Feb. 22, 1927. 1,618,333

L. B. GREEN

PUMP

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Fig. 1.

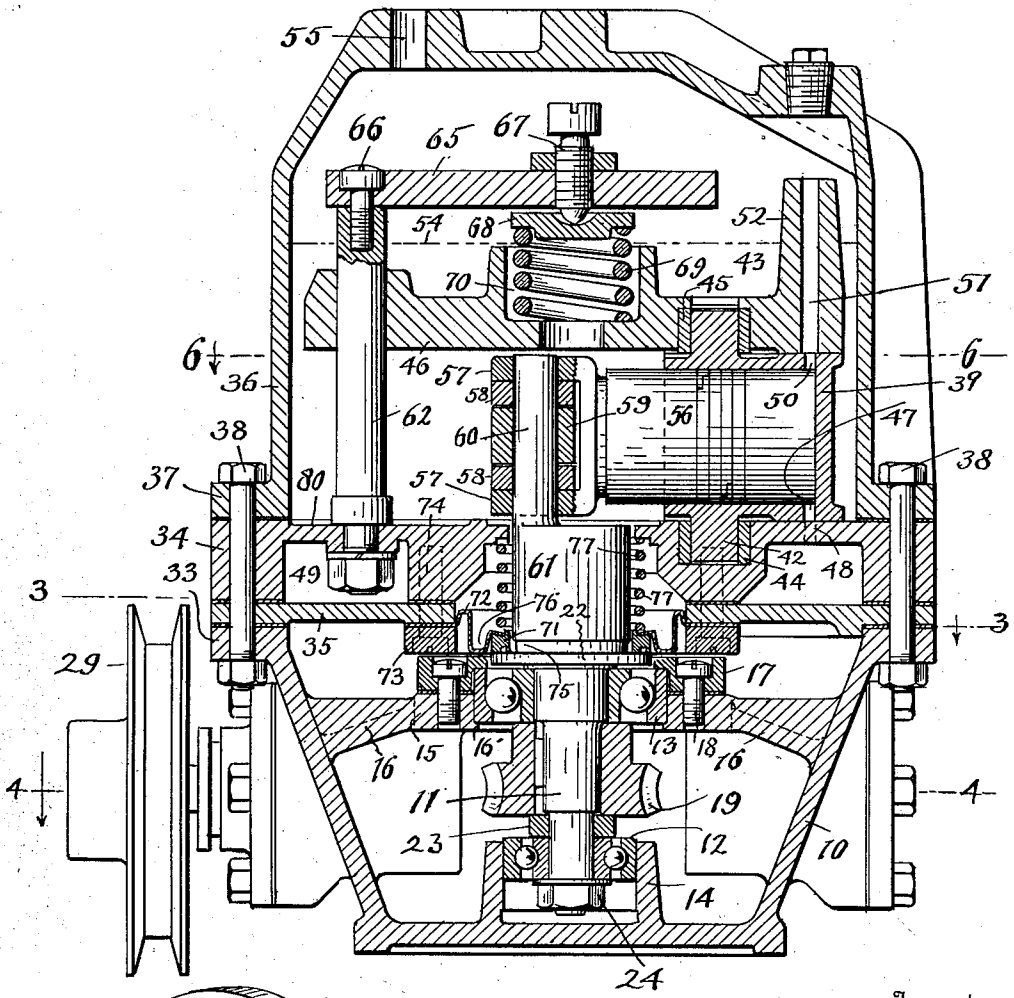
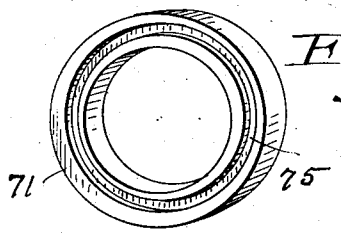


Fig. 7.



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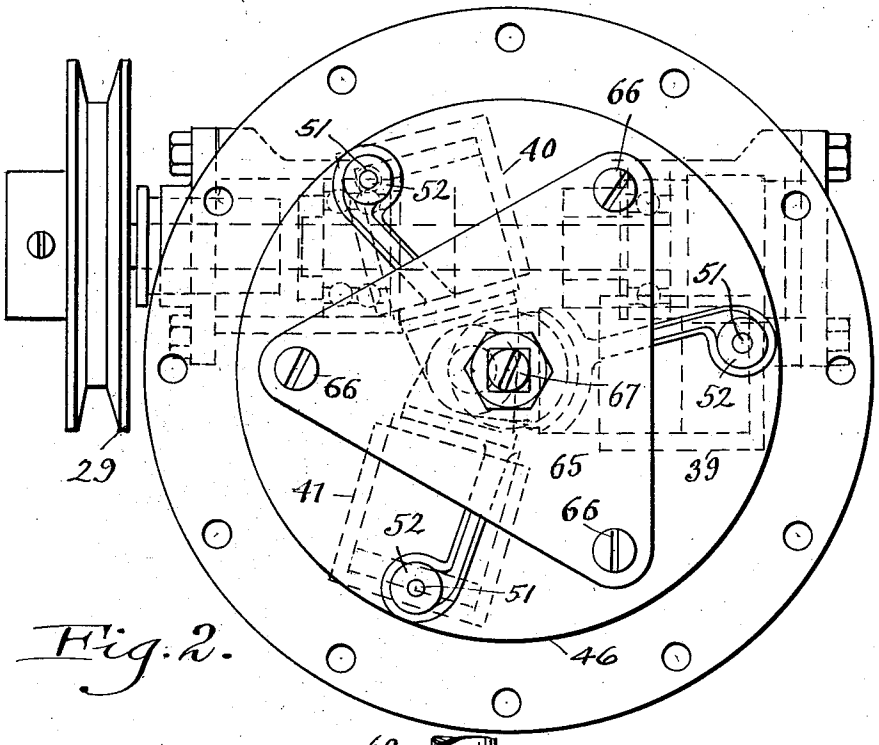


Fig. 2.

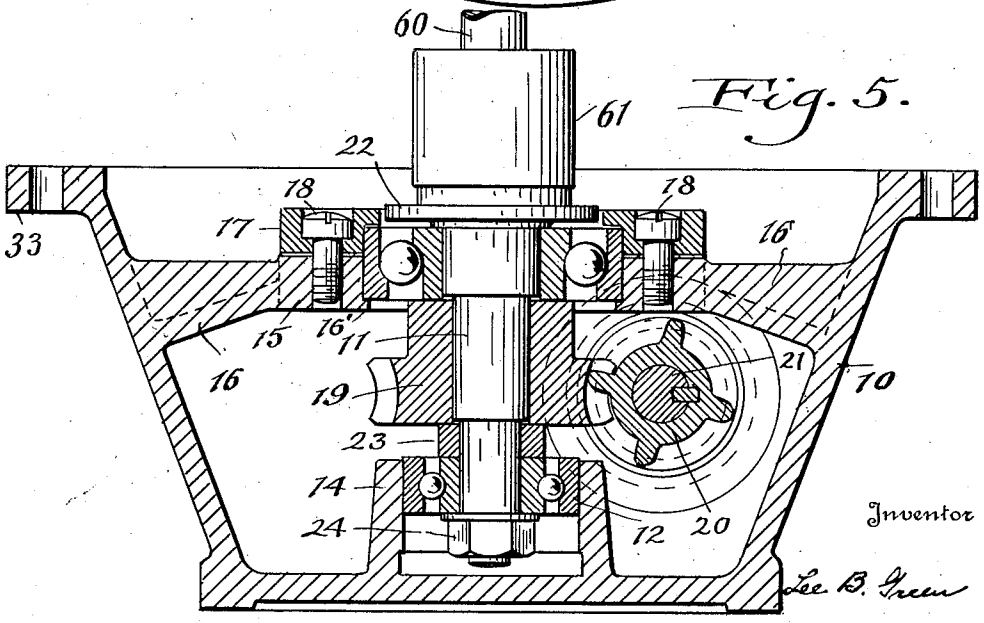


Fig. 5.

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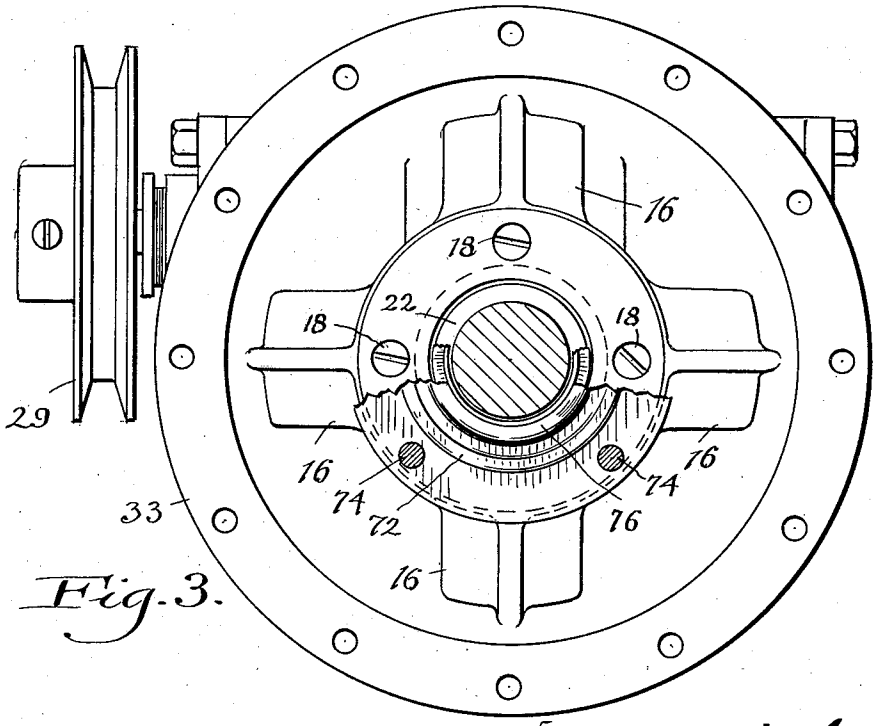


Fig. 3.

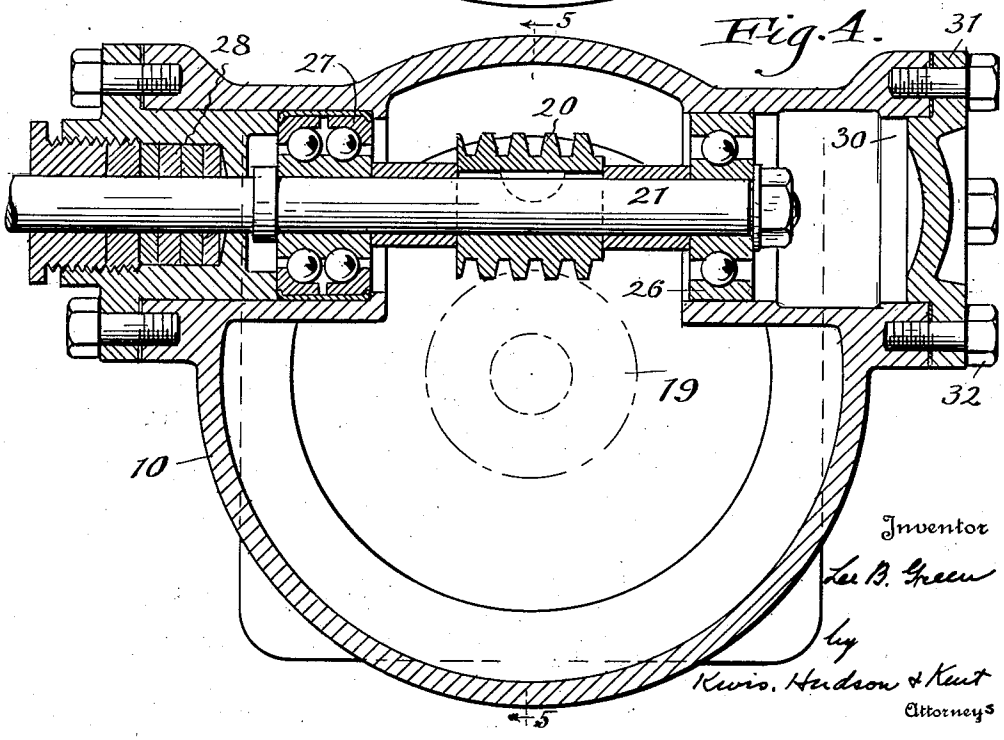


Fig. 4.

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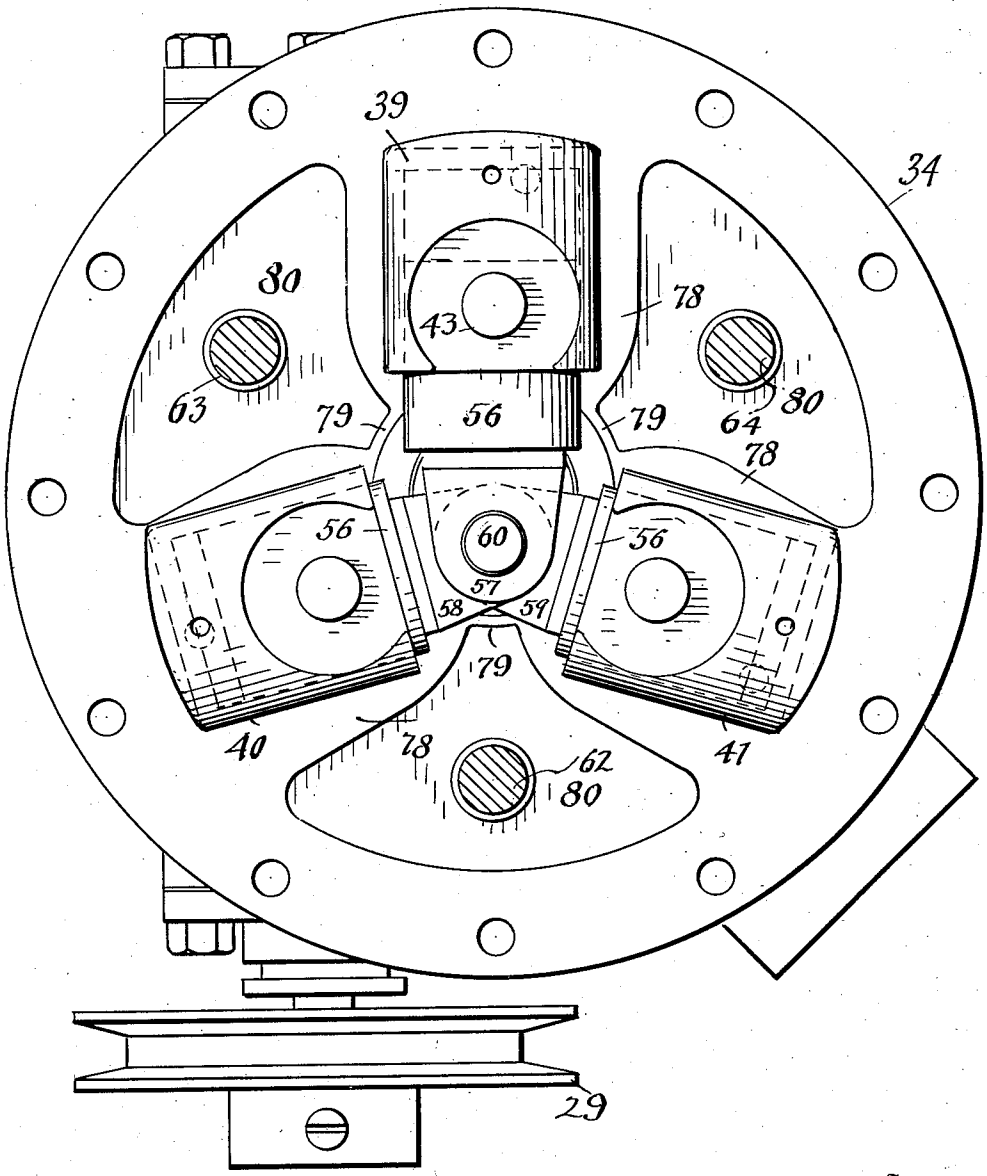


Fig. 6.

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Patented Feb. 22, 1927. 1,618,333

UNITED STATES PATENT OFFICE.

LEE B. GREEN, OF LAKEWOOD, OHIO, ASSIGNOR OF ONE-THIRD TO EARL L. JONES, OF CLEVELAND, OHIO; ONE-THIRD TO CASSIUS L. FINNEY, OF CANTON, OHIO; AND ONE-THIRD TO CONRAD B. KRAUSE, OF CLEVELAND, OHIO.

PUMP.

Application filed April 10, 1925. Serial No. 22,117.

This invention relates to pumps and more especially to pumps for use in connection with refrigerating apparatus for compressing the gas which is used as the refrigerant. The present invention is an improvement over the invention described and claimed in my earlier application No. 697,264, filed March 6, 1924.

It is one of the objects of the invention to provide an improved construction embodying a plurality of oscillating cylinders so arranged that the efficiency of the pump will be maintained over long periods of use. A further object of the invention is to provide a construction, of the type referred to, that may be quickly and easily assembled and disassembled and in which the moving parts are arranged in a sectional housing, the sections of which are of simple design, easily machined and so secured together that they may be readily disassembled when necessary. A further object of the invention is to provide a pump construction, of the type referred to, in which the operating shaft is mounted in bearings in a section of the housing that constitutes a separate unit permitting the cylinders, pistons and high and low pressure chambers to be removed without disturbing the shaft or its bearings. Another object of the invention is to provide an improved form of sealing means for preventing leakage from the high pressure chamber along the shaft to the chamber containing the shaft bearings.

Other objects of the invention and the features of novelty will be apparent from the following description taken in connection with the accompanying drawings, of which:

Figure 1 is a longitudinal section through a pump embodying my invention;

Fig. 2 is a plan view with the upper housing section removed.

Fig. 3 is a section substantially on the line 3—3 of Fig. 1;

Fig. 4 is an enlarged section on the line 4—4 of Fig. 1;

Fig. 5 is a longitudinally section on the line 5—5 of Fig. 4;

Fig. 6 is an enlarged section on the line 6—6 of Fig. 1; and

Fig. 7 is a perspective view of a novel form of sealing ring which I employ.

Referring to the drawings 10 indicates the base section of a housing having a shaft 11 arranged vertically therein and supported by the bearings 12 and 13. The bearing 12 is arranged in a sleeve 14 which projects upwardly from the bottom of the housing section 10 and the bearing 13 is a combined radial and thrust bearing that is carried in a ring 15 that is formed integral with the housing section 10 and supported therein by the brackets 16. The ring 15 has an internal flange 16′ which engages one side of the bearing 13, the bearing being clamped against this flange by means of the ring 17 and the screws 18. A worm gear 19 is keyed to the shaft 11 and driven by means of a worm 20 on the driving shaft 21. The inner member of the bearing 13 engages with a collar 22 on the shaft 11, being pressed thereagainst by the gear 19 which engages the opposite side of the bearing. A spacer 23 is arranged on the shaft 11 between the gear 19 and the bearing 12 and a nut 24 on the lower end of the shaft secures the parts in position, as best shown in Fig. 5. The shaft 21 is supported in the bearings 26 and 27, the latter being a combined radial and thrust bearing. The shaft 21 extends through a stuffing box 28 to the exterior of the housing section 10 and has secured on the outer end thereof a driving pulley 29 which may be driven from a motor or other source of power by means of a belt. Adjacent to the bearing 26 the housing section 10 has an opening 30 through which the shaft 21 may be removed, this opening being closed by a cover plate 31 which is secured in position by the bolts 32.

The housing section 10 has a laterally extending flange 33 which supports a hollow partition section constituting the low pressure chamber of the pump, this partition section consisting of the member 34 and the plate 35 Above the partition section there is a dome-shaped section 36, of the housing, having a flange 37. Bolts 38 extend through the flanges 33 and 37 and the member 34 and the plate 35, as shown in Fig. 1 and serve to clamp all of these sections together. The bolts 38 are so located as to be readily removable and permit the demounting of the several sections of the housing. In the specific embodiment of the invention illustrated in the drawings there are three horizontally arranged oscillating cylinders 39,

40 and 41 each of which is provided with a pair of trunnions, one on its lower side and the other on its upper side, one of the lower trunnions being indicated at 42, in Fig. 1 and one of the upper trunnions being indicated at 43. The trunnions 42 engage bearings 44 in the member 34 and the trunnions 43 engage bearings 45 in the pressure plate 46 that rests upon the upper sides of the cylinders 39, 40 and 41.

Each of the cylinders 39, 40 and 41 has a port 47 in its lower side, adjacent the end of the cylinder which cooperates with a port 48, in the upper wall of the member 34, for the purpose of controlling the intake from the low pressure chamber 49 to the interior of the cylinder. The cylinders are also provided with ports 50 in their upper walls which are adapted to communicate with ports 51 in the pressure plate 46 and control the discharge of compressed gas from the cylinders. The plate 46 is formed with upward projections 52, one for each of the ports 51, for the purpose of conveying the compressed gas to a point above the surface of the lubricating oil with which the high pressure chamber 53 is filled to a point slightly above the upper surface of the plate 46 as, for example, the level of the line 54. The housing section 36 has an outlet opening for the compressed gas at 55 and a pipe may be secured in this opening and run to the apparatus with which the pump is associated. Each of the cylinders 39, 40 and 41 contains a piston 56 and these pistons have yokes 57, 58 and 59, respectively, that engage an eccentric pin or crank 60 on the enlarged head 61 at the upper end of the shaft 11.

In order to guide the pressure plate 46, I provide rods or guides 62, 63 and 64 which are secured in the member 34, project upwardly therefrom, and have sliding engagement with the plate 46. The upper ends of the guides 62, 63 and 64 carry a triangular plate 65, which is secured thereto by the screws 66. This plate 65, carries at its center, a set screw 67 the lower end of which engages a small plate 68 against which abuts the upper end of a spring 69, the lower end of this spring being seated in a cavity 70, at the center of the pressure plate 46, so that the spring forces the pressure plate against the cylinders 39, 40 and 41 and the latter against the member 34, thereby maintaining tight joints at the points of relative movement of these parts.

In order to seal the space between the shaft 11 and the partition formed by the members 34 and 35, I provide a ring 71, of anti-friction material, such as bronze, on the upper side of the collar 22 and secure to the upper side of this ring, by soldering or otherwise, a flexible metal diaphragm 72 the outer peripheral portion of which is clamped in sealing engagement with the lower side of the plate 35 by means of a ring 73 and screws 74. The face of the ring 71, which contacts with the collar 22, has a groove 75 therein that is arranged eccentric to the axis of the ring and filled with a lubricating composition, which I prefer to make in the form of a paste from beeswax, pulverized Babbitt metal and graphite. The eccentricity of the groove 75 insures adequate lubrication of practically the entire surface of the joint between the ring 71 and the collar 22.

The flexible diaphragm 72 is preferably made as shown in Fig. 1, with a groove 76 in its upper side, this groove being adapted to trap any of the condensed refrigerant which accumulates in the high pressure chamber, when the pump is shut down, and drains onto the diaphragm, the nature of the refrigerant being such that if it were not trapped and were allowed to reach the joint between the ring 71 and the collar 22, it would find its way through this joint into the gear chamber and cause a serious deterioration of the mechanism therein.

The pressure in the high pressure chamber 53, acting on the upper surface of the diaphragm 72, serves to press the ring 71 against the collar 22 and maintain a tight joint therebetween and, since the suction in the pump cylinders is never applied to the diaphragm, there is no possibility of the pump drawing air into the apparatus through the joint between the ring 71 and the collar 22, this arrangement, therefore, overcoming one of the serious objections to pumps as heretofore constructed. As a precautionary measure and to insure proper contact between the ring 71 and the collar 22, when there is no pressure in the chamber 53, I provide a spring 77 around the enlargement 61 of the shaft 11, the lower end of this spring engaging the ring 71 and the upper end engaging the member 34, as clearly shown in Fig. 1.

It will be noted from Figs. 1 and 6 that raised surfaces 78 are provided on the upper side of the member 34 on which the cylinders 39, 40 and 41 operate. These surfaces 78 have their inner ends connected by short ribs 79, thus forming shallow pockets 80 on the upper side of the members 34, between the cylinders, these pockets serving as means for trapping some of the condensed refrigerant that accumulates in the high pressure chamber. It will be understood that in the operation of a pump of this character, whenever the pump is shut down some of the compressed refrigerant condenses and in order to provide means for collecting this condensed refrigerant and keeping it away from the vital parts of the pump, I have provided the pockets 80, and the groove 76 in the upper side of the dia-

phragm 72. While these places that I have provided for the accumulation of condensed refrigerant are of relatively small capacity, they are ample for the purpose since, in any case, there is only a relatively small amount of condensation to be taken care of. When the pump is started up again the heat that is generated therein will evaporate the accumulations of condensed refrigerant.

Having thus described my invention, what I claim is:

1. In pumps, the combination of a support, a plurality of oscillating cylinders bearing against said support, a piston in each of said cylinders, a shaft having a crank operatively connected with said pistons, a floating member engaging the sides of said cylinders opposite said support and having ports with which ports in said cylinders cooperate, said cylinders being provided with trunnions engaging bearings in said support and said member, respectively, guiding means independent of said trunnions for holding said member from rotating and on which it may slide axially of said shaft, and spring means for pressing said member against said cylinders.

2. In pumps, the combination of a support, a plurality of oscillating cylinders bearing against said support, a piston in each of said cylinders, a shaft having a crank operatively connected with said pistons, a floating member engaging the sides of said cylinders opposite said support and having ports with which ports in said cylinders cooperate, said cylinders being provided with trunnions engaging bearings in said support and said member, respectively, a plurality of guide rods projecting from said support through said member to prevent rotation of the latter and on which the member is slidable axially of said shaft, a plate carried by said rods, and a spring between said plate and said member for pressing the latter against said cylinders.

3. In pumps, the combination of a support, a plurality of oscillating cylinders bearing against said support, a piston in each of said cylinders, a shaft having a crank operatively connected with said pistons, a floating member engaging the sides of said cylinders opposite said support and having ports with which ports in said cylinders cooperate, said cylinders being provided with trunnions engaging bearings in said support and said member, respectively, a plurality of guide rods secured to said support between said cylinders and extending parallel with said shaft and through said member to hold the latter against rotation but permit it to slide axially of the shaft, a plate carried by said rods, a spring between said plate and said member, and adjusting means on said plate for varying the pressure of said member on said cylinders.

4. In pumps, the combination of a hollow support forming a low-pressure chamber having ports through one of its walls, a plurality of oscillating cylinders resting on said support and having ports certain of which are adapted to register with the first-mentioned ports to control the intake of said cylinders, a piston in each of said cylinders, a shaft extending through said support and having a crank operatively connected with said piston, a floating member engaging the sides of said cylinders opposite said support and having ports which are adapted to register with certain of said cylinder ports to control the discharge from said cylinders, said cylinders being provided with trunnions engaging bearings in said support and said member, respectively, guiding means independent of said trunnions for holding said member against rotation and on which it may slide axially of said shaft, a plate carried by said guiding means, a spring between said plate and said member for pressing the member against said cylinders, and a housing secured on said support and enclosing the other parts mentioned and forming with the support a high-pressure chamber into which the discharge from said cylinders is received.

In testimony whereof I affix my signature.

LEE B. GREEN.