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COMPRESSOR FOR REFRIGERATING APPARATUS

Filed Jan. 31, 1924

2 Sheets-Sheet 1

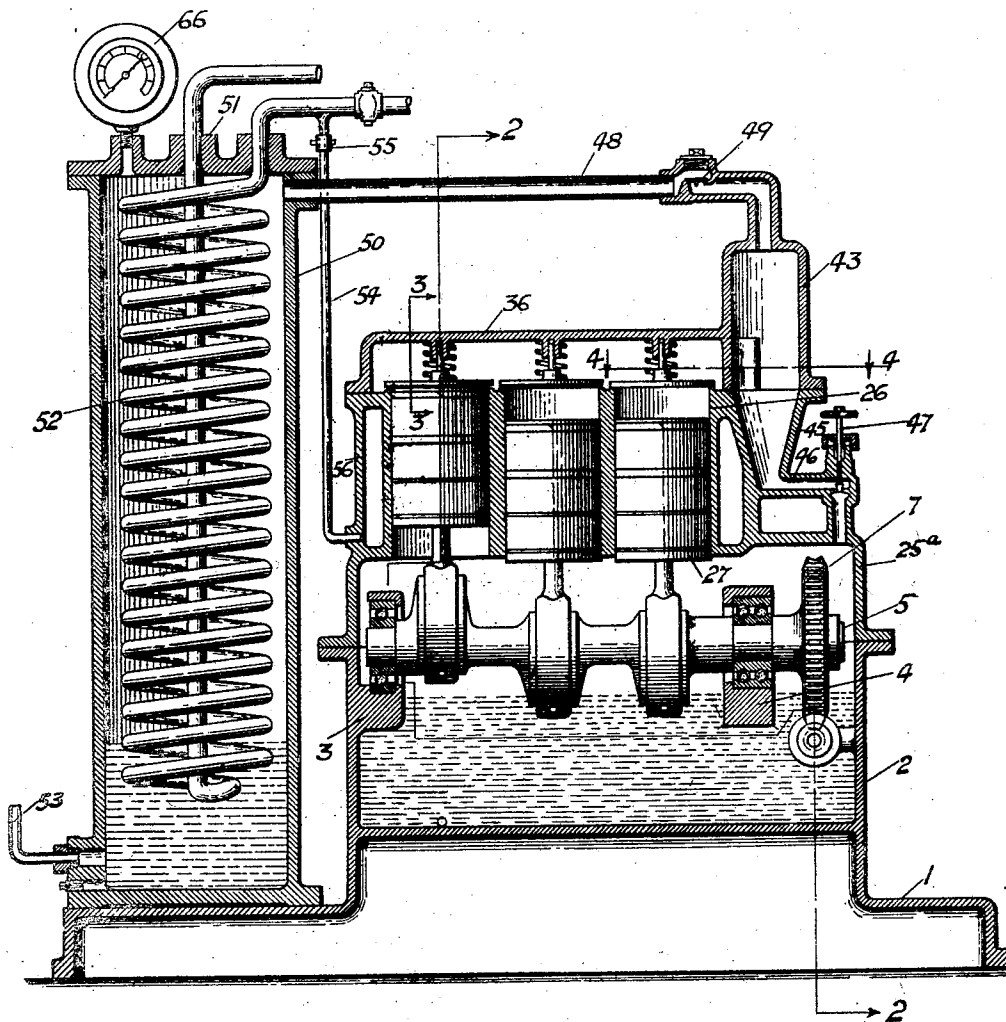


FIG.-1.

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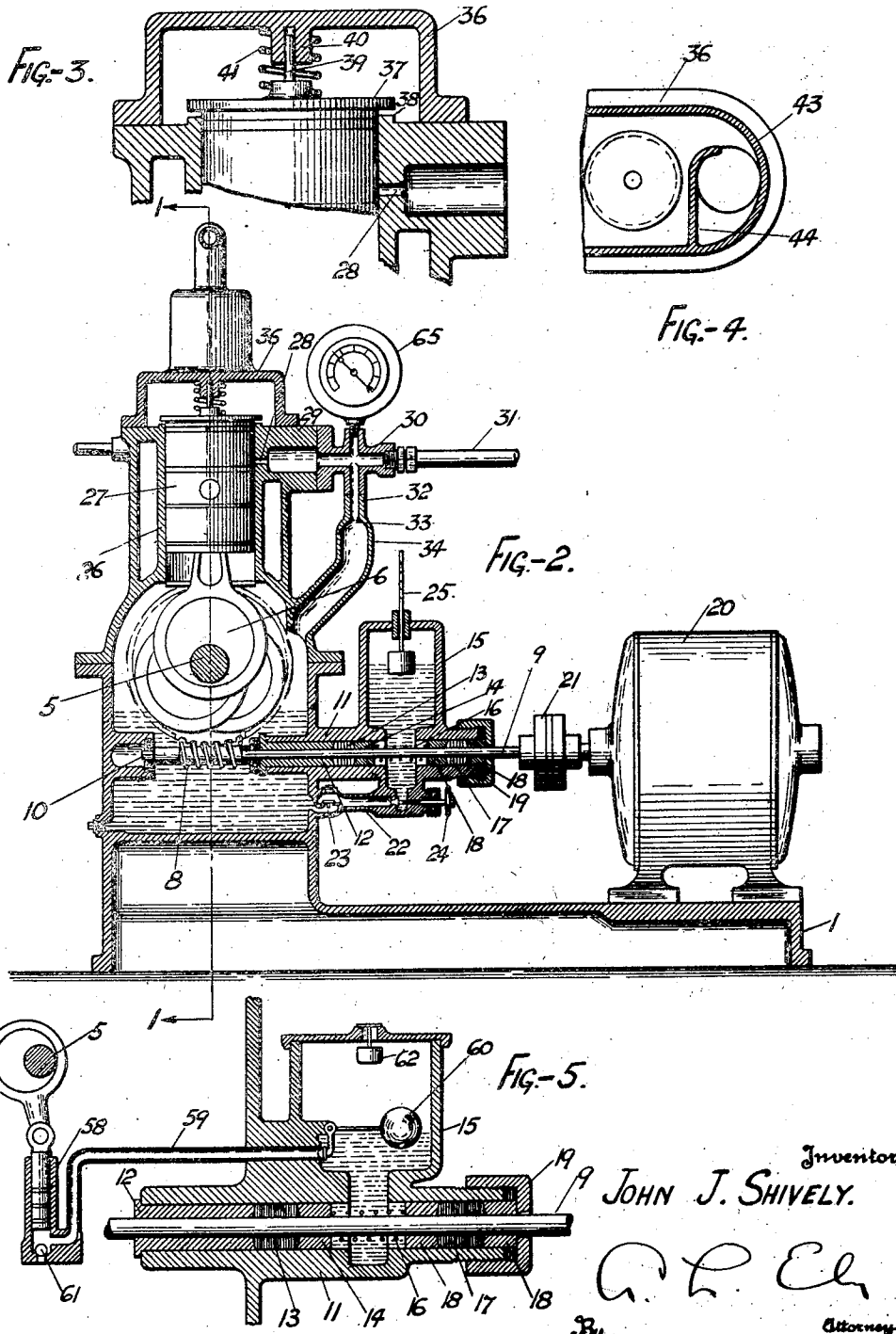
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UNITED STATES PATENT OFFICE.

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COMPRESSOR FOR REFRIGERATING APPARATUS.

Application filed January 31, 1924. Serial No. 689,710.

To all whom it may concern:

Be it known that I, JOHN J. SHIVELY, a citizen of the United States, and a resident of Brookville, county of Jefferson, State of Pennsylvania, have invented certain new and useful Improvements in Compressors for Refrigerating Apparatus, of which the following is a specification.

This invention relates to apparatus for compressing vapors for use in refrigerating plants. The apparatus is suitable for use with a great variety of refrigerants and is a successful and efficient apparatus for the purposes set forth.

The object of the present invention is to improve upon and simplify existing machines of this general type and to provide a practical operative machine without objectionable features. The present invention has for its object the construction and design of a machine which is suitable for household use or for use in refrigerating plants of all types. It is economical in operation and does not allow any of the gas used for refrigerating purposes to escape.

Other objects will be apparent to those skilled in the art, and it will be appreciated that changes and modifications may be made within the scope of the present invention.

In designing the machine provision has been made to insure a perfect operation of the compressing mechanism so that the cylinders will be cleared upon the stroke of the pump. The valves are simple in construction and cannot get out of order, and are so constructed that they will close without noise. Means are provided to clear the compressed gas of any oil or other foreign substance which it may have picked up in the apparatus. Means are also obtained for maintaining the crank shaft housing under a partial vacuum at all times so that the gas will not be liable to escape therefrom and so that any of the refrigerant which may find its way into the oil will boil off and be returned to the system. Means are also provided for sealing the point at which the drive shaft enters the casing.

In the drawings which show one embodiment of the invention:

Figure 1 is a longitudinal vertical section through the compressor and condenser, the line of section being indicated by the line 1—1 of Figure 2;

Figure 2 is a section on the broken line 2—2 of Figure 1;

Figure 3 is an enlarged detail of the valve mechanism;

Figure 4 is a section through the discharge port for the compressed gas on the line 4—4 of Figure 1; and

Figure 5 is a modification of the power shaft sealing means.

In the drawings, the apparatus is shown mounted upon a base or standard 1 upon the upper surface of which is formed the oil reservoir or crank shaft casing 2 in which there is maintained a supply of lubricating oil. At one end of the casing and spaced from the opposite wall are bearings 3 and 4, respectively, which support, in ball or roller bearings, the longitudinal crank shaft 5 on which are carried a plurality of eccentrics or crank portions 6. They are shown as three in number and spaced at 120° about the shaft, but the number and spacing may be changed to suit particular requirements, as will be understood.

At the end of the shaft beyond the bearing 4 is carried a worm gear 7 which is driven by a worm 8 on the power shaft 9. At its inner end the power shaft is seated in a thrust bearing 10 formed in the wall of the casing 2. The wall of the casing is formed with an elongated bearing 11 in which is situated a sleeve 12 through which the power shaft passes. Near the outer end of the sleeve is a packing 13 and over the packing is placed a sliding plug 14. Exteriorly of the sleeve is provided a supplementary reservoir 15 which is kept supplied with oil. The oil flows around the shaft and affords an effective seal for the shaft bearing. A spring 16 surrounds the shaft and bears against the plugs 14 and 18. The shaft 9 passes out of the reservoir through a similar packing 17 held between plugs 18 and adjusted and maintained under pressure by a screw threaded cap 19 on the outer end of the bearing, the cap serving to place the spring 16 under compression. The shaft is driven by the motor 20 through any suitable yielding connection 21.

In the form of the invention shown in Figure 2, the oil reservoir 15 is supplied with oil from the crank case through a passage 22 which is provided with a check valve 23 and with an adjustable needle valve 24. The height of the oil in the reservoir is indicated by the float 25. It will be observed that an oil seal is provided between the packings 13 and 17 under atmospheric

pressure. The manner in which the oil is forced from the crank case to the reservoir will be explained in a later portion of the specification.

5 Over the casing 2 is located the cylinder block 25^a in which are located the several cylinders 26. Each cylinder houses a piston 27 operated from the crank shaft or eccentric 6. As each piston reaches the lower
10 limit of its stroke it uncovers a port 28 which is supplied with the refrigerant through a manifold 29 which in turn receives its supply from a coupling 30, one side of which is connected with the supply
15 pipe 31. From the coupling 30 extends a by-pass 32 which terminates in a restricted opening 33 leading to an enlarged duct 34 into the upper portion of the crank case. The purpose of this construction is to maintain a partial vacuum within the crank case
20 which is accomplished by reason of the fact that the passage 34 is in communication with the intake side of the pump. The orifice 33 is small so that when pressure is
25 supplied to the crank case the escape thereof through this opening will be very slow. It is of sufficient size, however, to maintain the partial vacuum within the crank case and to return to the system gases finding their way
30 into the crank case. The partial vacuum within the crank case induces the boiling out of any refrigerant which may be carried into the oil. A further object in providing the small orifice 33 is to prevent any very
35 sudden drop in pressure in the crank case which might cause a violent boiling off of fluid with the possible drawing up of any lubricant into the intake passageways of the pump and to secure a complete elimination
40 of the oil from the slowly moving vapor as it ascends through the passage 34.

Surmounting the cylinder block is the head 36 in which is located the discharge passage from the pump and the valves for
45 the cylinders. Each valve is preferably in the form of a circular plate 37, which, when the pistons are withdrawn, rests upon a flange 38 around the top of the cylinder. The valve is guided in its movement by a
50 stem 39 which reciprocates in a vertical guide 40 depending from the head. A coil spring 41 surrounds the guide and holds the valve down upon its flange. The mechanism is so arranged that as the piston
55 reaches the upper limit of its stroke it passes beyond the upper end of the cylinder so as to clear it of all refrigerant. At the same time it contacts the valve plate and lowers it to its seat. In this manner noise of the
60 valve is eliminated. It will be observed in addition, that the valve mechanism is very simple and cannot get out of order.

65 The head 36 discharges into a separating chamber at one end thereof. This chamber is designated by the numeral 43 and the

passage from the head is so arranged that the gases pass into the chamber at a tangent. This result may be obtained in various ways, there being shown a transverse wall 44 so that the opening into the chamber is tangential thereto. 70

The chamber 43 is in the form of a cylinder and as the compressed gases are discharged into it tangentially, they are given centrifugal movement which causes the heavier oil to be separated from them and be deposited in the catch basin 45 at the base of the chamber. From the catch basin the oil is returned to the crank case through a by-pass 46. In the by-pass 46 is located
75 a needle valve 47. When it is desired to force oil from the crank case to the sealing reservoir 15, the valves 47 and 24 are opened and the pressure from the pump will force the oil through the passage 22 into the
80 reservoir. 85

The compressed gas, freed by the separator 46 of any oil or foreign substance which it might carry over, passes through a pipe 48, in which is located the check
90 valve 49 to the condenser 50. This condenser is in the form of a vertical cylinder closed at its upper end by a removable cover 51. Depending from the cover 51 is the cooling coil 52 which condenses the compressed gas so that it collects in liquid form
95 in the bottom of the condenser from which it is drawn through the pipe 53 to the usual expansion valve and brine tank or other cooling system and being returned in gaseous form through pipe 31. 100

It will be observed that the condenser coil is supported by and therefore may be removed with the cover for cleaning and repair purposes. A by-pass 54 connected to
105 the coil above the cover by a coupling 55 leads to the cooling jacket 56 for the pump.

As a substitute for the system by which the oil is supplied from the crank case by pressure, the arrangement shown in Figure
110 5 may be used. In this form of the invention a small pump 58 having a ball valve 61 and operated by an eccentric on the shaft 5, is situated within the crank case below the oil level. The pump delivers oil to the pipe
115 59 which discharges in the reservoir 15. A float valve 60 controls the flow of oil into the reservoir and a second float 62 may be mounted in the top of the reservoir. The
120 pump 58 is operating during the entire working of the apparatus. A fall in the level of the oil in reservoir 15 lowers the float 60, which permits the valve to seat and starts the pump drawing oil from the crank case
125 and forcing it past the float valve and into the reservoir. When the oil rises in the reservoir the float valve will rise and the pump will no longer draw oil from the crank case, and in this manner a constant
130 level of the sealing oil will be maintained.

Pressure gages 65 and 66 may be mounted on the intake coupling and the condenser, respectively.

It is believed that no extended description of the operation of this apparatus is necessary at this point. The refrigerant passes into the pump by the port 28, is compressed between the pistons and the valves and passes out through the separator 43 where any oil is extracted by the centrifugal action of the gas. The compressed gas flows into the condenser and is there condensed to liquid form for circulation to the point of refrigeration. The crank case is maintained under partial vacuum by the apparatus itself, which serves to prevent escape of the refrigerant. The drive shaft is sealed by the oil in the reservoir, which may be supplied as has been described. The device is closely sealed and gasketed at all other points so that it is leak-proof. The condenser is simple and easily cleaned and kept in repair.

It is obvious that other advantages are obtained as will be known to those skilled in the art and the invention is entitled to a fair scope within the meaning of the appended claims.

What is claimed is:

1. In a refrigerating device a pump, a crank case therefor, and means connected with the intake for the pump for maintaining the crank case under reduced pressure, said means comprising an enlarged duct communicating with the crank case and a

restricted orifice at the upper end of said duct.

2. In a refrigerating device, a pump, a crank case therefor, an enlarged by-pass from the interior of the crank case to the inlet for the pump whereby the crank case is maintained under reduced pressure, and a reduced fixed orifice near the inlet end of said by-pass to prevent passage of oil from the crank case to the intake.

3. In a refrigerating apparatus, a multiple cylinder compression pump, a crank case for said pump, a head into which compressed gas is discharged, a chamber leading from said head, and a passage tangential to said chamber for discharge of the compressed gas to the chamber.

4. In a refrigerating apparatus, a compression pump, a crank case for said pump adapted to contain lubricating oil, a chamber, a passage tangential to the chamber for discharge of the compressed gas thereto, a collecting basin at the bottom of said chamber, and a by-pass from said basin to the interior of the crank case.

5. In a refrigerating apparatus, a compression pump, a crank case for said pump adapted to contain lubricating oil, a chamber, a passage tangential to the chamber for discharge of the compressed gas thereto, a collecting basin at the bottom of said chamber, a by-pass from said basin to the interior of the crank case, and a valve in said by-pass.

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