivered into casing 36, from which said medium may pass into the condensing coil 3. In its movement toward the right, the piston 19 has tended to form a vacuum to the left of the left hand valve 23, causing the opening of said left hand valve 23. Refrigerating medium from pipe 27 will pass through opening 26, port 25 and hollow piston, past said left hand valve 23 into the chamber to the left of said left hand valve 23. It will be clear, therefore, that reciprocation of the piston 19 will draw refrigerating medium alternately into the spaces at the ends of said piston, said gas being compressed on the return stroke and delivered to conduit 35, from which it is discharged into casing 36. The parts should preferably be so designed that the space between the ends of the pistons and the corresponding valves 29 should be reduced substantially to zero when the valves 29—29 are positioned to uncover the ports 31. By reason of this structure each of the valves 29 will closely follow the piston 19 on its receding stroke and a complete expulsion of gases in the sleeve 9 will be accomplished on every compression stroke.

By reason of the construction provided, a single double-acting piston serves to com-

press the refrigerating medium at each half revolution of the operating crank disk. The operating mechanism for driving the piston may operate in a bath of lubricant, which
 5 may have a level above the bearings for the shaft 16. Inasmuch as all the other joints through which air may enter the compressor are between relatively fixed parts, and inas-
 10 much as the lubricant in chamber 5 will effectually act as an air seal, the leakage of air or refrigerating medium is effectually prevented. The device is very compact and the cooling medium is utilized to the fullest advantage, not only in cooling the condensing
 15 coil 3 but in cooling the operating piston 19 and the gas compressed thereby.

Though a preferred embodiment of the present invention has been described in detail, it is to be understood that said embodiment is to be construed in an illustrative and
 20 not in a limiting sense. Many modifications and many changes in detail will occur to those skilled in the art. It is intended to cover all such modifications that fall within
 25 the scope of the invention as defined by the appended claims.

What is claimed is:

1. Apparatus providing, in combination, a casing for cooling medium, said casing being provided with inner walls providing a chamber, a cylindrical sleeve supported within said chamber, said inner walls providing abutment means for one of said cylindrical sleeve, a second cylindrical sleeve encircling said first mentioned sleeve and having abutting relationship with the other end of said first mentioned sleeve, cooperating ports in said sleeve, a piston within said first mentioned sleeve and transmitting
 30 mechanism for communicating reciprocating motion to said piston, said piston and said first mentioned sleeve being provided with cooperating valves, said valve in said sleeve being adapted to control said ports, said
 35 transmitting mechanism, piston and valves being so proportioned that said piston at a limit of its travel reduces to substantially zero the space between said valves when said valve uncovers in said sleeve the port in said
 40 first mentioned sleeve.

2. Apparatus of the class described pro-

viding, in combination, a casing for cooling medium, said casing being provided with inner walls providing a chamber, a cylindrical sleeve supported within said chamber, 55 said inner walls being provided with abutment means for abutting against one end of said cylindrical sleeve, a second cylindrical sleeve encircling said first mentioned sleeve and having abutting relation with a shouldered portion adjacent to the other end of said first mentioned cylindrical sleeve, said cylindrical sleeve being readily removable from said chamber, readily removable means for holding said sleeves in position, said 65 sleeves being provided with cooperating ports.

3. Apparatus of the class described providing, in combination, a casing for cooling medium, said casing being provided with 70 inner walls providing a chamber, a cylindrical sleeve supported within said chamber, said inner walls being provided with abutment means for abutting against one end of said cylindrical sleeve, a second cylindrical sleeve encircling said first mentioned sleeve and having abutting relation with a shouldered portion adjacent to the other end of said first mentioned cylindrical sleeve, said cylindrical sleeve being readily removable 80 from said chamber, readily removable means for holding said sleeves in position, said sleeves being provided with cooperating ports, a piston within said first mentioned sleeve, said piston being provided 85 with an outwardly opening valve in an end thereof, said sleeve being provided with an outwardly opening valve in one of its ends, said sleeve valve being adapted to open communication between said piston and said 90 chamber through said ports, actuating mechanism for said piston, said actuating mechanism, piston and valves being so proportioned that said piston at the limits of its travel reduces to substantially zero the space 95 between said sleeve valve and said piston valve when said sleeve valve opens communication to said ports.

Signed at Chicago, Illinois, this 13th day of March, 1923.

PHILIP FISCHBACHER.