

Aug. 2, 1932.

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1,869,362

LUBRICATING SYSTEM FOR PISTON MACHINES

Filed Dec. 23, 1929

2 Sheets-Sheet 1

Fig. 1.

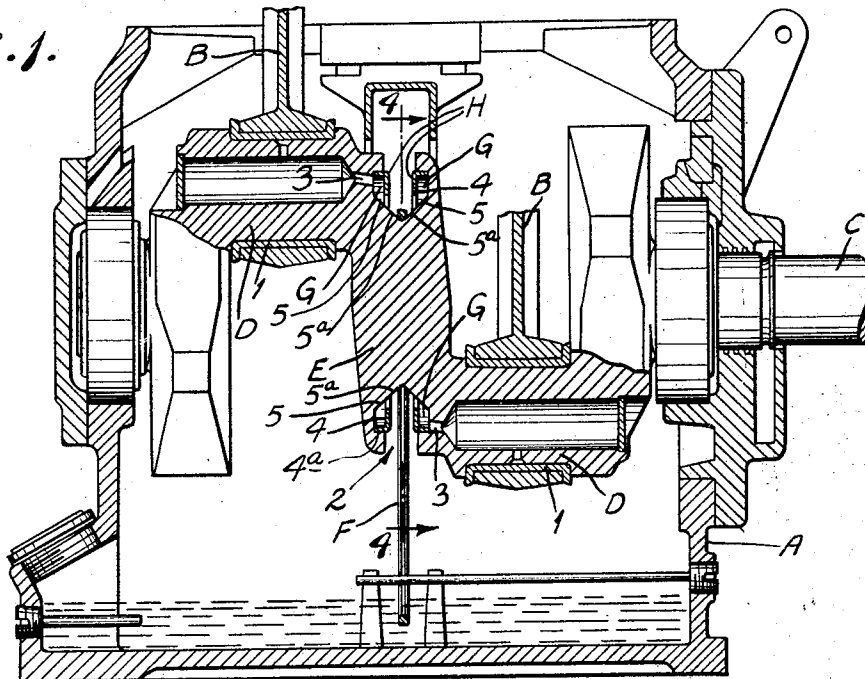
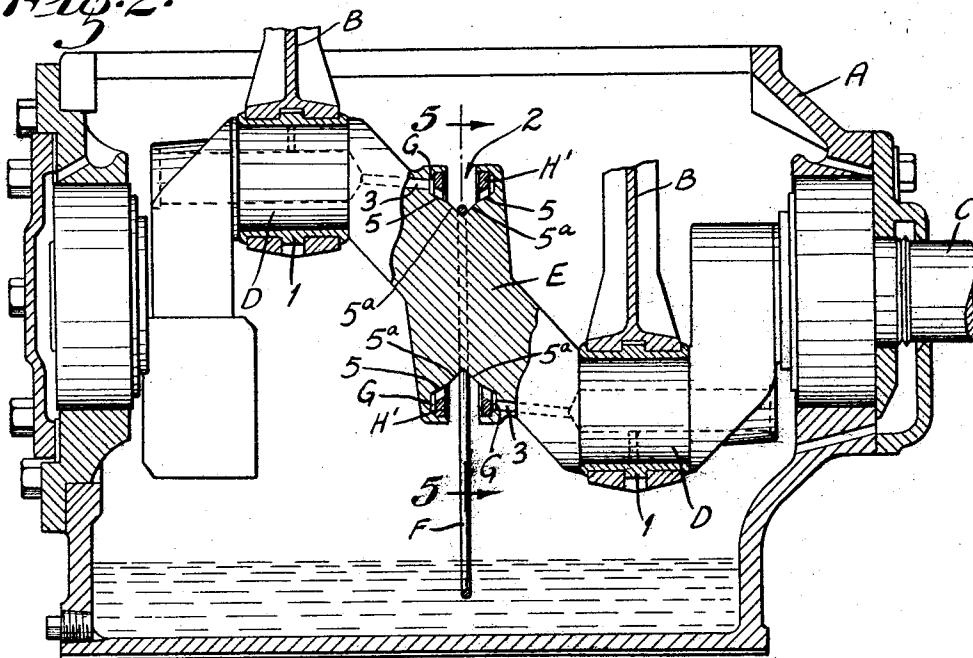


Fig. 2.



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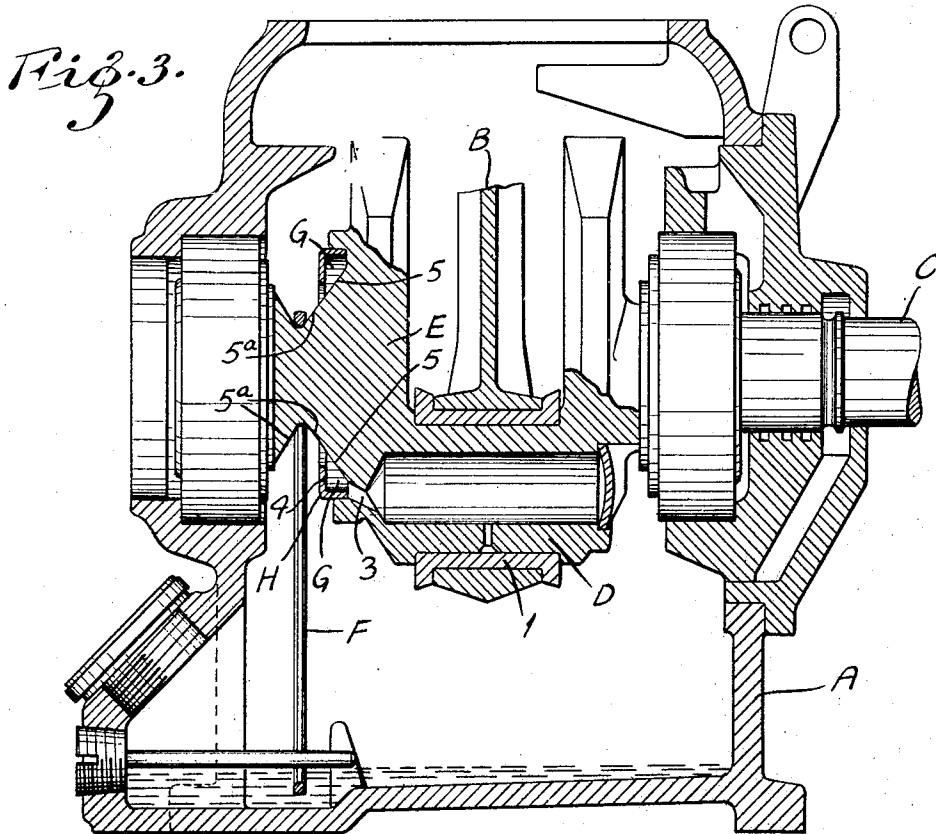
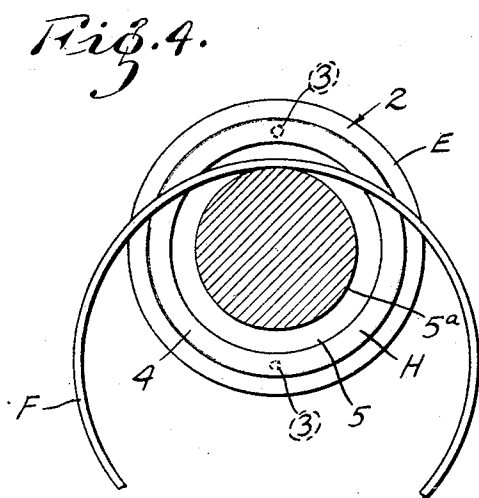
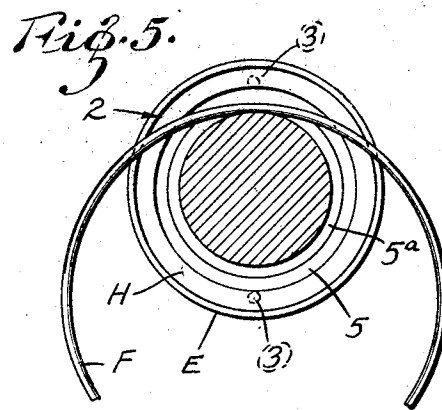
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UNITED STATES PATENT OFFICE

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LUBRICATING SYSTEM FOR PISTON MACHINES

Application filed December 23, 1929. Serial No. 416,017.

This invention relates to a lubricating apparatus for piston machines of the general type described in the pending application for patent of Edwin H. Steedman, Serial No. 196,104, filed June 2, 1927, which has matured into Patent No. 1,847,418.

The lubricating apparatus forming the subject-matter of the said Steedman application comprises a rotatable member combined with the crank shaft of the machine so as to revolve with the same and arranged at right angles to the longitudinal axis of said shaft, a substantially annular centrifugal pressure chamber or oil pocket in said rotatable member, open at one side and having its outer wall undercut, and means for automatically delivering oil to said chamber or pocket when the machine is in operation, the centrifugal force produced by the rotary movement of the member in which said chamber is formed acting in conjunction with the walls of said chamber to create pressure that is used to force oil out of said chamber through a duct or passageway that leads to a crank pin on the crank shaft of the machine.

The main object of my invention is to simplify the construction and reduce the cost of manufacture of a lubricating apparatus of the general type above described.

To this end I propose to construct the centrifugal pressure chamber or oil pocket in the rotatable member on the crank shaft, by forming a substantially annular groove in said member, open at one side, and then attaching or combining with said member in any preferred way, a separate part that in effect constitutes an undercut outer wall for said chamber that functions in the same way as the undercut outer wall of the pressure chamber, pocket or oil groove described in the said Steedman application.

Figure 1 of the drawings is a longitudinal sectional view of a lubricating apparatus embodying my invention, designed for use in a two cylinder compressor.

Figure 2 is a longitudinal sectional view illustrating another form of my invention.

Figure 3 is a longitudinal sectional view of a lubricating apparatus for a single cylinder compressor, equipped with a centrifugal pres-

sure chamber or oil pocket of the same kind as that shown in Figure 1.

Figure 4 is a transverse sectional view, taken on the line 4—4 of Figure 1; and

Figure 5 is a transverse sectional view, taken on the line 5—5 of Figure 2.

In the drawings which illustrate the preferred manner of constructing a lubricating apparatus embodying my invention, A designates the crank case of a compressor, internal combustion engine, reciprocating pump or other machine equipped with one or more cylinders whose pistons are joined by connecting rods B to crank pins on the crank shaft C of the machine, each of the connecting rods being provided at its lower end with a bearing 1 that surrounds a crank pin D on the crank shaft. The crank shaft C has associated with the same a rotatable member E that can either be formed integral with the crank shaft or detachably connected to the crank shaft. In the case of a multiple cylinder machine the member E can consist of a substantially disk-shaped portion on the crank shaft that is located between adjacent connecting rods and which forms part of the crank arms on the crank shaft that carry the crank pins D, as shown in Figure 1, or the member E may consist of a substantially disk-shaped part arranged mid-way of an inclined portion of the crank shaft whose opposite ends are attached to the crank pins, as shown in Figure 2. In the case of a single cylinder machine the member E is arranged adjacent one end of the crank shaft of one side of the connecting rod, as shown in Figure 3.

The member E is preferably arranged at right angles to the longitudinal axis of the crank shaft and is provided with either one or a plurality of centrifugal pressure chambers or oil pockets, depending upon whether the apparatus is designed for use with a multiple cylinder or a single cylinder machine. Means is provided for automatically feeding oil to said pressure chamber or chambers, and a duct or passageway is associated with each of said chambers, so as to deliver oil from the same to a crank pin of the machine. In the form of my invention shown in Figure 1 the peripheral edge of the member E is bifur-

cated so as to form a slot 2 that is adapted to receive an oil ring F whose lower portion is normally submerged in a bath of oil in the crank case A, said oil ring being used to automatically deliver oil from said bath to two centrifugal pressure chambers or oil pockets G in the member E that communicate with oil distributing ducts or passageways 3 which lead to the connecting rod bearings 1. Any other suitable means than the ring F may be used to supply or deliver oil to the pressure chambers G.

In order to simplify the construction and reduce the cost of manufacturing the apparatus, each of the pressure chambers or oil pockets G is constructed by forming an annular groove in the member E at one side of the slot 2 in said member, and then attaching to said member E a part that forms a partial closure for the outer side of said groove and which in effect forms an undercut outer wall for the chamber G. In the form of my invention illustrated in Figure 1 the part just referred to consists of a split ring H of angle shape in cross section whose horizontal flange is pressed into tight engagement with the outer wall of the annular groove formed in the member E and whose vertical flange 4 projects inwardly towards the longitudinal axis of the crank shaft, so that it acts as a partial closure for the outer side of the pressure chamber or oil pocket G. The inner wall 5 of the annular groove formed in the member E is inclined outwardly and is preferably so disposed that it forms a continuation of an outwardly inclined oil distributing surface 5^a on the member E located at the inner end of the slot 2 in said member E and disposed in concentric relation with the axis of rotation of the member E. The oil delivering ring F rests on and is in direct contact with said oil distributing surface 5^a. When the machine is in operation the oil ring F carries oil upwardly from the bath of oil in the crank case, onto both of the concentrically-disposed, inclined oil distributing surfaces 5^a at the inner end of the slot 2 in the member E, and the centrifugal force produced by the rotary movement of said member E causes said oil to flow upwardly over the surfaces 5^a, and thence into the pressure chambers G in the member E. The undercut or inwardly inclined outer walls 4^a of the chambers G effectively prevent the oil in said chambers from escaping through the open sides of the same, and the pressure that is created in the chambers G by the centrifugal force causes the oil in said chambers to be forced out of same through the ducts or passageways 3 that lead to the crank pins D and the connecting rod bearings that surround said crank pins.

Instead of forming the undercut or inwardly inclined outer walls of the centrifugal pressure chambers G from angle shaped rings H that are pressed into the annular grooves

formed in the member E, said undercut walls may be formed by means of split expansion rings H', similar to the conventional piston rings, that are arranged in the annular grooves in the member E at opposite sides of the slot 2 in said member, as shown in Figure 2, said rings H' being so proportioned that they serve as partial closures for the outer sides of the annular grooves in the member E into which oil is supplied automatically by centrifugal force, from the concentric, outwardly inclined oil distributing surfaces 5^a to which oil is delivered by the ring F.

By constructing the centrifugal pressure chambers or oil pockets in the member E in the manner above described, I overcome the necessity of forming parallel inclined surfaces at the inner and outer sides of the annular grooves in said member, thereby simplifying the construction of the apparatus and reducing the cost of manufacturing the same. As previously stated, the apparatus illustrated in Figure 3 is constructed in the same manner as the apparatus shown in Figure 1, but it is designed for use in a single cylinder compressor. Due to the fact that the annular member H which is used to form the undercut or inwardly inclined outer wall of the centrifugal pressure chamber is located adjacent one end of the crank shaft, and on the outside of the crank arm on said shaft, it is not necessary to provide said member with a split, as in the structure shown in Figure 1.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a machine of the character described, a crank shaft provided with a crank pin, a rotatable member that revolves with the crank shaft, provided with an open-sided pressure chamber formed partly by a substantially annular groove in said member that is open at one side, a split ring in said groove that forms an undercut or inwardly-projecting outer wall that only partially closes said chamber, an oil distributing surface on said member disposed in concentric relation with the axis of rotation of said member, for feeding oil into said chamber at a substantially definite rate when said member is in operation, means for supplying oil to said distributing surface, and a duct or passageway leading from said chamber to the crank pin.

2. In a machine of the character described, a crank shaft provided with a crank pin, a rotatable member that revolves with said crank shaft, provided with an open-sided pressure chamber formed partly by a substantially annular groove in said member that is open at one side, an outwardly inclined wall at the inner side of said groove disposed in concentric relation with the axis of rotation of said member, a split ring combined with said rotatable member so as to

form a partial closure for the open side of said groove, means for supplying oil to the concentric, outwardly-inclined wall of said groove, and means for delivering oil from the closed inner side of said chamber to the crank pin.

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3. In a machine of the character described, a crank shaft, a rotatable member that revolves with the crank shaft, provided with an open-sided pressure chamber formed partly by a substantially annular groove in said member that is open at one side, a ring positioned inside of said groove so as to form a partial closure for the open side of said pressure chamber, means for supplying oil to said chamber by centrifugal force, and means for delivering oil from said chamber to a part that requires lubrication. 70
4. In a machine of the character described, a crank shaft provided with a crank pin, a rotatable member that revolves with the crank shaft, provided with an open-sided pressure chamber formed partly by a substantially annular groove in said member that is open at one side, a ring positioned inside of said groove so as to form a partial closure for the open side of said pressure chamber, an oil distributing surface on said member disposed in concentric relation with the axis of rotation of said member for feeding oil into said chamber when said member is in operation, an oil supplying device partially submerged in a bath of oil and contacting with said oil distributing surface, and means for delivering oil from said chamber to the crank pin. 75
5. In a machine of the character described, a crank shaft provided with a crank pin, a rotatable member that revolves with the crank shaft, provided with a slot that has an outwardly inclined oil distributing surface at its inner end disposed in concentric relation with the axis of rotation of said member, means for automatically delivering oil to said distributing surface from a bath of oil, an annular groove in one of the side walls of said slot that forms a centrifugal pressure chamber provided with an inclined inner wall that forms a continuation of said concentric oil distributing surface, a split ring arranged in said groove so as to form an undercut or inwardly inclined outer wall that only partially closes the open side of said chamber, and an oil distributing duct or passageway leading from said chamber to the crank pin. 80
6. In a machine of the character described, a crank shaft provided with a crank pin, a rotatable member that revolves with the crank shaft, provided with an open-sided pressure chamber formed partly by a substantially annular groove in said member that is open at one side, a split expansion ring arranged in said groove, so as to form an undercut or inwardly inclined outer wall that par- 85